TOWARD AN EVIDENCE-INFORMED, THEORY-DRIVEN MODEL FOR CONTINUING MEDICAL EDUCATION

by

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Abstract

TOWARD AN EVIDENCE-INFORMED, THEORY-DRIVEN MODEL FOR CONTINUING MEDICAL EDUCATION

This thesis develops the basis for an evidence-informed, theory-driven educational model for planning, implementing and evaluating continuing medical education (CME). Using an historical and conceptual analysis the author argued current CME educational planning models, based on Tyler's Curriculum Model, failed to build a systematic body of knowledge to improve learning and teaching and are founded on historical, structural, organizational and pedagogical factors that arose from research and beliefs about learning prevalent at the turn of the twentieth century. Using a case study of a three-year province-wide, evidence-informed, multi-agency, comprehensive education program to enhance family and emergency physicians' knowledge and skills regarding the diagnosis and management of whiplash-associated disorders, the thesis demonstrates the feasibility and adaptability of using the PRECEDE-PROCEED Model for CME. The PRECEDE-PROCEED Model is a community-oriented and epidemiological-based educational planning model that provides a systematic approach to identifying and organizing contextual factors influencing knowledge uptake and knowledge utilization. The case study provides a basis for modifying the PRECEDE-PROCEED Model as a tool for planning, implementing and evaluating CME programs. The changes are intended to assist CME planners in integrating behavioural and non-behaviour factors with theory and best practices in the actual “curriculum” or intervention-program design. In addition, the proposed modification to the PRECEDE-PROCEED Model adheres to the standards established by the Joint Committee on Standards for Educational Evaluation as to what a
comprehensive evaluation should address. Based on the case study, the thesis recommends a modification to the current PRECEDE-PROCEED model of health promotion that provides a clearer conceptual understanding of the structure, components and theoretical underpinnings of an emerging evidence-informed, theory-based curriculum model.
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Chapter One
Introduction

Statement of the Problem

During the past forty years the continuing medical education (CME) community has been continually challenged to be more effective, accountable and responsive to an expanding group of stakeholders concerned with health care issues. (1-5) These new stakeholders include all levels of government, allied health professionals, health policy decision-makers, business, organized labour, consumers, lawyers, international CME, undergraduate and graduate medical educators, CME researchers, and professional education specialists. (6;7)

The CME leadership is increasingly under pressure from within and outside the profession for CME to: (a) improve the quality and cost-effectiveness of health care (8), (b) address priority health issues informed by current population health data rather than just those needs identified by physicians (3-5;8;9), (c) reduce medical error and physician incompetence (6;7), (d) encourage physician, allied health professional and other stakeholder participation in CME planning (4;6), (e) improve the relevance of programs offered (3), (f) improve pedagogical practices and provide a greater variety of proven efficacious education interventions (4) pp. 10-11 (6) p. 212, (g) create a more comprehensive ‘continuing’ education program, instead of the current practice of ‘episodic instruction’ (9) and, (h) conduct more intervention and qualitative research to identify factors that enhance or hinder behaviour change. (10;11)

System-based Failure in Planning, Implementation and Evaluation

Critics of current educational practices in medicine, including leaders in the CME field, have argued that traditional ways of planning, delivering and evaluating CME
programs or activities have failed to provide sufficient information to build a coherent body of knowledge to improve the efficacy of CME. Most CME programs in the field are not systematically evaluated, and until recently, most CME providers primarily used self-report satisfaction evaluations, variations on the 'happiness index', providing feedback on the participants' level of satisfaction of the facilities, audio-visual, speaker presentations and program management. (4;5;12;13) Changes to accreditation policies in the late 1980s and early 1990s have resulted in CME providers collecting additional evaluation information, such as asking attendees to evaluate whether the CME session or activity fulfilled explicit learning objectives. However, there is little research demonstrating that these program evaluation changes have enhanced learning, led to program improvement, or informed CME providers how to plan, implement and evaluate more effective CME resulting in changes in clinical practice behaviour and improvements in patient health outcomes.

In the 1970s the CME debate focused on whether CME programs or activities were effective in improving the competence and performance of physicians and whether they resulted in improvements of health outcomes for society. (5;8;14) Unfortunately the development and implementation of systematic, well-designed research is relatively new in the field of CME. In a comprehensive review of 238 evaluation studies between 1935 and 1982, Davis, Haynes et al. (15) found 71% of the studies were inadequate descriptive or before-after designs, most studies suffered from methodological problems with little attention or reporting on evaluation instrument development and testing, and underreporting on the populations studied and had deficiencies in statistical analysis. (16)

The call to demonstrate the efficacy of CME gave rise to hundreds of randomized controlled trials investigating the overall value of CME programs through summative
measures (achievement scores, change in clinical behaviour). However, little attention was paid to program development or theory related to identifying determinants of behaviour change (17). Literature reviews in the 1980s provided the CME community with strong evidence that some CME interventions effect physicians’ knowledge in the test situation, less robust evidence that some CME interventions facilitated changes in clinical practice, and only weak evidence that CME altered health outcomes. (18) The increased use of Randomized Controlled Trials (RCT) designs in examining the efficacy of CME in the 1980s, coupled with the growing interest in evidence-based medicine in the 1990s and the application of meta-analytic and evidence-based synthesis procedures to the CME literature, resulted in a number of systematic reviews investigating the impact of CME interventions on physicians’ knowledge, physicians’ clinical routines and patient health outcomes. These systematic evidence-based reviews (18;19) found there is no one magic bullet that leads to knowledge transfer and changes in physician behaviour, and that a combination of best-evidence educational strategies and those considered to be most promising would be more effective. It was also apparent that the commonsense belief that learning was a rational process of experts teaching practitioners, primarily by lecture, did not usually lead to the acquisition of new or updated knowledge resulting in practice change. (20;21)

Need for a Theory-Informed Conceptual Framework to Improve CME Research and Practice

Although the systematic reviews based on RCT designs have provided the CME community with valuable information as to whether some CME interventions or combination of interventions result in changes in clinical practice or impact health.

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1 Davis et al. (15;18) and Oxman et al. (19) noted in 1984 seven articles met their inclusion criteria, in 1992 a further 43 RCTs met their criteria, by 1995 an additional 49 articles were included.

2 Clinical routines are defined as those practices that have become routinized, habitual and automatic and are believed to be a factor in why informational interventions on their own are not successful. (280)
outcomes, they failed to illuminate what factors lead to a program’s success or failure in enhancing knowledge transfer and its utilization. (18) However, RCTs typically lack sufficient qualitative details to inform theory development or improve the conceptual understanding about phenomena or the intervening critical factors. (18) Chen (22), presenting a conceptual model for integrating qualitative and quantitative procedures to enhance evaluation methods in the social sciences, describes the strengths and weaknesses of methods-oriented evaluations and theory-driven evaluations and suggests that the “excessive advocacy of any one method might result in the exaggeration of that method’s strengths and blindness to its weaknesses.” (22) In discussing weaknesses with typical methods-oriented research, Chen claims the evaluation methods used simply fail to provide insight into the underlying causal mechanisms that facilitate or hinder treatment effects. Without a strong conceptual framework, both methods-oriented research and theory-driven research may be susceptible to Type II errors of inadequate measurement, for instance, not sensitive to changes in attitudes, beliefs and behaviour. (22) Green (23) posits that other factors, such as, if researchers do not explicitly investigate and report whether the planned treatment differed from the delivered treatment, or the official goals differ from the operative goals, could lead to reporting inaccurate findings and conclusions, which he refers to as Type III errors. Lipsey (24) refers to these types of methods-oriented evaluations as “Black Box” evaluations (see Figure 1). “Black boxes,” as Ashby (1956) defined them, “are organisms, devices or situations for which inputs and outputs can be observed, but the connecting processes are not readily visible.”

With the recognition that without a strong theoretical framework most CME evaluations will continue to use simple input-output evaluations, Robert D. Fox, the editor for *The Journal of Continuing Education in the Health Professions* in 1995, established a new mission for the journal. In his editorial entitled, *Narrowing the Gap between Research and Practice*, Dr. Fox announced the creation of new sections to challenge the continuing education leadership and research community to build a stronger theoretical framework and to improve the efficacy of continuing education in improving physician knowledge, changing physicians’ routine behaviour and improving health outcomes. A primary goal for this reconceptualization of CME was to link educational theory to practice.

The reconceptualization of continuing education in the health professions is still in its early stages. The leadership in CME research has recognized that part of the solution required to address challenges facing the field of CME is the need to develop a strong theoretical framework to better inform research and praxis in the CME field. (18;21;25-28)

**Introduction of the PRECEDE Model to CME**

Davis, Thomas et al. (18), in a review of 50 randomized controlled trials investigating the impact of CME interventions, modified components of Green’s (29) PRECEDE model to categorize the type of educational interventions in the CME literature for

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4 Dave Davis (2002) attributes the idea to use this taxonomy arose from discussions with Andrew Oxman, one of the co-authors of the systematic review.
analytic purposes. PRECEDE is an acronym for determinants of behaviour change in the health promotion field. It stands for predisposing, reinforcing and enabling constructs in educational diagnosis and evaluation. The original purpose of the model was "to organize existing theories and constructs (variables) into a cohesive, comprehensive and systematic view of relations among those variables important to planning and evaluation of health promotion." (30) p. 40

Predisposing factors include a person’s or population’s knowledge, attitudes, beliefs, values, and perceptions that facilitate or hinder motivation for change. Enabling factors are those skills, resources, or barriers that can help or hinder the desired behavioural changes as well as environmental changes. Reinforcing factors, the awards received, and the feedback the learner receives from others following adoption of the behaviour, may encourage or discourage continuation of the behaviour. (30) pp. 28-29

Davis et al. (18) modified these constructs to group intervention strategies as follows: Predisposing interventions primarily involve communicating or disseminating information, enabling interventions facilitate the desired change at the practice site, and reinforcing interventions involve reminders or feedback. For analytic purposes Davis et al. grouped interventions into four types: (i) those using predisposing factors only; (ii) those using predisposing and enabling factors; (iii) those using predisposing plus reinforcing factors; and, (iv) interventions as a single multi-faceted maneuver such as chart review with a peer physician or a combination of all three types of interventions. Davis et al. found those interventions using predisposing methods produced mostly negative or inconclusive results, 9 out of 10 studies using predisposing and enabling methods attempting to change physician performance were positive, and 2 of 6 studies attempting to change health outcomes were successful. Interventions using primarily feedback and reminder systems in conjunction with predisposing factors were effective in changing physician performance in 12 out of 31 interventions instances when used alone,
or in conjunction with didactic sessions, workshops, academic detail visits or printed material. Interventions using a combination of all three strategies were effective in 8 out of 8 interventions studied in changing physician performance and 7 out of 8 studies investigating health outcome. Although it was not clear what variables were contributing to a program’s success or failure, it was clear that there was no one ‘magic bullet’ leading to more efficacious interventions and that a combination of interventions using predisposing, enabling and reinforcing factors have a greater potential to changing physician behaviour and patient health outcomes. (18)

The utilization of the construct of predisposing, enabling and reinforcing factors appears to be a fruitful topology for categorizing educational interventions and has also been discussed in the CME literature as components to various conceptual schemes. Adelson et al. (31), for instance, defines and incorporates predisposing, enabling and reinforcing factors, into a conceptual framework for facilitating performance in an organizational setting to address potential institutional barriers to innovation. In recent years there have been a number of studies focusing on specific predisposing factors attempting to identify potential barriers to change including the identification of physicians’ motivation for attendance at CME programs (32), current opinions, attitudes and behaviours of participants, and the assessment of physicians’ interest or commitment to change. (33-37)

In 1991, Green and Kreuter expanded the model to include a broader range of factors believed to influence behaviour change. PROCEED is an acronym for additional elements in planning, implementation and evaluation recognizing that other institutional factors such as policy, regulatory, and organizational constructs in educational and environmental development influence behaviour change.
The PRECEDE and the PRECEDE-PROCEED models are extensively used in the health promotion community and have been shown to be robust conceptual educational models for the planning, implementation and evaluation of health promotion programs targeting primarily lay populations. With over 1,000 studies using the PRECEDE or PRECEDE-PROCEED models, there are a growing number of rigorously evaluated, randomized clinical and field trials reported in the health promotion literature. (38;39) Based on the success of the model in the health promotion field, the NHS Centre for Reviews and Dissemination in their Effectiveness Health Care Bulletin in 1999 recommended the PRECEDE-PROCEED model for facilitating the uptake of evidence into practice. (40)

Central Purpose

In this dissertation, I will argue that the most commonly used approaches to CME planning, implementation and evaluation fail to take advantage of current research and thinking in the cognitive sciences and learning theory, program planning, and program evaluation. This system-based failure speaks to the need in CME to experiment with other educational models that are utilized in other fields, such as the health promotion field. I will argue that the most promising conceptual model for future research and practice in the CME field, given the current gaps and challenges facing this field, is the PRECEDE-PROCEED framework especially if it is modified for CME purposes.

This thesis uses a case study to illustrate, reflect and test the adaptability and feasibility of adopting a modified version of the PRECEDE-PROCEED model for CME purposes. The case study is based on a province-wide CME program in Canada with the primary educational objective of enhancing family and emergency physicians’ knowledge and management of whiplash-associated disorders.
Purpose of a Conceptual Analysis

Although there is not a specific methodology for conducting a conceptual analysis, there are some conventions concerning its purposes and means of validation. Coombs and Daniels (41) posit that the purpose of a conceptual analysis is to enhance our understanding by improving "the sets of concepts or conceptual structures in terms of which we interpret experience, express purposes, frame problems and conduct inquiries."

If our conceptual structures lack logical coherence, blur important distinctions, or create useless dichotomies, or we understand them so poorly that we are unable to translate them adequately into research instruments and policy prescriptions, curricular policies and research studies will fail to be fruitful. (41) p. 1

Fruitfulness is typically associated with pragmatic ideas of usefulness such that, if the conceptual framework assists in the generation of theories and if the theories lead to a more accurate accounting of the phenomena, it is considered to be fruitful. (42) p. 12 It is my hope that this body of work will foster reflection on CME praxis as well as promote and advance further experimentation with alternate conceptual models of planning, implementation and evaluation in the CME field.

Significance of this work

The importance of continuing professional development was well articulated at the turn of the 20th century by Sir William Osler. Dr. Osler, a Canadian, and possibly the founder of modern CME, during his keynote address in London, England, on July 4, 1900, entitled, The Importance of Post Graduate Study stated, "More clearly than any other, the physician should illustrate the truth in Plato’s saying, that education is a lifelong process." (43) p. 9 Osler was also a renowned scientist and recognized that with the tremendous scientific and medical advances in the late 19th century, the gap between good medical care and the routine practices of those whose training ended when
attending medical school was widening. In 1965 there were 100 randomized controlled trials on medical innovation in the United States, by 1999 over 10,000 RCTs were published annually. (44) Today, with over 20,000 medical journals and two million articles published annually it is estimated that physicians would need to read 19 original articles daily in order to keep current. (45) Even if physicians were able to keep abreast of the research findings, there are growing concerns about the great variance in the quality of research published and evidence that most physicians are not competent in critically appraising research or translating evidence-based findings or guidelines into practice. (46,47) The expanding gap between what is known and what is practiced in today’s world necessitates new ways of thinking about the purpose and role of continuing professional education.

In this thesis I argue for a need to reconceptualize CME to better meet the many challenges facing CME and most importantly the growing need to more effectively and efficiently reduce the gap between current knowledge and clinical practice. This thesis provides an historical analysis to better understand some of the forces shaping current CME practices in order to identify fundamental structural, pedagogical and related contextual problems requiring attention. Having identified problems with current practices, this thesis presents an alternate conceptual model originally developed in the health promotion field, and uses a case study to illustrate the adaptability and feasibility of this model to the CME environment.

Limitations

This thesis is investigating the feasibility and adoptability of a systems-based conceptual framework integrating theoretical work across disciplines to inform planning, implementation and evaluation processes in CME for the purpose of enhancing
knowledge transfer and its utilization. There is, therefore, a need to introduce and summarize a very broad base of literature to provide both an historical understanding as to how we have ended up with our ‘normative’ model of operation, and how current research and other conceptual models could enrich CME practices. The benefits of drawing on a large body of literature is the potential to integrate and synthesize methods and ideas arising from different literatures. However, a limitation in attempting to address a system-based problem informed by a broad range of literature is the need to be very selective in presenting pertinent areas of a given literature body and being unable to present an in-depth analysis of any one body of knowledge or explicate and analyze a broad range of controversies within a given field or discipline.

This type of transdisciplinary research is fraught with challenges. Lattucca (48) defines disciplines as complex phenomena, “…as sets of problems, methods and research practices or as bodies of knowledge that are unified by any of these. They can also be defined as social networks of individuals interested in related problems or ideas.” Disciplines not only pertain to certain fields of study and inquiry methods, they are also made up of various communities and subgroups that share a range of assumptions, behaviours, and beliefs about scholarship. Value judgments are made by individuals within a discipline regarding issues of research validity and legitimacy, the appropriateness of topics for investigation, the kind of questions that are valid to ask, the methods one uses, and what constitutes a valid answer. As this thesis crosses many disciplines and fields of study, I have tried to take a very pragmatic perspective on selecting literature to inform the conceptual framework rather than working from a more ideological perspective.
A major area of contention within the education community has been concerned with questions related to ideology, epistemology, and ontology, especially within the education research community. (49;50) Firestone (49), discussing the rhetoric of quantitative and qualitative research paradigms, cites Rossman and Wilson's idea that there are two camps at the extremes of the quantitative and qualitative debate: the purists and the pragmatists. The purists assert that qualitative and quantitative methods are based on incommensurate paradigms "that make different assumptions about the social world, about how science should be conducted and what constitutes legitimate problems, solutions, and criteria of 'proof'." Purists believe that method represents a logic of justification that begins with first principles about truth, reality, and the relationship between the principles inherent in the paradigm. Pragmatists view a more instrumental relationship between paradigms and methods. To pragmatists, methods are seen more as a collection of techniques and are not necessarily inherently linked to quantitative and qualitative paradigms. This thesis is more clearly aligned with a pragmatist perspective and strongly recommends that both qualitative and quantitative research and evaluation methods are needed to better inform our practices. I also suggest that greater collaboration between practitioners engaged in qualitative and quantitative research could potentially lead to improvements in research methods used by both research communities.

Author's Interest in CME

But who shall parcel out
His intellect by geometric rules,
Split like a province into round and square?
Who knows the individual hour in which
His habits were first sown, even as a seed?
Who shall point as with a wand and say
This portion of the river of my mind
Came from yon fountain? (51) lines 208-15
My original training and occupation was in the field of early childhood education, a subject distant, at least in the span of ones educational development, from my current vocation and interests in the field of CME. There are many factors influencing the twists and turns, challenges and opportunities that contribute to ones life experiences that cause me to resonate with Woodsworth's Prelude. However some selective background of myself, my work experience and interests in the general field of education and current involvement in the planning, implementation and evaluation of CME will provide the reader with an insight into some of the pragmatic challenges facing CME, and some of the author’s past experiences contributing to the development of the proposed model.

In 1974 I graduated in Early Childhood Education (ECE) from Seneca College, a technical college in Toronto, Ontario, and was hired as a co-coordinator for a cooperative daycare situated at the University of British Columbia. The early childhood program was focused on child development, theories about learning, with special attention for students in the program to become more reflective of ones own life experiences and how they might influence ones behaviour with children. After working in the field for a number of years, my interests moved from younger children to working with 'teenagers at risk' and I worked as a child care worker responsible for developing ‘meaningful’ after school programs for teens living in a low income housing project. My interest in cooperative endeavors, coupled with the recognition of the pitfalls of ghettoizing low income families, led to volunteer and leadership involvement in the cooperative movement, in the housing sector and the food cooperative sector. In the early 1980s I was the co-founder of a community-based not-for-profit cooperative restaurant with the goal to generate funds and resources to support international and community-oriented social action projects.
My personal interest in health education, the human potential movement and complementary health care, eventually led to my return to school to complete an undergraduate baccalaureate degree specializing in health education through Antioch University’s independent study program administered through Cold Mountain Institute and Antioch West. My Faculty Advisory Committee consisted of two medical physicians, Drs. Wendy Palmer and Ron Puhky, both practicing preventative medicine, Professor Gaalen Erickson, a UBC Faculty of Education member as well as an advisor associated with Cold Mountain Institute. After graduating from Antioch West, I trained in Toronto to become a massage therapist and in 1981 became the President of Part III, Massage Section for the Association of Physiotherapists and Massage Practitioners in British Columbia, the licensing body for physiotherapists and massage practitioners. During my term as President, it was apparent that the field of massage therapy needed to improve its curriculum and examination process to better reflect the growing scientific body of literature regarding massage therapy and to create higher standards to prepare students for practicing massage therapy working under the provincial medical plan environment in British Columbia. It was also clear that massage therapists needed to establish a professional body to address more adequately some challenges, especially its legitimacy as a health profession, as well as to enhance the continuing education needs of the profession. Action plans were developed leading to a new curriculum and examination process and the birth of a professional body, The Massage Therapists Association of British Columbia.

Following my initial training in massage therapy, I was fortunate to have postgraduate training with Dr. John McM. Mennell, a noted doyen in the field of physical
Dr. Mennell developed a systematic approach to the assessment of common musculoskeletal disorders using manipulative methods for differential assessment, and when applicable, for treatment purposes. Within my practice as a massage therapist, it soon became apparent that from a patient's perspective, the type of diagnosis and treatment one "had" was based more on "who" the patient saw, rather than through a comprehensive systematic standardized assessment procedure. It was also very clear that the lack of communication and collaboration among health professionals, be it between physicians and therapists, physicians and specialists, or therapists and therapists, was a tremendous barrier to improving our collective knowledge-base and the development of best practices in the rehabilitation field. It was through this recognition and discussions with Dr. Mennell that led to the establishment of the Physical Medicine Research Foundation (PMRF).

PMRF was established as a consumer-based registered charitable organization, the majority of its Board Members being non-health professionals, with a mandate to reduce disability and impairment from musculoskeletal conditions and improve the quality of care. To accomplish this, PMRF uses a grassroots community-based operating model, seeking the interest and involvement of a broad range of stakeholders to improve the quality and cost-effectiveness of care for people with musculoskeletal complaints with the understanding that all stakeholders must work together, as equal partners, to find better solutions for people presenting common non-malignant musculoskeletal complaints, such as back pain, whiplash, cumulative strain disorders etc. Disciplines involved with PMRF include epidemiologists, family physicians, emergency physicians,

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6 Dr. Mennell was a consultant in physical medicine to the three armed forces in the United States and former member of the Expert Review Committee on Independent Providers of Medicare for the US Congress. He worked extensively with a number of Veteran Administration Hospitals. He was Founding Member, Past President of the North American Academy of Manipulative Medicine. Dr. Mennell published over 50 articles, five textbooks as well as producing numerous films and videos on physical medicine.
orthopaedic surgeons, physical medicine and rehabilitation specialists, occupational physicians, occupational nurses, acupuncturists, chiropractors, massage therapists, medical and allied health care educators, health services researchers, and on the whiplash prevention side, auto-engineers.

PMRF facilitates and funds multidisciplinary research projects, facilitates and plans strategic planning meetings, conducts needs assessment activities, as well as plans, implements and evaluates health professional and consumer education programs. PMRF incorporated two guiding principles arising from my experience in community-based development, and training in the field of education: (i) the principle of non-hierarchal participation of health professionals, researchers and educators working together with other stakeholders for the betterment of humankind, and (ii) the commitment to cultivate and foster best practices in the creation of lay and health professional educational interventions informed by high quality research, and where possible, evidence-based research in medicine as well as in education.

PMRF has held ten international conferences, over forty continuing education workshops (typically one to four day courses), four strategic planning meetings, two public forums and hosts a monthly chronic pain self-help support group. The majority of PMRF’s health professional education programs are accredited under the auspices of the host university’s Faculty of Medicine or Division of Continuing Medical Education. PMRF also seeks and receives accreditation from other professional associations, such as The College of Family Physicians of Canada, MAINPRO Category I program and the Royal College of Physicians and Surgeons of Canada MOCOMP program.

In the mid 1990s, PMRF like most other educational planners seeking CME accreditation, incorporated a few principles of ‘adult learning theory’ and the utilization
of 'behavioural learning objectives' not only in the planning process but also in the
evaluation process as part of the requirement for accreditation. However, these instituted
changes in planning and evaluation have, for the most part, failed to generate sufficient
data to inform improvements in CME programming. The questions rumbling in my mind
were: How can CME planners better determine what programs should be created? How
can we improve the planning process and who should be involved? More specifically,
what factors, aside from content, should be considered in planning, implementing and
evaluating CME to enhance knowledge uptake and utilization? And what instruments
could be developed to collect better qualitative and quantitative data to inform CME
research and praxis?

Introduction of Case Study

The idea for the BC Whiplash Initiative (BCWI) project, the case illustrating the
application of the proposed curriculum model, arose from PMRF's 8th international
symposium, Musculoskeletal Pain Emanating from the Head and Neck, held in Banff,
Alberta, in October 1995. The conference was still in its planning phase just as the
Quebec Task Force Report on Whiplash-Associated Disorders (QTF) released the first
systematic evidence-based and consensus-based report on whiplash-associated disorders
(WAD). A number of the authors of the report were invited to speak at the conference.
During the conference, PMRF also held a parallel focus group consisting of invited
speakers to recommend actions arising from the conference discussions and proceedings.
All but one member of the focus group concluded that the QTF Report (52) represented
the first evidence-based synthesis and consensus to date on the state of our knowledge-
base about WAD and recommended that PMRF commit itself to disseminate the findings
of the report for the benefit of patient care through the development of a comprehensive CME program.

There were a number of unusual elements in the planning, implementation and evaluation of this CME program that contributed to the program’s uniqueness and facilitated the development of the curriculum model underpinning the program. Unlike most CME programs organized by accredited CME providers, the founding organizing body for this project was PMRF.

After acceptance of this recommendation by PMRF’s board of directors, local stakeholders were brought together to discuss whether there was a perceived need for a comprehensive community-based education project. Initial stakeholders included the BC College of Family Physicians of Canada, University of British Columbia (UBC) Division of Continuing Medical Education, UBC Department of Family Practice, Rural Education Training, UBC Family Practice Residency Program, and UBC Undergraduate Medical Education. This ad-hoc committee concluded that there was a strong need to develop educational initiatives to update physicians in British Columbia (BC) to improve the diagnosis and management of patients presenting WAD at several levels, including undergraduates, graduates, and practicing clinicians. A representative from the Insurance Corporation of British Columbia (ICBC), the public auto insurer for BC, was also invited to this initial meeting as a guest and indicated an interest in funding a provincial educational initiative at arms’ length in the way of an unrestricted educational grant.

In my capacity as PMRF’s Executive Director and as a graduate student with the Centre for the Study of Curriculum and Instruction, I was interested in applying a more systematic planning framework to this project. I was responsible for writing the grant proposal including the development of initial educational objectives, research objectives,
research budget, project timelines, PMRF’s administrative budget, and collating stakeholder proposals related to program delivery. During the proposal building phase, Marc Broudo, Assistant Director, Division of Educational Development and Support, UBC, and I conducted a review of recent systematic reviews of the CME literature and reviewed the seminal text, The Physician as Learner: Linking Research to Practice, edited by David Davis and Robert Fox published in 1994. The book inspired an adventure in curriculum development and program evaluation through articulating a common goal to bridge the gap between health professional practices and current research using the best educational practices available.

If health care practices based on the best available information are an ideal of clinicians, then, equally, delivery of CME, based on the best evidence about its efficacy, should also become an integral ingredient in CME provision.(6) p.247

Once the proposal was drafted, it was reviewed by participating bodies and, upon their agreement, funding was sought for this initiative. To our surprise and delight, funding was forthcoming from ICBC in the way of an unrestricted grant and in accordance with Canadian Medical Association policy regarding industry sponsorship of CME programs. The BCWI, through an extensive 12 month curriculum development process and the collaboration of all stakeholders, created the largest CME educational initiative directed to general and emergency practitioners in B.C. and the first initiative addressing the continuum of learning from undergraduate training, residency training and physicians in practice.

The BCWI used many different types of educational vehicles to deliver the curriculum and to engage the interests of physicians. These included one hour grand round sessions primarily at hospitals, with some one hour sessions at group practice sessions, telemedicine sessions reaching out to rural physicians, half day and full day
sessions that included educational material on medico-legal reporting and the management of chronic pain conditions. The project also culminated in hosting a World Congress on Whiplash-Associated Disorders in February 1999, where preliminary findings on the BCWI were presented. The World Congress and the BCWI planning process led to initiating a $318,000 whiplash research and awards competition funding 9 research projects and 5 best poster awards.

Summary

This chapter provided an overview of the many challenges facing the CME field and introduced the argument that many of these challenges are a result of a system-based failure in current planning, implementation and evaluation procedures used. From both within and outside the profession there is a growing recognition that CME needs to develop a more robust conceptual framework to better inform CME research and practices. Since the 1980s, the CME research community have begun to address some of the challenges facing the field. Systematic reviews of RCTs have provided a body of evidence that demonstrate certain types of CME interventions are more effective than others in knowledge uptake and facilitating physician behaviour change, however, the lack of conceptual framework is a barrier to understanding this phenomenon or creating a more systematic approach to uncovering factors contributing to knowledge transfer.

This chapter also introduced the PRECEDE-PROCEED framework and presents the central thesis that this framework, especially if it is modified to address many of the stakeholders’ challenges facing CME, is a better conceptual framework for CME research and practice. The final part of this chapter introduced some background on myself as well as background on the case study that was used to illustrate the adoptability and feasibility of the PRECEDE-PROCEED framework for the CME field.
Structure of Literature Review

The review is informed by the literatures of medical history, medical education, medical teaching, medical innovation, principles of evidence-based medicine, curriculum development, program planning, program implementation, program evaluation, adult education, cognitive sciences, health promotion, social psychology, and a growing body of literature on knowledge transfer and diffusion.

The organization of the literature review is primarily through an historical chronological lens, providing an analysis of predisposing and enabling factors that contribute to the failure of current planning, implementation and evaluation of CME as well providing an alternative set of predisposing and enabling factors that could contribute to the creation of a better model for CME programming. Green’s original typology defines predisposing factors as those variables that facilitate or hinder motivation for change which include a person’s or population’s knowledge, attitudes, beliefs, values, and perceptions, whereas enabling factors are variables that can help or hinder the desired behavioural changes and/or environmental changes such as the development of skills, resources, or barriers that hinder or enable change.

The argument being presented is that CME planning as we know it is based on old models of learning theory and program planning that have become institutionalized to such a degree that reconceptualizing CME will need to not only incorporate current knowledge about learning, planning and evaluation, but likely require changes across the continuum of medical education including institutional structures, regulatory policies, funding and governance. The identification of these factors contribute to my argument that a modified PRECEDE-PROCEED model lends itself as a fruitful framework for informing a reconceptualization of the CME field.
In order to help the reader appreciate how we have arrived at this state of affairs, this chapter first examines and analyzes an historical perspective on the development of medical education and CME in Canada and the United States and presents the argument that current challenges to CME practices arise from many of the same challenges faced in undergraduate medical education and that this continuum of medical education, historically and currently, is strongly influenced by the presence, absence and effectiveness of internal and external administrative, organizational, policy and regulatory forces. The second part of the chapter presents the argument that the continuum of medical education, historically and currently, with a few exceptions, has not kept abreast of developments in our understanding about the nature of learning and that this failure in understanding, regarding how people learn, and what factors enhance or hinder knowledge uptake and its utilization contribute to the continued use of less effective models of program planning, teaching and evaluation.

In the third chapter, I argue that this reliance on current models of program planning and evaluation have failed to provide sufficient information to better inform the development of a more robust conceptual framework to enhance knowledge transfer and its utilization to improve patient health outcomes. Lastly, I argue that the solution to challenges facing CME are multi-faceted and require a radical reconceptualization of the CME field that also has implications for undergraduate medical education.
Overview of Internal and External Forces Shaping CME

As discussed in the introduction, CME is in a state of crisis. It is not only under increasing pressure from many stakeholders to improve current practices, it also suffers from a lack of a robust conceptual framework to underpin its research and education practices. Michael Gammon of the AMA proposed the diagram below (see Figure 2) to represent multiple and complex forces influencing CME during the past twenty years. (6)

Figure 2. Internal and External Forces Influencing CME (6)
Davis and Fox (6), describing Gannon’s conception of these forces, state the innermost circle represents the current players directly involved in CME planning, research, faculty members, leaders and resources. The middle layer includes the CME providers, CME accreditation bodies, physician participants, and the CME system. The outer layer are those factors that Gannon has characterized as being external factors including government interests, changes in patient demographics and expectations, advances in technology, rapid increase in scientific knowledge, undergraduate medical education, international CME etc.

The representation of the range of forces influencing CME practice is successful from a graphical perspective in framing current conceptions of internal, organizational and external forces. However this representation does not provide sufficient conceptual linkages to better understand how these forces have shaped and continue to influence CME practice or challenge the status quo regarding who should be actively involved in the CME planning, implementation or evaluation process and what resources are needed to ensure CME programming meets society’s need to improve the quality of preventive and curative care.

Historical Perspective on the Continuum of Medical Education

The development of CME is intimately linked to the evolution of medical education, a progression from an apprenticeship learning model to a university-based curriculum model, the birth of post-graduate extension lectures, later to be defined as CME. CME followed the traditional model of undergraduate medical education which was intellectually driven by theories and principles arising from experimental science attached to a teaching style which was primarily passive in nature. (53) The structure of all medical education was based on the curriculum design of the Hopkins Medical School
that has remained the dominant structure for medical education. (54)\textsuperscript{3} The basic objective was to teach academic content. The assumption behind medical school curricula generally, and CME programs in particular, was that learning was a rational process of experts teaching practitioners primarily by lecture with the occasional workshop or case-based study. It was believed that, with the acquisition of new or updated knowledge, clinical practice would change. (20)

**Early Organizational, Administrative, Regulatory, Policy Factors Shaping the Continuum of Medical Education**

The North American medical school system began as a supplement to the apprenticeship system common in the 17th and 18th centuries. (55)

Virtually all physicians in the Atlantic seaboard colonies had learned their craft by apprenticeship but from early in the 18\textsuperscript{th} century many of them crossed the ocean to visit the hospitals and attend lecturers of the professors of Leydon, Paris, London and Edinburgh. A desire to teach was a natural sequel to this experience; consequently as early as 1756 classes were held in Philadelphia. (56)\textsuperscript{14}

The movement towards a university-based medical training program began taking shape in the first half of the 19\textsuperscript{th} century in France and in the latter half of the 19th century spread to Germany, the United Kingdom, Canada and the United States. University-based training held the promise for “high matriculation standards, an organized curriculum, regularly appointed permanent faculty, and laboratories linked with a hospital service to facilitate research and teaching.” (56)\textsuperscript{18}

Medical schools in the United States began in 1765 with the medical department of the University of Pennsylvania, Columbia College, formerly King’s College. Harvard University followed in 1767, Dartmouth College in 1798 and Transylvania College in 1799. Delegates from these medical schools and societies held formal discussions about establishing standards of medical education in Northampton, Massachusetts, as early as 1827. In Canada, formal medical teaching began at the Montreal Medical Institution in
1823 with twelve students, but closed after two years. (56;57) Six years later it re-opened and became the Faculty of Medicine at McGill University. The University of Toronto and University of Montreal's Faculties of Medicine commenced in 1843, University of Laval in 1852, Queen's University in 1854, and Dalhousie in 1867. In 1881, the University of Western Ontario's Faculty of Medicine opened its doors, soon to be followed by the University of Manitoba in 1883. By the turn of the twentieth century, over 457 medical schools had started in the United States and Canada, many shortlived, most of them considered of very poor quality with a mixture of private and public institutions. (55;56;58;59)

This period of rapid uncontrolled explosive growth of medical schools in North America led to a mounting need both within the profession and outside of the profession to establish standards for medical practice. In 1846, the first national medical conference was held in the United States to discuss the establishment of standards of medical education. The following year, at the second national meeting, the American Medical Association (AMA) was formed to attempt to standardize instruction in medical schools, but met with little success (54). Twenty years later, in 1867, the Canadian Medical Association (CMA) was formed to establish a standard for medical education and a uniform system of licensure at the start of the newly constituted Dominion of Canada. (60)

Craig (1976) claims The Montreal Medical Institute began in 1823 noting that the four physicians who established the school were graduates of the University of Edinburgh. MacFarlane et al. (1964) stated the Institute began a year later, in 1824.

In the more western provinces, medical schools began in 1913 at the University of Alberta, 1926 at the University of Saskatchewan, and at the University of British Columbia in 1949.

MacFarlane (1964, p. 19) claims "Whether measured by standards of admission, length and character of curriculum or qualification of their teachers many were little more than a "diploma mill."

The formation of national organizations and decisions about membership requirements and licensure also led to battles within and outside of the profession questioning whom and what practices were deemed to be legitimate and whether physicians should associate with non-physicians. MacDermont (1938) reports on prominent physicians in 1869 being refused admission to the CMA executive on grounds that they did not violently oppose the Parker Act or were accused of consorting with unlicensed practitioners including homeopaths.
be disbanded six years later as its membership representing both commercial and public institutions became untenable and failed to advance medical education standards. In 1891 the Association of American Medical Colleges (AAMC) was organized. State licensing authorities during this period were also being created to establish legal requirements for medical practice. Although there had been many singular efforts made to improve medical standards, no one organization on its own was successful in improving medical education standards across North America. Only when there were sufficient organizational and legal structures in place and an overall consensus among these stakeholders could improvements in standards take place. (54) p. 15

In 1905, one year after the AMA formed the Council on Medical Education, the Council initiated an independent review of schools in the United States and Canada through the auspices of the Carnegie Foundation for the Advancement of Teaching, to report on the state of medical education to the AMA and the House of Delegates. The survey was conducted by Abraham Flexner, a noted educator11, and Dr. Nathan Colwell, Secretary of the AMA’s Council on Medical Education. (56) p. 19 Mr. Flexner visited 155 medical schools seeking information about: (i) the entrance requirements and their enforcement, (ii) the size and training of faculty including the pre-clinical sciences, (iii) the sum of funds available from endowment and from fees and its use, (iv) the quality and adequacy of the laboratories provided for instruction and, lastly, (v) the relationship between the medical school and hospitals including “freedom of access to beds and freedom in the appointment by the school of the hospital physicians and surgeons.” (55)

11 Flexner a graduate of John Hopkins University founded a school that reportedly had very high applicant success rates by its students to top university programs in the U.S.A..” (55)
The release of the Flexner Report in 1910 is a landmark year in medical education in North America. The report was a scathing assessment of the state of medical education in the United States and Canada, as medical schools in Canada suffered from similar deficiencies as those in the United States.

In the matter of medical schools, Canada reproduces the United States on a greatly reduced scale. Western University (London) is as bad as anything to be found on this side of the line; Laval and Halifax Medical College are feeble; Winnipeg and Kingston represent a distinct effort toward higher ideals; McGill and Toronto are excellent. (56) p. 21

Most medical historians and scholars claim the Flexner Report resulted in many changes including school closures, the end of private medical schools, changes in criteria for admission, the establishment of basic sciences curriculum taught by full-time scientists striving to advance knowledge in their field, clinical subjects taught by scholarly physicians who “devote themselves to their hospital wards”, and the alignment with university-based education. (54) In Canada, MacFarlane (56) pp. 107-8 in his report, Royal Commission on Health Services: Medical Education states that three main points arising from the Flexner Report to inform the development of medical education in Canada are:

- most proprietary schools of medicine should cease to exist,
- only a few schools [none in Canada] *sic his brackets* were providing a satisfactory academic atmosphere for the teaching of physicians.13
- there must be at least a nucleus of full-time teaching staff in each department of a medical school.

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12 B. Barzansky & N. Gevitz, Beyond Flexner: Medical Education in the Twentieth Century, 1992, (p. 3-8, 13) posit the reform of medical education was well underway prior to the Flexner Report, and suggests that the report was not so much revolutionary as catalytic to an already evolving process. There is little debate by medical historians that the Flexner Report was instrumental in galvanizing media interest as well as social and economic resources to support medical education.

13 MacFarlane's claim that none of the schools in Canada provided a satisfactory academic atmosphere for teaching physicians contradicts Flexner's statement that McGill and University of Toronto Faculty of Medicine were excellent.
The Flexner Report also resulted in a number of unintentional changes that have played a significant role in the shaping of the modern medical school. Hudson (58) pp.16-17 posits the Flexner Report was ‘misconstrued’, leading to two major common misconceptions attributed to the Flexner Report, although they were contrary to Flexner’s own pedagogical beliefs. Flexner’s critics believed that he was a strong proponent of The John Hopkins Medical School, endorsed its lockstep curriculum and pedagogical practices, later to be known as the ‘Hopkins Model’. Hudson (58) p.17 however suggests some of Flexner’s critics had likely not read Flexner’s Report and were responding to other people’s interpretation of Flexner’s assertion that the John Hopkins Medical School was the best medical school in North America.  

Flexner did state that John Hopkins Medical School was the best school operating in the United States based on his review criteria, however he did not believe John Hopkins Medical School represented the gold standard for medical training. This misconception, led to the diffusion of the “Hopkins Model” as being the gold standard model “that other schools, either willingly or not, would eventually follow.” (54) p.16

CME, historically, included any systematic training after graduation including voluntary internship, specialty training, post-graduate extension lectures, or courses. With the lack of North American standards of medical education, Flexner saw one of the

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14 Ffrangcon Roberts, 1948 criticizes the Flexner Report for judging medical schools by their original contributions to knowledge rather than the standards of care provided by their graduates [he did recognize such an assessment would be beyond the ability of any one person]. He was also critical that Flexner “had no intimate knowledge of the intellectual difficulties which students experience (p. 3) and was concerned about the assertion that basic sciences should be taught by scientists far removed from the practitioner’s need for elementary information within a given field, rather than the more advanced areas of interest of a scientist wishing to advance the field.

15 MacFarlane (1965) notes in 1912 Flexner also completed a survey of medical education in Britain, France, Germany and Austria which encouraged the movement towards professorships associated with various and departments, rather than the use of clinicians in practice

16 Flexner et al. (1960, p. 112) in his biography refutes the authorship of the ‘full-time scheme’ and states it did not originate with him and was not mentioned in ‘Bulletin Number Four’ or ‘Bulletin Number Six’. Flexner, however, did subscribe to the belief that the full-time positions were a necessary condition to further ‘teaching and cultivation’ and assisted John Hopkins Medical School in receiving a 1.5 million dollar endowment for this purpose.

17 Flexner’s pedagogical perspective was similar to Dewey’s perspective of the need for a flexible curriculum that would foster an inquiring scientific mind.
primary goals of post-graduate continuing education as a means of improving the competence of medical practitioners 'to repair' the damage of poor medical training. (61) The Flexner Report recommended a period of supervised clinical practice as a prerequisite for graduation. Until 1913 no medical school required an internship period, although 70% of medical graduates voluntarily took internships. (61) In 1919, the AMA Council on Medical Education established the first set of standards for internship programs, *The Essentials of an Approved Internship*.

Similarly, the training of specialists, for the most part, was not formalized prior to 1928 when the AMA House of Delegates adopted the *Essentials of Approved Residencies and Fellowships*. (61) Prior to the 1900s, practitioners would take some courses, usually in Europe, and self-proclaim their specialty. Later some specialty societies were established, however there were no licensure requirements. Flexner voiced concern about the rise of proprietary graduate and post-graduate training and advocated graduate training roles be fulfilled by university-based medical schools associated with training hospitals. This recommendation was not taken up by medical schools until the 1970s. (61) In 1920, the AMA established fifteen committees to define specialties, their training programs and their qualifying examination and certification process. During the 1930s, the American Hospital Association required specialty certification in awarding hospital privileges. The increase in specialists arose from a number of factors mentioned earlier as well as the perception during World War I that specialist surgeons in the army were more efficacious. In addition, improvements in transportation systems and the general movement towards large urban centres led to markets large enough to support full-time specialists.
From the formation of the Canadian Medical Association in 1867 until 1923, the primary focus of the CMA, and medical schools in Canada was on issues related to licensure, undergraduate medical education, the development of professional bodies, organizational financial concerns, and addressing specific legislative issues. (62) The first mention of the need for post-graduate teaching in Canada by the CMA was in a report from its Committee of Education in 1923. To this end at the beginning of 1925, two physicians, Drs. F.J. Tees of Montreal and F.W. Marlow of Toronto, and the General Secretary of the CMA delivered a series of lectures in a limited tour of eight cities in the western provinces. The first ambitious effort to deliver CME in Canada occurred in the latter half of 1925, after the receipt of an unrestricted grant from the Sun Life Assurance Company which provided up to $30,000 to support post-graduate extension lectures. Within the first year of the program, 169 teachers delivered 513 lectures to an aggregate attendance of 17,264. (62) The program was particularly well received by practitioners living in rural areas. This funding was renewed each year until 1932, during which time 401 lecturers were provided support to deliver 832 lectures with an average attendance of 38. (62)

In Canada, prior to 1950, post-graduate lectures were offered through voluntary efforts by professional associations and some universities. After World War II, the demand for short courses and refresher courses increased and universities became more active in planning and implementing post-graduate courses through the establishment of volunteer-based post-graduate committees. By 1960, in the US there were only 18 medical schools with an identifiable CME program, however this number grew significantly as state legislation required CME for re-registration of medical licenses, as well as by generalists and specialty professional societies. (63) In 1969, the AAMC's committee on CME recommended that member schools recognize CME among their
major responsibilities. This recommendation was not supported and the committee disbanded in 1971. In 1974, 64 years after Flexner's initial recommendation that CME be an integrated component of university-based schools of medicine, the AAMC's Group on Medical Education acknowledged the increasing demand by activists and stakeholders to expand the mandate of schools of medicine to include the continuum of medical education. It was not until the late 1970s that the chair of the post-graduate committee at the University of Toronto, Faculty of Medicine became a part-time university appointee.

Medical schools, already overwhelmed with managing undergraduate medical education, research centres, and teaching hospitals, many already providing some continuing medical extension programs in their teaching hospitals, were reluctant to be responsible for CME as part of their core business. CME activities were typically initiated by volunteer committees and later through the appointment of a part-time faculty member. As interest in CME increased, CME programs became seen as revenue generators for the Faculty of Medicine and these division/departments were provided with some limited additional resources to create the infrastructure to support program delivery. From a funding perspective, CME has remained a poor cousin of Faculty of Medicines’ budgets with little to no investment to support CME research, program innovation, and program evaluation. (64)

The adoption of the Hopkin's model, particularly the premise of full-time faculty members/scientists involved in their research interests, blossomed after World War II, spurred on by the US government, industry and foundation investment in biomedical research. On the positive side, this investment led to unprecedented advances in biomedical research, however this investment changed the focus of medical schools.
Government Research Funding Policies: A Primary Force Changing Medical Education

Lewis and Sheps (65) posit this economic investment in biomedical research and the decision to target these funds to departments in medical faculties rather than support the creation of external research centres, as done in some other countries, led to a significant shift in the goals and priorities in medical schools. Medical schools were no longer primarily concerned with undergraduate education, “Less emphasis was given to teaching the undergraduate medical student, and more to the research process and recruiting and developing faculty whose major interests and skills were in biomedical research.” (66) This investment in biomedical research also contributed to a lack of interest of academic medical centres to foster and support physicians oriented to community health care. (67) This investment in research funding had, and still has, a profound impact on the organizational culture of departments within schools of medicine as well as their position and status within the university culture and its governance. Schools of medicine have become economic engines for universities and those department heads overseeing biomedical research continue to have the most powerful voices shaping the medical curriculum, faculty recruitment, facility expansion and research activities.

Having faculty members actively participate and contribute to new knowledge in their field kept faculty members abreast of new research in the field and provided an opportunity for disseminating new knowledge for the benefit of their students. However, the usefulness of such exposure was questionable depending on the research interests of a faculty member and the learning needs of a physician in training. The socio-economic and political forces influencing the prestige of certain departments over others, and the strength and forcefulness of individual faculty members representing their own
specialized research interests, has led to the creation of a curriculum that is “warped and uneven, with important elements entirely missing or referred to hastily and inadequately.” (66) p.138

In 1945, Joseph Wearn, the Dean of Case Western Reserve University School of Medicine (CWRU), describes the state of turmoil at his institution as follows:

...departments had become ‘feudal duchies’ that were completely independent of each other. Heads of the preclinical departments were ‘in active competition with each other for teaching time and exam time’. Student-faculty relationships were very poor; ‘students were terrified’ of the faculty in general, and of the preclinical department heads in particular. ‘Any department head could dismiss a student without consultation and without an appeal process...the education climate was dismal, with students caught in the middle between competing departments’. (54) pp. 47-8

This turmoil was not isolated to CWRU, but was, and in many cases still is, problematic at most medical schools. With each department competing for time and resources and faculty development, and a system of promotion based on research productivity, ones prestige and position were, and continue to be, subservient to ones ability to teach. Lewis and Sheps (65) pp. 11,137 posit that by mid-twentieth century the traditional core function of medical schools, that is teaching undergraduate medical education, became a by-product of ever expanding academic medical centres responsible for managing networks of schools (in some cases, including allied health professionals, and related diagnostic and technical personnel), teaching hospitals, clinics, laboratories, training facilities, and research centres.

The medical faculty is not a coherent body. It is made up of groups and individuals with distinctive interests and commitments, whose strength is a function of their relative prestige and amount of money available to them. The money comes from many different sources, much of it directly from outside agencies with special interests, rather than an institutional budget allocation determined by the university or the medical school....In most academic medical centers, the diverse research and clinical interests of the faculty provide an
intellectual smorgasbord that does not reflect many health problems that play a significant role in the lives of the public. (66) p. 137-8

Lewis and Sheps describe internal and external forces transforming medical schools into multi-million dollar academic medical centres and argue they are institutions in a state of chaos and crisis, essentially devoid of effective governance and public accountability, run by "a loose federation of duchies and principalities", focused too much on resource development rather than planned development in the interest of the public good. To correct this lack of public accountability and ineffective governance they argue governments need to develop a comprehensive coherent health care delivery strategy that recognizes the role academic medical centres play in training healthcare professionals, cultivating research and delivering patient care and to build a more coherent and cogent structure to enhance policy development, operational support, and fiscal control to better serve the public’s interest in physicians’ education, research and patient-care. (66) pp. 217-249

Lewis and Sheps and others (65) p. 141 (3;4;9) assert that a fundamental problem in undergraduate medical education, which is also shared by CME, is a mismatch between the educational programs delivered and the needs of society. In undergraduate medical education, the focus on biomedical research has led to an overemphasis of subjects and topics tending to concentrate on the unusual diseases, rather than reflect the knowledge and skills necessary to address the more common diseases and conditions as well as reflect changes in demographics. In CME program current needs assessment approaches, for the most part, are based on the self-interest of practitioners rather than a systematic

18 Williams (1980, p. 290) commenting on the position and role of deans states, "...the faculty shapes the dean—in fact, often picks the dean from "one of us"...[he continues, quoting a Harvard Professor] "The dean is just like a janitor, no different. He sees to it that the leaks in the roof are repaired and the burned-out light bulbs changed."

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analysis of data collected on medical errors, physician incompetence, and population health needs (see Chapter 3).

Part of the problem stems from poor health services planning and the lack of standardized mechanisms for capturing data across the provinces. However, deeper structural, regulatory and policy problems contribute to situation. These problems become more evident when one compares the economic burden of illness in Canada in relationship to the level of funding provided for research purposes. Figure 3 below presents 1993 data on the distribution of direct and indirect costs associated with diagnostic categories. Figure 4 presents the level of funding that is provided for research by diagnostic category. There is a relationship between funding and the economic impact a disease or condition presents. Unfortunately it is mostly an inverse relationship, the greater the economic burden a disease has, the less funding it receives. To improve our practices we must not only develop better means of collecting data, we must develop mechanisms in the planning cycle that actively uses data available to better meet society's need for efficacious, cost-effective healthcare provided by well-trained health care professionals.
Lewis and Sheps posit that population health needs of today are very different than health concerns at the turn of the century when biomedical research was much more relevant to addressing life threatening diseases responsive to antibiotic or other pharmaceutical interventions. Current population health needs require the creation of a
different type of physician, one who is also trained in bio-psychosocial medicine and health promotion in order to become a more effective active change agent promoting lifestyle change. (69;70) To actualize some of these changes will necessitate a realignment of research investment to further our knowledge base in the social sciences and humanities area.

The current emphasis of clinical training in teaching hospitals, with its focus on tertiary care, has led to an under-emphasis of ambulatory care, yet as illustrated in Figure 5. below, less than 1% of the total of number patients seeking medical care at any point of time are found in tertiary environments. (65;71)

**Figure 5. Estimates of Illness in the Community and Types of Service Providers Sought** (72)  

The mismatch among population health needs, research investment and curriculum of undergraduate medical students therefore is not solely a medical education problem but reflects deficiencies in government leadership, health care planning, coordination and collaboration among all stakeholders involved in research funding, health professional
education, medical funding, and health services planning. In Canada, for instance, there is no central standardized data collection process for clearly identifying national and regional population health priorities, or tracking health professional competency. Most of the health care data available is from tertiary environments rather than ambulatory care. With little standardization among provincial data collection systems it is difficult to assess performance across provinces. The lack of investment in research in the behavioural and social sciences has left physicians in training and in practice without a sufficient evidence-informed knowledge-base to become more effective change agents to better address current population health needs. At a time when there is a growing concern and desire for greater accountability for research support, Canada lacks a coherent infrastructure to assess population health needs and facilitate a more systematic way to meet these needs. Since 1999 some action has been taken to standardize data collection. (73) These more recent developments will be discussed further in Chapter Six.

Since the 1970s the European Commission office of the WHO, in particular, has voiced concerns about deficiencies in the training of health professionals and the need to reconceptualize the continuum of health professional training linking such training to population health needs, and to utilize pedagogical methods that foster lifelong learning, to remain competent, rather than the episodic CME programming currently employed. (9; 74)

Present efforts in this field are often unsystematic, poorly supported, little influenced by contemporary educational science, episodic, focused more on transmitting new information than on improving competence and only incidentally related to the health and national health priorities. (9)  

Before these deficiencies of undergraduate and continuing medical education can be remedied, there needs to be a systematic framework in place to guide a comprehensive diagnosis of the many challenges facing current conceptions of health professional
training as well as a better understanding of the knowledge and skills available to create new models of education to support the delivery of efficacious and cost-effective preventive and curative care.

**Organizational, Regulatory, Economic, and Environmental and Regulatory Factors**

From an historical perspective there are organizational, regulatory, economic, and environmental factors that have contributed to shaping the continuum of medical education. In Table 1 below I summarize and highlight some of these major forces shaping our current system.

**Table 1. Historical Factors Contributing to the Development of the Modern Medical Curriculum**

- Lack of legal, organizational development and regulatory infrastructure resulting in unfettered growth in number of medical schools and little means to develop and enforce medical training standards.
- Lack of government planning, leadership and funding to support and refine the multiple roles academic medical centres play in training medical personnel, providing medical services and supporting research activities.
- Lack of representation of other stakeholder involvement including consumers in identifying societal health care and research needs to better link current activities to population health and information needs.
- Mistaken adoption of the Hopkins Model as the gold standard for medical training leading to a rigid 2 plus 2 curriculum structure rather than Flexner’s vision of working with educators to create more productive pedagogical models fostering the development of a scientific inquiring mind.
- Need for better ways to identify areas of physician incompetence and linking curriculum development to address competence issues and population health needs.

The melding of all these influences created a system which has led to great advances in biomedical research, however it has generally failed to be responsive to the public’s interest in meeting the population health needs in urban and rural communities with a sufficient workforce of well-trained primary care practitioners and specialists.
Professional Development of CME Research Practices Begins in the 1980s

The lack of resources available for CME development, planning and research coupled with the lack of a regional, national or international consensus on the purpose of CME has resulted in each CME provider creating their own agenda and has limited the professional development of the CME field. However a number of developments in the 1980s contributed to improving research practices in the CME field.

In 1981, a growing professional interest in CME research led to the birth of the first CME journal in North America, Mobius, “dedicated to lifelong continuous learning in medical education” published by the University of California. The year 1986 represented another landmark year in CME research with the release of the seminal monograph: Changing and Learning in the Lives of Physicians edited by Drs. Robert Fox, Paul Mazmanian, and Wayne Putman, as well as the initiation of a series of conferences, entitled, Research in CME (RICME) organized by acknowledged leaders in the CME research field, Drs. Robert Fox, Paul Mazmanian, David Guillion, Nancy Bennett, Wayne Putman, Jocelyn Lockyer, and David Davis, with the purpose of cultivating and promoting process and outcome-based research in the field. (63) These conferences brought together researchers in the field to share their research and discuss common issues and concerns.

In 1988, Mobius, changed its name to The Journal of Continuing Education in the Health Professions (JCEHP) and became the official journal of the Society of Medical College Directors of Continuing Medical Education, (later to be renamed, Society for Academic Continuing Medical Education), the Alliance for Continuing Medical Education (ACME), the Council on CME and the Association for Hospital Medical Education. JCEHP not only acted as a communication vehicle publishing research in the
field, its editors began to shape and influence research practices and foster a recognizable community of CME researchers.

Two milestone events arose from formal and informal discussions at RICME. In 1989 an intensive one week exploratory planning conference was held in Banff, Alberta, with 20 participants exploring questions and issues in CME resulting in a summary statement recognizing the need for CME to be more responsive to the needs of the practitioner/learner informed by principles of adult learning, cognitive and educational psychology, to become more cognizant of external forces having an impact on CME, to be an active agent influencing the practice of CME and health care delivery, and to further develop practice-based delivery of CME. This 1989 conference laid the groundwork for the planning and implementation of a three day invitational consensus workshop held in 1991 at Beaver Creek, Colorado.

The Beaver Creek conference, hosted by the American and the Canadian Medical Associations, was focused on a set of questions about physician learning, the assessment of physicians and the provision of CME. The process was literature-driven with working groups initiating literature reviews in each of these areas. The literature reviews and discussions for the topic area of physician learning focused on physician motivation, self-directed learning, adoption of innovation, effects of age or stages of development, and how physicians learn from clinical encounters. The section on assessment of physicians focused on questions related to the effectiveness of chart audits in performance assessment, effectiveness of standardized patients and structured clinical examinations in competency assessment, as well as the question of how to identify incompetence. The section on the provision of CME focused on the differences among CME providers, the effectiveness of CME activities, factors influencing physician participation in CME, the
nature of individualized CME, and the impact of practice environments on learning. The results of this consensus workshop, informed by later reviews, led to the publication of the seminal text, *The Physician as Learner: Linking Research to Practice*, edited by David Davis and Robert Fox.

Aside from producing a state of the art review of the literature, the main thesis of the text was the recognition that in order to have an impact on the delivery, outcome, and evaluation of CME interventions, major efforts were needed in intersectoral collaboration and research involving many stakeholders including (i) medical and other health care professions and their licensing, credentialing agencies and specialty societies, (ii) partners involved with quality assurance, utilization review, competency assessment, health services research and governments, (iii) educators and students of adult education including educational psychologists, and others interested in continuing professional education or involved with the continuum of medical education, and (iv) CME providers and CME researchers. This seminal book, along with more recent evidence-based systematic reviews, provided the groundwork for planning, implementing and evaluating the case study described later in this thesis. The findings from these systematic reviews challenged beliefs, attitudes and values about current pedagogical practices in the field and further challenged the profession to utilize more evidence-informed educational interventions to enhance knowledge transfer.

The call for pedagogical changes in the continuum of education has repeatedly been made throughout the past century. Angela Towle (1), in a recent article entitled, *Shifting the Culture of Continuing Medical Education: What Needs to Happen and Why Is It So Difficult?* raises concerns that not much has changed in continuum of medical education since a talk she delivered 6 years ago on rethinking CME for the 21st
Century. Her vision in 1994 and reiterated 6 years later stated CME must be:
educationally effective in relation to health outcomes, planned systematically on the basis
of needs assessment and prioritization, responsive to rapid changes in the world, inclusive
of services providers and users, designed to promote self-directed learning and problem-
solving based on a proven effective educational process and informed by the experience
of others. Towle suggests that part of the answer is the need to bring consumer
stakeholders into the educational process and proposes a clinical approach that fosters a
shared decision making process. She also posits that the current stakeholders involved in
the continuum of education need to reach a consensus on whether there is a need to shift
the culture of CME, what it might look like and asks the CME community if there is
sufficient interest in changing it.

I suggest part of the challenge to changing the culture of the continuum of medical
education, and in particular, CME is a faulty understanding about knowledge acquisition
and knowledge utilization. To better understand current practices, an historical
perspective on medical pedagogical practices may help the reader understand the roots of
current pedagogical practices and further recognize the need to change current practices
based on newer models of learning and planning.

**Pedagogical Factors Shaping Undergraduate Medical Education and CME
Practices**

George Miller, a noted doyen in the field of medical teaching, claims that one of the
most serious problems facing medical education is a deficiency in medical teaching
which he posits is historically related to the lack of cross-collaboration between faculties
of medicine and faculties of education. Miller (78) pp. 5-20 provides an excellent
summary of individual academic and clinical leaders and single institutional attempts to
improve the teaching of physicians. As early as 1811 the Austrian Imperial Commission
on Schools had issued “An Order for the Establishment of Training Schools for Future Professors of Medicine and Related Sciences.” Although there was recognition of the importance of pedagogical training to improve medical training there was little knowledge to determine what sorts of changes were required to enhance learning.

In training, and especially in teaching large groups, the importance of form and method must not be underestimated. On the contrary, we must acknowledge their great pedagogical significance, and therefore spare no effort to perfect them. (78)

In 1901, the president of the Association of American Medical Colleges (AAMC), at the annual general meeting, acknowledged the need to introduce better methods of teaching and the need to study medical pedagogy. In 1908, during the period of Flexner’s investigation in medical education, there was sufficient interest in improving medical pedagogy that AAMC also established a standing Committee on Medical Teaching to consider “pedagogic elements in medical education, with special reference to the training of medical teachers, methods of instruction employed and allied topics.” Miller (78) reports there was little in the AAMC archives that suggested this committee engaged in any significant action.

The development of medical pedagogy was in its infancy. Flexner, and a number of his critics, had grave concerns about the rigid lockstep curriculum and pedagogical practices that became characteristics of schools as they reformed according to the

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19 Miller (1980) reporting on Theodore Billroth's 1876 book on medical education entitled, Lehren und Lernen der Medicinischen Wissenschaften (Teaching and Learning in Medical Education).
20 Prior to 1876 most schools in the United States offered all subjects simultaneously and students repeated the same subjects and lectures during the second year (281). Harvard Medical School in 1871-1872 introduced a three year graded curriculum with instruction in the basic subjects in the first year followed by applied and clinical courses. By 1890 approximately 30% of the schools switched to the graded program. By 1900 nearly all medical schools had a four year curriculum with time divided up equally between basic sciences and clinical disciplines, known as the 2 plus 2 lockstep curriculum which is still the dominant curriculum structure today. In 1909, The Committee of One Hundred under the auspices of the AMA’s Council on Medical Education released a model medical curriculum consisting of 4100 hours of instruction, almost half, 1970 hours (48%), related to the basic sciences. Barzansky (1992, p. 22) states, “In actuality, about one fifth of the hours in the four year curriculum were devoted to anatomy (an average of 600-800 hours), 450 hours to physiology and biochemistry (in the best schools), 150 hours to pharmacology, and 500 hours to pathology and bacteriology. A year later, the AAMC Committee on Curriculum recommended 2,010 hours to the basic sciences and allotted 61% of these hours to laboratory work.
Hopkins Model. (58;59). Although profound changes did take place following the Flexner Report in "institutional settings, curriculum organization, subject matter content, and faculty credentials" Flexner’s pedagogical advice embedded in his report was not incorporated. (78)

Flexner, in his writings before and after releasing his report, asserted the lockstep curriculum was contrary to his belief that medical instruction should facilitate individual creativity, active learning and maintain "academic flexibility". Flexner was a proponent of active student learning noting that "purely didactic presentations were hopelessly antiquated." In Flexner’s 1925 book, Medical Education: A Comparative Study, speaking about the rigid lockstep curriculum, he states, "Anything more alien to the spirit of scientific or modern medicine or to university life could hardly be contrived."

Flexner’s own pedagogical concerns were echoed in the 1925 US Commission on Medical Education Report stating:

Chief criticisms of the training in the medical sciences are directed against the presentation too early of too many details, often of temporary, miscellaneous, and inconsequential value, the overemphasis on the technical procedures of laboratory work, and the artificial separation of the subjects...

The present system of detailed subject examination, which rely so largely upon memory and which are still popular in secondary schools and some colleges, tends to defeat the major purposes of training, which are not the collection of facts but the intelligent and discriminating use of knowledge which is applicable to a given problem. (56) p.37

Between 1921 and 1941 there were repeated surveys on medical education with many complaints centred on teaching and the lack of skilled teachers trained in pedagogy. (67) p.21 Historically, medical education arose from pedagogical beliefs prevalent at the turn of the 19th century and, except for a few instances in the mid-1950s and more recently in the last twenty years, have remained isolated from pedagogical developments occurring within other areas of education, or more recent research in medical learning and cognitive
sciences. When one considers the term, ‘doctor’ in latin means ‘teacher’, the predominate attitude was that a ‘good’ doctor or researcher would make a ‘good’ teacher.

**Learning Theories Underpinning the Continuum of Medical Education**

In the late 1800s medical education teaching was heavily influenced by several assumptions on knowledge transfer arising from a curriculum rationale based on “faculty psychology”. Faculty psychology was based on two primary assumptions. Firstly the belief that the mind was considered an organ like a muscle and learning was a product of mental exercise consisting of rote memorization and recitation, and secondly, the belief that certain subjects involve different exercise regimes and that students could apply this knowledge across all relevant areas. (79) In 1892, E.L. Holmes addressing the annual banquet of the Practitioners Club in Chicago, stated:

> Despite the great advances in American medical education during the last few years, it still remains a painful fact that the methods of teaching in our colleges are unphilosophical and the means of instruction lamentably inadequate...What is needed to improve the instruction in our medical schools is...the addition to the usual corps of professors [of] a large number instructors similar in function to drill masters in the army. (78)

The advocates of faculty psychology have dominated the curriculum field throughout the school system since the late nineteenth century and “loud echoes remain today.” (79)

p. 76 In the 1890s the National Education Association in the US appointed three committees to create curriculum policy: The Committee of Fifteen on Elementary Education, The Committee of Ten on Secondary School Studies, and The Committee on

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21 Pinar et al. (1995, p.73) stated the golden age of faculty psychology as being from 1860s – 1890 and is still present in the 1980s. Pinar, reporting on The Yale Report (quoting Sloan 1971, p.244) defines ‘faculty psychology’ “as a systematic and detailed psychological theory developed by some of Europe’s outstanding Enlightenment thinkers’ who postulated human beings having three constituent faculties or powers (i) presence of will, (ii) emotions, and (ii) intellect. Key concepts underpinning ‘faculty psychology’ were discipline and furniture (referring to bodies of knowledge). “The aim of education is to expand the powers of the mind and store it with knowledge...The primary aim in a curriculum, then, should be to call into daily and vigorous exercise the faculties of the students” (Pinar et al. paraphrasing Cohen, 1974)

22 B. Barzansky & N. Gevitz, Beyond Flexner: Medical Education in the Twentieth Century, 1992, p. 21 states, “Flexner felt that teaching the basic sciences in the context of their eventual clinical application had become [wrongly] discredited in the United States because unqualified teachers had turned such application into a mechanical drill.

23 Miller (78) quoting E.L. Holmes’ address at the annual banquet of the Practitioners Club in Chicago J.A.M.A. 18:114-115, 1892
College Entrance Requirements. This period of curriculum development became known as the ‘The Curriculum Committees’. Dr. Charles Eliot (1834-1926), the President of Harvard University, chaired the Committee of Ten and was considered a visible scholar associated with faculty psychology. (79) Dr. Eliot was also instrumental in the reorganization of medical teaching at Harvard. (56) William Harris (1835-1909), the United States Commissioner of Education between 1889-1906 and a prominent member of the Committee of Fifteen, was a leading proponent of the classical curriculum model “with a view to afford the best exercise of the faculties in their natural order, so that no one faculty is ...overcultivated or...neglected.” (79)

The earliest experimental work on learning was carried out by William James and his lead proponent, Edward Thorndike. Thorndike believed learning to be a physiological process a “situation (S) stimulates the nervous system, which in turn triggers a particular muscle or gland response (R)....” (66) p. 22 Thorndike’s physiological law of use and disuse, the notion that connections between neurons are enhanced through exercise and diminished when not in use, supported beliefs among faculty psychologists of the importance of exercise and drill. However Thorndike, unlike faculty psychologists, believed that learning transfer was possible from one situation to another only if the situation contained identical elements of content and the same patterns of procedures. (80) Thorndike’s law of effect was the precursor of behaviourism depicting human behaviour in terms of stimulus and response, popularized by the early work of J. B. Watson (1913) and B. F. Skinner (1938). Behaviourists viewed all organisms, human and sub-human, as biological entities immersed in their environments and looked for linear, measurable cause and effect learning mechanisms. Tolman remarks [cited by Amsel

24 Thorndike’s work contributed to a new conception of knowledge transfer and he was a recognized pioneer in the field of educational measurement and test development.
Mental processes are, for the behaviourist, naught but inferred determinants of behaviour, which ultimately are deducible from behaviour.”

Watson (82) p. 104 illustrated this belief when he stated:

Give me a dozen healthy infants, well formed, and my own special world to bring them up in and I will guarantee to take any of them at random and train him [her] to become any type of specialist I might select - doctor, lawyer...

Miller (80) describes behaviourists as follows:

[Behaviourists] concluded that learning is basically a process of establishing relationships between a given stimulus and an appropriate response. The stimulus may be visual, auditory, or tactile, and the response motor or intellectual, but to each stimulus a fixed response is developed. As learning continues the response patterns accumulate and become more complex but they are always precipitated by stimuli of one sort or another [...] new learning is achieved through trial and error, which leads to the acquisition of new responses to further stimuli, and the synthesis of past and present experience into new and more complex forms of behaviour. p. 47

Taba (71) in her seminal text, Curriculum Development and Practice, describes the behaviourist conception of learning as follows:

In these behavioristic theories the higher mental functions have a very small place. Learning takes place largely by trial and error and conditioning. Thought, and individual differences in it, is secondary to the system of establishing responses. Motives can be controlled from without by conditioning, punishments, and rewards. Practice (or drill) is essential, especially when combined with applying the law of effect—-that is, with rewards and punishments. Transfer is limited. An individual transfers what he has learned in one situation to another one only if the two are similar in content or procedure. Since the behaviorists, such as Skinner and Mowrer, believe that a science of behavior must be built only on what is observable, this school will not consider such unobservable behaviors as purpose, thought, and insight. (71) p. 80

From a behaviourist perspective the learner is seen to be a passive receptor with the teacher being the provider of the active stimuli shaping the learning environment and facilitating the firing of the appropriate synapses. The learning theory of the behaviourists was based on experimental scientific work with rats utilizing reward and punishment systems. With the increased interest in scientific investigation in other areas of science,
the scientific study of learning behaviour as described by Skinner and Watson was very influential between the late 1930s to the 1950s. The influence of behaviourism on medical teaching and training is, ironically, discussed by G. P. Meredith (83) in his humorous paper entitled, The Student Rat and the University Maze presented at the second annual conference of the Association for the Study of Medical Education where he portrays the inadequacies of behaviourist learning theory by his clever juxtaposition reflecting on “the path of the student rat [within the University maze]...from the experimental psychologist studying the learning of rattus rattus in the laboratory.”

Since it is hard to be scientific with children and students but relatively easy to be scientific with rats (who cannot answer back) the argument is that we should start with the rat, establish the basic equations of learning at that level and then gradually work up the mammalian scale adding whatever new variables are necessary at each evolutionary level until, by about the year 3,000 A.D. perhaps we reach the medical student (regarded by some as the lowest level of human life). (83) p. 20

The behaviourists’ understanding of the world was atomistic, mechanistic with a strong belief that all phenomenon belonged to a linear, rational universe that obeyed the law of cause and effect, a perspective popular with proponents of the philosophy of logical positivism. This was the milieu that gave birth to what Miller and Seller (66) coined the ‘transmission meta-orientation’ to curriculum development, “the function of education is to transmit facts, skills and values.” p. 5

There were alternate perspectives on learning during this period. John Dewey’s seminal text, The School and Society (84), originally published in 1899, and later text, Democracy and Education published in 1916, countered the classical curriculum of routinization, memorization and recitation of mental discipline and promoted a curriculum based on the philosophy of inquiry and reflection with the purpose of enhancing active democratic practice for the betterment of humankind. (79) The premise
that one should focus on memorization of facts was antithetical to Dewey’s beliefs about education as a means to cultivate social awareness and democratic vision to foster meaningful social change.

The mere absorption of facts and truths is so exclusively individual an affair that it tends very naturally into selfishness. There is no obvious social motive for the acquirement of mere learning, there is no clear social gain in success. Indeed, almost the only measure for success is a competitive one, in the bad sense of the term - a comparison of results in the recitation or in examination to see which child has succeeded in getting ahead of others in storing up, in accumulating the maximum of information. (79)

To Dewey, the focus of educational activity was more context-based than content-based. Intelligence was a product of the individual’s interaction with the social environment, particularly through problem-solving.

Dewey’s concept of problem-solving is rooted in the scientific method. In the first step of the problem-solving process the individual confronts a problematic situation that causes confusion or puzzlement he or she must resolve. In the second step the person must define exactly what the problem is. The third step, clarification of the problem consists of a careful examination or analysis of factors contributing to the problem. In the fourth step the person develops hypotheses or “if-the” statements that offer possible solutions and consider the possible consequences of each alternative. In the fifth and final step the person selects one hypothesis or alternative and implements it. If the chosen alternative is successful the person continues his or her activity; if the hypothesis does not work the individual selects another. (66) p.65

These new cognitive models of learning, rather than focusing on biological driven notions of cognition, were more concerned with ‘mental events’. Learning was seen as a dynamic process concerned with the organization, processing, and storage of information. Taba (71) describes these more cognitive-based field and gestalt theories as follows:

Another set of theories of behavior are referred to variously as the organismic, Gestalt, and field theories. The common feature of these theories is that they assume that cognitive processes — insight, intelligence, and organization — are the fundamental characteristics of human response, present even in the simplest perception of the environment. Human actions are marked by quality of intelligence and the capacity to perceive and to create relationships. This understanding of relationships steers man's actions. His responses are shaped by
his purposes, cognition, and anticipation. Man is also an adaptive creature who organizes each subsequent response in the light of his prior experience. pp. 80-81

Miller and Seller (66) describe the cognitive family of learning theories as a blending of biological and cognitive perspectives, rather than viewing the physiological process as both the means and the ends of learning. p. 47

These new cognitive perspectives saw learning as a process of discovery.

[Cognitive] theorists have concluded that learning is largely a process of establishing the significance of sensory experiences, of finding and gaining understanding of relationships through the development of insight, which may be sudden and dramatic.... Learning according to these theorists is more rapid and more efficient in the presence of clear perceptual organization of sensory experiences. This means that the whole is not only greater than the sum of the parts but also precedes the parts in the act of learning, since the parts are derived by degrees from perception of the whole.

The learner is seen as an active participant in the process of acquiring and using knowledge. The learning process therefore is an act of construction or more appropriately called ‘reconstruction of knowledge’. Central to the vision of constructivism is the belief that we actively reconstruct our mental models of the world via schemas, otherwise known as ‘cognitive maps’. From a constructivist cognitive perspective, learning is a dynamic process in which we project our “existing schemas or forms of knowing on a new situation, framing it and interpreting it according to what we already know.” Learning is seen as a process beginning with simple schemas, gradually expanding, revising and linking them with other schemas. With each use or referral we build more complex representations of links and associations and deepen our knowledge and expertise base. (85) Learning is not simply a process of responding to stimuli, but involves an active process attempting to make sense of things. As Soloway et al. (86) remarked, teachers’ words are not simply engraved in the student’s mind, after passing through the ear, they are acted upon and interpreted.” p. 190 Key concepts espoused by
constructivists are that understanding and learning are an active process that involve constructive or reconstructive processes which is generative in nature, involving assimilation, augmentation and self-reorganisation.

This was the milieu that gave birth to what Miller and Seller (66) coined the ‘transactional position’ to curriculum development, “represented by the cognitive-process orientation, certain elements of the discipline orientation, and democratic-citizenship orientation.” p. 91

Flexner and Dewey shared similar pedagogical perspectives. Both believed knowledge is related to experience and requires active engagement and reflection rather than something that is passively received by students. Flexner believed medical schools should promote an atmosphere of scientific inquiry and provide greater flexibility concerning curriculum programming to better meet different learning needs of students. Kember et al. (87) discussing inquiry-based learning and the need for reflective thinking, quoting Dewey states:

Reflective thinking, in distinction from other operations to which we apply the name of thought, involves (1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring, to find material that will resolve doubt, settle and dispose of the perplexity. (87) p. 10

Both Flexner and Dewey’s pedagogical ideas regarding the need for an inquiry-based curriculum were also congruent with McMaster University School of Medicine’s problem-based learning (PBL) curriculum, however current research suggests an incongruence between constructivist theory and how it is conceptualized and utilized in undergraduate medical education environments (discussed later in this Chapter).

This more transactional approach to learning was supported by other noteworthy developments in curriculum development. The seminal work of Tyler (1949) Basic

Tyler proposed a curriculum model to address four fundamental questions: What educational purposes should the school seek to attain? What educational experiences can be provided that are likely to attain these purposes? How can these educational experiences be effectively organized? How can we determine whether these purposes are being attained?

To address these questions Tyler’s curriculum model consisted sequentially of four steps: (i) specify objectives, (ii) select learning activities, (iii) organize learning activities, and (iv) specify evaluation procedures. Tyler’s 1949 book became the backbone of teaching practices around the world. The book was translated into seven foreign languages and sold over 85,000 copies during 36 printings. (79) Tyler’s framework will be discussed in further detail in Chapter Three as current conceptions of CME planning and accreditation are based on this framework.

Bloom’s seminal work, Taxonomy of educational objectives: Cognitive domain, more commonly called, “Bloom’s Taxonomy” introduced a more cognitive-model of knowledge representation. Bloom’s taxonomy provided a structuralist perspective on knowledge representation.

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25 Tyler is also regarded as a pioneer of evaluation in education, the principles outlined in his 1934 text, Constructing Achievement Tests provided the basis for most evaluation efforts in common use today. (79)
The levels of knowledge representation identified by Bloom are as follows:

- **Knowledge**: recall of basic information
- **Comprehension**: understanding the knowledge
- **Application**: the ability to use generalizations and to apply principles to specific situations
- **Analysis**: the ability to break down a concept or idea into its components
- **Synthesis**: the ability to combine a number of unorganized elements into a unified whole
- **Evaluation**: the ability to assess concepts, theories, and materials according to selected criteria.

This structuralist approach to cognition blends both transmission and transactional notions of learning. Bloom's taxonomy is a linear and sequential model with the idea that each lower step needs to be obtained in order to move to the next step. The first three steps, knowledge, comprehension and application, are the most developed components of Bloom's model. The first step is commonly interpreted as "knowing the facts", whereas the second and third steps are the process of contextualization, with comprehension representing a step where the learner understands certain relationships among sets of facts, and application representing the stage when a learner can apply this knowledge to a given situation.

Under a more recent cognitive theory framework, Royer et al. (88) posits the following types of measures of cognitive skills are considered:

- Measures of knowledge acquisition, organization and structure
- Measures of depth of problem representation
- Measures of mental models
- Measures of meta-cognitive skills
- Measures of automaticity of performance
- Measures of efficiency of the procedures

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26 The construct of knowledge comes from the root, to know, which gave rise to numerous other words from Latin and Greek such as cognition, note, and notion (Barnhart, 1986, p. 569).
These structuralist approaches to knowledge representation were also congruent with an alignment with a disciplines approach to learning. When the Russians launched Sputnik in 1957, the education field was under intense pressure to improve its practice especially in the sciences. In 1958, the US National Defense Education Act provided an enormous boost to a number of disciplines within and outside the education field by providing one billion dollars in federal aid “to upgrade the teaching of science, technology, and foreign languages.” (41) The National Academy of the Sciences, Air Force, Rand Corporation, US Office of Education, American Association for the Advancement of Science, and Carnegie Corporation hosted a national conference, The Woods Hole Conference, inviting psychologists, scientists and mathematicians to develop a new curriculum program to enhance knowledge transfer, particularly in science and technology.

The findings of the conference resulted in a new curriculum manifesto reported in Jerome Bruner’s 1960s text, The Process of Education, outlining a curriculum theory based on the concept of disciplinary structure. He posited that each discipline has a particular structure and understanding each structure “enabled the student to understand how a discipline worked: how it understood its problems, what conceptual and methodological tools it employed to solve those problems....” (79)

Although the 1950s and 1960s were a fertile period in the education field with over 290 books published in the curriculum field, unfortunately these rapid developments, for the most part, were not transferred to the business of educating physicians. (79) Only a few medical schools broke the discipline barrier between the faculties of medicine and faculties of education.
More Recent Attempts at Innovation in Medical Education

Although there were many calls for curriculum renewal after the Flexner Report, it was not until the early 1950s that a few medical schools engaged in a substantial process of curriculum renewal to address a growing concern about the inadequacies of medical teaching and the disparity between medical school training and the practice of medicine. For the purpose of this thesis I will present a very short summary of two major attempts of innovation in medical curriculum, Case Western Reserve University School of Medicine (CWRU) and McMaster School of Medicine. Both initiatives were more cognizant of the learner being an active participant in the learning process, they led to significant pedagogical experimentation within some faculties of medicine and have a potential pedagogical contribution to make to the practice of CME.

Curriculum Renewal at Case Western Reserve University School of Medicine (CRWU)

CWRU was recognized by the Council on Medical Education, and later in the Flexner Report as a top ranked medical school in the North America. It was an early adopter of the two year basic sciences plus two year clinical sciences, known as the 2 plus 2 curriculum. It had extensive laboratories for teaching and research as well as full-time professors in the basic sciences. By 1945, when Joseph Wearn became Dean, it was clear that there were significant problems with departments (earlier I quoted Dean Wearn claiming that his departments had become feudal duchies actively competing for greater time and resources). To Wearn, the solution required a radical change to the curriculum and departmental structure.
A thorough re-evaluation of the curriculum is essential, with a view to improve the quality, efficiency, and coordination of the teaching. This will necessitate eradication of the sharp line now existing between clinical and preclinical years and a close integration of all departments in teaching — in short, a complete revision of the present methods of teaching.

Dean Wearn struck a committee entitled, Committee on the Correlation of Instruction to report their findings to the newly formed General Faculty. The report highlighted the following deficiencies: a lack of correlation of content taught by the various departments, lack of understanding of the amount of teaching time devoted to certain subjects leading to some subjects being overemphasized while others neglected, a lack of effort to evaluate or improve teaching on a departmental level, the absence of consensus on what a graduate of the school should have been trained to do, and, a lack of information regarding other medical school education programs. To address these concerns Dean Wearn recognized that the current organization structure and departmental leadership were part of the problem and his change strategy was to recruit five new department heads, which he accomplished over six years, with an explicit goal of faculty and curriculum renewal.

To assist him in this process of renewal, expertise was sought from noted educators in the 1940s and 1950s including “Ralph Tyler, Benjamin Bloom, Jerome Bruner, B.F. Skinner, Donald McKinnon and T.R. McConnell, among others.” In 1949, Wearn hired Hale Ham, a noted scientist and very popular teacher at Harvard, to coordinate the planning of the new curriculum. The integration of faculty of medicine members with pioneers in the education field led to the unique development and implementation of an organ-system based method of teaching the basic sciences linked to and relevant to

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27 Williams citing Wearn's Memorandum dated February 1945 to the hiring committee.
28 Williams (1980, p. 461) quoting John Ellis, states, “...it is of interest that no other dean emulated the Wearn maneuver of directly displacing curriculum control from department chairmen to a general faculty and subject committee.”
clinical practice. The creation of new broad education objectives (see Table 2) initiated a more interactive and flexible curricular program.

Table 2. Broad Education Objectives for the Medical Education at (Case) Western University

- Curricular content should be selected for its importance and organized in a sequential and coordinated manner. Throughout the curriculum there should be correlated teaching concerning biology, the principles of medicine, and the care of the patient.
- Content selection should be a continuing process, emphasizing basic principles, methods, and scientific evaluation of data. The teaching methods should be selected to fit the content.
- The process of teaching should be carried out, “as a cooperative venture of faculty persons, who represent a variety of interests and departments and are organized as teaching groups to carry out a particular portion of the program.”
- Adequate numbers of faculty should be available, to allow “growth in research, teaching and education.” Effective teaching should be “recognized and rewarded, be considered in selection and promotion, and that guidance be given to inexperienced or ineffective teachers.”
- The medical student should be treated as a “colleague and as a student in a graduate professional school who is given increasing responsibility for his own education…”
- There should be longer contact between students and instructors.

Similar core educational objectives were recommended three decades later at the World Federation for Medical Education as part of the Edinburgh Declaration in 1988, and again at the World Summit on Medical and Continuing Medical Education in 1993 (26) which recommended twelve remedial principles to improve medical education including: the integration of sciences, teachers being trained as educators, the need for relevant educational settings, curriculum-based on national health needs, life-long active learning, competency-based education, etc. A similar call for curriculum renewal and the integration of sciences was echoed as well in Martson and Jones (53) report entitled, Medical Education in Transition Commission on Medical Education: The Sciences of Medical Practice, commissioned by The Robert Wood Johnson Foundation.

Aside from creating an organ-based curriculum, CWRU created two other significant curricular changes, the creation of a community-based family medicine/obstetrics
experience program for first year students, and a student-directed scheduled free study time. The community-based medicine program provided first year students with exposure to ‘live’ ambulatory patients from day one. First year students were assigned to a pregnant mother and followed the mother’s development and the baby to term, observed the delivery and participated in post-delivery consultations. Having clinical teaching in community-based medicine from day one was a significant departure from the 2 plus 2 curriculum program and the traditional reliance of clinical training taking place in tertiary environments. The later creation of “The Continuity Clinic” clerkship program emphasized the importance of ambulatory care and provided students with the opportunity to follow patients after hospital discharge, providing them with opportunity to observe the natural history of acute and chronic diseases, permitting the student to continue to follow the development of the mother and child they observed during their first year. The CWRU curriculum reduced the amount of laboratory time required, with core lectures occurring in the morning and three afternoons per week devoted to student-directed learning with occasional special lectures on ethics, death and dying, home visits etc. Although CWRU introduced an emphasis on ambulatory care ten years prior to the notion of primary care specialists, it was one of the last medical schools to formally establish a Department of Family Practice. CWRU leadership, similar to other elite medical schools, believed that “good family physicians came of a student with the intellectual capacity and drive to qualify as a board-certified general internist or general pediatrician.” (67) Since the creation of the Department of Family Practice, CWRU has become a leader in producing graduates exiting into family and community-based practice.
CWRU’s experiment in curriculum change had a major impact on medical schools in North America. By 1974, twenty-eight other medical schools, twenty-four in the US and four in Canada, had introduced interdisciplinary teaching, particularly in the biomedical sciences, as well as providing some clinical experience during the first two years. With the success of community-based training programs fostering an interest in primary care, McMaster Medical School is planning to adopt a similar community-based program in 2002 as there is growing evidence that community-based medicine programs result in more physicians choosing to practice as primary care physicians as opposed to those graduating from traditional programs.

However, CWRU today suffers from many of the challenges facing medical education. Faculty, although perceived to be more humanistic, were not necessarily better teachers. Williams (67) states, “Clinical teachers often found it difficult to answer the first question: What is it that you would like your students to learn in your course?” Promotion and tenure are still primarily based on research and publications rather than high performance of teaching. Although Wearn, as early as 1951, was interested in evaluation of medical teaching and created a subcommittee on evaluation, there was an ongoing struggle between evaluators and researchers. Reserve medical educators were interested in qualitative research in medical education whereas demands by the Commonwealth Fund in the early 1950s and members on the subcommittee were not interested in “nature” studies which resulted in little evaluation research being carried out. One of the main barriers to conducting research at CWRU was that the program was undergoing constant change making the evaluation of the continuing ‘experiment’ unmanageable. Other issues, common with educational research, include the very general nature of the stated objectives. In CWRU’s case, objectives for each phase of curriculum
renewal were essentially “not too precise” nor clearly linked to a pedagogical conceptual framework which made any systematic measurement problematic. In 1956, Wearn revamped the subcommittee and applied and received support for the establishment of the Division of Research in Medical Education (DORIME). Although DORIME was prolific, publishing many articles, Williams (67) claims most of these articles were of minor significance and did not adequately address major educational research questions or methodological and conceptual problems associated with education research.

**McMaster University School of Medicine**

The next major medical curriculum innovation occurred in 1966 as McMaster University implemented a new medical school. Dr. Evans, the founding Dean of Medicine at McMaster, recruited Drs. William Walsh, William Spaulding and Fraser Mustard, who were colleagues of Dr. Evans, as well as Dr. John Anderson. These medical founders shared similar concerns regarding the highly fragmented selection and organization of knowledge and the belief that a new system was needed to address their perception concerning the lack of relevancy of traditional medical education for the practicing physician. The McMaster curriculum was patterned after CWRU’s system-based curriculum with the addition of problem-based learning and tutorials.

The founders of McMaster medical school initiated a survey directed to specialists and sought information about what basic science content the specialist felt was essential to practice. They ended up with “an elaborate highly detailed compendium of basic science knowledge with a marked lack of overlap from one specialty to another… [and realized] medical practice was so diffuse …it is impossible to identify any set of prerequisite facts that is applicable across the range of the profession.” (54) From
this belief they proceeded to identify two major objectives for the McMaster undergraduate medical program (see Table 3).

Table 3. Founding Educational Objectives of McMaster University Medical School (54) pp. 62-63

<table>
<thead>
<tr>
<th>Objective</th>
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<tr>
<td>• To help students become effective solvers of problems, by enabling them to understand the principle essential to the solution of such problems, and by teaching them how to seek out and use the information acquired for their solution.</td>
</tr>
<tr>
<td>• To foster attitudes leading to behaviour as responsible physicians and scientists in relation to patients, colleagues, and society. Such behaviour is marked by compassionate concern for patients, coupled with action to promote the public good when the physician is faced with an ethical decision.</td>
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The premise that good physicians are people who are good problem solvers became a driving force for two new movements in medicine. The McMaster model of 'problem-based learning' (PBL) not only stimulated a number of medical schools to develop and adopt PBL as a curricular method of integrating sciences and clinical practice, but students also began actively searching and questioning the source and validity of material being taught, which ultimately provided the right environment for the more recent development of the evidence-based medicine movement in North America. (89)

**Problem-Based Learning: Pedagogical Challenges and Controversies**

PBL had its roots in undergraduate medical education at McMaster University (and almost concurrently at Michigan State University's College of Human Medicine) in the late 1960s and was seen as an alternative to traditional instruction in the basic sciences that was increasingly perceived to be dehumanizing, demotivating, inefficient and even ineffective.

In PBL, problems are organized in thematic blocks e.g. ischemia, inflammation etc. and are discussed in small groups. Specifically, students are presented with a problem consisting of a set of phenomena in need of an explanation. The problem has been specifically designed for instructional purposes. Eight to ten students, in a group guided
by a tutor, discuss the problem and generate learning issues that they believe are prerquisites for a better understanding of the phenomena in terms of its underlying processes, principles, or mechanisms. The learning issues are starting points for students. Students are provided time to engage in self-directed learning activities to gather information about the identified learning issues. In a second tutorial students report back information collected and an attempt is made to use this collected information to draw conclusions. The analysis of health problems as a means to learn basic sciences is believed to provide an integrated contextual understanding between basic sciences and clinical practice.

Founders and proponents of PBL claim that their curriculum would (i) stimulate students’ interest in the basic sciences more powerfully, (ii) improve medical problem-solving skills, (iii) increase understanding of basic science concepts and their relationship to clinical practice, (iv) be more satisfying for students and faculty, (vi) lead to better self-directed study and (vii) be more fun. (90) To date, using a range of reliable and valid outcome measures, there is no consistent evidence that the current utilization of PBL in an undergraduate program results in improved learning. There are a multitude of problems associated with evaluating PBL versus traditional instruction via individual studies in current literature synthesis and meta-analysis type reviews. Ross (91) in an attempt to clarify problem-oriented learning activities, suggested a taxonomy differentiating among problem-oriented, problem-based and problem-solving curricula. Ross suggested problem-oriented curricula is one where problems are used as selection criteria for content (and method), problem-based curricula is where students work on problems as part of the course, and problem-solving curricula is where students are given specific training for solving problems. This taxonomy is not utilized in the field nor in
research. The lack of categorization of the variety of PBL instructional methods reduces the accuracy and generalizability of individual and systematic review results. (92) p. 472

Differences in instructional design, lack of or inadequate reporting on instructional design variables, different methodology, inconsistent reporting of data collection, lack of reporting on test reliability, dissonance between findings and conclusions, make it difficult to interpret and generalize the findings of such research. The lack of robust results has resulted in some medical schools who adopted PBL curricula to revert to traditional curricula programs. Slavin (93) p. 12 states that part of the problem with meta-analysis type reviews is that they focus the reader on a few unqualified effects, for example, often the effects cannot really be understood without considering interactions and confounded variables.

The specific application of PBL is poorly defined in the literature. On the macro level each school and/or course interprets and implements PBL in different ways in their curriculum, and on the micro level each instructor and student implements and responds to PBL in unique ways. The lack of a clear classification system identifying the key instructional methods presents a much higher possibility of confounding and makes researchers' discussion of small positive results, though not statistically significant, more suspect.

Berkson (90) p. 80 in reviewing whether PBL teaches problem-solving better than traditional curricula, reported that experiments attempting to measure hypothetico-deductive or forward thinking processes failed to provide evidence that PBL students were better able to employ either type of reasoning more effectively (resulting in the correct diagnosis) than students from traditional curriculum. For instance, Patel et al. (94), studying the effects of conventional and PBL curricula on problem-solving reported
that McMaster medical students discussing a written case describing a patient with acute bacterial endocarditis hypothesized more but came to the correct diagnosis less often that did a group of (not clearly comparable) McGill medical students.

Berkson (90) report on studies which demonstrated that attempts to measure the performance of individual components of the hypothetico-deductive model, sometimes measured by patient management problem (PMP), proved highly case-specific and not generalizable, and tutoring in the individual components did not effect proficiency. Berkson also reported on a study evaluating a curriculum designed to facilitate hypothetico-deductive reasoning employed by fourth year medical students from a traditional curriculum at the University of Michigan and the problem-based curriculum at Michigan State University that showed no difference between the treatment group and controls in their use of the different components of hypothetico-deductive reasoning or in their ability to benefit from instruction in the relevant heuristics. Berkson concluded that there is a lack of definition regarding problem-solving powerful enough to guide the development of measurement tools, let alone instructional programs. There is little evidence to support the supposition that problem-based learning enhances effective decision-making. Further research is needed to clarify and measure problem-solving capacities.

**Differences in Novice and Expert Problem-Solving Methods**

Possibly relevant for use of PBL in CME were experiments in non-medical fields. For example, Berkson (90) reporting on a study by Larkin et al. (1980) investigating expert versus novice performance in solving physics problems, demonstrated that “experts employed sophisticated abstractions that subsumed variable amounts of data and from which they extrapolated conclusions”, this being an example of forward reasoning.
Novices, those lacking knowledge and/or experience within a content-specific domain, were unable to efficiently and single-mindedly organize the data and employed hypothesis-driven reasoning. There was some evidence that novices using hypothesis-driven reasoning for certain problems may have greater difficulty with utilizing forward reasoning later. Our lack of understanding of problem-effectiveness and overall problem-solving competency, as well as the lack of test reliability reported in measures used, make it difficult to generalize these results.

In spite of the rapid growth in the implementation of new medical curricula, there is confusion about what PBL is and whether there is significant value in using PBL instead of traditional instruction in undergraduate education. However, there are significant differences between undergraduate medical students using PBL, and practicing medical physicians using PBL with other experienced and knowledgeable colleagues. There is some evidence to support the hypothesis that PBL may be better placed in a CME environment. Berksen's review suggests that 'expert's', practicing physicians, may be more effective utilizing a problem-solving format than novices.

**PBL and Implications for CME**

The Kaufman and Mann’s (95) study comparing student perceptions regarding their courses in PBL or conventional curricula demonstrated that PBL students rated their courses significantly higher than (p. 001) students in conventional curriculum on 11 of 12 items. This higher level of satisfaction within undergraduate medical students may also be translated to higher satisfaction within a CME environment. Research on the information seeking behaviour of physicians suggests that they more likely seek advice from colleagues than any other source (96;96) and a PBL environment might provide another opportunity to fulfill this need.
Berkson (90) suggests that there is a lack of coherence between the current application of PBL in undergraduate studies and the theoretical framework based on 'constructivism', and suggests that the unqualified extrapolation from the cited theory to current practice may not be sound. There are, however, new developments in the cognitive sciences and learning theory that may help us better link adult learning theory to a conceptual framework concerning learning processes and lead to a more informative framework to support further research in our understanding about medical learning.

**New Developments in the Cognitive Sciences and Learning Theory**

I will be discussing three recent conceptions regarding learning (i) neurocognitive, (ii) cognitive production theory, and (iii) social cognition. The following summary also illustrates some confusion among theorists and researchers across disciplines which I believe is a result of an underdeveloped taxonomy about what is meant by 'learning' 'knowledge' and the processes involved in its acquisition and utilization. The problems of an unclear taxonomy, regarding different types of 'knowledges' and the different 'dimensions' involved in the acquisition processes, leads to similar confusion as illustrated in the following taxonomy of the animal kingdom attributed to an ancient Chinese encyclopedia entitled, *The Celestial Emporium of Benevolent Knowledge*:

On those remote pages it is written that animals are divided into (a) those that belong to the Emperor, (b) embalmed ones, (c) those that are trained, (d) suckling pigs, (e) mermaids, (f) fabulous ones, (g) stray dogs, (h) those that are included in this classification, (i) those that tremble as if they were mad, (j) innumerable ones, (k) those drawn with a very fine camel's hair brush, (m) those that have just broken a flower vase, (n) those that resemble flies from a distance.[Borges, 1966, p.108 cited by Rosch (97) p.27]

**Neurocognitive Psychology**

The neurocognitive development model arose from Hebb's connectionist theory and views the learning of a skill as an interlocking set of standard operating procedures that
have been inscribed on the nervous system and ‘expertise’, an extension of a skill, as a refinement of years of experience. Hebb, as described by Waldrop (98), describes learning and memory as the process of the brain taking in random data and immediately commencing to organise it. He states:

A sensory impulse coming in from the eyes, for example would leave its trace on the neural network by strengthening all the synapses that lay along its path.... Experience would accumulate through a kind of positive feedback; the strong, frequently used synapses would grow stronger. He then postulated that the stronger pathways would then cause the brain to form cell assemblies - subsets of several thousand neurons in which the circulating nerve impulses would reinforce themselves. (98) p.158

Some neuroscientists believe that all aspects of the mind, including consciousness, are likely to be explained in a more materialistic way as the behaviour of large sets of interacting neurons. (99) p.153 Kandel and Hawkins (100) p.79 claim that “learning engages a simple set of rules that modify the strength of connections between neurons in the brain.” To the neuroscientist consciousness and meta-cognition is principally a neural phenomenon. Former more mentalistic psychological models, have been reclassified as ‘folk psychology’ whereas the real ‘psychology’ is based on biological modeling and biochemical investigations. Neuroscientific perspectives are primarily concerned with reductionist phenomena such as brain processing and the demonstration of information processing through biological modeling. The description of biological processes and theoretical constructs which attempt to ‘make sense’ of the phenomenon sometimes, unfortunately, gets interpreted as an explanation of the phenomenon itself. Part of the problem with this perspective is that the construct of ‘evidence of learning’ is poorly defined and generalised so that all chemical changes are equated to demonstrate learning.

Neurocognitive investigations into learning concentrate on the neurophysiological level of information processing including biological aspects related to motor/perceptual
control and abnormal brain function. This microscopic perspective has provided us with some greater insight regarding certain types of learning and dysfunction. In addition there has been some limited cross-discipline research within the human-computer interface community integrating aspects of neuropsychology with human behaviour, although the scope of these investigations have been quite limited (positioning, display qualities, attention factors etc.).

Cognitive Production Theory and Related Learning Theories

Anderson (42)\(^{19}\) in his influential text, *Architecture of Cognition* (cited >1900 times between 1983-2002 Social Sciences Citation Index) implicitly defines knowledge as that which can be remembered or acted upon. He proposes a cognitive production theoretical model for knowledge representation. I will outline some aspects of his model which will be pertinent to later discussions concerning content knowledge and learning contexts and the need to create a more grounded taxonomy for knowledge domains which may be more 'fruitful' than current conceptions for the purpose of curriculum planning in CME. Of particular importance is the differentiation between the novice learner and the experienced learner and the need to move beyond the notion that the application of generic adult learning principles to the context of the CME environment will improve learning.

In 1983, Anderson (42)\(^{19}\) proposed a theoretical model entitled, *Adaptive Control of Thought (ACT)* which is a theory of basic principles of operations built into the cognitive system. His original framework has been modified and discussed in his later book, *Rules of the Mind* (101), published in 1993. He has coined his modified framework ACT-R ("R" for rational). His 1993 work incorporates necessary changes to be consistent with new research findings in cognitive psychology.
Unique to Anderson’s ACT and ACT-R theories is his differentiation between the acquisition of declarative knowledge and procedural knowledge. Whereas a ‘fact’ may be committed to memory after a few seconds of study, in contrast it appears that new procedures can be created only after much practice. It is difficult to explain this huge discrepancy if both types of knowledge are encoded in the same way. (42) p. 23

Declarative knowledge includes propositional knowledge i.e. the knowledge of association (that Joe hates Bill), spatial images (triangles), or strings of information (numerical order). (42) p. 23 Declarative knowledge includes knowledge that people can describe or report, whereas procedural knowledge is manifest in performance. Anderson (42) p. 215 describes procedural knowledge as developing primarily through the act of executing the skill; one learns by doing. When we think of skills we tend to think of motor skills like bicycling, however cognitive skills include activities such as decision-making, mathematical problem-solving, computer programming, clinical skills and language generation.

Knowledge can involve an integration of both declarative and procedural knowledge. An activity such as typing initially involves memorizing the keyboard as a form of declarative knowledge, however, its automaticity, learned through the act of doing, may lead, though not necessarily, to a reduction of declarative knowledge. This can manifest itself in a typist needing to think of her/his finger placement to recall a letter position, rather than just mentally recalling its position on the keyboard. Most procedural knowledge involves moving from an initial transfer of declarative knowledge through a process of “doing” being transformed to procedural knowledge. The repetitive act of doing leads to a decrease of cognitive processing in a similar way that driving a car, after practice, requires less cognitive processing related to the act of doing.
There is significant research supporting this claim of disassociation between declarative and procedural knowledge especially on patients who have suffered from brain trauma or disease. The most notable case being patient HM who lost the ability to acquire new declarative knowledge, but was able to acquire new skills, or other patients who acquired the procedural skill of reading words but had substantial impairment in remembering words they had read. (100;102)

Anderson's framework for knowledge representation rests on three theoretical assumptions (see Table 4).

**Table 4. Anderson's Production Theory for Knowledge Representation (42)**

- there are two long-term repositories of knowledge: a declarative memory and a procedural memory
- the 'chunk' is the basic unit of knowledge in declarative knowledge
- the 'production' is the basic unit of knowledge in procedural knowledge

Chunks represent an encoded set of elements in a particular relationship (propositional, temporal or spatial). In complex knowledge structures one cognitive unit (also called chunks) appears as an element of another. The interconnections of these structures and elements define a network or schema-like structure. Anderson (42) suggests that each of these units could be called 'nodes' and that the connections between them could be called 'links'. Declarative knowledge building is seen as a process by which “a chunk is to be represented as a pattern of activation that associates the elements of the chunk and the context information.” Anderson’s model of cognitive skill development is based on the theoretical assumptions described below (see Table 5).
Table 5. Theoretical Assumptions: Development of Procedural Knowledge

- the knowledge underlying a cognitive skill begins in an initial declarative form (an elaborated example) which must be interpreted (problem-solving by analogy) to produce performance
- as a function of its interpretive execution, this skill becomes compiled into a production-rule form
- with practice individual production rules acquire strength and become more attuned to circumstances in which they apply
- learning complex skills can be decomposed into learning functions associated with individual production rules (For a further elaboration of his work, see Anderson 1983, 1993)

Anderson’s theory of cognition is also congruent with recent research investigating physician thinking. Irby's (103) model of clinical skills learning is based on an assortment of cognitive models and learning theories discussed in the medical literature, most notably Patel and Groen’s text, Toward a General Theory of Expertise (94) and Lemieux and Bordage (104) describing semantic structures and models for representing semantic structures of medical knowledge and thinking of experts and novices. Bordage and Lemieux, as described by Irby, posit that the structure of medical knowledge can be represented as follows (see Table 6).

Table 6. Structure of Medical Knowledge (103)

<table>
<thead>
<tr>
<th>Compiled High Knowledge</th>
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</thead>
<tbody>
<tr>
<td>High knowledge, clinical prototypes, pattern recognition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elaborated Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>High knowledge, clinical prototypes, clinical reasoning in context</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dispersed Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encyclopaedic knowledge, little conceptual integration, out of context</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reduced Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little, disorganized knowledge, inaccessible and out of context</td>
</tr>
</tbody>
</table>

Groen and Patel (105) pp.293-294 in discussing the relationship between comprehension and reasoning in medical expertise, cited a series of studies (Johnson, 1970, Patel and Frederiksen, 1984 and Frederiksen 1979, 1981) which all noted that in routine cases,
similar to those that a physician frequently encounters, experts make more inferences from highly relevant information than do novices. On the other hand, novices both recall and infer more information of low relevance than do experts. Alternatively, when the case-based problem is scrambled, the differences between experts and novices disappear. Medical experts presented with routine problems are quickly able to differentiate between relevant and irrelevant information as it pertains to the task of making a diagnosis. Therefore testing simple recall or number of inferences made may bear little relevance to the ability to solve the problem nor accurately assess knowledge acquisition.

This type of expert knowledge however, is different from other studies exploring differences between novices and experts in different areas of study. For instance, de Groot (1946) cited by Berkson (90), investigating recall among advanced chess players, masters and grand masters with mid-game positions, required them to recall the positions of the pieces on the board, and showed a strong correlation between level of expertise and increased ability to recall. However, with physicians it has been repeatedly shown that they have less recall than students. It is suggested that physicians, in fact, create different representations of knowledge due to a process coined as ‘knowledge encapsulation’ which is the packaging of lower level detailed propositions, concepts and their interrelations in an associative net under a smaller number of higher level propositions with the same explanatory power. (106). Therefore physicians, analyzing a problem, translate elaborate information into ‘chunked’ highly inclusive concepts. In medicine the encapsulating concepts tend to be of direct clinical relevance. For instance, an internist would take a list of symptoms and chunk them to ‘patient has a septic condition’. A recent reformulation of Van Dijk and Kintsch’s theory (1983) of text comprehension elucidates why current theories of text processing have difficulty explaining this anomaly. Kintsch's construction-integration model deviates from existing schema-based...
conceptions of text comprehension in that it conceptualizes the processing of text as largely bottom up. It assumes that knowledge is not prestored in fixed structures, but generated in the context of the task for which it is needed. A reader attempting to understand text, words or phrases will activate their corresponding nodes and this activation will spread to other related nodes. In this way a pool of knowledge is activated that may or may not be relevant to the task of understanding the text at hand. Kintsch describes this as the construction phase in text comprehension. Further reading and hence activation of concepts and their interrelations will, however, constrain the meanings of what was previously read by deactivating irrelevant knowledge. Thus a coherent representation of the text formed occurs, integrating knowledge from earlier cycles of activation with those from later cycles of activation. In the course of this integration process the reader may have to produce bridging inferences and form macro propositions to create or maintain coherence. Prior knowledge and information from the text itself thus becomes integrated into a text base that represents meaning.

Boshuizen and Schmidt (106) posit it seems reasonable that the more prior knowledge a person has the less time is needed to construct a coherent text base. They suggest that experts can be expected to produce less bridging inferences, simply because these are already part of their knowledge base and will be generated automatically. This in itself does not explain the lower recall. Groen and Patel (105) suggest that subjects reading a text about a patient transforms the discourse into different kinds of representations, such as, the text base, which is semantic representation, and a situation model which is a cognitive representation of the events, actions, persons or situation.

Boshuizen and Schmidt suggest that novices and intermediates process a clinical case in a way described by Kintsch. They also report that, whereas novices and intermediates
refer to biomedical concepts while reasoning aloud, physicians rarely do and suggest that these concepts have become encapsulated into higher level concepts.

Berkson (90) reporting on a study by Larkin et al. (1980) investigating expert versus novice performance in solving physics problems, demonstrated that “experts employed sophisticated abstractions that subsumed variable amounts of data and from which they extrapolated conclusions.” This is an example of forward reasoning. Novices, those lacking knowledge and/or experience within a content specific domain, however, were unable to efficiently and single-mindedly organize the data and employed hypothesis-driven reasoning. There was some evidence that novices, using hypothesis-driven reasoning for certain problems, may have greater difficulty with utilizing forward reasoning later. These notions of encapsulated knowledge, or Irby’s idea of ‘compiled higher knowledge’ are similar to Anderson’s idea of procedural knowledge and his claim that the transformation of declarative knowledge to procedural knowledge may lead, though not necessarily, to a reduction of declarative knowledge. It appears that experts are better able to filter out irrelevant information from a case.

Anderson's theory is also similar to a constructivist cognitive perspective, although constructivist proponents have not grounded their cognitive modeling of learning adequately differentiating from an operational perspective the acquisition of declarative and procedural knowledge. The benefits of Anderson’s cognitive production theoretical model of knowledge representation are threefold, (i) unlike some biological models such as Hebb above, Anderson does not confuse the theoretical model of knowledge representation with the end product of learning, (ii) it is congruent with current research exploring differences between novice learners and expert learners, (iii) it provides a more promising framework to explore the development of physician tacit-knowledge and
pattern recognition to enhance our understanding regarding differences between novice learning and expert learning, which might help resolve some of the practical challenges of using PBL in undergraduate environments. (107)

### A Model of Social Cognition

Social scientists, as represented by Butterworth (108), believe that knowledge acquisition is principally a social phenomenon and that the transmission of knowledge is embedded in complex value systems where information gained within one context is not necessarily easily transferred to another, from even within the same subject domain.

For instance, Butterworth (108) states that the classical Piaget perspective focused on logico-deductive processes within the individual child and Vygotsky's perspective on problem-solving viewed thought processes and cognitive growth as being just socially-situated. Recent work on sociocognitive development has moved away from viewing contextual factors as being moderators to the learning process, to the position that contextual constraints are “inextricably linked to the acquisition of knowledge.” In socioculturalism, learning is seen as the process of enculturation. Learners become collaborative meaning-makers among a group defined by common practices through

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29 Piaget's development theory drew heavily on his training in biology. Eklind (1989), reporting on Piaget's development theory stated, “Mental growth is inseparable from physical growth: the maturation of the nervous and endocrine systems, in particular, continues until the age of sixteen.” Piaget coined the term “genetic” epistemology to describe his philosophy on how we know the world. Piaget (1969) believed human intelligence grew in a series of stages related to age and could not be hurried. His stages of development sensorimotor, pre-operational symbolic, concrete operational and formal operation were based on reflecting how the child deals with concepts of space, time, causality and logico-mathematical constructs. Piaget’s description of how children learn utilized biological terms of accommodation and assimilation. Accommodation is the process which causes behavioural changes caused by the child adapting to external forces. Assimilation is the process of internalization which is most easily seen in watching children play. These concepts of assimilation and accommodation provided a new construct of learning theory. Learning was seen as an interactive, rational process that provided a basis for a new transactional model for understanding learning and development.

30 Vygotsky (1978), expanded Piaget's concept of intelligence by looking not only at the child's degree of organic development but also at the unity of perception, speech and action. He viewed the learning process as the mastery of mediating tools leading to high mental flexibility and problem solving. He expanded the biological model to include both a biological and a cultural perspective. He believed that instruction was critical and that timing and content were very important. Vygotsky devised the concept of “zone of proximal development”, the distance between what the child could do by itself versus what a child could do with assistance. His primary concept of learning was to challenge or stretch the child's current skills through introducing gradually more difficult levels of problem solving.
language, use of tools, values and beliefs. Bandura (109) in his seminal text, 
Social Foundations of Thought and Action: A Social Cognitive Theory, describes social 
cognitive theory as follows:

Social cognitive theory embraces an interactional model of causation in which 
environmental events, personal factors, and behaviour all operate as interacting 
determinants of each other. (109)

Whereas most psychological approaches to learning look within the individual to 
understand how learning occurs, the central idea of social learning theory is to look 
outside the individual at specific types of information exchanges (verbal and non-verbal 
communication) with others to explain how behaviour changes. (110)

The differences among sociocognitive, neurocognitive and cognitive models of 
learning are important, however, they are not necessarily, from a theoretical perspective, 
in opposition with each other. (111) Anderson's theoretical modeling of cognition does 
not exclude sociocognitive factors in knowledge acquisition as schemata are considered 
contextually rich chunks. The construct of 'sociocultural cognition' places the emphasis 
on the sociocultural contextual ways knowledge is constructed whereas a neurocognitive 
framework attempts to model the information processing aspect of cognition. The notion 
of highly developed automated processing of high level pattern recognition, a form of 
procedural knowledge, is also reflected in research and discussion concerning the concept 
of embodied knowledge and skills, and constructs of tacit-knowledge, particularly in 
understanding everyday decision making and planning. (112-114)

If one accepts the idea that knowledge is not simply a transmission of information but 
rather a complex cognitive and enculturation process, involving different cognitive 
processes dependent on the experience level of the learner and the familiarity of the 
context, then planning an educational intervention should involve a comprehensive
diagnosis of the experience level of the targeted audience as well as a contextual
diagnosis identifying administrative, organization, regulatory, policy, peer and
professional factors as well as individual attitudes, beliefs and practice routines that could
hinder or facilitate learning.

In practice, however, there is little difference between teaching practices in
undergraduate medical education (novices) and CME (experienced practitioners), which
is not surprising when one recognizes that formal CME practices arose from the same
pedagogical beliefs underpinning undergraduate medical education.

Merging of Learning Theories, Diffusion Theory and Models of Knowledge
Transfer

Theories and knowledge about diffusion have benefited from a recent convergence of
diffusion research in the fields of anthropology, sociology, rural sociology, education,
public health and medical sociology, communication, marketing and management and
other disciplines. (110) Knowledge transfer research and theory, although related to
diffusion research, arises from other disciplines, particularly industrial psychology, and
educational psychology. Whereas diffusion research is primarily addressing what factors
influence knowledge uptake and its utilization, knowledge transfer theory and research
tends to be is more focused on the conditions of transfer, integrating cognitive learning
theories regarding knowledge acquisition and how trainees apply the knowledge, skills
and attitudes gained in a training context to the job as well as how these attributes are
maintained over time. (115)

The traditions behind these different disciplines arise from different cognitive models.
Roger's(110) claims that diffusion theory has many similarities to social learning theory,
and that both share a central belief that “stress information exchange as essential to
behaviour change, and view social factors as the main explanation of how individuals
alter their behaviour." Knowledge transfer research arising from industrial psychology tends to focus on inputs, such as instructional methods, and sequencing of training materials using principles of learning based on more neurocognitive learning models. Knowledge transfer research recognizes the importance of social systems, however views the social systems as moderators influencing knowledge uptake especially regarding reinforcement and maintenance of knowledge learned, rather than viewing knowledge acquisition as principally a social phenomenon (see Figure 6 below).

Figure 6. A Model of the Transfer Process (115) p.65

Baldwin and Ford (115) describe the transfer process as input and output factors using behavioral terms common to the field of industrial psychology. Baldwin and Ford categorize input factors as those related to trainee characteristics, training design and work environment variables. Training outputs and training input factors, they posit, have
direct and indirect effects on conditions of transfer. Their model describes six conceptual links among the different components.

Table 7. Conceptual Links Proposed by Baldwin and Ford on Knowledge Transfer and Utilization (115)

- In order for trained skills to be transferred training material must be learned and retained (linkage 6).
- Training characteristics and work environment factors are hypothesized to have direct effects on transfer regardless of initial learning and retention. For instance, lack of motivation or lack of supervisory support may hinder transfer. (linkage 4 and 5).
- All training inputs (trainee characteristics, training design and work environment) impact learning and retention (linkage 1, 2, and 3).

Baldwin and Ford (115) in their critical review of knowledge transfer research, used the above framework to classify the different types of research activities represented in the field in reference to learning principles commonly held within the field. In this review they present information about the research studies cited in support of a given learning principle (or lack of research). They also discuss limitations of current research with the intent to determine gaps in the knowledge-base of the field and specify the types of research needed to further understand the transfer process.

While it is relatively straightforward to operationalize principles such as overlearning in controlled experimental settings with motor or memory tasks, the appropriate operationalization of learning principles in more complex organizational-training programs is problematic. For example, there is no empirical data regarding how much and in what ways a trainer should incorporate learning principles such as stimulus variability into a behaviour-modeling program to enhance the transfer of managerial skills. In addition, W. Schneider (1985) suggests that several training-design maxims (e.g. practice makes perfect) are fallacious when training for “high performance” skills. (115)

Baldwin and Ford note a number of critical limitations of past research efforts which support my argument that a better conceptual framework and taxonomy of ‘knowledges’ is needed to better understand the linkages among cognitive models and their relationship to knowledge transfer and diffusion. A major part of the problem with knowledge transfer
research, Baldwin and Ford (115) posit, is the tendency for knowledge transfer research to focus on training input factors rather than to develop more appropriate measures of the condition of transfer.

To develop appropriate measures of generalization requires a linkage of needs-assessment information, the specification of training objectives, and the determination of criteria to determine how much of the knowledge, skills and behaviours learned in training are transferred to the actual job. In addition, the relevance of the skills learned for effective job performance must be determined. (115)

The concern regarding the deficiencies with current measures for assessing knowledge retention and its application is not unique to researchers engaged in knowledge transfer research. A significant problem with all current cognitive models is that no one model provides a reliable and valid taxonomy of knowledge representation with reliable criteria for testing different levels of knowledge representation. (88;90;116)

**Use of Diffusion Theory in the Medical Field**

Diffusion in the medical field has been extensively investigated addressing uptake of new pharmacological products, new surgical procedures, computer information systems, and, more recently, the uptake of clinical guidelines. Davis et al. (6) posit that most medical studies investigating knowledge and behaviour transfer have based their conceptual model on Rogers (117) seminal text, *Diffusion of Innovation* (see Figure 7 below).
Rogers' diffusion model has been used in multiple fields and contexts investigating individual and/or organizational change and the adoption of new ideas and technologies. Roger (110;117) proposed a series of stages in the innovation process recognizing that diffusion occurs over time rather than as an instantaneous act. He conceptualized the decision-making process through which an individual or group (i) has first knowledge of an innovation, (ii) forms an attitude toward the innovation, (iii) makes a decision to adopt or reject the innovation, (iv) implements the innovation, followed by, (v) confirmation, or rejection of this decision. His model also presented a number of predisposing factors influencing adoption, which he called prior conditions. These included (i) previous practice, (ii) felt needs/problems, (iii) innovativeness, and (iv) norms of social systems. Rogers (110) also produced a parsimonious set of characteristics, linking characteristics of both the innovation and of the adopter (see Table 8). These characteristics help explain

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**Figure 7. A Model of Stages in the Innovation-Decision Process (117)**

<table>
<thead>
<tr>
<th>Prior Conditions</th>
</tr>
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<tbody>
<tr>
<td>1. Previous practice</td>
</tr>
<tr>
<td>2. Felt needs/problems</td>
</tr>
<tr>
<td>3. Innovativeness</td>
</tr>
<tr>
<td>4. Norms of the social systems</td>
</tr>
</tbody>
</table>

**COMMUNICATION CHANNELS**

- **I. KNOWLEDGE**
- **II. PERSUASION**
- **III. DECISION**
- **IV. IMPLEMENTATION**
- **V. CONFIRMATION**

**Characteristics of the Decision-Making Unit**

- 1. Socio-economic characteristics
- 2. Personality variables
- 3. Communication behavior

**Perceived Characteristics of the Innovation**

- 1. Relative Advantage
- 2. Compatibility
- 3. Complexity
- 4. Trialability
- 5. Observability

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some of the variability why some innovations spread rapidly and others more slowly.

(118) p. 69

Table 8. Factors Affecting Adoption of Innovation (117)

- Relative Advantage: The degree to which an innovation is perceived as better than the idea it supersedes.
- Compatibility: The degree to which an innovation is perceived as being consistent with existing values, past experiences and needs.
- Complexity: The degree to which an innovation is perceived to be difficult to understand and use.
- Trialability: The degree to which an innovation can be experimented with on a limited basis.
- Observability: The degree to which results of an innovation are visible to themselves and others.

Rogers (110) conceptualized the diffusion of innovation as a communication and decision-making process that takes place through channels occurring over time and targets specific members of the target community. (118) p. 64 Each step in the model contributes to the decision of an individual or organization whether to adopt a given innovation and whether such adoption will be maintained. The first step in the diffusion process is awareness of the innovation and its compatibility and relevance to the individual. The complexity of the innovation, the clarity of information informing the desired change, and perceived trialability may influence knowledge uptake. The second step in the process is persuasion. This can involve informal and formal clinical evidence, public and professional media, examples of successful implementation, adoption by opinion leaders in the local community. Some theorists such as Weiss (119) and Lomas (120), have paid particular attention to identifying or theorizing factors influencing the knowledge and persuasion phase of Rogers' diffusion model. Weiss, investigating the effectiveness of research utilization, looked at three different presentations of research on decision makers, research presented as data, research presented as ideas, and research
presented as argument. She found research presented as argument as the most compelling way knowledge can be presented to policy makers, although she warns that stripping away ‘details’ may omit vital elements and therefore distort research findings. Lomas and Lave building on Weiss’s work, posit, that in order to advocate for change, research findings need to be condensed and translated into key messages and that these key messages or thematic messages need to be presented persuasively comparing current practice to the desired change(s). Kramer (121) quoting Lave (1999) work states, “Key messages should draw on all available research (and only profile and place in context the results of a specific research project when relevant), be compelling, and relate to a decision or set of decisions.” For knowledge transfer purposes the unit of transfer are ideas rather than data. The idea of using key messages as a means to enhance dissemination has now been incorporated in the British Medical Journal and other journals including the Journal of Continuing Education in the Health Professions. (122)

The third stage of Rogers’ diffusion model is the decision to attempt to adopt the innovation. Trialability is influenced by a number of factors including whether the individual willing to attempt the change is able to make the change within the context of their practice or organizational structure and has the financial and human resources needed to make such a change.

Huberman, cited by Kramer (121), building on Rogers’ work and his own work investigating the causes and determinants by which innovations are generated, adopted, implemented, and finally institutionalized, created a Social Interaction Model which posited a number of factors that influence successful dissemination programs (see Table 9).
Table 9. Factors Influencing Successful Dissemination

- accessibility, availability and adaptability of the program
- relevance and compatibility of the program
- quality of the presentation
- number of vehicles and methods used to convey the innovation
- linkage and engagement of users
- sustained interactivity between knowledge brokers (researchers, innovators, program leaders) and users

Davis et al. (6) provides a summary of factors believed to contribute to the adoption of innovation in the medical literature. These factors meld individual, social factors and principles that influence the uptake of medical innovation (see Table 10 below).

Table 10. Summary of Factors Impacting Behaviour Change in the Medical Community (adapted from Davis et al.) (6)

- multiple pieces of information from a variety of credible sources are required before physicians will make a change to their clinical practice
- simpler changes require fewer sources of information and usually result in faster adoption
- major changes requiring more complex procedures require greater number of sources and longer period needed for adoption
- strength of the evidence supporting the innovation.
- dependent upon collegial communication, particularly among peer-respected specialists.
- physicians who are in association with a group practice, serve on major committees, published in medical literature, board certified, or hold an academic appointment tend to be early adopters of innovation
- physicians must make a personal commitment to change
- a conceptual base is necessary, as well as time to reflect whether the innovation is valid and relevant to their practice and attainable within their community, organizational context needs to support individual commitment to change
- evidence of peers making changes
- success of initial experience with attempting the innovation

Importance of Informal Communication with Peer Respected Colleagues

Recent medical research has found that, while clinicians utilize a wide range of resources which contribute to their knowledge base and contribute to changes in clinical behavior, informal communication is consistently rated as a major source of information-
seeking behavior by physicians. (123) Gruppen et al. (124) found unique patterns of information-seeking behavior of family physicians with their first choices of information resources being informal consultations with colleagues (33%), consultations with community specialists (32%) and textbooks (27%). Use of journals (4%) and consultation with outside specialists (2%) were minimally important. Kaufman et al. (125) confirmed these findings in their recent survey of Nova Scotian Family Physicians who reported that formal and informal communication with colleagues and consultants were the most often used methods when seeking medical information and advice.

In the medical literature different labels have been attributed to opinion leaders including gatekeepers, informal leaders, informal educators, credible messengers and educational influentials. (123;126) The use of educational influentials (EIs)/opinion leaders in disseminating information has been shown to be an effective method of changing clinical practice. For instance, Stross et al. (127), in a randomized controlled trial, showed a significant difference in the inpatient management of chronic obstructive pulmonary disease in intervention hospitals. The EIs who participated in the comprehensive educational program were involved in only 5% of cases but logged formal and informal consultations affecting another 25% of cases. Lomas et al. (128) found that clinical opinion leaders increased the proportion of vaginal births after previous cesarean sections. In Davis et al.’s (18) extensive review entitled, Evidence for the Effectiveness of CME it was recommended that promising interventions such as the use of educational leaders deserved further testing and use.

Although the credibility of the messenger may be an important factor in uptake, there are other factors that can influence judgments regarding the credibility of the content. These factors include the need for transparency, endorsement for the desired change from...
credible organizations, referencing authoritative and unbiased sources of information, and adequately addressing controversial issues. (129) p. 549

There are also a number of structural, organizational, demographic and motivational factors that may hinder or facilitate information-seeking behaviour of physicians. (130) These factors include their age and point in their career, the type of medical school they attended, their type of practice, the distance between learning centres and their practice, their access, comfort and training in new technology, whether they have a university connection or research interest, whether they are in a solo or group practice, whether they are remunerated for education, and whether they are attending CME for accreditation purposes only. Typically these contextual factors are not considered within typical CME programming.

Summary

The first part of this chapter presented an alternate representation of internal and external forces shaping CME practices to the model proposed by Gammon, providing the reader with an historical lens to better understand organizational, political, socio-economic, administrative and legal factors contributing to the development of our current CME practices. The second part of the chapter focused on the evolution of pedagogical beliefs, theories and research underpinning the continuum of medical education, outlining two attempts at medical curriculum innovation and the incongruence between the espoused theory of proponents of adult education and problem-based learning, and current research in the cognitive sciences, as well as research in medical teaching and learning. The last part of the chapter introduced research in the area of knowledge transfer, and medical diffusion. The lack of cross-discipline communication and collaboration among researchers involved in the cognitive sciences, knowledge transfer,
and diffusion has resulted in a disjointed artificial separation among different conceptions regarding what knowledge is, how it is transferred, what factors influence its utilization, and effective application resulting in improvements in this case, physician competence, and improved patient outcomes.

When looking at the range of principles and factors discussed that may influence knowledge uptake, its utilization and effective application, there is a bewildering level of chaos mixing different types of knowledges with an assortment of principles and factors informing different aspects and dimensions of learning from cognitive processing, instructional design, socio-demographic and other contextual factors. The challenge for the planners of the case study was how to create greater order and coherence from this muddled array of information.

The next chapter looks at a prototypical model of CME planning recommended by the ACCME, current accreditation policies and principles, and some planning and conceptual models arising from adult education and research into medical teaching and learning. The chapter provides a counterpoint to the planning methods used in the case study and provides an opportunity to reflect and discuss problematic issues with current planning in light of more recent ideas regarding learning theory and cognitive science research.
Chapter Three

Current CME Planning Practices in North America

In Chapter Two, I argued that the continuum of medical education, historically and currently, is based on a faulty conception regarding how people learn, and has failed to create a curriculum development process that is linked to physician competence and population health needs. This chapter describes a prototypical planning process that is promoted to CME planners interested in fulfilling accreditation policies with the intention of enhancing physician learning opportunities.

Protypical CME Planning Practices

I could find very little qualitative or descriptive research investigating how CME planners and faculty committees actually plan CME programs. Cervero and Wilson (131) present a short case study looking at planning practices of an annual seminar for practicing pharmacists, and more recently, Golden, Parochka et al. (132) and Katz, Goldfinger et al. (133) explore the relationship of academia and industry on the planning process. However, there are a number of protypical planning frameworks for CME and adult education planners. (134-5)

For the purpose of this chapter I am using Rosof and Felch (134), second edition of Continuing Medical Education: A Primer, to describe the CME planning process, as this text is used as a training guide and recommended reference book by ACCME in their training programs for CME providers and is linked to a set of principles and requirements of CME accrediting bodies. Adelson et al.’s (135) text, Continuing Education for Health Professionals: Educational and Administrative Methods, is similar in content to Rosof and Felch’s text using the Tyler curriculum model as the CME field’s planning template.
Most planning texts in CME and other education programs have adopted the four basic principles informed by Tyler's 1949 curriculum model. The planning principles (see Table 11) proposed in Rosof and Felch's text are more descriptive than prescriptive, however certain elements must be addressed by the CME provider who is seeking program accreditation.

Table 11. Four Principles of Good CME and Adult Education (136)

- Conducting a needs assessment; having some kind of mechanism for determining just what it is that physicians need to (or want to) learn.
- Stating of educational objectives: establishing, in advance, how you plan to satisfy those needs, or put another way, what it is you expect participants to achieve by attending the CME activity.
- Designing educational activities: deciding when and where and how you will arrange to put on the CME activity.
- Evaluation: having a more or less formal way after the event of assessing the CME activity and how well it achieved the objectives previously set.

I will briefly summarize each of the recommended steps discussed in Rosof and Felch's text discuss challenges to current practices.

Phase One Planning CME: The Needs Assessment

In the Manual of Procedures (137) produced by the Committee on Accreditation for Continuing Medical Education for the Canadian Association of Continuing Medical Education there are several principles related to the needs assessment requirement (see Table 12).
Table 12. Accreditation Principles: Needs Assessment Process

- Principle 1. The provider should have a written statement of its aims, goals, major functions, and target population(s) within CME approved by the Faculty of Medicine.
- Principle 5. The provider should have established procedures for identifying and analyzing CME needs, documented or perceived, of individuals or groups of intended participants.
- Principle 6. The procedures for needs identification and allocating resources should include a coordinating mechanism for establishing priorities among needs identified. The mechanism for priority setting should reflect the provider's statement of aims, goals and major functions.

Moore and Cordes (138) describe the needs assessment process as follows:

(i) identifying a problem, (ii) deciding to respond to the problem, (iii) involving others, (iv) determining data collection strategy, (v) collecting the data, (vi) analyzing the data, and (vii) implementing the findings.

The first step of the needs assessment process, "identifying a problem" is described as employing formal, informal and intuitive methods to identify developmental issues emerging when an individual or organization decides some changes are required from current practices to either an existing accepted standard of performance or a new standard of performance. Once an area of interest is identified, Moore and Cordes (138) suggest, the second step is to create a planning committee, including members of the target audience, faculty, educational planners, and administrators. The role of the planning committee is to "collect, compile and analyze needs assessment data about current circumstances as well as standards." The third step is collecting data related to the identified problem. This data could include general socioeconomic, health systems, epidemiological, work setting, individual performance, and individual characteristics. The fourth step is for the planning committee to decide what sources of data are available and to seek input from the targeted audience.

Moore and Cordes (138) summarize the types of data collection methods discussed in the literature (see Table 13).

<table>
<thead>
<tr>
<th>Unsystenomatic Techniques</th>
<th>More Formalized Expert-Centred</th>
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</thead>
<tbody>
<tr>
<td><strong>Hunches</strong> – professional intuition of CME planners obtained from conversation, mass media and general observation</td>
<td><strong>External consultants</strong> – process or content experts participating in a needs assessment process or one time consultation</td>
</tr>
<tr>
<td><strong>Requests</strong> – usually from potential course directors often reflecting the perspective of one or more vocal individuals</td>
<td><strong>Educational Influentials</strong> – key individuals in departments</td>
</tr>
<tr>
<td></td>
<td><strong>Document Analysis</strong> – studying of documents such as committee minutes, the medical literature, and other published literature.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>More Formalized Learner-Centred</th>
<th>Most Systematic Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surveys and Interviews</strong></td>
<td><strong>Tests and examinations</strong> – both formative and summative tests to identify learner deficiencies and progress.</td>
</tr>
<tr>
<td><strong>Questionnaires</strong> – a low cost means of reaching a large number of people, data can be easily summarized and analyzed though less informative if highly structured with little opportunity for comments.</td>
<td><strong>Observation</strong> – using actual or simulated patients.</td>
</tr>
<tr>
<td><strong>Interviews</strong></td>
<td><strong>Self-Assessment</strong> – individual or in collaboration with peers various self-assessment strategies are employed to help physicians assess their needs.</td>
</tr>
<tr>
<td><strong>Formal and highly structured interviews</strong> with prepared questions</td>
<td><strong>Group meetings</strong> – formally or informally using brainstorming or nominal group methods to help identify education needs.</td>
</tr>
<tr>
<td><strong>Flexible and learner-directed interviews</strong> allowing for spontaneous topics and exploration of complex issues including uncovering feelings</td>
<td><strong>Patient Care Evaluations</strong> – from simple chart reviews to comprehensive research studies to identify specific deficiencies to address in the design of the CME.</td>
</tr>
</tbody>
</table>

CME departments typically conduct a formal needs assessment by surveying the target audience regarding their perceived educational needs. Moore and Cordes (138) report that the most common sources for data collection are course directors and potential learners and suggest other sources could include “experts in the field, potential faculty, representatives of professional groups, hospital administrators, detail persons, representatives of government agencies, researchers and patients.” They also suggest a “largely untapped” variety of document sources could be used including “hospital patient...”
records, despite some limitations [...] minutes of regularly convened committees, incident reports and patient complaints, morning reports, and site visit reports from regulatory groups [...] professional literature [...] federal government [...] health statistics and technological developments." p. 46 Once the data is collected, the fifth step in this planning process is analyzing the data to ascertain (i) whether any needs exist, (ii) if they do exist to decide whether the needs are real "educational needs", that is those addressing deficits in knowledge, skills and attitudes or whether they require different action, such as "changes in staffing patterns, purchase of new equipment, and policy changes," p. 48 and (iii) to prioritize the identified needs based on the "severity of the problem, the number of patients affected, the number of staff involved, available resources, time investment required, capability and willingness of learners, and availability of previously developed programming protocols." p. 49

The sixth and final part of the needs assessment process is implementing the findings. This phase involves documenting the purpose, people and methods used for conducting the needs assessment process, reporting on the findings, and translating needs into education objectives. It is suggested that a list of educational needs for the targeted community be prioritized through three different lenses, or perspectives – strategic, programmatic and individual activity. It is recommended that these needs be restated with the assistance of members of the planning committee and members of the targeted audience into behavioural descriptions of what the learner is expected to change as a result of participating in the educational activity.

**Challenges to Current Planning Strategies: The Needs Assessment Process**

There are a number of barriers to conducting needs assessments. To conduct a needs assessment a number of human and information resources are required "including staff
Divisions of CME are generally poorly resourced which hinders effective planning processes, survey/interview development and associated costs for conducting needs assessments. Having limited resources, comprehensive needs assessment processes are typically conducted once every three to five years depending on resources available as well as perceived need by the CME leadership and their ability to raise sufficient funds. Unfortunately both comprehensive needs assessment processes and less formal needs assessment processes most commonly used primarily focus on physician identified educational needs rather than using data concerning physician incompetence and population health needs as primary indicators for selecting CME topics.

With limited funding and no central body systematically collecting and disseminating national, regional and local health statistics, CME providers would have a difficult time bridging the gap between real world educational needs and what CME programming currently offers.

The WHO Report (9) entitled, Continuing Education of Health Personnel and its Evaluation, recommends that a radical change is needed in how needs assessments are typically conducted. They suggest educational planning should emerge from a systematic study of existing health care patterns and the needs of health services and communities and suggest such information should be derived from national public health statistics or by regional, local or individual identification of health problems most frequently encountered. The authors of the WHO report state, “Unfortunately program objectives too often do not take into account the real needs of health services but rather are a
manifestation of the views held by health workers, university staff or administrators concerning those needs.”

**Phase Two Planning CME: Stating Educational Objectives**

The second part of the curriculum model is formalizing learning objectives. Stating learning objectives is also a requirement for CACME, AACME and most other accreditation bodies (see Table 14).

<table>
<thead>
<tr>
<th>Table 14. Principles of CACME and AACME: Educational Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Principle 8 CACME</strong></td>
</tr>
<tr>
<td>• The provider should have stated objectives for all learning activities. These objectives should be based on identified CME needs. (CACME, 2002)</td>
</tr>
<tr>
<td><strong>Essential 3 ACCME</strong></td>
</tr>
<tr>
<td>• The Sponsor shall have explicit objectives for each CME activity. The sponsor shall:</td>
</tr>
<tr>
<td>• State the educational need(s) which the individual activity addresses.</td>
</tr>
<tr>
<td>• Indicate the physicians for whom the activity is designed (target audience).</td>
</tr>
<tr>
<td>• List any special background requirements of the prospective participants.</td>
</tr>
<tr>
<td>• Highlight the instructional content and/or expected learning outcomes in terms of knowledge, skill, and/or attitudes.</td>
</tr>
<tr>
<td>• Make these objectives known to prospective participants.</td>
</tr>
</tbody>
</table>

Mager’s seminal work, *Preparing Instructional Objectives*, provides a conceptual rationale on why objectives should be identified. Rosof (139) p. 54, citing Mager states, “If we do not know where we are going, it is difficult to select a suitable means of getting there, or, for that matter, even to know if or when we arrive.”

Explicating learning objectives helps the CME planner, instructor and learner reflect and clarify what the intended outcome is for the learning activity. Learning objectives are usually constructed using action verbs to describe what the learner should know or be able to do at the end of a learning activity. Having clear objectives may also assist planners and faculty members in selecting appropriate teaching methods and materials to facilitate the learning as well as in planning evaluation methods. The rationale behind
constructing learning objectives is that CME planners or faculty are able to effectively use these to design successful educational activities and evaluation instruments.

**Challenges to Current Planning Strategies: Stating Educational Objectives**

The stating of educational objectives is more common in CME programming due to mandatory accreditation requirements. The process of defining learning objectives is primarily left to the instructor, possibly in consultation with the CME planner, rather than members of the target audience.

There are a number of challenges to creating meaningful educational objectives. Without a strong conceptual framework linking the objectives to an evidence-informed educational design and a theory-driven evaluation, the process of defining learning objectives becomes a procedural step rather than a reflective process. Typically educational objectives are content-based rather than context-based, with many objectives either focusing on recall of information (i.e. identify three factors...) or have little relationship in applying this information to their practice environments.

To change routine clinical behaviour requires a much deeper understanding regarding general and individual barriers to knowledge uptake and its utilization. Whereas some of these barriers might be identified via focus groups with the targeted audience, other barriers may be specific to an individual’s work place. If one was to incorporate a more social cognitive conception of knowledge uptake, learning objectives could include having the participants identify institutional, environmental and regulatory barriers to knowledge utilization and the creation of action plans to address these barriers.
Phase Three: Designing Educational Activities

The next phase of the curriculum model, designing the educational activities, is also referred to as the instructional design process. The CACME principle speaks to this issue (see Table 15).

Table 15. Principles of CACME and AACME: Learning Objectives

<table>
<thead>
<tr>
<th>Principle 9 CACME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The provider should develop and implement learning activities consistent in content and method with the objectives and with the intended participants.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Essential 4 ACCME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The provider must develop and implement learning activities consistent in content method with the objectives and with the intended participants.</td>
</tr>
</tbody>
</table>

This phase of the curriculum model “often gets less-than-adequate attention.” Program planners tend to focus on the mechanics of the educational exercises — appropriate time scheduling, room arrangements, audiovisual resources, and so on—but usually, when questions about format comes up, they settle for the conventional assumption that continuing medical education (CME) means a visiting or local speaker delivering a lecture of common length and style. They are content if the lecture is well presented and the slides are relevant. (140) p. 60

Fink Jr. and Osborn (140;141) pp. 65-67 present a broad range of possible educational activities CME planners could utilize including case review, skills sessions, simulations, self-assessment inventories, teleconferencing, computer simulations and interactive videodisc, mini-residencies, individualized learning plans, curriculum-based CME. In addition, Fink, Jr. & Osborn (140) p. 61 describe six learning principles they claim could inform planning educational activities: (i) the learner’s degree of motivation correlates directly with how that learner can incorporate new facts, concepts, skills, values, and so on, (ii) active participation on the part of the learner tends to result in higher-quality
learning than does passive, uninvolved experience, (iii) A problem-solving approach tends to foster both motivation and active involvement, and thereby facilitates learning, (iv) repetition and reinforcement helps the learner remember information, especially if the reinforcement comes as a result of using the information, (v) reward and positive feedback are related principles and help promote useful learning, especially if this the reward is internalized, (vi) multisensory signals (hearing and seeing) are helpful to most learners.

Fink Jr. and Osborn (140) also mention three challenges facing CME planners, especially in regard to creating innovative programming: (i) obtaining physician support/participation, (ii) obtaining good teachers, and, (iii) obtaining good facilities.

**Challenges to Current Planning Strategies – Designing Educational Activities**

Part of the problem with Phase Three is that this is the least developed or understood part of Tyler's curriculum model and is rarely linked to current research in teaching and learning. There are major challenges to designing efficacious educational strategies without a clear understanding of what types and level of knowledge is needed, what contextual factors hinder or facilitate the process of knowledge acquisition, and lead to appropriate utilization. As this section begins to integrate some of the earlier discussion about theories of learning and problems of ineffective teaching, I will present a more comprehensive analysis about challenges to designing efficacious educational activities and identifying some bodies of research that may better inform planning practices.

Under a more behavioural model of instructional design, learning technologists reduce phenomenon to the language of task analysis, breaking down human activities into inputs and outputs, entry behaviour, stimulus and reinforcement. Learners are seen as
human information processors. It assumes that learning occurs in predictable, systematic and controllable ways and that learners are not problematic nor particularly dynamic.

Under a more biological-driven cognitive model as promoted by Gagne (142) p. 188, the learning process is operationalized in a linear manner (see Table 16).

**Table 16. Gagne’s Biological-Cognitive Model of Instructional Design**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>Determines the extent and nature of reception of incoming stimulation</td>
</tr>
<tr>
<td>Selective perception</td>
<td>Transforms this stimulation into the forms of object features, for storage in short-term memory.</td>
</tr>
<tr>
<td>Rehearsal</td>
<td>Maintains and renews the items stored in short-term memory.</td>
</tr>
<tr>
<td>Semantic Encoding</td>
<td>Prepares information for long-term storage.</td>
</tr>
<tr>
<td>Retrieval, including search</td>
<td>Returns stored information in the working memory or response generator.</td>
</tr>
<tr>
<td>Response organization</td>
<td>Selects and organizes performance.</td>
</tr>
<tr>
<td>Feedback</td>
<td>Provides the learner with information about performances and sets in motion the process of reinforcement</td>
</tr>
<tr>
<td>Executive control processes</td>
<td>Selects and activates cognitive strategies; these modify any or all of the previously listed internal processes.</td>
</tr>
</tbody>
</table>

Gagne’s model of instructional design, he claims, is based on over 50 years of behavioural and educational research and is used and promoted by adult educators typically interested in instructional design. (143) However, most of Gagne’s own research, and the research he cites, occurs in very specific learning environments such as schools or the military and focuses on relatively uncomplicated tasks involving immediate recall and task replication.

The business of translating learning objectives into educational activities has been conceptualized in the educational literature as being the domain of teachers’ knowledge. Research into teachers’ knowledge has been prolific from 1983 through to 1992. Investigations since the early 1970s have moved from examining the relationship between teacher behaviour and student outcomes to considerations of teacher thinking,
especially in regard to the decision-making process leading to instructional actions (144) p. 255. Part of this change was due to the influential work of Philip Jackson, *Life in the Classroom* (1968) that gave a richer description of the full complexity of the teacher task.

Shavelson and Stern (145) pp. 456-7 suggest that this change in research focus was based on two fundamental assumptions: (i) a teacher's behaviour is guided by his/her thoughts, judgments and decisions, and (ii) teachers are reasonable professionals and, similar to physicians, make judgments and carry out decisions in uncertain complex environments.

This change in assumptions was based on changes in conceptions regarding research on teaching moving from a behavioural model which just looked at teacher behaviour, to one that examines the link between intentions and behaviour with the premise that this research may lead to a better understanding regarding the teaching process and inform teacher education. (145) pp. 455-6 It was believed that to better understand the decision-making process we needed a better conceptual framework to examine the knowledge and beliefs that inform decision-making. (146) p. 20 (147) p. 307

To meet this need, several educators/researchers have conceptualized a range of different types of knowledges which are interwoven in practice. (148-152) Each of the knowledge domains suggested by Shulman and others is not considered as being distinct and separate from each other. It is believed that in real life there are not clear boundaries between these knowledges and that there is a dynamic interaction amongst these knowledges that inform action. With this in mind, I will briefly summarize some of the distinctive characteristics among each of the knowledge domains described by a range of
educators and researchers to provide some greater context about the classification used to define the domains as well as to briefly explore some differences in typologies suggested.

Shulman (149) conceptualizes a range of knowledges which underlie the teacher understanding needed to promote comprehension. These knowledges include content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners, knowledge of educational contexts, and knowledge of educational ends. In Table 17 below you will note Shulman's conceptual framework on the left. Grossman's (146) summary of domains of teacher knowledge merges content knowledge with pedagogical content knowledge and curriculum knowledge with knowledge of others. Grossman also includes an additional knowledge domain, the knowledge of self. Irby (153) in the third column, exploring knowledge domains related to clinical teaching in medicine, linked a constructivism framework with knowledge domains. Irby's qualitative study reported on knowledge domains described by six distinguished pedagogues using data from interviews, a structured task and observations.
Table 17 Comparison of Typologies of Teacher Knowledge Domains

<table>
<thead>
<tr>
<th>Knowledge Domain</th>
<th>Shulman’s Typology (149)</th>
<th>Grossman’s Typology (146)</th>
<th>Irby’s Typology (103)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content knowledge</td>
<td>- understanding of the facts, concepts and knowledge structure (organization</td>
<td>- combines subject matter knowledge with pedagogical content knowledge</td>
<td>- clinical knowledge is more closely related to experience with clinical cases</td>
</tr>
<tr>
<td></td>
<td>- understanding of fundamental principles of a discipline) within their subject area</td>
<td></td>
<td>- differences in knowledge representation between novices and experts</td>
</tr>
<tr>
<td>General pedagogical knowledge</td>
<td>- knowledge of pedagogical principles and techniques</td>
<td>- knowledge of classroom organization and management and general methods of teaching</td>
<td>- general principles of teaching and learning conceptions</td>
</tr>
<tr>
<td></td>
<td>- broad principles and strategies related to classroom management and organization</td>
<td></td>
<td>- experienced teachers have large repertoires of teaching strategies</td>
</tr>
<tr>
<td></td>
<td>- not bound by topic or subject matter</td>
<td></td>
<td>- knowledge of instructional resources</td>
</tr>
<tr>
<td>Curriculum knowledge</td>
<td>- understanding of the programs and materials designed for teaching particular topics and subjects</td>
<td>- includes knowledge of both the process curriculum development and of school curriculum across the grades</td>
<td>- general medical knowledge incorporating both basic sciences and clinical experience</td>
</tr>
<tr>
<td>Knowledge of Other</td>
<td>- understanding of knowledge of other subject areas that can assist in developing links with other subject matter and increase relevancy.</td>
<td>- combines curriculum knowledge with knowledge of other</td>
<td>- the need for assisting learners in building links across subject matter</td>
</tr>
<tr>
<td>Pedagogical content knowledge</td>
<td>- knowledge of what it means to teach a particular subject including the principles and techniques of teaching and learning.</td>
<td>- combined with content knowledge</td>
<td>- develops though the repetitive experience of teaching resulting in teaching scripts</td>
</tr>
<tr>
<td>Knowledge of learners</td>
<td>- including knowledge of student characteristics</td>
<td>- knowledge of learners and learning theory, physical, social, psychological, cognitive development of students, motivational theories and practice, ethnic, socioeconomic and diversity among students</td>
<td>- specific representations of content (explanations, analogies, examples learning tasks)</td>
</tr>
<tr>
<td>Knowledge of educational contexts</td>
<td>- ranging from the workings of the group, classroom</td>
<td>- teacher’s knowledge of students, families, local community,</td>
<td>- understanding learners prior knowledge</td>
</tr>
<tr>
<td></td>
<td>- the governance of the school, character of the learners community and cultures</td>
<td>- historical, philosophical and cultural foundations of education within a country</td>
<td>- conceptions and misconceptions of subject matter</td>
</tr>
<tr>
<td>Knowledge of educational ends</td>
<td>- understanding of educational aims, goals and purposes informing pedagogical action.</td>
<td>- combined with knowledge of self</td>
<td>- learner needs, motivations and abilities</td>
</tr>
<tr>
<td>Knowledge of Self</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Carter (151) in her review on research into teachers' knowledge, investigating primarily qualitative studies, reports on other emerging conceptions on teachers' knowledge and presents an alternate conceptual framework. Aside from formal subject
matter knowledge, teachers' institutional and occupational perspectives, and professional knowledge base (which were mentioned though not defined nor covered in her review), she proposes that research into teachers' knowledge in the classroom could be divided into two broad categories: practical knowledge and pedagogical content knowledge.

Practical knowledge, she states, is "referring to the knowledge teachers have of classroom situations and the practical dilemmas they face in carrying out purposeful action in the setting." Carter describes research into pedagogical content knowledge as "representing an attempt to determine what teachers know about their subject matter and how they translate that knowledge into classroom curricular events." p.299

The relevance of conceptualizing the specialized knowledges of teachers is the need to rethink the development of effective educational strategies that take advantage of pedagogical practices as the need to provide sufficient training to doctors and researchers interested in medical teaching.

There are also other bodies of literature that could systematically inform improvement in teaching, especially a growing body of research investigating instructional design practices and the field of cognitive ergonomics. The literature concerned with human factors and cognitive ergonomics is better known is England and Europe. Wright (154) states, "whereas conventional ergonomics is concerned with how the physical work environment matches human physical/physiological characteristics, 'cognitive ergonomics' is concerned with how the presentation of information influences intellectual performance (understanding, memory, reasoning, etc)." The most significant work in the area is related to a range of print media, the use of different types of prose-written instructions, instructional texts, as well as the use of tables and charts, with more limited research in videotape and computer assisted learning.
James Hartely (155) in his seminal text, *Designing Instructional Text*, presents some guidelines on a range of variables involved with the presentation of written information. For instance, Hartley (155) notes that the principle weakness of much instructional material is the lack of consistency in the positioning and level of relevance of its components such as listed information, numbered items, headings and subheadings, diagrammatic presentations, tables, explanatory notes, and pictorial features. The lack of consistency leaves the reader to continually ask themselves, “where am I to go from here?” p. 17 For this reason he suggests the use of a master reference grid and the development of style guides (see Table 18):

**Table 18. Designing Instructional Text: Evidence-Informed Style Guides (155)**

- printed pages need to provide a reliable frame of reference within which the reader can move about, leave and return without confusion
- the user must make sense of why different typefaces or conventions are used, style sheets and specification charts need to be made in advance not on a page by page basis
- words printed in capital letters contain less distinctive information per unit of space, so this makes groups of them more difficult to read p. 29
- when listing information - if there is an actual sequence order use Arabic numbers or alpha order, and if sequence is not important then use bullets p. 47
- Misanchuk (1992) suggests that devices such as capital letters, underlining, italic and bold need to be used sparingly as they can lose their significance
- Ellington and Race (1993) provide examples of effects of typefaces when used in slides or projection particularly the reduction of legibility

There has also been considerable research looking at prose and graphic features. This includes the use of pretests, titles, pre and post summaries, section headings, questions in text, sentence length, typographical cues, use of positive terms (more than, heavier than, thicker than) rather than negative terms (less than, lighter than, thinner than). As well there has been research into alternatives to prose — flow charts, tables, data presentation, line graphs, bar graphs, pictorial charts, use of illustrations or pictorial instructions.

Wright (156), for instance, exploring the impact of presentation of information on
retention and understanding, showed differences among the use of a decision tree (algorithm), prose, table and short sentences with structural spacing on different outcome measures. Her results indicated that well designed tables were effective for content retention for simple problems although short sentences and algorithms were comparable when used for problem-solving. However, when working from memory, performance improved with the use of prose and lists of short sentences. Simple changes in presentation such as placing figures in columns rather than rows can in some contexts greatly influence comprehension of data information. Hartley (157) provides educators and researchers an excellent evidence-informed review of instructional text research suggesting eighty ways of improving instructional text.

Wright has explored a wide range of communication/medium variables i.e. tables, algorithms, reading comprehension, print versus hypertext, print versus videotape, within a range of subject domains and experimental contexts. Wright's research attends to socio-contextual factors, including user's relevance, user's preference, and access issues. For instance, Wright (158) reporting on research investigating “reading to do” versus “reading to learn” scenarios, suggests that when interpreting experimental studies on reading it is important to specify the reading of what, by whom and for what purpose. Reading goals are usually up to the experimenter. Sometimes subjects will know what and how they will be tested so they will read in such a way to maximise their score. Research cited by Wright (158), (Olshavsky 1976-77, Sticht 1978 and Samuels and Dahl, 1975) suggests that readers change reading strategies based on intrinsic or extrinsic goals e.g. reading for recall of general information, or specific details, reading for verbatim retention or a paraphrase quiz. Olshavsky (1976-77) reported 10 different reading strategies used by 24 people who were reading short stories that varied in their degree of
abstractness. It therefore becomes important to clearly inform the reader what you want them to be able to demonstrate and to ensure that there is congruency between your explicit outcome measure and the measure you have chosen to demonstrate this type of learning.

Without paying closer attention to instructional design elements and the contextual factors (stated purpose, users relevance, awareness of test measures) among comparable treatments, research efforts are likely to be powerfully confounded by these uncontrolled variables.

By looking at the many difference ways of framing teachers' knowledge as represented by Shulman, Grossman, Irby and Carter it is apparent that there is not a clear taxonomy for conceptualizing teachers' knowledge domains. Part of this problem is that there are different purposes for the creation of constructs of teachers' knowledge. Different purposes might require different conceptions of teachers' knowledge. For instance, research investigating the praxis of teaching as it is practiced is very different from research exploring teacher effectiveness or differences between novices and experts. There are many research interests involved in exploring teachers' knowledge. Some research agendas include: (i) identifying factors which influence how and why a teacher teaches in particular ways, (ii) gaining a deeper understanding about each of the factors identified, (iii) gaining insights into differences between novices and experienced teachers, (iv) understanding what qualities differentiate noted excellent pedagogues from 'less effective' pedagogues, (v) exploring teachers' perspectives on their reported perceptions, beliefs and knowledge about teaching and learning. The various conceptions of knowledge domains serve different descriptive purposes however, I suggest, that the lack of explicitness of purpose for a given conceptualization (or categorization) decreases
its utility. Research in teachers’ knowledge dispels the myth that being a physician, scientist or researcher with ‘content expertise’ somehow qualifies them to be appropriate teachers. The old axiom “Learn One, Do One and Teach One” just does not cut the mustard even if the Latin translation of ‘doctor’ is ‘teacher’.

**Attempts to Incorporate Adult Learning Principles in CME to Inform Educational Design**

Since the mid 1980s there has been a growing movement in CME to adopt adult learning theory as the philosophical underpinning for the field to inform educational planning. (159-163) For instance, in 1995, the College of Family Physicians of Canada established new CME guidelines that explicitly state that all programs must be based on adult learning theory. The hope is that application of generic adult learning principles will enhance CME programming and lead to better outcomes. Unfortunately adult learning theory as espoused in the literature is ill-defined and not linked to an efficacious cognitive model, or at least one that has a developing body of evidence linking theory to practice.

Slotnick (160) describes adult learning characteristics as embodying the following principles for physicians: (i) they are practical learners (ie they seek to solve problems), (ii) they wish to participate actively in their own learning; and (iii) they have multiple demands on their life and wish to meet their psychological needs of security, affiliation and self-esteem. Bennett (161) lists ten characteristics of adult learners: (i) adults of all ages have the ability to learn, (ii) adults are self-directed in their learning, (iii) experience is a resource for learning, (iv) participants look for practical learning, (v) adults learn by choice: learning is voluntary, (vi) learning is more effective when adults are actively involved, (vii) feedback is a critical part of learning, (viii) uses for learning change with different stages in a career, (ix) people learn differently — differently from one another
and on different occasions, (x) learners are more apt to make changes as a result of learning if they are have a clear image of what will be achieved. Adelson (162) reporting on characteristics derived from the work of Knowles describes similar characteristics associated with adult learning including adults being self-directed, being more problem-centred than subject centred, and more concerned with the immediate application and professional relevance of information.

The problem with the blanket adoption of adult learning theory in CME is that there is not a strong conceptual framework underpinning adult learning theory. The adult learning principles discussed in the literature, for instance, do not adequately assist CME planners in making informed linkages between the desired learning objective and the types of educational activities and learning materials that could best be employed to facilitate learning. Adult learning theory does not differentiate between novices and experienced practitioners, nor is it informed by current research in the field of cognitive ergonomics, other research in the cognitive sciences, or specific research in medical teaching and learning. Despite the interest of sociocultural or socio-cognitive factors in adult education there is little research or and scholarly work directly linking sociocultural theory to adult learning. (164) Without a clear conceptual framework and taxonomy linking theory to practice, CME planners have limited information to enhance knowledge transfer.

This failure is not limited to the field of CME, Pamela Wiggins, Vice-President, Knowledge Products and Mobilisation for the Social Sciences and Humanities Research Council of Canada (SSHRC) remarked at a knowledge transfer workshop\textsuperscript{31} how public education systems “deliver” education to students, with the change process often

\textsuperscript{31} Knowledge transfer workshop hosted by the Canadian Institutes of Health Research on June 19, 2002.
appearing to be ideologically driven rather than on the basis of systematic research evidence.

Without a clear conceptual framework for selecting educational activities informed by research in teaching and learning linked to meaningful educational objectives with adequate instruments for evaluation, we are left with a haphazard approach to program planning. However even if we have a more integrated model for planning CME, action would need to be taken to address the other environmental factors that are barriers to develop and maintain innovative programming, especially if certain types of learning require more small group interactive programming rather than traditional conference programming, which will result in lower financial returns.

Phase Four: Evaluation

The final phase of the curriculum model is evaluation.

Principles of CACME and AACME: Evaluation

<table>
<thead>
<tr>
<th>Principle 9 CACME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The provider should evaluate the effectiveness of the overall CME program and</td>
</tr>
<tr>
<td>each learning activity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Essential 5 ACCME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Periodically review the extent to which the sponsor’s mission is being</td>
</tr>
<tr>
<td>achieved by its educational activities.</td>
</tr>
</tbody>
</table>

Show that these evaluations assess:

• the extent to which educational objectives are being met
• the quality of the instructional process
• participants’ perception of enhanced professional effectiveness
• use evaluation methods that are appropriate and consistent in scope with the educational activity.
• demonstrate that evaluation data are used in planning future CME activities

From a CME planners’ perspective evaluation encompasses a broad range of activities including the effectiveness of planning procedures, budget versus actual expenditures, future programming, adequacy of facilities and effectiveness of faculty and
impact of CME on the target community. Green (165)\(^\text{p. 73}\) does suggest alternate types of data collection techniques planners could use including interviews, other written questionnaires, written tests, performance tests, observations, and existing data sources. However these suggestions are more the exception than the rule.

**Challenges to Current Planning Strategies – Evaluation**

There are many challenges to current evaluation strategies. From a planners’ perspective one of the traditional reasons for conducting an evaluation of an educational program is to determine information about the perceived quality of the program and gain direction for improving future programming. (166) Most evaluation methods and instruments used in CME have tended to focus on satisfaction measures rather than assessing the impact of CME on physician learning and behaviour and its impact on patient health outcomes (see Appendix IV: Sample Prototypical Program Evaluation). More recent attempts by accreditation bodies to improve evaluation have led to planners restating educational objectives and having participants score how well the session has met those objectives without demonstrating whether this form of evaluation is a useful exercise for the participant or necessarily informs future planning. As mentioned in the introduction, CME evaluations have historically relied on ‘black box’, ‘input-output’, or outcome-focused evaluation.

Without the development of a theory-driven conceptual framework identifying what factors contribute to programs’ successes and failures in planning, implementation, evaluation and patient outcomes, we will continue to stranded in the sea of variables unable to effectively determine what factors have contributed to program successes and failures. There have been some concerted efforts to improve the quality of evaluations
across educational program domains. One major attempt has been the development of standards for the profession.

**Standards in Program Evaluation**

In 1981, the Joint Committee for Standards in Educational Evaluation (JCSEE) published standards for program evaluation and established a comprehensive set of guidelines to reflect the best practice of educational program evaluation at the time the standards were written. (166) In 1994, the second edition was published. *The Standards*, as they referred to in the text, are organized around four primary attributes of an evaluation: utility, feasibility, propriety and accuracy. All four primary attributes are pragmatically-based. *The Standards* speak to the need to create evaluations that address the need for the measurement of intended outcomes but also meet the timely information needs of various stakeholders. One of the failures of past evaluations is that for the most part, evaluations are rarely used by stakeholders to make informed decisions about program continuance, program changes, or impact policy or regulatory activities. (119;167) (168)

**Utility Standards:** Although all attributes are important, the first attribute discussed in *The Standards* is “utility” which addresses the questions, why is the evaluation needed, what is the purpose of the evaluation, what are the information needs of the clients and stakeholders and what is the timeline for specific information needs. The JCSEE committee’s purpose of highlighting “utility” as the first attribute to be addressed is in recognition that program evaluations must be conducted in such a manner that they address the information needs required by all stakeholders and decision-makers in order to enhance the potential utilization of the program evaluation. Far too often, professional evaluators were disappointed that their evaluations were being shelved or underutilized. The standards grouped under this category are: (i) stakeholder identification, (ii)
evaluators' credibility, (iii) information scope and selection, (iv) values identification, (v) report clarity, (vi) report timeliness and dissemination, and (vi) evaluation impact. It is believed that clearly addressing each of these components will increase the likelihood that the evaluation will be utilized and have some practical value and application.

**Feasibility Standards:** All program evaluations require important decisions around choices made concerning research design(s) used, instruments employed, data collected procedures and analysis used. Evaluation considerations must take into account that the evaluations are typically conducted in the field, and that evaluations must address resources available, materials needed, personnel and time allocated. The best research design constructed for a given research question may produce greater evidence to make stronger claims concerning the program’s merit or worth, however if the design does not take into consideration resources available, the stakeholders information needs and timelines, the evaluation will lose utility and its value may be much more limited. For instance, the project funders or stakeholders might have specified windows of opportunities where an evaluation can assist in determining program continuance, program improvement or have the greatest impact among stakeholders and decision-makers.

**Propriety Standards:** As the programs being evaluated can affect many people in a variety of ways, these standards “facilitate protection of the rights of people affected by an evaluation.” These standards require evaluators to learn about the laws concerning privacy, freedom of information, and the protection of human subjects. The standards are: service orientation, formal agreements, rights of human subjects, human interactions, complete and fair assessment, disclosure of findings, conflict of interest, and fiscal responsibility.
**Accuracy Standards**: In order for program evaluations to be informative, there must be sufficient evidence that the evaluation is producing sound information and is comprehensive enough "to address as many of the program’s identifiable features as practical and should have gathered data on those particular features judged important for assessing the program’s worth or merit. The standards are: program documentation, context analysis, described purposes and procedures, defensible information sources, valid information, reliable information, systematic information, analysis of quantitative information, analysis of qualitative information, justified conclusions, impartial reporting and meta-evaluation.

*The Standards* attempt to establish ‘best practices’ concerning ethical, legal and types of information and practices deemed important to conduct reasonable program evaluations, as well as to establish professional standards and codes of behaviour. Although these standards were established in 1981 and recommended in 1983 for adoption in continuing education in the health profession (17), in reviewing all research articles published in the *Journal of Continuing Education in the Health Professions* since 1984 I was unable to find one research article that reported they had systematically addressed each standard. To facilitate its use the JCSEE published a checklist to help planners assess and self-report on the level of compliance (see Appendix III: Program Evaluation Standards Checklist).

The need to improve the quality evaluation papers on educational interventions is also evidenced by the recent establishment of the British Medical Journal’s committee, *Education Group for Guidelines on Evaluation* and the publication of new guidelines for authors, editors, reviewers, and readers on educational interventions. (169) The BMJ created this committee recognizing the rising importance of education intervention
research as well as the problem with current research in the field. They state, “Unfortunately many of the accounts we receive of educational interventions comprise a thin description of the innovation and an evaluation that says little more than the students liked the intervention.”

Although the utilization of The Standards will address BMJ’s call for more in-depth description of interventions and evaluation methods, The Standards fail to provide insight on how to improve evaluation designs to specifically enhance the efficacy of educational interventions and improve the conceptual understanding of what variables should be attended to in the planning, implementation and evaluation process to link theory to practice.

**General System Failure in the Planning Literature: Linking Theory to Practice**

The gap between theory and practice in educational planning is not solely related to CME practice. Sork and Buskey (170), analyzing adult program planning literature between 1950 – 1983, described a series of steps common to many planning models. These steps include: (i) analysis of the planning context and client system(s) served, (ii) assessment of the client system needs (iii) development of objectives, (iv) selection and ordering of content, (v) selection, design and ordering of instructional processes, (vi) selection of instructional resources, (vii) formulation of budget and administrative plan, (viii) design of a plan for assuring participation, (ix) design of a plan for evaluating the program.

Cervero and Wilson (131;171), however, claim program planning in practice is a value-laden activity, where the central activity planners engage in is negotiation. Specifically, they assert the practice of program planning in its social context is
inextricably linked to the complex world of personal and organizational power relationships and interests, where planners bring their own interests to the planning process as well as construct the program with others. Cervero and Wilson's conception of program planning is very different from the typical model described in the linear step-by-step model described above. From a CME perspective the importance of having explicit standards and a clear universal understanding about the purpose and role of CME is critical in today's world of competing demands and values (171), especially with the lack of financial resources for effective CME planning and the increasing reliance of industry support. (172)

Sork and Buskey (170), in their evaluation of different planning models looked at two factors, the sophistication necessary to benefit or use the planning model effectively and, the degree to which the model has an explicitly stated theoretical framework. Specifically they looked at the level of comprehensiveness of each step (steps i - ix above) described in each of the planning models reviewed to determine whether a planner could implement every step of the model effectively from the material presented by the author. In their review they outlined a number of problems with the literature they reviewed. These problems included: lack of cross referencing and absence of cumulative development in the literature, literature has a low degree of theoretical explanation, few books treat planning as a comprehensive process, lack of integration/recognition that some planning models developed for a specific context could have applicability for other contexts, heavy bias for group instruction, less literature for individual instruction, literature does not clearly look at the variety of roles played and what levels of proficiencies (skills) are necessary for planners and do not discuss the degree of group interaction in the planning process.
Planning as a Guiding Tool or a Point of Reflection

Extending Cervero and Wilson's conception of planning as a process of negotiation, some social theorists suggest that, typically, people do not use a logical-deductive approach to planning. Research in the late 1980s suggests that for the most part human beings do not generally follow external plans or directions in everyday decision-making. Suchman (173), a researcher at Xerox PARC, was studying how ordinary people use Xerox machines' built-in help and diagnosis programs. In looking at how ordinary people responded to Xerox machine problems she proposed two theoretical frameworks. The first being a cognitive science-based instructional framework constructed using a hierarchical system of subprocedures for how Xerox machines 'should' be used or diagnosed. The alternative process she labeled 'situated actions', that is the 'lived' experience of Xerox users. Suchman defines situated actions, as "simply actions taken in the context of particular, concrete circumstances."

Suchman (173) introduces John Seely Brown's ideas about everyday cognition (see Table 19).

Table 19. Aspects of Everyday Cognition

- act on situations
- make sense out of concrete situations
- resolve emergent dilemmas
- negotiate the meaning of terms
- use plans as resources
- socially-construct physical and social reality

Streibel (1991, p.117) in reviewing Suchman's work on the notion of situated cognition and poses a fundamental question: "Do human beings, such as teachers or learners, follow plans no matter how tentative or incomplete those plans might be, when they solve real-world problems or do human beings develop embodied skills that are only..."
prospectively or retrospectively represented by plans?" Suchman (173) argues that plans are representations of situated actions and posits that "these representations always come before or after the fact, in the form of imagined projections or recollected reconstructions." This is quite different than viewing plans as controlling procedures.

Suchman (173) recommends that in the case of human beings, "plans should not be treated as 'psychological mechanisms' that control and give meaning to subsequent behaviour. Rather, plans should be treated as artifact[s] of our reasoning about action." She continues, instructional plans should not be used to control instructional interactions, rather, plans should be used for communicating about situated actions with other humans beings and reflecting on and reconceptualizing situational actions."

This notion about situated learning may have an important contribution to make in how we conceptualize decision-making behaviour, however it too suffers from a lack of conceptual or research base and fails to address differences apparent in novice or expert decision making behaviour. Qualitative and quantitative research is needed to better understand how planners actually plan and what factors they perceive are influencing their decision-making and based on current conceptions about learning researchers should clearly differentiate among novices and more experienced planners.

Closed Planning Models versus Open System Models

Tyler's original pedagogical teaching model was primarily addressing teaching children in the school system and arose from learning theories based on behavioural and transactional beliefs about learning. Learning was perceived to be an unproblematic learning process that involved a more linear and technical process, rather than a more complex process intrinsically linked to a process of enculturation. The Tyler model was flexible enough to accommodate learning theories arising from biological, behavioural
and behavioural-cognitive notions about learning, however I suggest the model is too limited to adequately address sociocognitive ideas. Part of the problem with the Tyler model is that it is constructed and utilized as a closed system model. It is a model where inputs and outputs are constructed in a mostly linear fashion without sufficient conceptual linkages to better identify other factors contributing to our understanding about how learners learn, informing how teachers should teach, and how planners should and actually do plan. Program planners working in the field of continuing education, as against funded public schools must also address other challenges, programs must attract participants, maintain their interest, and provide an enjoyable educational experience.

The Tyler model tends to focus attention on only looking at what the program planners intended learning outcomes were, rather than identifying what learning occurred or reflecting on how it occurred without consideration as to what factors should inform the planning process. If the Tyler model does not really represent what planners actually do, as Cervero and Wilson believe, and has failed to be a fruitful model for systematically building our knowledge base on how to improve our practices, I believe it is time to look at other planning models.

**CME Accreditation Bodies**

There are approximately 2600 accredited CME providers in the US and Canada. The Committee on Accreditation of Canadian Medical Schools accredits undergraduate and CME programs. Specialty residency and specialist CME programs are accredited by the Royal College of Physicians and Surgeons of Canada, and family residency and family physician CME programs are accredited by the College of Family Physicians of Canada.

In the US, CME accreditation is managed by the American College of Continuing Medical Education (ACCME). The Committee for Review of Recognition of the
ACCME provide accrediting authority for state medical societies, which in turn accredit 1912 local CME providers. Other accrediting bodies in the U.S. include American Osteopathic Physicians and the American Academy of Family Physicians. In Canada, medical schools and medical related societies are the only accredited bodies to provide CME.

**Calls for a Change to Accreditation Practices**

In North America the accreditation bodies are rooted in Tyler’s curriculum development model, with some minor additions, such as the requirement to maintain an organizational mission that includes CME, and assuring there is adequate management and other resources to effectively fulfill the CME mission. (174) Since 1985 leaders in CME and adult educators have been questioning the current accreditation system and the adequacy of Tyler’s model to inform the accreditation process. However there are many barriers to changing the current system. Mazmanian and Duff describe these barriers as follows:

Many ACCME-accredited sponsors seem unprepared for major changes. They are not fully subsidized, and to offset potential fiscal deficits, they become deeply involved in the provision of conferences, with the promise of spending little money to attract a lot more. Trusting the logic of the Essentials for accountability and accreditation review, CME planners carefully document educational needs assessment, objective setting, educational design, and budgetary decisions, and demonstrate the use of data from previously administered survey instruments and financial summaries...

Some of the heavy dependence on the Essentials may be due, in part, to the limited training of those responsible for providing leadership in CME programs. It has been estimated that over 95 percent of those responsible for carrying out continuing medical education in the United States have been trained as members of the professional groups with which they work, rather than in the field of adult education. (174)p.292

Mazmanian and Duff (174) suggest an alternative vision of CME, one which is less preoccupied with the codification of rote-like accreditation, with a ‘gentler’ and broader
definition of CME borrowing one from adult education recognizing the need to nurture
the human potential of physicians.

... a process whereby (physicians) who no longer attend school on a regular full-
time basis... undertake sequential and organized activities with the conscious
intention of bringing changes in information, knowledge, or skill, appreciation
and attitudes; or for the purpose of identifying or solving personal, professional or
community problems. p. 294

Mazmanian and Duff propose the creation of “locally situated independent learning
centers” bringing together medical educators, health services researchers and medical
practitioners to develop “functional linkages among medical schools, hospitals, specialty
societies and federally funded peer-review organizations.” p. 296 They suggest these
centres adopt the following three principles identified as indicators of successful Area
Health Education Centers (AHEC) (see Table 20).

Table 20. Principles Identified as Indicators of Successful AHEC Programs (174)

<table>
<thead>
<tr>
<th>Principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The formation of a new and permanent organization with participating schools and target communities that serve to decentralize and regionalize health professions education;</td>
</tr>
<tr>
<td>• Strong linkage of the organization to health services delivery in the target area</td>
</tr>
<tr>
<td>• The inclusion of key decision-makers from educational, service, and other organizations in the community who maintain authority for hiring staff and making program and budget decisions.</td>
</tr>
</tbody>
</table>

Part of this new vision is the creation of a new role for medical schools, providing
peer mentors who will facilitate the development of formal and informal individualized
curriculum informed by health services research including epidemiological reviews of
community-based health care problems, and other patient care data, set of performance
objectives developed by specialty societies, and standards of care or clinical guidelines.

In essence, these independent learning centers define adequate health care
performance, and permits self-assessment, self-monitoring, and self-directed
planning of CME activities to achieve specific objectives integral to the overall
educative and health care performance of the individual practitioner. p. 300
Mazmanian and Duff's vision of a different structure of CME practice incorporates a number of ideas proposed by a series of Technical Reports on continuing education of health professionals commissioned by the European World Health Organization.

However the vision is grounded more in the ideology of self-directed learning rather than addressing the pragmatic issues of systematically gathering a body of knowledge to inform learning and teaching, conducting and attending to a comprehensive diagnosis of the continuum of education, and addressing the many structural barriers to creating an alternative system of education.

**Funding Support for CME**

Most academic or medical societies seek financial support to subsidize educational programming. Revenue sources include registration fees, exhibitor fees, and industry support. There is very little government support for continuing professional education. In Canada, the Canadian Institutes of Health Research may provide up to a maximum of $5,000 to support conferences and workshops. Industry sponsorship is a major source of revenue for CME providers, however there is very little descriptive literature about how CME is actually planned or what influence industry support has on educational planning.

The table below (see Table 21) provides a breakdown of all CME providers directly accredited by ACCME and the level of industry support provided in relationship to total revenue reported, however there is little consistency in reporting financial data. (174)
Table 21. Breakdown of Accredited CME Providers by Type and Total Income (175)

<table>
<thead>
<tr>
<th>Type of CME Provider</th>
<th># of CME Providers</th>
<th>Total Income</th>
<th>Income from Commercial Support</th>
<th>% of Commercial Support to Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Companies</td>
<td>22</td>
<td>86,169,205</td>
<td>80,135,373</td>
<td>93%</td>
</tr>
<tr>
<td>Education Co. Other</td>
<td>54</td>
<td>134,193,787</td>
<td>80,483,954</td>
<td>60%</td>
</tr>
<tr>
<td>Health Care Delivery System</td>
<td>21</td>
<td>14,997,147</td>
<td>7,536,483</td>
<td>50%</td>
</tr>
<tr>
<td>Hospital</td>
<td>50</td>
<td>23,606,155</td>
<td>11,144,762</td>
<td>47%</td>
</tr>
<tr>
<td>Consortium/Alliance</td>
<td>5</td>
<td>13,125,420</td>
<td>5,865,103</td>
<td>45%</td>
</tr>
<tr>
<td>Not for Profit Fdn</td>
<td>59</td>
<td>108,919,247</td>
<td>47,786,242</td>
<td>44%</td>
</tr>
<tr>
<td>Physician Member Org Non Specialty</td>
<td>12</td>
<td>10,910,924</td>
<td>4,756,914</td>
<td>44%</td>
</tr>
<tr>
<td>Schools of Medicine</td>
<td>118</td>
<td>219,228,082</td>
<td>95,108,860</td>
<td>43%</td>
</tr>
<tr>
<td>Physician Member Org Specialty</td>
<td>196</td>
<td>10,696,164</td>
<td>4,002,796</td>
<td>37%</td>
</tr>
<tr>
<td>Other</td>
<td>61</td>
<td>59,871,148</td>
<td>22,298,330</td>
<td>37%</td>
</tr>
<tr>
<td>Voluntary Health Association</td>
<td>10</td>
<td>9,161,689</td>
<td>3,099,860</td>
<td>34%</td>
</tr>
<tr>
<td>State Medical Society</td>
<td>20</td>
<td>5,730,490</td>
<td>1,831,104</td>
<td>32%</td>
</tr>
<tr>
<td>Publishing Co</td>
<td>14</td>
<td>35,251,792</td>
<td>9,345,539</td>
<td>27%</td>
</tr>
<tr>
<td>Education Co. Physician Owned</td>
<td>12</td>
<td>469,445,825</td>
<td>91,366,541</td>
<td>19%</td>
</tr>
<tr>
<td>Government or Military</td>
<td>15</td>
<td>68,810,219</td>
<td>2,183,794</td>
<td>3%</td>
</tr>
<tr>
<td>*Insurance/ Managed Care</td>
<td>11</td>
<td>1,072,287</td>
<td>24,336</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>680</td>
<td>1,271,189,581</td>
<td>466,971,991</td>
<td>37%</td>
</tr>
</tbody>
</table>

* HMO and insurance-based CME providers subsidize their own programming, not included in commercial support income.

Confusion in Purpose and Role Among Different Types of Accredited CME Providers

The provision of CME is no longer the purview of a profession or academic-based voluntary commitment to enhancing professional practice. In the US and to a lesser extent in Canada, CME is big business, supporting a number of primary and secondary industries. Whereas there are a number of articles discussing the purpose and role of academic-based or professional society accredited CME providers, there are very few articles in the medical literature describing the purpose and role of 'for-profit based' or industry affiliated 'not-for-profit' accredited CME providers. Obtaining information about more commercial-based or industry affiliated CME providers appears to be difficult. A recent survey seeking profile information about communication companies, both non-profit and for profit, had a return rate of 25.2%. Of 182 companies identified,
only forty-six companies responded to a 21 item questionnaire with no information reported on the non responders. (132) Accrediting organizations and professional bodies have strict policies concerning industry-sponsored CME. Common components being (i) the funder should provide the support in the form of an unrestricted educational grant, (ii) the CME provider should be 100% responsible for the quality, content, and choice of speakers, (iii) speakers must disclose any relevant financial connections, (iv) the educational program should be the motivator rather than exhibits and entertainment. Although funders should not be directly involved with the content, such conditions, however, do not prevent influence on the CME provider choosing topics that are of interest to potential industry sponsors. (99) Katz et al. (99), investigating an academia-industry collaboration in CME between Harvard Medical School and a communication company, looked at 103 symposia offered at 4 Pri-Med conferences during the academic year 2000-2001. Pre-Med is a collaboration between M/C Communications, a marketing company, and Harvard Medical School “to create a wide reaching and low-cost continuing education program.” The assistance of the marketing firm working with the faculty-based planning team led to a rapid growth in industry-sponsored breakfast, lunch and dinner sessions at Pri-Med conferences, with 40% of the delegates attending these symposia. Of 103 symposia offered at these four conferences, 94 were funded by a pharmaceutical company that had received US Food and Drug Administration approval within three years of the symposia for a drug related to the topic. Thirty-one percent of the CME sponsors for these funded symposia were medical schools, 35% percent were non-profit organizations and 34% were for-profit medical education and communication companies. Katz et al. (99) warns that a reliance on this type of sponsorship would likely lead to imbalances in CME programming and recommends that when CME is
funded by industry, multiple rather than single funders should be used, and CME providers should guard against topic selection being influenced by funding sources.

The threat of further commercialization of CME programming is very real if alternative funds and resources are not found to support CME practice. To address this threat I believe a clear consensus is needed on the purpose and role of CME by public and professional stakeholders (governments, health professionals, medical schools, and consumers) concerned with the public good. This is an important question especially when considering the level of industry-sponsorship provided to the five major groups of CME providers. For example, Pri-Med’s three day courses providing 16 hours accredited study credits are offered for registration fees as low as $40 USD and are well received by physicians attending these courses. CME planners must secure sufficient industry sponsorship in order to deliver low cost programming. With little government or alternative financial support for CME programming, market pressures may play a more significant role in determining the types of educational programs available to physicians. The lack of alternative funding resources in the field is also a barrier to innovative programming as well as to the development and utilization of better evaluation tools.

In addition, a systematic framework using international, national data, regional health data and professional data is needed to determine what educational programming is needed to enhance physician competence, adequately address population health issues and improve patient outcomes.

Summary

As mentioned in Chapter One, Chen (22) posited that reliance on solely methods-oriented evaluation as currently constructed has not provided sufficient information to help us understand what is occurring in the “black box” of learning. I also suggest that
CME planners and associated accreditation bodies have been "boxed in", relying too much on methods-oriented planning procedures associated with the Tyler Curriculum Model, and that a more open system of curriculum development is needed for the field of CME. New concepts about learning, program planning practices and evaluation require a different conception about how to plan more efficacious educational activities.

Chapter Four more formally describes the PRECEDE-PROCEED model, how it is conceptualized and used in the health promotion field, and describes how the model was interpreted for the purpose of planning, implementing and evaluating the case study.
Chapter Four
Utilizing the PRECEDE-PROCEED Model as an Analytical Tool for BCWI

In the introduction, I presented the recent utilization and modification of Green’s (29) PRECEDE model in CME as a framework for categorizing the type and potential efficacy of educational interventions in the CME literature. In 1991, Green and Kreuter published a new text, *Health Promotion Planning: An Educational and Environmental Approach* (30), and introduced the PROCEED part of the model, recognizing that other institutional and environmental factors influence knowledge uptake and behaviour change. Taken together, the PRECEDE-PROCEED Model, I argue, provides a more promising framework for guiding and analyzing CME interventions such as the BC Whiplash Initiative (BCWI). This chapter will demonstrate just how the model was applied to the BCWI.

The primary conceptual framework utilized for the planning, implementation and evaluation of the BCWI was based on Green and Kreuter’s (30), PRECEDE-PROCEED health promotion model. The framework was not, however, used as a step-by-step guide. Rather, the model represented activities considered during the program development, implementation and evaluation, in a manner similar to Suchman (173) and Varela’s (114) notion of “situated cognition”, the utilization of embodied procedural knowledge, developed and learned through years of involvement with community-based organizations.

The PRECEDE-PROCEED Model was familiar to some members of the steering and research committee active in the health promotion field and provided a common language
in identifying predisposing, enabling and reinforcing factors that could facilitate or impede knowledge uptake and behaviour change.

Although the PRECEDE-PROCEED Model does not arise out of the adult education literature, I will argue that the model has a rich conceptual base that can have wider application in the field of adult education. It is also built on a set of principles that address a number of the challenges including ethics, power and interests discussed previously regarding deficiencies in current adult education models. (131)

Whereas one of the main challenges discussed in the introduction of this thesis was the need to develop a stronger theoretical framework for CME practices, the PRECEDE-PROCEED Model provides an underlying planning process to identify systematically key contextual factors that can facilitate the creation and evaluation of theory-driven, enduring CME programs.

**Supporting Theories and Models**

Green and Kreuter's PRECEDE-PROCEED Model is founded on the notion that social context greatly influences knowledge transfer and uptake. Green and Kreuter do not explicitly define the socio-cognitive framework underpinning their model. They do refer to a number of specific models and theories in their text such as, Health Belief Model, Social Learning Theory, and Theories of Reasoned Action, that support the principles underpinning the PRECEDE-PROCEED framework. (30;176) These theories and models, although shown to be fruitful for the purpose of facilitating individual health-related behaviour change, may also have value in the development of theoretical models to improve our understanding regarding what factors and conditions are necessary to facilitate behaviour change or other desired changes in the context of CME. In this
chapter I will describe the above model and associated theories as they represent fundamental constructs underpinning the PRECEDE-PROCEED Model.

As there is always some confusion over how best to define such terms as theories, concepts, constructs, models and variables to simplify and clarify, I rely on the definitions described by McKenzie and Smeltzer. (177)

A theory is a set of interrelated concepts, definitions, and propositions that presents a systematic view of events or situations by specifying relations among variables in order to explain and predict the events of the situations [...] The primary elements of theories are known as concepts [...] When a concept has been developed, created or adopted for use with a specific theory, it is referred to as a construct [...] The operational (practical use) form of a construct is known as a variable. p. 138

Models attempt to represent linkages among constructs believed to be relevant and bring together a number of theories to better understand a specific problem in a particular setting or context. The importance of these distinctions will become clear as I describe a number of theories and associated models underpinning the PRECEDE-PROCEED Model, beginning with the Health Belief Model

Health Belief Model

The Health Belief Model (HBM) (see Figure 8) was developed by a group of social psychologists working at the US Public Health Service in the 1950s in an attempt to understand factors that could contribute to people adopting preventative health measures or screening tests for early prevention of asymptomatic disease. The essential premise of HBM is that behaviour change depends on two variables: the value placed by an individual on a particular goal, and the individual’s estimate whether a given action or actions are likely to achieve that goal. (178) The HBM posit that demographic and other psychosocial variables are influenced by various “cues to action.” These cues to action are educational messages or experiences, such as mass media, advice from others,
reminder postcards from health care providers, and newspaper or magazine articles, that are more or less persuasive in conveying a perceived threat, and influence individual perceptions concerning the perceived risk of contracting the condition and the potential impact such a condition would have if contracted. The likelihood of changing an individual’s behaviour is further influenced by an individual’s beliefs as to whether the actions recommended are effective in reducing the risk, and what the perceived negative consequences are of taking the recommended action.

Figure 8. The Health Belief Model (178) p. 10

The HBM, as a first generational model, has been extensively researched with a large body of cumulative evidence in support of each construct (perceived benefit, perceived barrier, perceived susceptibility, perceived level of severity) as being significantly associated with health-related behaviour. (178) p. 10 Although the model has proven to be fairly robust, theorists and researchers have been exploring other constructs to better
address some other intervening variables. For instance, some investigators have added a new construct to the HBM, that of “self-efficacy”, recognizing the importance of the level of confidence a person has in being able to undertake a given behaviour change.

From a social cognitive perspective the model’s primary focus on individual attitudes and beliefs as being the primary determinant of whether a person makes a decision to change, may be too narrow. For instance, there may be economic or environmental factors preventing an individual from adopting a given behaviour change. But clearly, attitude is a critical factor in behavior change, no less so in a person acting on health information than in a physician implementing knowledge and skills learned through continuing medical education.

**Theory of Reasoned Action**

The Theory of Reasoned Action (TRA) is a second model that the PRECEDE-PROCEED Model draws on. (30;176) It is similar to HBM, posits that a decision or intention to make a behaviour change is based on a combination of attitudes about an action, and considers an individual’s perception of the impact of following a course of action within their social milieu. Rather than just seeing socio-demographic variables act as intervening factors on determinants of behaviour, TRA is based on the premise that ones perception of “normative influences” as a basis for reasoning within a given social milieu plays an important role in the prediction of behaviour. Concepts and constructs in this model might be useful to further explore the impact of undergraduate medical training on the creation of beliefs and attitudes concerning normative physician behaviour. Changes in this enculturation process could lead to new norms of behaviour more supportive of lifelong learning activities. The TRA, takes as axiomatic that individuals are rational or at least reasonable in their decision-making process.
Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB), although not specifically mentioned by Green and Kreuter, is an extension of the TRA. (178) TPB considers two primary variables – the strength of an individual’s attempt to perform the behaviour and the degree of control the person has over the behaviour including knowledge, skills, time, money, willpower and opportunity.

Consistent with Theory of Reasoned Action, the relative influence of attitude and subjective norm on intention is dependent on the behavioral goal. For some behaviors, the attitudinal component will be the major determinant on intention, while others, the importance of social pressure will be the primary influence. In general, the more favourable an individual’s attitude toward attempting a behavior, and the more the individual believes that significant others are in favour of his or her trying, the stronger will be his or her intention to try. (178) p. 11

The concepts and constructs of TPB are also relevant in the CME environment. Theories such as TPB can be used to conceptualize and test educational strategies that use forms of peer pressure, such as the use of educational influentials, or utilize informal peer to peer communication networks. Building on existing theoretical models may lead to the development of more successful strategies for motivating physicians who are not successful in their first attempt of knowledge utilization, which has been found to be a barrier to continued knowledge uptake.

Principles Underpinning the PRECEDE-PROCEED Framework

In addition to the above models and theories, the PRECEDE-PROCEED Model is based on a series of explicit principles that Green and Ottoson (179) state are derived from theories and practices discussed in adult education, social and behavioural sciences, program evaluation, epidemiology, administrative sciences, and communications, and are congruent with beliefs about conditions necessary to facilitate behaviour change for the purpose of health education and health promotion.
In Table 22 below I have selected principles of health promotion particularly relevant to CME planning. I have renamed Green and Ottoson’s “Principle of Health Promotion, to “Principle of Environmental Factors”, as the principle speaks to the need to address organizational, legal and economic factors which are applicable to a broader range of professional education programming.

Table 22. Summary of Selected Principles of Health Education Applicable for CME (179) pp. 95-8

<table>
<thead>
<tr>
<th>Principles of:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cumulative Learning</strong> – Behaviour is the sum of a lifetime of personal and cultural experiences. Behaviour change requires a planned sequence of experiences and activities over time tailored to the circumstances and prior experiences of the target group. No single educational input should be expected to have significant or lasting impact on behaviour unless it is supported by other inputs.</td>
</tr>
<tr>
<td><strong>Multiple Targets</strong> – Individuals’ knowledge, attitudes and behaviour are intermediate to the final goals of a program. Targets must include social systems that enable its behaviour and structures/relationships that reinforce behaviour.</td>
</tr>
<tr>
<td><strong>Stakeholder Participation</strong> – Involvement of a broad base of stakeholders to identify the problems, assess their causes, and anticipate barriers to change. Early involvement influences curriculum design, implementation strategies and facilitates commitment of all those involved.</td>
</tr>
<tr>
<td><strong>Situational Specificity</strong> – Utilize educational methods that are appropriate for the situation and informed by theories and principles arising from research.</td>
</tr>
<tr>
<td><strong>Multiple Vehicles</strong> – Consider all vehicles for education including instructional methods, staff development, community methods (e.g. mass media), computer-based instruction. The best combination of educational methods, media and messages for some people is not necessarily the best combination for others. A variety of learning opportunities or experiences must be provided.</td>
</tr>
<tr>
<td><strong>Intermediate Targets</strong> – Changes in resources, skill development and referrals enables or facilitates behaviour change. Significant others reinforce behaviour change. Behaviour change is the result of predisposing factors including changes in knowledge, attitudes, beliefs, values and perceptions. Focus on intermediate targets antecedent to the more distal outcomes desired.</td>
</tr>
<tr>
<td><strong>Environmental Factors</strong> – Accomplishing voluntary behaviour change may be impaired by organizational, legal or economic factors that must be addressed with health promotion interventions.</td>
</tr>
<tr>
<td><strong>Effective Administration</strong> - Adequate financial and human resources and a clear program plan with roles and responsibilities defined are required to successfully implement program planning.</td>
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</table>
These principles of health education and health promotion present a far broader conceptual understanding of factors to consider in program planning for the purpose of knowledge uptake and utilization than usually considered by planners using Tyler’s Curriculum Model, educators adopting adult learning theory principles or the principles underpinning Gagne’s model of cognitive dimensions of learning. Most of the above principles are congruent with the belief that for knowledge transfer to be effective, interventions must address environmental and social factors that hinder or facilitate adoption.

For comparison purposes (see Table 23 below) I have grouped principles and assumptions discussed in the CME and adult learning literature when describing “adult learning principles.” Usually these principles and characteristics are presented in the literature as a list with little or no attempt to organize them into a useful typology. I have grouped these factors to help build a more informative nomenclature.
Table 23. Commonly Espoused Assumptions of Adult and Physician Learners

<table>
<thead>
<tr>
<th>Ability</th>
<th>Motivational Factors</th>
<th>Instructional Design Factors and Instructional Activities</th>
<th>Cognitive Processing and Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>• adults of all ages have the ability to learn (161)</td>
<td>• physicians are practical learners (i.e. they seek to solve problems, content relevant to practice, with immediate utility)(160;162;181;182)</td>
<td>• learners are more apt to make changes as a result of learning if they are have a clear image of what will be achieved (161)</td>
<td>• repetition and reinforcement helps the learner remember information, especially if the reinforcement comes as a result of using the information (140)</td>
</tr>
<tr>
<td>• people learn differently — differently from one another and on different occasion (161;180)</td>
<td>• adults are self-directed in their learning and wish to participate actively in their own learning (160-162;181-183)</td>
<td>• active participation on the part of the learner tends to result in higher-quality learning than does passive, uninvolved experiences (161)</td>
<td>• reward and positive feedback are related principles and help promote useful learning, especially if this the reward is internalized, feedback is a critical part of learning (161)</td>
</tr>
<tr>
<td>• experience is a resource for learning (161;181)</td>
<td>• adults learn by choice: learning is voluntary (161)</td>
<td>• a problem-solving approach tends to foster both motivation and active involvement, and thereby facilitates learning (140;183)</td>
<td>• multi-sensory signals (hearing and seeing) are helpful to most learners (140)</td>
</tr>
</tbody>
</table>

The PRECEDE-PROCEED Model, on the other hand, heavily emphasizes a comprehensive diagnosis of the nature of the educational, Behavioural and attitudinal problems, the desired outcomes, the context of the clients, and the identification of potential barriers that could interfere with producing the desired outcome.

135
In order to make the case for greater utilization of the adaptability and feasibility of this model for CME purposes, I will introduce each of the distinct phases of the PRECEDE-PROCEED Model, as it is discussed in the health promotion literature and describe how these principles were incorporated in the planning, implementation and evaluation of the BCWI.

Figure 9. Phases of the PRECEDE-PROCEED Model (30) p. 35

Phases of the PRECEDE-PROCEED Model

PRECEDE-PROCEED Model, Phases 1 and 2: Social and Epidemiological Diagnosis in the Context of Health Promotion Education

In working with community health programs, the first phase of this model calls for an analysis of social problems or quality-of-life concerns. This phase identifies subjective
concerns and values of the community as well as objective data on social indicators, such as unemployment, violence and poverty. The second phase, closely linked to the first phase, involves assessing the incidence, prevalence, and cause of the health problems associated with the social problems in a given population:

The sponsoring agency should use the most recent available demographic, vital, and sociocultural statistics of the subpopulation experiencing the health problem. The problem should be further analyzed on the basis of the experience of related agencies and a review of previously published reports. To gain perspective on the experience of the community with the health problem, similar data from other cities, states, or regions should be compared. (179) p. 100

In some renditions of the PRECEDE-PROCEED Model, Phases 1 and 2 are represented graphically as one phase. (38) From an ethical perspective, the decision to move forward with a health program, after working through these first two phases, needs to be based on evidence that the issue warrants action and is remediable or can be effectively addressed, as opposed to other possible competing interests. Integral to the model is the involvement of a broad range of credible stakeholders who are in agreement that the problem is important and requires action.

In the community health model, stakeholders include patients, consumers, parents and various health service providers. And while the phases below are described in a linear fashion, data and information collection for all phases begins upon the project’s conception and the involvement with other stakeholders. Having set out the terms of the initial phases of the PRECEDE-PROCEED Model as establishing an ethical and practical basis for taking action, I would now turn to the BCWI to demonstrate how this model serves the particular needs of CME.
BCWI Phases 1 and 2:
Incorporating Social and Epidemiological Diagnosis in CME Planning

For the purpose of CME planning, the BCWI utilized Phases 1 and 2, and integrated a number of principles underpinning community health planning (see Table 22, page 133), participatory action research, and factors identified in the knowledge translation literature (see Table 24 below).

Table 24. Phases 1 and 2 Social and Epidemiological Diagnosis: BCWI Putting Principles into Practice

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identify and involve stakeholders from the beginning, including credible organizations and peer-respected individuals. Engage all stakeholders in the social and epidemiological diagnosis process. Identify subjective concerns of the community.</td>
</tr>
<tr>
<td>2</td>
<td>Gather objective data to assess the incidence, prevalence, and cause of the health problems associated with the patients presenting with WAD problems, in BC in relationship to other jurisdictions.</td>
</tr>
<tr>
<td>3</td>
<td>Base the decision to proceed on population health needs, rather than solely professional interests.</td>
</tr>
</tbody>
</table>

To discern whether physicians and their organizations felt there was a need for CME programming on whiplash-associated disorders, PMRF held a focus group with academic and professional organization leaders concerned with undergraduate medical education, family practice residency, family practice and CME, to discuss whether the leadership believed there was a need for such an intervention. The meeting was called together under the leadership of Dr. Andrew Chalmers, former Chair of PMRF’s Western Canada Multidisciplinary Committee and the Associate Dean of Undergraduate Medical Education. Dr. Chalmers was also former Head of the Department of Rheumatology at UBC. Don Gilbert from ICBC was invited as an observer.
From PMRF's perspective, it seemed reasonable that we should bring together all professional and related academic organizations to better assess and address potential learning needs through the continuum of medical education. Surprising to us this had not been done before. However, the idea of collaborating on a province-wide project was enthusiastically supported by all parties. Dr. Stephen Barron, liaison with the BC College of Family Physicians (later to become the co-chair of the BCWI steering committee) stated, "the lack of evidence-based education about whiplash-associated disorders is a pain in the physician’s neck." This statement was later transformed into some of the marketing material – "Is dealing with whiplash patients a pain in your neck?"

(2) Gather objective data to assess the incidence, prevalence, and cause of the health problems associated with the patients presenting with WAD problems in BC in relationship to other jurisdictions.

BCWI used a number of different methods to assess the viability and relevance of the program including meetings with stakeholders, focus groups, review of needs assessments, and findings of strategic planning activities. The use of multiple methods of data collection provided subjective and objective information to help determine the need and potential relevancy of an intervention.

PMRF held a series of multidisciplinary strategic planning sessions in 1986, 1988 and 1990, to identify major gaps and challenges in the musculoskeletal field and developed a strategic plan to address these gaps and challenges. One of the primary findings of these strategic sessions was the need to enhance family physicians’ knowledge and skills in the diagnosis and management of musculoskeletal conditions. PMRF had also reviewed two needs assessment surveys conducted by the Division of CME, at the UBC in 1992.

32 The undergraduate medical curriculum at most medical schools provides little clinical training in musculoskeletal medicine other than basic neurological tests and some limited history and diagnostic red flags for differential diagnosis purposes. Until the mid-1990s, and the use of evidence-based synthesis procedures, it was more difficult to glean value from non-systematic literature reviews due to problems related to selection bias and methodological problems of small sample sizes and conflicting results.
and 1995, looking at the perceived educational needs of family physicians and found there was a significant interest in further education on back pain, (back and neck pain were not differentiated on the surveys). In addition, PMRF runs a self-help support group for people with chronic pain conditions. From the consumer perspective anything we could do to enhance the quality of care in this area would be appreciated. Having personal experience with two rear-end motor vehicle accidents in 1988 and 1990\(^3\), I also recognized the human face of dealing with neck and back pain in a not so perfect world of medicine, allied health care and insurance plans.

During the proposal-building phase, an adhoc steering committee was created under the auspices of PMRF in partnership with the BC College of Family Physicians of Canada, UBC Division of Continuing Medical Education, UBC Department of Family Practice, Rural Education Training, UBC Family Practice Residency Program, and UBC Undergraduate Medical Education (see Appendix I: BCWI Committee Members).

At the first meeting of the Adhoc Steering Committee there was frank discussion about the range of problems associated with the whiplash phenomenon. One of the first issues raised was the recognition that problems associated with WAD were not solely a medical problem. Other factors played an important role in its prevention, management and prognosis, such as the presence or absence of auto-engineering occupant protection systems\(^4\), identification and effective management of psycho-social factors, and other environmental factors including insurance and compensation dynamics, and level of satisfaction in ones work environment.

\(^3\) My second rear-end MVA took place at an intersection while I was stopped at a red light. The vehicle behind me was a public transit HandyDart bus for disabled people. The driver thought the light had changed to green!

\(^4\) Between 1966 and 1979, the introduction of a variety of safety features in automobile design (laminated windshields...interior padding, lap and shoulder belts, increase side door strength...) helped reduce the vehicle accident fatality rate per mile traveled by 40%. Only three of the innovations added more than $10 to the price of the car, and in total they accounted for only 2% of the average price increase during 1975 - 1979. (World Health Report 2000, p. 6)
Base the decision to proceed on population health needs, rather than solely professional interests.

PMRF sought epidemiological and other sources of data to better understand the scope of the problem including its prevalence, the economic burden of illness on patients and society, comparative data across provinces in Canada, and provincial claims data from ICBC. Based on this data it was clear that musculoskeletal problems in general, and neck pain in particular, placed an enormous financial burden on society in terms of health care costs, compensation, and time away from work. In 1993, Health Canada released a report on the economic burden of illness. Musculoskeletal disorders and injuries were ranked second and third by diagnostic category with direct and indirect costs reaching $17.8 billion and $14.3 billion respectively. (68) Up to 85% of the population will suffer from musculoskeletal pain and of these, less than 10% of these sufferers consume 75% of the available resources. ICBC estimated WAD costs the motorists of BC about a half billion dollars annually, including wage loss, medical expense, pain and suffering awards. (184) In 1996, ICBC processed 45,500 whiplash-associated soft tissue injuries. Although most soft tissue injury claimants return to work within 30 days, 25% do not. In 1996, permanently disabled claimants made up 9% of the total number of claims, but accounted for 49% of the total payments made. The whiplash claim rates in BC in 1995 were approximately 850 per 100,000 compared to 70 per 100,000 in Quebec and 90 per 100,000 in Saskatchewan. Claim rates in the US and around the world are very hard to interpret or compare due to differences in insurance policies, carriers, and various claims management strategies. (185) Easier to compare are crash rates. The crash rate in BC is 25% higher than the national average and 65% higher than in Alberta. This may be due to a number of factors including climate, topography, and lifestyle. (184)
The collection of these data was important for a number of reasons. It provided useful information to convey to all stakeholders concerning the justification of the program and the program funding needed. Population health data related to the impact of whiplash on patients and society reaffirmed the relevance of the program to the planning team target audience and was used in the curriculum to enhance participant interest and motivation.

Both formal and informal data collection helped assess physicians' perceived educational needs. For instance, surveys reported that at least 42% of family physicians felt that they have been poorly trained to manage back and neck pain. The needs assessment surveys found that 71% of family physicians in BC deem further education in back pain a high priority (neck pain was not differentiated on survey) in 1988, and was still regarded a high priority in 1995. What was less clear were objective data related to the range of clinical decisions, preventive interventions, and the current medical and allied health care treatment of people presenting whiplash. (52) p. 115

With input and interest expressed from a broad range of stakeholders supported by preliminary epidemiological data collected including its incidence, prevalence, and socio-economic impact on society, the decision to move ahead was made.

**BCWI Phase 3: Incorporating Behavioural Diagnosis in CME Planning**

The BCWI utilized Phase 3 of the PRECEDE-PROCEED Model with a focus on the practices of physicians in relation to their work and education regarding whiplash (see Table 25).
Table 25. Phase 3 Behavioural Diagnosis: BCWI Putting Principles into Practice

| (1) Assess undergraduate and residency training and current clinical practice |
| (2) Evaluate the current literature that could inform improvement in practice |
| (3) Identify and prioritize specific behaviour or other desired changes that could improve current practice based on appraisal of literature available |
| (4) Reflect on the context of current practice, clearly identify what changes to routine clinical practice are desired |
| (5) Identify beliefs, attitudes and values of the target audience and their milieu that could influence the adoption of innovation |

(1) Assess undergraduate and residency training and current clinical practice

From discussions with steering committee members involved with medical education, it was clear that physicians had no training in undergraduate or residency programs to address whiplash disorders unless it was through their own initiative. This was of little surprise as the QTF represented the first systematic review of the whiplash literature. In addition, other than the insurer’s report form designed for insurance purposes, physicians had no systematic framework or decision-making aid to capture pertinent data for case history-taking or to guide and document a comprehensive physical examination. The lack of training and tools available was believed to be a major factor in physicians feeling uncomfortable with assessing, diagnosing, and managing patients presenting WAD.

Members of the Steering Committee also believed that physicians would benefit from a refresher workshop in conducting a comprehensive physical examination.

(2) Evaluate the current literature that could inform improvement in practice

To inform the behavioural diagnosis process all members of the Steering Committee received and reviewed copies of the scientific monograph of the QTF published in the journal SPINE. (52) This provided Steering Committee members an opportunity to reflect on the current state of knowledge and consider what behavioural changes were recommended in the literature.
To establish a ‘gold standard’ of knowledge about WAD, the QTF collected bibliographic information on 10,382 articles published between 1980 and July 1994 on WAD. Based on a predetermined screening process using inclusion and exclusion criteria, 1204 studies were selected to be reviewed. Of these 1204 articles, once reviewed, only 294 were deemed to be scientifically admissible for a more in-depth review. Using a structured critical appraisal process, 62 studies were deemed to provide valid and useful data. The systematic process employed by the QTF was believed to be credible by members of the Steering Committee and produced a gold standard of knowledge about what was known and not known about WAD. The QTF, through a consensus process, also recommended importantly, a classification system to provide physicians with a consistent way of grouping patients' symptomatology and case history, in the belief that the use of this typology will lead to improvements in patient management. Moreover its clear it had utility for future prognostic and outcomes research.

(3) Identify and prioritize specific behaviour or other desired changes that could improve current practice based on appraisal of literature available

The QTF presented a number of recommendations related to clinical assessment, diagnosis and management. The core outcome objectives arising from the QTF report, as interpreted by the BCWI, were:

- Enhance physicians’ knowledge, skills and confidence in the diagnosis and management of WAD
- Improve documentation and procedures for case history taking, physical examination and utilization of the QTF proposed WAD Grade system.
- Improve physician-patient communication especially the need to provide realistic patient reassurance
- Reduce unnecessary diagnostic interventions (x-rays, MRI scans)
- Reduce the use of narcotic-based pharmaceutical agents as well as muscle relaxants and long term use of NSAIDS
- Promote active rather than passive rehabilitation.
(4) Reflect on the context of current practice, clearly identify what changes to routine clinical practice are desired

Family physicians on the steering committee and curriculum development committee reinforced the need for the curriculum to address the context of a family physician’s busy practice. Any recommended changes to clinical routines would need to fit into this milieu. In addition to the uptake of new knowledge and commitment to change clinical routines, tools would need to be developed to effectively and efficiently enable and remind a physician about the new system of diagnosing and managing patients.

The steering committee agreed with the QTF assertion that part of the solution to improve physician’s confidence in the diagnosis and management of WAD was the need to provide physicians with a standardized framework for managing patients, valid and reliable instruments for recording patient history and progress, and a knowledge-base informed by a systematic appraisal of the literature on natural history, diagnosis, management and prognosis.

(5) Identify beliefs, attitudes and values of the target audience and their milieu that could influence the adoption of innovation

The following concerns were identified:

(a) Concerns about Industry Sponsorship

An early concern of the steering committee was the need to have a clear separation between the content development of the project and the funder, ICBC. Some members of the Steering Committee were concerned that the funder might try to influence the content of the program. In addition, there was a concern that members of the target audience and other stakeholders might perceive the eventual education program to be tainted by possible vested interests of an insurance company.
(b) Negative or Ambivalent Beliefs/Attitudes about Evidence-based Medicine

The adoption of evidence-based guidelines has met with resistance by some physicians. (186-191) Some contrary views include the notion that evidence-based medicine (EBM) is a form a cookbook medicine, that EBM does not sufficiently account or address individual variations, and the fear that recommendations arising from evidence-based guidelines will be inappropriately interpreted by stakeholders, particularly payers of health care services and thereby lead to a deterioration of patient care. (186;187) Sackett et al. (187) argues that these concerns are antithetical to the purpose of EBM which he defines as “the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients.” Based on discussions with steering committee members, and reviewing internet discussions on the EBM Discussion List and opinion pieces in the medical literature, there were concerns that some physicians might have strong negative or ambivalent beliefs or attitudes about evidence-based medicine. From an educator's perspective, an important issue about this debate is that the promotion of evidence-based recommendations or guidelines per se, given such beliefs, may be a potential barrier to the adoption of better practice behaviour.

(c) Concerns that Physician-Patient Communication Contributes to Iatrogenic Disability

Committee members believed some physicians were providing patients with unrealistic prognostic expectations around symptom cessation, thus when symptoms did not cease undue anxiety might arise and potentially lead patients to believe they were more seriously hurt. Conversely, committee members believed some physicians did not acknowledge self-reported pain symptoms and that insufficient empathy could also lead
to future symptom magnification problems resulting in fostering pain behaviour and lead
to iatrogenic disability.

(d) Other physician-oriented concerns included
- The limited amount of time available for patient consultation.
- Lack of patient education materials
- Physicians’ lack of confidence with clinical examination skills
- The need to improve medical notes
- Lack of training and financial support (fee schedules) in disability prevention or facilitating
  return to work
- Marketing concerns fears that a CME program solely focusing on whiplash might not draw
  a large enough interest.
- Need for further education about medico-legal reporting

At the first ad-hoc meeting of stakeholders it was recognized that whiplash was not
just a medical concern, and concluded that improvements in physician diagnosis and
management would not resolve the many complex social issues bearing on the social and
medical consequences of people involved in a motor vehicle accident.

Non-Clincial Factors Discussed

- Need for improvement and use of auto-engineering protection features including head
  restraint and seat-back designs
- Failure of legislative measures or interest in manufacturers to improve vehicle safety
- Lack of public and stakeholder education about whiplash prevention
- Vested interests of other stakeholders including insurers, lawyers, payers of health care
  services.
- Lack of quality research investigating implications of current system-based problems
  including social policy issues on disability determination and compensation, impact of
different legal and compensation models on WAD prognosis.
- Need for better research in the prevention, diagnosis and management of whiplash patients

The systematic identification of a broad range of contextual factors played an
instrumental role in the curriculum planning process and informed the creation of the
program content, selection of instructional design features, and the development of
resource materials which is further discussed in Phase 4.
Phase 4 involves the categorization of identified behavioural and environmental determinants into three groups - predisposing, enabling, and reinforcing factors that form the basis of an educational and organizational diagnosis. Once identified and integrated with data collected during the prior phases, educational programming can be developed.

Predisposing factors have been characterized in different ways in the health promotion literature. Green and Kreuter’s (30) definitions are as follows:

- Predisposing factors are those antecedents to behaviour that provide the rationale or motivation for the behaviour.
- Enabling factors are the antecedents to behaviour that facilitate a motivation to be realized.
- Reinforcing factors are factors subsequent to a behaviour that provide the continued reward or incentive for the behaviour and contribute to its persistence or repetition.

The typical predisposing factors discussed are knowledge, beliefs, values, attitudes and confidence. Enabling factors include skills and the accessibility of resources that make it possible for a motivated person to take action. Reinforcing factors are the attitudes and the climate of support facilitating behaviour change including family, peers, teachers, employers, health providers, community leaders and decision-makers.

Unlike traditional CME programming, educational objectives are not just related to content-oriented objectives but become the intermediate or sub-objectives to the behavioural or non-behavioural factors identified. Green and Ottoson (179) classify these objectives as informational objectives, attitudinal objectives, competency objectives, community organization objectives and training objectives. In the classification system below I have added environmental objectives to specifically target environmental factors, such as internal administrative policies or other environmental factors that a physician may be able to change, as against community organization objectives which relate to
environmental factors outside of the work environment that can influence behaviour. I have also called training objectives, community-based training objectives to clarify that these training objectives are directed at other stakeholders (see Table 26).

Table 26. Subclassification of Educational Objectives for Health Promotion Modified for CME Purposes (179) pp. 106-7

- **Informational objectives** relate to identifying what content, beliefs and level of understanding are necessary for a member of the target audience to address a desired change.
- **Attitudinal objectives** relate to the predispositions or feeling people have towards certain health problems and specifically looks at motivational issues - what will sufficiently motivate someone to take an appropriate action
- **Competency Objectives** relate to specific procedural or competency skills necessary to fulfill a specific behavioural objective.
- **Environmental Objectives** relate to identifying what administrative, policy or other environmental factors need to be addressed to facilitate knowledge utilization.
- **Community Organization Objectives** relate to issues related to access of services, possible changes needed in community priorities and resources.
- **Community-based Training Objectives** focus on specified changes in knowledge, behaviour, and attitudes of colleagues, parents, employers, peers and others who have direct influence over the people whose behaviour needs to change and can encourage or reinforce desired changes (both from a physician and patient perspective).

The overall thrust of the educational and organizational diagnosis is the need to identify potential barriers and factors that can facilitate the desired change and then specifically develop an action plan that mitigates barriers and effectively utilizes those factors that can facilitate the desired change.

In the health promotion community examples of barriers could include:

...social, psychological, and cultural barriers include citizen and staff bias, prejudice, misunderstanding, taboos, unfavorable past experiences, values, norms, social relationships, official disapproval, rumours. Communication obstacles include illiteracy and local vernacular. Economic and physical barriers include low income and inability to pay for prescribed drugs...Legal and administrative barriers include residence requirements to be eligible for services, legal requirements... policy or regulations that restrict program implementation. (179) p. 107
Facilitators of behaviour change could include past positive experience with other community-based projects, the credibility of the organizations involved, involvement and support of local leaders, the use of existing delivery systems, support of various communication channels including schools, local media, clubs, churches, neighbourhoods and ethnic organizations.

Green and Ottoso (179) provide a planning overview (see Figure 10) that shows the relationship between the types of training objectives and their relationship to behavioural objectives and the health status objectives of community health programs.

**Figure 10. Relationship of Educational, Behavioural and Health Status Objectives in Planning Community Health Program (179)**

Donaldson et al. (192) more recently describes this phase of planning to consist of a number of program components “often intended to lead to immediate or proximal changes (mediators) in participants that are presumed to later cause more distal outcomes.” The program activity therefore is targeting factors believed to be antecedent to the desired outcome. Donaldson et al. represents this schematically (see Figure 11).
Theory-driven educational planning in health promotion is conceived as a process in which planners construct programming components that are thought, or for which there is evidence, to influence proximal intervening or causal mediators that in turn are believed to influence patient health outcomes. Bartholomew, Parcel et al. (193) have provided an overview schematic of an intervention mapping process being proposed for planning health promotion programs (see Figure 12).
Bartholomew, Parcel et al. (193) state:

Intervention Mapping is a systematic process that explicates a series of steps and procedures for the development of health education programs based on theory, empirical findings from the literature, and data collected from the population.  

Bartholomew, Parcel et al. provide an excellent integration of the PRECEDE-PROCEED Model as the foundation for intervention mapping with pragmatic suggestions.
about various methods and strategies for planning, implementing and evaluating theory-driven programs. However missing from this recommended process is the integration of evidence-informed pedagogical research to inform the curriculum development process.

The creation of theory-driven intervention research in health promotion and other fields is relatively young. Meta-analysis was first introduced in 1976 in the social sciences by Gene Glass who “galvanized the research community” with his article entitled *Primary, Secondary and Meta-Analysis of Research.* (194) Research especially in the applied behavioural sciences provides a growing body of evidence that theory-driven programming and testing of theoretical constructs has potential for improving practice in many fields. Meta-analytic approaches are used in the field of education, for instance, to assess the impact of class size, computer-based instruction, feedback and test performance, grade retention and achievement and teacher expectancy effects. (195) The utilization of theory, such as the Health Belief Model, provides promising evidence that theory-driven programming may lead to improvements in educational planning. However there are many methodological challenges that need to be addressed to improve meta-analytic procedures and evaluation reporting practices in order to reduce errors in the use and findings of meta-analytic reports across various fields and disciplines. (196-198)

Given the promising use of program theory in other areas of research concerning human behaviour, the creation of program theory for CME purposes has greater potential in better understanding factors contributing to knowledge acquisition and knowledge utilization than current CME planning models. To provide a better understanding about translating Phase 4 for CME purposes I will describe how it was applied in the BCWI and my role in this process.
BCWI Phase 4: 
Incorporating Educational and Organizational Diagnosis in CME Planning

Background to the Curriculum Development Process

For the purpose of accurately describing this phase and my role in this activity I need to provide additional background. I was the lead project planner and primary author of the proposal. The project planning activity was a collaborative process melding the experience and knowledge of members of the adhoc steering committee. As the lead project planner, I brought my knowledge and experience in community planning including facilitating stakeholder involvement and negotiation, and pedagogical knowledge, to prepare the funding proposal that was used as the blueprint for the overall BCWI project. As Executive Director of PMRF, I was ultimately responsible for overseeing the project. The contract for the project was between PMRF and ICBC with a series of subcontracts between PMRF and the other stakeholders involved in CME program implementation and delivery.

Once the project was approved, a project coordinator and additional staff were hired to assist with program development and logistics. For the first three months of the project I was on sabbatical, fulfilling a three-month residency requirement for doctoral studies and received permission to study with Professor Patricia Wright, Senior Scientist at MRC Psychology Unit, University of Cambridge, England. Professor Wright is a well-recognized leading researcher and scholar in the field of cognitive ergonomics.

During my absence, the project began making some headway in the curriculum development process. However there were some conflicts in pedagogical styles between members of the steering committee and the hired project coordinator, which I will address later in this section, and there was a need for leadership in the research area.

Upon my return, I became active in overseeing the curriculum development process, in a
similar manner as Cervero and Wilson (131) conceptualize the work of a program planner as being primarily concerned with the role of a negotiator among various interests. Marc Broudo and I were responsible for planning and applying current research in cognitive ergonomics to enhance the instructional design aspects of the final curriculum products (presentation, typographical elements, referencing and indexing systems, tabbed indexes, use of graphics, algorithms and clinical presentations). In addition to this role the Research Committee appointed and supported me in the role as Chair of the Research Committee.

Phase 4 of the educational and organization diagnosis, described by Green and Kreuter (30;176), begins the formal process of program planning, integrating program objectives with concrete actions to address factors believed to facilitate or hinder the outcomes desired. This activity was an iterative and synthesizing process bringing together data collected from initial and continuing discussions with stakeholders, reviewing the literature on whiplash-associated disorders, reviewing recent systematic reviews on CME and related educational interventions, and the application of pedagogical related research. Once the program was implemented, feedback was provided through process evaluation activities and programming components were modified or refined. Based on our experience with the application of Phase 4, I will propose modifications to the PRECEDE-PROCEED Model specifically to address CME planning and programming needs, however some of these modification might also be relevant to health promotion planning. These modifications will be discussed in more detail in Chapter Five.

**Curriculum Development Process – Translating Knowledge into Curriculum**

I have synthesized principles and various classification systems discussed in the health intervention literature concerning community health interventions including
precede-proceed, and pedagogical literature to organize and report on the curriculum development activities undertaken by the BCWI (see Table 27).

Table 27. Phase 4 Educational and Organizational Diagnosis: BCWI Putting Principles into Practice

| (1) | Develop overall program planning goals. |
| (2) | Utilize recent systematic reviews in CME and educational research to inform decisions about the types of interventions and educational methods used that have shown to be effective or promising in other programs targeting a similar audience. |
| (3) | Use combination of predisposing, enabling and reinforcing intervention strategies to facilitate behavior change. Utilize multiple formats and multiple strategies to encourage participation in one or more activity. |
| (4) | Categorize key factors identified in Phases 1 – 3 that are believed to impact knowledge transfer and utilization into predisposing, enabling and reinforcing factors. Use credible messengers and familiar dissemination channels endorsed by credible organizations. Plan for both formal and informal education inventions. |
| (5) | Identify a range of objectives including content (declarative knowledge), competency (procedural knowledge), attitudinal, environmental and community-based objectives. For each set of sub-objectives plan specific actions to mitigate factors believed to hinder uptake and take full advantage of those factors that can influence knowledge uptake. Address key non-behavioral, environmental and community-based factors which are achievable. |
| (6) | Apply pedagogical principles and standards in translating knowledge to curriculum ensuring the translation process addresses issues of content validity, clinical relevance, sequencing, readability, and the presentation is succinct and engaging. Integrate socio-contextual factors and content-related issues in the planning process. |
| (7) | Provide pedagogical training to teachers to enhance knowledge and skill development. Identify and discuss problematic content areas, and enhance and refresh interactive learning strategies. |

Although the principles above are not necessarily sequential steps, an early step in the process should be a careful review of systematic reviews regarding CME and pedagogical-related literature to build on existing knowledge.

1. Develop overall program planning goals.

The overall guiding principle for planning the BCWI intervention was that CME planners should utilize best evidence regarding pedagogical practices and CME research in developing CME programming. In addition to Green and Ottoson’s categories of types of subordinate objectives, the BCWI created overall program planning objectives (see Table 28).
Table 28. BCWI Initial Statement of Overall Program Objectives

- To develop cost-effective assessment, diagnosis and management protocols for patients presenting with WAD.
- To produce a CME module that would be of long term service in the training and ongoing education of family physicians in Canada and elsewhere.
- To be an innovative teaching model informed by the CME literature, built on multidisciplinary expertise and sophisticated principles of instructional design.
- To enable family physicians to become better equipped to improve the early intervention and management of patients.
- To develop and test a comprehensive and rigorous evaluation instrument for determining the effectiveness of the proposed CME module which will be designed to enhance the ability of family physicians to utilize cost effective assessment, diagnosis and management protocols for patients presenting WAD.
- To reduce the pain and suffering of the patients with WAD.

Creating overall program planning objectives provided an opportunity for stakeholders to reflect on the bigger picture. For instance, how could this project contribute to the common good? This may be an important consideration as the creation of enduring programs requires long-term commitment of stakeholders and having a greater sense of purpose may be a motivating factor. From a CME perspective, the project held both an academic and pragmatic interest to academic stakeholders and members of the target audience. The opportunity to create an evidence-informed educational intervention and to conduct a more sophisticated evaluation of the program was also seen as an area of great importance. In the early negotiations with ICBC, PMRF made it clear that the project would not proceed unless adequate resources were available to support a comprehensive evaluation of the project. Having overall program planning objectives also provided a context for planning or considering more immediate goals and objectives. Before discussing more immediate program objectives, the next step in the planning process was to review the CME literature and most recent systematic reviews. By looking at the literature planners can look at what factors other CME planners and researchers have considered in categorizing predisposing, enabling and reinforcing
factors both in terms of determinants of individual change, but also as a way to conceptualize various educational strategies used in other studies.

(2) Utilize recent systematic reviews in CME and educational research to inform decisions about the types of interventions and educational methods used that have been shown to be effective or promising in other programs targeting a similar audience.

We began planning the types of educational interventions at the proposal building phase of the project, utilized Davis et al.'s (199) summary of primary and secondary interventions (see Table 29) and reviewed other systematic reviews and summaries. (6;15;18;19;199;200) Based on this review it was clear that aside from a few very specifically targeted interventions, those where economic incentives could be successfully employed, there was no magic bullet available that was proven consistently to be an effective single strategy to change physician practice, rather multiple strategies appeared to be more successful. (19;201)

Davis et al. (199) reported on a systematic review of 50 Randomized Control Trials (RCTs)(18) of 74 discrete interventions that had, as a primary focus, the uptake of information. Using a modified taxonomy developed by Davis et al. (18), interventions were grouped for analysis by type of educational intervention planned. Type 1 were interventions using predisposing methods only. Predisposing methods included conveying information using didactic sessions – lectures, courses, conferences and grand rounds. Type 1 interventions generally demonstrated negative or inconclusive results. Although 7 of 11 studies displayed positive performance changes, none of the six attempts to change patient health status did so. (18) Factors contributing to changes in practice behaviour included practice strategies, case discussion and the opportunity to rehearse or consider practice behaviour. Type 2 interventions used 'enabling' strategies. Nine of the ten studies using enabling strategies included various aids that may be built
into a physician's routine behaviour such as flow charts, algorithms, patient education materials, consultation, and reference materials. These "enabling" strategies produced more successful outcomes on physician behaviour. Studies where knowledge testing and practice needs assessment strategies were employed also improved some aspects of physician performance. Type 3 methods were mainly feedback and/or reminders in conjunction with predisposing methods. In Davis et al.'s (18) study, 18 of 26 studies employing this type of intervention strategy to change physician behaviour had positive outcomes, and 6 of 9 studies seeking changes in patient outcomes using Type 3 methods were successful. Type 4 interventions used a combination of all three methods and produced positive results in 14 of 14 studies intending to change physician performance and 5 of 9 studies seeking patient health outcomes.

Davis et al. (199) also provided a summary of primary and secondary interventions as a guide to consider programming choices (see Table 29).
Table 29. Primary and Secondary Interventions in Continuing Medical Education (6)

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Synonyms, Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Interventions</strong></td>
<td></td>
</tr>
<tr>
<td>Formal CME</td>
<td>Didactic sessions, Courses, Conferences, Rounds</td>
</tr>
<tr>
<td>Printed Materials</td>
<td>Newsletters, Bulletins, Texts, journals, Practice guidelines, clinical policies</td>
</tr>
<tr>
<td>Audiovisual Methods</td>
<td>Audiotapes, Videotapes, Videodiscs</td>
</tr>
<tr>
<td>Academic Detailing</td>
<td>Physician educator visits</td>
</tr>
<tr>
<td>Computer Aided Instruction</td>
<td></td>
</tr>
<tr>
<td><strong>Secondary Interventions</strong></td>
<td></td>
</tr>
<tr>
<td>Enabling</td>
<td>Flow charts, algorithms, Patient education materials, Patient specific information, Question in practice programs, Consultation</td>
</tr>
<tr>
<td>Reinforcing</td>
<td>Reminders, Feedback</td>
</tr>
<tr>
<td>Mixed or multi-potential</td>
<td>Opinion leaders/educational influencers, Chart review</td>
</tr>
</tbody>
</table>

(3) Use combination of predisposing, enabling and reinforcing intervention strategies to facilitate behaviour change. Utilize multiple formats and multiple strategies to encourage participation in one or more activity.

Based on these results and considering a broad spectrum of educational research, a comprehensive educational strategy evolved using a combination of predisposing, enabling and reinforcing educational strategies. The predisposing strategies utilized in the BCWI included: (a) conducting a needs assessment (review of recent needs assessments
and focus group with professional leadership); (b) the involvement of credible organizations and recognized leaders within the profession; (c) use of peer-selected educational influencers (EIs) as trainers; and (d) trainers' workshop regarding planning successful programs and content review.

Enabling strategies included: (a) cueing of prior knowledge through the use of pretest; (b) adult-oriented educational program including lecture, case-based group discussions and hands-on clinical examination workshop; and (c) use of EIs for informal diffusion.

Mixed strategies (enabling and reinforcing) included: (a) instructionally designed, tab indexed comprehensive syllabus as both an instructional tool and reference manual, (b) use of 'Memos to Myself' participants immediately after exposure to the core material were asked to translate their learning into specific behaviour changes (a reminder was sent to participants three weeks after the program). Reinforcing strategies included: (a) immediate feedback on knowledge test results prior to and immediately after the course, (b) distribution of patient and physician educational material post course, (c) distribution of delayed posttest results indicating correct and incorrect answers with referenced answer key, (d) distribution of summary of peers intended behaviour changes collated from Memos to Myself, and, (e) access to content information through website.

Other challenges discussed in the literature for CME were the need to provide greater variety in programming as different types of educational activities would attract different audiences and/or encourage further learning. We decided multiple methods of delivery would have the greatest potential of attracting and exposing a broader base of physicians to the BCWI material and could provide different levels of exposure to the program.

Based on the data collected during the proposal building phase, integrating current evidence on CME primary and secondary interventions, and the knowledge and skills of
members of Steering Committee, the following conservative and innovative educational vehicles were proposed (see Table 30).

**Table 30. Educational Vehicles Original and Modified Roles and Responsibilities (202)**

<table>
<thead>
<tr>
<th>Education Vehicles</th>
<th>Provider</th>
<th>Original Role</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train the Trainers</td>
<td>BC College of Family Physician</td>
<td>Prepare budget, coordinate, implementation, logistics</td>
<td></td>
</tr>
<tr>
<td>Road Show</td>
<td>BC College of Family Physician</td>
<td>94 hospitals delivering 1 hour grand rounds, Prepare budget, coordinate, implementation, logistics</td>
<td>Cover each region in the province, not each hospital</td>
</tr>
<tr>
<td>Half-day Session</td>
<td>BC College of Family Physician</td>
<td>30 half-day sessions, Prepare budget, coordinate, implementation, logistics, Target 400 MD</td>
<td>Transfer to UBC CME</td>
</tr>
<tr>
<td>One Day Session</td>
<td>UBC Division of CME</td>
<td>20 Full day sessions, Prepare budget, coordinate, implementation, logistics, Target 600 MD</td>
<td>Target 1000 MDs not necessarily half day or full day sessions</td>
</tr>
<tr>
<td>Telemedicine</td>
<td>Rural Training Program, Dept. of Family Practice</td>
<td>2 Telemedicine Programs, Prepare budget, coordinate, implementation, logistics, evaluation - Target 170 - 200 MD</td>
<td></td>
</tr>
<tr>
<td>Web Page</td>
<td>Division of Educational Support and Dev</td>
<td>Translate curriculum materials for web use</td>
<td></td>
</tr>
<tr>
<td>Family Residency</td>
<td>PMRF in conjunction with Dept. of Family Practice</td>
<td>Prepare budget, coordinate, implementation, logistics</td>
<td></td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>PMRF in conjunction with Dept. of Emergency Medicine</td>
<td>Prepare budget, coordinate, implementation, logistics</td>
<td></td>
</tr>
<tr>
<td>Symposia</td>
<td>PMRF</td>
<td>Prepare budget, coordinate, implementation, logistics</td>
<td></td>
</tr>
<tr>
<td>Curriculum Development</td>
<td>PMRF</td>
<td>Prepare budget, coordinate, implementation, logistics</td>
<td></td>
</tr>
</tbody>
</table>

Using the above template physicians had multiple points of entry to the BCWI program. For instance, a physician might first be exposed to the BCWI material on the internet or at a one hour Grand Round held at a local hospital and be motivated to attend a more comprehensive program.
To enhance project credibility, professional bodies were provided with background information about the project through stakeholder liaisons and a formal request for project endorsement was made and received.

4. (a) Categorize key factors identified in Phases 1-3 that are believed to impact knowledge transfer and utilization into predisposing, enabling and reinforcing factors

Members of the Steering Committee participated in the identification of potential barriers and factors that might inhibit or facilitate physician participation, knowledge uptake and utilization. Based on discussions with stakeholders and factors identified in the medical and related literature I have summarized predisposing, enabling and reinforcing factors that committee members believed could inhibit or facilitate knowledge uptake and its utilization (see Table 31).
Table 31. Summary of Predisposing, Enabling and Reinforcing Factors Believed to Facilitate or Inhibit Knowledge Transfer and Utilization

<table>
<thead>
<tr>
<th>Predisposing Factors (Knowledge, beliefs, values, attitudes and confidence)</th>
<th>Facilitators</th>
<th>Inhibitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior Knowledge and prior feelings about the QTF recommendations</td>
<td></td>
<td>No knowledge about the QTF</td>
</tr>
<tr>
<td>Positive Beliefs, attitudes about evidence-based medicine</td>
<td></td>
<td>Negative beliefs, attitudes about EBM</td>
</tr>
<tr>
<td>Confidence in physical examination skills</td>
<td></td>
<td>Negative past experience with applying EBM guidelines</td>
</tr>
<tr>
<td>Feeling of safety and security with peers</td>
<td></td>
<td>Lack of confidence in physical examination skills</td>
</tr>
<tr>
<td>Awareness of peers having similar concerns about WAD matters</td>
<td></td>
<td>Feeling isolated</td>
</tr>
<tr>
<td>Academic affiliation or active in clinical research</td>
<td></td>
<td>Older and later in career path</td>
</tr>
<tr>
<td>Type of practice - affiliated and active with a hospital</td>
<td></td>
<td>Solo practice</td>
</tr>
<tr>
<td>Age - younger or early to middle in career</td>
<td></td>
<td>Aware of controversy concerning QTF</td>
</tr>
<tr>
<td>High quality presentation</td>
<td></td>
<td>Low quality presentation</td>
</tr>
<tr>
<td>Relevance of preference materials</td>
<td></td>
<td>Concerns about Industry funding</td>
</tr>
<tr>
<td>Speaker Impacts: Positive interaction with colleagues and instructor</td>
<td></td>
<td>Test anxiety</td>
</tr>
<tr>
<td>Positive learning environment including usual satisfaction measures (A-V, Facilities, Refreshments, Registration)</td>
<td></td>
<td>Poor speakers</td>
</tr>
<tr>
<td>Credible messengers, supported by accrediting bodies</td>
<td></td>
<td>Unknown messengers not affiliated with credible organizations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enabling Factors (skills, access of resources that facilitate a motivated person to act)</th>
<th>Facilitators</th>
<th>Inhibitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of systematic framework for diagnosis and management</td>
<td></td>
<td>Lack of systemic framework</td>
</tr>
<tr>
<td>Opportunity to expand skills in case history and physical examination</td>
<td></td>
<td>No opportunity to practice skills</td>
</tr>
<tr>
<td>Small group interaction</td>
<td></td>
<td>Lack of supervision - practicing skill incorrectly</td>
</tr>
<tr>
<td>Decision-making aids</td>
<td></td>
<td>Lack of decision - making algorithm</td>
</tr>
<tr>
<td>Ease of use of reference materials</td>
<td></td>
<td>Untabbed, poorly constructed indexes, poor sequencing of content</td>
</tr>
<tr>
<td>Use of advanced organizing strategies and instructional design so the learner knows what to expect (consistencies in presentation) Pre-test, learning objectives, standardized style sheets with meaningful typographical elements</td>
<td></td>
<td>Lack of advanced organizers, unclear use of typographical elements, unclear changes in typographical elements</td>
</tr>
<tr>
<td>High quality patient education material</td>
<td></td>
<td>No patient education material or poorly quality patient education</td>
</tr>
<tr>
<td>Active reflection on translating learning into concrete behaviour change</td>
<td></td>
<td>No opportunity to reflect on implications of learning on clinical practice</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reinforcing factors (Attitudes, climate of support elements facilitating behaviour change including family,</th>
<th>Facilitators</th>
<th>Inhibitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reminder of intended change</td>
<td></td>
<td>No reminders of intended change</td>
</tr>
<tr>
<td>Positive reaction of material by colleagues</td>
<td></td>
<td>Negative reaction of material by colleagues</td>
</tr>
<tr>
<td>Feedback on colleagues intended changes</td>
<td></td>
<td>No feedback on colleagues intended changes</td>
</tr>
<tr>
<td>Delay post-test</td>
<td></td>
<td>No post-test</td>
</tr>
<tr>
<td>Ongoing News bulletins</td>
<td></td>
<td>No ongoing material</td>
</tr>
<tr>
<td>High quality reference material - able to get information on demand</td>
<td></td>
<td>Untabbed, poorly constructed indexed, poor sequencing of content</td>
</tr>
<tr>
<td>Positive reaction of other stakeholders, including work colleagues</td>
<td></td>
<td>Negative reaction of other stakeholders, including work colleagues</td>
</tr>
<tr>
<td>Ease of institutionalizing procedures</td>
<td></td>
<td>Difficulty in institutionalizing procedures</td>
</tr>
<tr>
<td>Fits with practice time frame</td>
<td></td>
<td>Difficulty in doing in practice timeframe</td>
</tr>
</tbody>
</table>
The systematic identification and categorization of predisposing, enabling and reinforcing factors provided a broader contextual understanding about what factors needed to be addressed in the creation of curriculum, resource materials, and evaluation measures. Whereas in traditional CME planning using the Tyler Curriculum Model, the curriculum development process tends to focus on the delivery of content-based objectives, the curriculum focus using the PRECEDE-PROCEED Model shifted to consider socio-contextual factors as having at least equal weight in the planning process.

4. (b) Use credible messengers and familiar dissemination channels endorsed by credible organizations

One of the most promising non-economic approaches to facilitate knowledge utilization suggested by Lomas et al. (128) and other (123;203) is the use of educational strategies involving direct contact with a credible messenger.

Although it was well accepted in the Social Sciences literature that key individuals play an important part in the dissemination of information, the use of educational influencers in CME was rarely reported in the literature except for the early work of Hiss, Stross (127;204-211) and, more recently, Lomas. (128) The use of educational influencers by pharmaceutical companies through their speakers bureaus appears to be a successful marketing strategy although this type of intervention has not been evaluated.

The application of the use of educational influencers reported in the literature were typically in community-based hospitals. For instance, Stross et al. (127) in a randomized controlled trial showed a significant difference in the inpatient management of chronic obstructive pulmonary disease in intervention hospitals. The EIs who participated in the comprehensive educational program were involved in only 5% of cases but logged formal

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35 The continuing use of this strategy by pharmaceutical companies suggests that this type of marketing has an impact on pharmaceutical sales.
and informal consultations affecting another 25% of cases. Lomas et al. (128) found that
the influence of clinical opinion leaders could be traced to an increase in the proportion
of vaginal births after previous cesarean section. The context of EIs identified in hospital
settings is likely quite different than EIs outside of a hospital given the potential
difference in number of contact moments and opportunity for mentoring. Further
investigations in other attributes of EIs and differences in contextual factors may lead to a
better understanding on the various types of EIs and their potential influence in
facilitating behaviour change.

In addition to looking at CME research investigating the use of EIs, the BCWI also
reviewed literature looking at the information seeking behaviour of physicians. The
reliance of physicians on informal communication was consistently rated as a major
information source of physicians. (96;212;213) Gruppen et al. (124) found unique
patterns of information seeking behavior of family physicians with their first choices of
information resources being informal consultations with colleagues (33%), consultations
with community specialists (32%) and textbooks (27%). Use of journals (4%) and
consultation with outside specialists (2%) were of minimal importance compared to other
sources.

4. (c) Plan for both formal and informal education inventions

After reviewing this literature I proposed that we identify educational influencers in
the province of BC and utilize them for both formal and informal dissemination purposes.
A more detailed account was published in the Journal of Continuing Education of the
Health Professions in 2000, entitled, Identifying educational influentials for formal and
informal continuing medical education in the province of British Columbia (214)
To continue the curriculum development process the next step was to integrate predisposing, enabling and reinforcing factors in planning more specific objectives for the creation of syllabi and course materials.

5. Identify a range of objectives including content, competency, attitudinal, environmental and community-based objectives

Reflecting on the creative process involved in designing the blueprint for the project I have used Green and Ottosons’ subclassification of educational objectives to describe the range of objectives considered in planning the BCWI.

**Informational Objectives**

The process of specifying informational objectives was a long and arduous process. Initial attempts by the founding project coordinator and syllabus author to identify and define behavioural objectives related to content for the program, based on Mager’s work, *Preparing Instructional Objective* (215) and Bloom’s Taxonomy (216), were believed to be too pedantic for members of the Steering Committee. I was alerted to this problem six weeks into my sabbatical in England. This pedagogical dilemma was particularly problematic for the project coordinator who was skilled in instructional development work within this particular milieu.

Upon my return this situation was resolved by the recognition that, whereas the identification of measurable and relevant objectives are particularly important for test design and measurement purposes, more general objectives are useful for the purpose of informing participants about the type of information to which the learner was going to be exposed. From a pedagogical perspective the statement of learning objectives to the target audience was not for the purpose of measurement, rather its purpose was to be used as an advanced organizer to prepare the participants to the course material.
The Steering Committee believed it was critical to ensure that the curriculum did not misrepresent the level of evidence supporting recommendations for changes to practice. A goal for the curriculum committee was to provide a clear understanding regarding what the recommendation was, what level of evidence, if any, or rationale informed that recommendation and to provide physicians with sufficient transparency so they could reflect on whether the recommendation was reasonable given the current state of knowledge or consensus opinion.

Competency Objectives

Competency objectives relate to specific competency and procedural skills necessary to fulfill a specific behavioural objective. Using Anderson’s representation of knowledge production, the ability to perform a skill is a process starting with declarative knowledge and then, through practice and experience, it may become automated to the point it might not require much conscious effort. The building of competency could then be perceived as a process of becoming aware of new information and acting on this knowledge. Three types of competency objectives were identified. Competency objectives were initially perceived as those objectives related to procedural skills such as history-taking, improving the accuracy and comprehensiveness of medical notes, and mastery of physical examination skills. However, competency objectives could include the development of tacit knowledge including pattern recognition or other inductive problem-solving skills as one gains experience with the WAD grading system, patterns related to signs and symptoms and WAD management goals.

Discussions with Steering Committee members also influenced programming related to skills development in case history taking and physical examination. Although there was some discussion about having other professions attend the sessions, it was decided to
focus on family physicians and emergency physicians except in some small rural environments. This was due to concerns about some physicians feeling intimidated in practicing assessment skills with physiotherapists or other health professionals who might have greater skills and confidence in physical examination procedures.

**Attitudinal Objectives**

Attitudinal objectives relate to the predispositions or feelings people have towards the credibility, relevance, and other motivational issues related to knowledge uptake and its utilization. The attention paid to issues related to content validity and relevance in the creation of the curriculum and evaluation instruments not only spoke to the desire of the CME planners to create a program designed to specifically address pragmatic concerns of the target audience, but also to address potential attitudinal concerns of the target audience.

Already mentioned in the behavioural diagnosis phase were concerns regarding the potential impact of beliefs and attitudes about industry sponsorship, the use of evidence-based medicine as the underlying framework for the program, and other issues that could impact program credibility. Specific steps were taken to mitigate the potential impact of these factors. For instance, policies were established that provided parameters for ICBC involvement. While ICBC had no involvement in the curriculum development process, it did have an ex-official liaison with the Steering Committee and was involved in specific research areas – providing baseline data on incidence and cost of whiplash, use of their claims database to link with Pharmanet, the provincial database on drug use, and provided some marketing and printing support. These policies conformed to standards developed by the Canadian Medical Association and other accrediting bodies concerning industry supported CME programming which are particularly focused on pharmaceutical
industry support. In addition, to mitigate the potential negative impact industry based funding could have on the target audience, the curriculum addressed ICBC’s funding support directly and provided a clear understanding about ICBC’s level of involvement.

To address issues regarding program credibility, the planning process identified and engaged stakeholders from the beginning who would liaise with professional bodies to identify any concerns and provide direct avenues of communication between the project and other stakeholders. Project endorsement was sought and received by the BC Medical Association as well as the BC College of Family Physicians of Canada and the Division of CME at UBC. CME accreditation was secured for all educational activities under the auspices of the Division of CME and the College of Family Physicians and the program was to be delivered by familiar CME organizations. The Steering Committee members, for the most part, were well-recognized in their field and well-regarded by their peers.

The systematic identification and utilization of educational influentials as being the “credible messengers” was also an integral part of the project’s program theory to enhance program credibility. Instructional programming and slides used at the beginning of the session clearly addressed who was involved with the program development, and directly addressed and acknowledged ICBC’s funding support as an unrestricted educational and evaluation grant.

To address possible concerns about EBM, the curriculum development team chose to be as transparent as possible concerning the recommendations of the QTF, clearly stating the level of evidence, if any, or consensus opinion supporting the guideline. As many of the guidelines were based on weak evidence or consensus, the objective was to provide the physician with sufficient information to allow him/her to make an informed opinion regarding the recommendation. In addition, it was emphasized that there was a need for
further research and that these recommendations were time-limited subject to new research in the area. The underlying belief by the educational planners was that if physicians fears or anxiety about evidence-based practice was reduced by providing transparency regarding the level of evidence and reinforcing the need for physicians to use evidence-based guidelines in conjunction with their clinical judgment, based on case history and physical examination findings, physicians would be more willing to consider the recommendations.

Mid-way through the program implementation there were concerns about a growing controversy about the scientific merit and credibility of QTF, PMRF and BCWI which resulted in the need to address other environmental factors. The Trial Lawyers Association of BC and an adhoc group called the Coalition Against No Fault, believed the PMRF World Congress on Whiplash-Associated Disorders and the BCWI were initiatives conceived by ICBC under the auspices of PMRF as an attempt to bring no fault insurance on the provincial agenda again. The Trial Lawyers Association’s newsletter, The Verdict, propagated this idea to their membership. (217) Communication between trial lawyers associated with the Coalition Against No Fault and Dr. Merskey led to a review of the BCWI syllabi by Dr. Merskey who subsequently co-authored an article with Dr. Teasell published in the journal, Pain Research & Management, the journal for the Canadian Pain Society, with the misleading title: The Quebec Task Force on whiplash-associated disorders and the British Columbia Whiplash Initiative: A study of insurance industry initiatives. (218) Other trial lawyers associations and some researchers associated with these organizations were actively trying to discredit either the scientific merit of the QTF or propagate personal attacks on researchers and organizations

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36 Deyo and Psaty (282) state: “The fact that scientists are sometimes challenged by special-interest groups should be no surprise [...] with widening media coverage of health research [...] expanding research on the outcomes of
associated with the QTF or involved in the dissemination of the findings of the QTF.

(219)

An attempt by members of the PMRF’s Research Committee and myself as the executive director was made to correct factual errors including providing source material to the Trial Lawyers Association and to Dr. Merskey, Chief Editor, for the journal, *Pain Research and Management*. Although our response to Teasell and Merskey’s article was published (220) it was followed by authors’ responses. Rather than address the scientific issues raised in the letter, the authors continued to address non-scientific issues in an apparent attempt to discredit the organizations and professionals associated with those organizations. (221) Some issues raised by Teasell and Merskey’s article, we believed, brought out legitimate concerns about the BCWI Chronic Pain Module which did not provide a gold standard of knowledge about chronic pain diagnosis and management. As a result of these concerns, PMRF sought funding support to conduct a systematic review of the chronic pain literature to produce an evidence-informed curriculum on the diagnosis and management of chronic pain. Material was kept on these concerns, reviewed by the Steering Committee and considered potential barriers to uptake. Although there were concerns about these developing controversies, there was no evidence that these developments had an impact on the target audience.

By clearly identifying attitudes, beliefs and other factors that could hinder or facilitate uptake, program planners can strategically create curricula that address potential barriers and use a range of factors believed to facilitate knowledge uptake and its utilization.

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"clinical care, such attacks may become more frequent and acrimonious. The huge financial implications of many research studies invite vigorous attack."
Community Organization, Environmental and Training Objectives

As there are overlaps in identifying community organization objectives, the need to address environmental factors, and educate other stakeholders which could facilitate or inhibit knowledge utilization, I have combined these objectives. Community organization objectives relate to issues concerning access of services, possible changes needed in community priorities and resources, and the education of other stakeholders. Environmental objectives are concerned with identifying what administrative, policy or other environmental factors need to be addressed to facilitate knowledge utilization. Training objectives refer to educational efforts beyond the immediate stakeholders which could impact knowledge utilization.

Table 32. Community Organization, Environmental and Community Training Objectives

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<th>Objective</th>
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<td>(1) To foster cross-discipline communication with all stakeholders involved in whiplash related activities including auto-engineers, allied health workers, insurance and disability stakeholders</td>
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<tr>
<td>(2) To address administrative barriers to improve knowledge utilization</td>
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<tr>
<td>(3) To develop patient educational material to improve patient’s knowledge about whiplash and as an enabling and reinforcing tool for changing physician behaviour</td>
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(a) To foster cross-discipline communication with all stakeholders involved in whiplash related activities including auto-engineers, allied health workers, insurance and disability stakeholders.

There are many stakeholders involved in the prevention and management of WAD. Other stakeholders include auto-engineers, government regulatory bodies, other health care providers including physiotherapists, massage therapists, occupational therapists, chiropractors, psychologists, other medical specialties, such as neurologists, physiatrists, orthopaedic surgeons, psychiatrists, insurance professionals, case managers, adjudicators, plaintiff and defense lawyers, clinical and academic researchers, consumer organizations etc.
The main CME programming limited itself to primarily target family and emergency physicians. It was recognized by the Steering Committee that additional community educational efforts were needed to ensure patients received more consistent messages from various health care providers. Separate sessions were offered on a fee recovery basis to other health professional organizations and staff at ICBC. As mentioned earlier, in some smaller rural communities there were some workshops that included physiotherapists and chiropractors.

PMRF's World Congress on Whiplash-Associated Disorders was open to all health professionals and other stakeholders. As the project evolved, new challenges and opportunities presented themselves leading to new objectives and initiatives. For instance, as the relationship developed with ICBC, the PMRF symposium became a major initiative leading to the creation of a World Congress on WAD having three separate streams: Traffic Safety and Auto Engineering, Diagnosis and Treatment, and Insurance and Disability.

New objectives arose while planning the symposium. PMRF became aware of two recent developments in auto-engineering, the development of active and passive anti-whiplash head restraint systems developed for SAAB and Volvo. Recognizing that prevention of whiplash was the best method of resolving all WAD-related concerns, PMRF initiated two strategic planning meetings with a broad group of stakeholders to identify research gaps and action plans to mitigate occupant injury from MVAs. ICBC, as a result of these new initiatives, decided to provide new owners of SAAB and Volvo cars a one-time $100 rebate. Within weeks of this initiative ICBC was contacted by other vehicle manufacturers to find out what they could do to receive similar benefits. This was
a very big coup as other stakeholders including ICBC had been trying to make these changes through regulatory bodies for over 20 years with no success.

**Table 33. New BCWI Community-based Objectives**

- To expand the PMRF planned symposia to become a World Congress on Whiplash-Associated Disorders.
- To secure $300,000 to support researchers and further build research capacity. A primary recommendation of the QTF was the identification of research gaps and research priorities, as well as the need to raise the standard of research in the field as well as research investment. The desire to raise funds for research also arose when PMRF heard that some researchers in the community were concerned that ICBC’s investment in the project would limit funding available for other projects.
- To encourage government involvement and participation at the World Congress to encourage changes in head restraint legislation.

(b) To address administrative barriers\(^{37}\) to improve knowledge uptake and knowledge utilization

An integral part of the planning of BCWI was to address gaps in undergraduate and residency training in whiplash diagnosis and management. Meetings with stakeholders involved in undergraduate education and residency programs led to the creation of instructional and resource material for these audiences. Resource materials were provided to the Department of Family Practice, Emergency Medicine and the medical library. Surveys following the course sought participant feedback on perceived barriers to knowledge utilization.

(c) To develop patient educational material to improve patient’s knowledge about whiplash and as an enabling and reinforcing tool for changing physician behaviour

Research in guideline implementation and CME provided some evidence that the development and use of high quality patient education materials is beneficial for both the consumer and to support knowledge utilization. (18;200) Using principles of instruction design and a systematic content review approach, members of the Steering Committee,

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\(^{37}\) Addressing administrative, policy and environmental factors are part of the planning process in Phase 4. In Phase 5 administrative and policy diagnosis relate to the capacity of the planning organization to implement the program effectively, rather than the identification of environmental factors inhibiting knowledge acquisition or knowledge utilization.
external reviewers, and consumers, BCWI developed two patient education products for physicians and patients, a brochure entitled, *Neck Talk: Your guide to whiplash recovery,* and an exercise prescription pad, entitled, *Neck-specific Exercises.* These products were provided to all physicians who participated in the BCWI program (see Appendix IV).

(7) Apply pedagogical principles and standards in translating knowledge to curriculum ensuring the translation process addresses issues of content validity, clinical relevance, sequencing, readability, and the presentation is succinct and engaging. Focus on socio-contextual factors as well as content in the planning process.

To ensure that the curriculum translation process did not misrepresent the content of the QTF, an internal and external systematic approach was used during the curriculum writing process, test development and the production of the final product. Steering Committee members, external content experts and members of the target community (see Appendix I: BCWI Committee Members) were hired to review the curriculum drafts and used an explicit grading system to review the content for accuracy, clinical relevance, and clarity.

Similar systematic steps were taken in the knowledge test development process. From a curriculum development perspective the critical components of the WAD review process were to ensure the material accurately reflected current knowledge and to address issues of clinical relevancy. The actual steps employed in the development of instruments will be discussed in Phase 7, the process evaluation phase.

Aside from the creation of the materials on whiplash, two other educational modules were developed to attract participation, one for medico-legal report writing and one for chronic pain management. The medical report writing module was reviewed and revised by two members recommended by the Canadian Bar Association. As no systematic reviews could be found to create the chronic pain module, the module, although reviewed
by external reviewers, did not provide a gold standard of knowledge to participants. Although this addition might have fulfilled a marketing concern, it later became a political issue (discussed earlier in this chapter).

(8) Provide pedagogical training to teachers to enhance knowledge and skill development. Identify and discuss problematic content areas, and enhance and refresh interactive learning strategies.

Under the auspices of the BC College of Family Physicians, Tony Williams, a noted educator, was consulted to plan and conduct Train-the-Trainers sessions, and to provide programming guidance to assist planners create a safe environment conducive to interactive learning. The following program elements were incorporated. To facilitate group discussions half-day and full-day CME sessions were limited to 30 participants to provide a more intimate environment. The program also utilized specific instructional strategies and techniques to engage the learners at the beginning of the session, immediately following the pretest. Among educational methods used were group discussions to have participants identify and reveal challenges they have with dealing with patients presenting whiplash symptoms, and the use of case-based examples, role-playing and mini-lectures.

A series of mini-lectures were planned for a number of important reasons. Lectures are a format physicians are used to and feel comfortable with. Lectures are efficient in delivering needed content, new information, and provide an opportunity for the instructor to use examples based on their clinical experience to demonstrate the relevance of a particular point. Lectures as the sole means of dissemination, however, are not effective

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38 More recent research, Davis, O'Brien et al. (283) provide some limited evidence that interactive CME sessions that provide the opportunity to practice skills can effect change in professional practice and sometimes on health care outcomes.

39 One method used was the use of post-it notes where participants would write down areas they find challenging, one area per post-it note, and place the post-it notes on a flip chart. The issues would then be categorized and summarized as per the topics covered in the session, for instance, natural course of injury, diagnosis and management, medico-legal issues etc.
in changing behaviour, although lectures in combination with other programming are a necessary ingredient when much information is needed to be conveyed from a content and context perspective.

Enabling tools, such as case history and physical examination forms, and a decision-making algorithm, were developed to facilitate and guide the case history, the physical examination and a decision-making process to enhance diagnosis and management decisions.

The creation of curriculum, choice of educational methods, and instructional design strategies used arose from a blending of current research and experience in CME and education practices, the identification and categorization of predisposing, enabling and reinforcing contextual factors believed to influence knowledge acquisition and its utilization, and the earlier categorization of educational strategies using a similar typology. The construction of program theory is created by explicating the underlying assumptions, theories and models underpinning this creative process and is linked to the development of process and impact evaluation tools which will be discussed in Phases 7 - 9.

The next phase of the PRECEDE-PROCEED Model addresses administrative and policy assessment issues in the construction of educational interventions.

**PRECEDE-PROCEED Model, Phase 5:**

**Administrative and Policy Diagnosis in the Context of Health Promotion Education**

Administrative diagnosis in the health promotion context refers to the analysis of the institutional capacity (human resources, financial resources, knowledge, skills) including the accuracy in projecting revenue and expenses to implement the program, and the ability of the project leadership to effectively apply the health promotion planning
principles outlined earlier in Table 22 (see page 133). A primary concern in the administrative assessment diagnosis phase is to identify and remedy possible administrative barriers to the effective coordination and implementation of the program. (222) Policy diagnosis involves the identification of policies that could hinder or facilitate program implementation. In the health promotion context this could include primary care systems, environmental polluters, housing entities, or policy-making organizations, such as state or provincial legislative or regulatory bodies. In addition, policies of other types of organizations in the public or private sector such as health departments, local schools, and HMO may need to be addressed. (223) Green and Krueter (176) provide a list of policy, organizational and political factors they have identified which can contribute to the program’s successful implementation. These include the implementing organization’s structure, the match between the organization’s mission and the project, its technical capability, its resource base, the motivation, knowledge and skills of its employees, its political milieu and project timing. It takes little imagination to see that these factors have as much relevance to CME.

**BCWI Phase 5: Incorporating Administrative and Policy Diagnosis in CME Planning**

The administrative unit at the centre of the BCWI initiative was the PMRF. As a consumer-oriented, community-based organization, PMRF relies on the volunteer support of a broad range of stakeholders and is not well-known to the target audience. With a core staff of three to actualize specific projects, PMRF, as part of its planning, identifies project staff and volunteer needs and hires accordingly. PMRF does not have core government funding. It receives funding through providing its educational programs on a fee-for-service basis, individual donations, membership fees, administration fees of
research funds raised (approx. 11%) to support its research grants and awards program, and project funding. Prior to the BCWI, PMRF organized over forty episodic CME programs and ten international conferences with conference budgets usually less than $300,000 with minimal industry-based sponsorship.

With limited funds, PMRF can only embark on extensive proposal development if sufficient stakeholders and funders “buy in” to the project idea. To provide development funding, $10,000 seed funding was sought and received from ICBC to support PMRF’s activities in preparing the final proposal including budgets, timelines and subcontracts with stakeholders committed to fulfill deliverables related to the planning, implementation and/or evaluation process.

To avoid confusion over roles and responsibilities, each subcontract detailed deliverables and a payment schedule based on the successful completion of a set of deliverables. The subcontracts for the most part were based on a set fee for each set of deliverables with a contingency amount being available per contract to address some variance between budget and actual expenses.40

The following committees were created: Steering, Curriculum, Research, and Marketing. Job descriptions were developed for each committee, detailing committee areas of responsibility, outlining specific tasks, and stating to whom the committee was accountable. Timelines were prepared using a Gantt chart to identify and illustrate personnel needed, expected tasks, time allotted for tasks, and the interplay among tasks, for instance, what tasks needed completion before others could begin, or what sets of tasks could be worked on concurrently. To provide sufficient infrastructure support,

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40 After approval of the proposal, one of the organizations realized they had erred in their budget preparations and did not have sufficient resources or infrastructure to manage a component of their planned deliverables, resulting in the need to renegotiate educational programming targets and areas of responsibilities among other CME providers.
PMRF budgeted project staff to assist with program coordination, data entry, and research and evaluation activities. A member of the Steering Committee was hired by PMRF as the principal writer for the curriculum, test development, patient education materials and content for web-related materials.

In addition, funds were budgeted for a range of consultants to be hired on a fee for service basis for a variety of tasks including content experts to review the curriculum, test development, patient education and patient education materials, an external evaluator to specifically plan and implement a stakeholders' evaluation of the project, statistician, and desktop publisher. Funds were also budgeted to provide honoraria to Steering Committee members participating in planning meetings.

Being a small organization created challenges that needed to be adequately addressed. This included the need to partner with other organizations to add human and financial resources to provide sufficient infrastructure. PMRF, although more known to specialists and allied health care providers involved with rehabilitation, was not well known to family physicians. Partnerships with well-known organizations were essential for the program to be successful.

**PRECEDE-PROCEED, Phase 6:**
**Implementation Planning in the Context of Health Promotion Education**

Phase six is the implementation stage. This phase is conceptualized as pulling together all the components ensuring all stakeholders are involved and “on board”, attending to final program logistics, marketing, and preparation of educational materials. By this time, after reviewing budget timelines and schedules, final decisions are made to implement the most effective combination of educational interventions and activities, guided by reviewing the most recent scientific literature on the evaluation of health education methods, and human and financial resources available. Once the selected
strategies are established, the program planner can proceed "to develop and schedule the use of educational tools, tactics and methods." p.108

It is suggested that material be pretested with the intended audience to determine its acceptability. Pedagogical advice given includes the recognition that key communication components must arouse attention, promote interaction, use repetition and message retention techniques, and encourage desired attitudes and adoption of practices.
Pamphlets or other one-way communication efforts are seen as being useful in some interventions to promote awareness or when other methods are not feasible. Single interventions are seen as being less likely to succeed. Those involving interaction are perceived to be more effective than passive methods. Multiple interventions directed to the target audience and other stakeholders who can influence or reinforce behaviour change are necessary. Program logistics include orientation and training of educators, enhancing communication skills, reinforcement techniques and priority messages, reviewing data collection forms for formative and summative evaluation, scheduling the program implementation taking into consideration the training schedule, production schedule, community events, and holidays. While this may seem obvious enough and just plain good sense, what is critical is the idea that such concerns need to be addressed and need to have people and resources devoted to seeing them through. Effectiveness follows not just from the execution of detail work, but the fact that a thorough approach to logistics is essential for success.

**BCWI Phase 6: Utilizing Implementation Planning as a Tool for CME**

From a participatory action research perspective (224;225), the implementation phase for the BCWI project actually began shortly after the program idea was conceived and stakeholders confirmed their participation. Cultivating stakeholder participation at the
beginning of the project was actually the first step in program implementation. By the
time stakeholders had participated in each preceding phase, all players were ready for
final program implementation planning and activities. In the case of the BCWI all
subcontracts were in place during the administrative and policy phase with each
stakeholder being aware of their role in the project. However, until project funding was
available most of this planning process was theoretical. Once funding was secured, the
reality of commitments made by program partners resulted in minor programming
modifications discussed earlier and noted in Table 12.

Green and Ottoson (179) provide some recommendations to help guide planners
during the implementation phase, such as the need to pretest material based on
acceptability to the intended audience, and some criteria on choice of media based on
their efficiency and presumed effectiveness of conveying the messages. However, the
curriculum development process requires a more complete description in order to help
planners understand tasks and activities involved in integrating current pedagogical
knowledge to educational programming. What is lacking in the current construction of
the PRECEDE-PROCEED Model is a systematic process to link program theory to
curriculum development and to the evaluation planned.

Phase 7 PRECEDE-PROCEED:
Process Evaluation Planning in the Context of Health Promotion Education

Green and Kreuter conceptualize the evaluation activities as consisting of three
components: process, impact and outcome evaluation. They define evaluation as the
comparison of an object of interest against a standard of acceptability.
Objects of interest include any or all of the factors that one takes into account in applying the PRECEDE-PROCEED framework. The objects may be measures of quality of life; health status indicators; behavioural and environmental factors; predisposing, enabling, and reinforcing factors; intervention activities; methods of delivery; changes in policies, regulation, or organizations; levels of staff expertise; and quality of performance and educational materials. Any of all may be objects of interest for evaluation. The interest in program evaluation per se is in some change in the object that can be associated with some change in program activity or input. (176) p.220

Green and Kreuter discuss standards of acceptability as referring to the question of “how much” and “when” in relation to the program objectives. In health promotion programs the standards are defined by “the expected level of improvement in the social, economic, health, environmental, behavioral, educational, organizational, or policy conditions stated in the objectives.” p.222 Green and Kreuter discuss different types of standard setting approaches. For instance, they describe historical standards as being usually based on the previous year’s performance, scientific standards are based on evidence generated by systematic reviews of similar programs, normative standards are based on comparison to other similar programs. Green and Kreuter’s elaboration of these standards is descriptive rather than prescriptive in nature and provides an overview of what types of standards have been employed in the field of health promotion.

Although Green and Kreuter in describing the PRECEDE-PROCEED Model provide descriptions and examples of different types of evaluation methods and strategies used in the health promotion literature, there is little guidance provided to help planners identify and address necessary linkages between program and evaluation components to improve the curriculum development and evaluation process.

The Joint Committee on Standards for Educational Evaluation (JCSEE) suggests other issues to address. The authors of The Standards, like Green and Kreuter, recognize that a comprehensive program evaluation needs to address many issues beyond
curriculum-based outcomes. Other issues raised in *The Standards* include the need to consider the needs and influence of program funder(s), other stakeholders, how needs for the program were determined, the curriculum development process including its educational objectives and theoretical underpinnings, issues related to reliability and validity and the test instrument, the similarities and differences among instructors, the content taught and educational strategies used, marketing issues, data collection methods and the limitations and appropriateness of the statistical analysis methods chosen. Recognizing the interplay of all of the above factors has a role in the appropriate interpretation of the data collected. (166)

Both Green and Kreuter and the JCSEE definitions recognize the importance of addressing factors beyond curriculum-based objectives. The PRECEDE-PROCEED Model provides an excellent framework for addressing issues related to stakeholders, the determination of needs, and the systematic identification of contextual factors to create program theory. However the PRECEDE-PROCEED Model does not provide sufficient conceptual and pragmatic information to help planners translate program theory into quality curricula and adequately link curricula to program evaluation measures used.

Process evaluation is also called formative evaluation because it provides information early in the program implementation. This allows for early detection of problems and provides opportunities to remedy any problems. Green and Kreuter suggest various data sources can be used including pretesting of materials for readability and acceptability as well as looking at financial issues, such as budget versus actual expenses. Process evaluation can be based on results from surveys, observations, discussions with end users, administrative records, and feedback from instructors. Green and Kreuter recommend these preliminary results be charted and compared with other programs or
standards and also suggest that formative evaluation results be communicated to all stakeholders. Green and Kreuter also noted that positive results provide reinforcement and continued participation, especially when the stakeholder’s contributions were critical to the program success, whereas negative results provide an opportunity for stakeholders to reassess program strengths and weaknesses and consider possible solutions.

**Phase 7 BCWI: Reconceptualizing Process Evaluation in Planning CME**

In the planning of the BCWI each component of the curriculum development was conducted in a purposeful and integrated manner to address each of the issues identified by the JCSEE’s description of what a comprehensive evaluation entails. The building of reliable, valid and meaningful measures requires a number of linkages and value judgments addressing a range of curriculum issues such as, readability, accuracy, relevancy, and congruency. Value judgments must be made about the quality, credibility and relevancy of a given knowledge-base to inform clinical practice. Congruency is needed between the knowledge-base, the learning objectives and test items created. Unfortunately the failure to adequately address and report on the issues identified above make most findings of evaluations suspect and difficult to assess with regard to the accuracy of their findings and conclusions. Moreover, recent systematic reviews using meta-analysis procedures to assess educational interventions do not address the above factors, as these factors are seldom discussed in research papers. This has led a number of researchers to conclude that CME educational interventions have little impact on changing behaviour. I suggest such a conclusion is premature as it is based on an appraisal of generally poorly designed or poorly reported educational interventions with a range of confounding factors including poor instructional quality, lack of congruence between instruction and learning objectives, failure of evaluation instruments to measure
changes in beliefs, attitudes and behaviour change, and whether the intervention was implemented as planned. Until the field has developed a more systematic framework for constructing and reporting on evidence-informed interventions, I believe the use of meta-analysis procedures will fail to portray accurately the state of our knowledge about the efficacy of using educational interventions to facilitate knowledge acquisition and behaviour change.

To understand the importance of attending to each of these linkages in the curriculum development process, I need to present some information related to issues of validity, reliability and generalizability. The term “validity” is not a straightforward construct. Historically and currently it has many different definitions proposed by many authors. In the 1950s there were many investigators developing their own version of what the construct to validity represented. Investigators were writing about a range of validity types and terms including intrinsic validity, extrinsic validity, divergent validity, convergent validity, and face validity. In order to reduce the confusion, members of the American Psychological Association, American Education Research Association and the National Council on Measurement in Education met on a number of occasions and established Standards for educational and psychological measurement.

Messick (226) p. 13, in the third edition of Educational Measurement, provides a significantly different definition of validity than those used in prior Measurement Standards.

[Validity is] an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and the appropriateness of inferences and actions based on test scores or other modes of assessment.

41 I am using the term Measurement Standard to differentiate the term from The Standards referring to evaluation standards established by The Joint Committee on Standards for Educational Evaluation. Measurement Standards established by a committee of members of the American Psychological Association, American Education Research Association and the National Council on Measurement in Education is usually referred to as Standards.
Bartley (227) posits that this new definition is a significant departure from prior conceptions of validity in two important ways. Firstly, he states that Messick presents validity as a unitary concept, where inferences and actions together with their underlying theories must be validated. Secondly, Messick clarifies parameters by explicating characteristics of validity. These characteristics include the recognition that (i) validity is now seen as a matter of degree, (ii) validity is continuous over a range and likely to change over time, (iii) validity evidence gains or loses strength with new findings and as the expected consequences of testing are realized (or not) by the actual consequences. (227) p. 11 Most importantly, the act of determining evidence of validity is recognized as one based in the realm of human judgment which is value-laden. The importance of this change in definition of validity for CME purposes is to recognize that test validity and reliability co-efficients commonly reported in research can be misleading, as test instruments are not in themselves valid or invalid. Ebel (228) explains this further:

The validity of any test is clearly a matter of degree, not an all-or-none quality. Tests are not valid or invalid. They are more or less valid. Further validity of a test is not completely determined by the test itself. It depends on the purpose for which the test is used, the group with which it used, and the way it is administered and scored. Instead of asking, "How valid is this test?" it would be more precise to ask, "How valid are the scores from this test when it is used in a specific way for a specific purpose with a specific group." p. 447

The three categories of validity evidence established in the 1985 Measurement Standards are: content-related evidence of validity, criterion-related evidence of validity (concurrent and predictive) and construct-related evidence of validity. (229) p. 96

Content validity is defined by Messick (226) p. 17 as being "based on the professional judgments about the relevance of test content to the content of a particular behavioral domain of interest and about the representativeness with which item or task content covers that domain." Messick recognizes that content relevance and representation
influence the nature of score inferences, but believes that validity of score interpretation must be supported by other evidence. (227)

Criterion-related validity is concerned only with “specific test-criterion correlations.” (226) Messick describes this as focusing upon a specific part or parts of the external structure of a test. This may lead to a range of criterion related validities as scores are compared with other measures.

Construct validity is “based on an integration of any evidence [or evidence-informed theory] that bears on the interpretation or meaning of the test scores.” (230) The test score, or other assessment instrument measure, cannot be equated with the construct it is intended to tap and should not be considered as defining the construct, but rather as “one of an extensible set of indicators of the construct.” (226) In this sense, a construct would be “invoked as a latent variable or 'causal factor' to account for the relationships among its indicators.” The breadth of construct validity enables “almost any kind of information about a test.” Construct validity subsumes content representation and criterion-relatedness because such information contributes to score interpretation. With the consideration of the consequences of testing, the three historical types of validity and the evidence supporting them have been embraced by construct validity.

In order to make a judgment about the adequacy of an instrument, sufficient information needs to be provided on what procedures were used to address content, construct and criterion validity issues.

The concept of reliability is a close cousin to the concept of generalizability and is intricately related to validity issues.
Theoretically, reliability is defined as "the degree to which test scores are free from errors of measurement. [...] Measurement errors reduce the reliability (and therefore the generalizability) of the score obtained for a person from a single measurement." (231)⁶

Walker (232)⁷ pp. 200-1 states that high reliability in quantitative studies infers that it should be routine for other researchers to reach the same representations from the same events. Reliability, however, is seen as a necessary but not sufficient condition in the validity of data interpretation. Feldt and Brennan (233), in their chapter entitled Reliability in the Handbook of Educational Measurement, warn against exaggerated concerns for reliability. They acknowledge:

…the primacy of validity in the evaluation of the adequacy of an educational measure. No body of reliability data, regardless of the methods used to analyze it, is worth very much if the measure to which it applies is irrelevant or redundant⁸ p. 143

Reliability and validity are distinct and separate constructs. Reliability is addressing issues of consistency rather than evaluating content attributes. An example of the fallacy of relying too heavily on issues of reliability and not enough on validity would be if adequate steps were not taken to ensure the course material accurately reflected research evidence, and had sufficient clinical relevance to the target audience.

In planning the curriculum and evaluation components, the BCWI also needed to pay attention to issues related to generalizability of results, also known as external or extrinsic validity. Firestone (50) suggests that a researcher generally uses a mixture of three broad arguments to make the case for generalizability of findings.
These claims are arguments in the sense that the author asserts a conclusion that cannot be fully proven. The three arguments are (a) extrapolation from sample to population, (b) analytic generalization or extrapolation using a theory, and (c) case-to-case translation. In practice, these arguments have been linked to certain broad clusters of methods: sampling with survey research, analytic generalization with experimental and quasi-experimental methods, and case-to-case translation with qualitative methods. However, these associations are tendencies, not rules.

Firestone (50) states, “the strongest argument for generalizing is usually thought to be extrapolation from a sample to a population.” Analytic generalization, on the other hand, does not rely on samples and populations. Firestone (50), citing Yin (1989, p.44), states, “in analytic generalization, the investigator is striving to generalize a particular set of results to a broader theory. To generalize to a theory is to provide evidence that supports (but does not definitively prove) that theory. Generalization to a theory is different from generalizing to a population.”

When one generalizes to a theory, one uses the theory to make predictions and then confirms those predictions. In a specific study, predictions hold under specific conditions. If the predictions hold only under those conditions, they become scope conditions that limit the generalizability of the theory. Another way to increase confidence in a finding through analytic generalization is to anticipate threats to doing so, what Cook and Campbell (1979) call threats to external validity.

The third generalization argument comes out of recent efforts to use qualitative methods for program evaluation called case-to-case transfer or translation.

It is the least familiar argument for generalization to educational researchers, but it is becoming more prevalent, especially among those with a qualitative bent (Erickson, 1992; Lincoln & Guba, 1985). It is important to note, however, that while there is considerable overlap between the study of cases and qualitative research, the two are not the same. Qualitative research focuses on up-close observation of behavior in settings as well as interviewing people in those settings and collecting and analyzing documents and artifacts. Its purposes are to describe those settings and understand the definitions of those settings held by people in them (Firestone, 1987; Van Maanen, 1982). The emphasis on up-close description fits nicely with an interest in cases, but there are traditions in qualitative research in which the case becomes difficult to identify and delimit (Strauss & Corbin, 1990) as well as case studies that are largely quantitative.
In planning the BCWI, the research and evaluation team was interested in addressing issues concerned with validity, reliability and generalizability within the limitations of funds available.

To improve the curriculum development process the BCWI used a systematic approach to ensure the program and test items used were relevant to the target population and that the curriculum development process and materials developed took advantage of current pedagogical research including research in the field of cognitive ergonomics. (154;234-237) Attention was also paid to potential confounders discussed in systematic reviews. (238) Haladyna (237) states, “In the ideal world we would like there to be a perfect correspondence between the curriculum/content and test.” p. 172 To ensure congruency between test items and the curriculum systematic review tools were developed and various statistical approaches were employed. (196) The MCQ-MTF test was a criterion-based 85 item multiple choice questionnaire (MCQ) and multiple true and false (MTF) test. It was based on the learning objectives for the BCWI and the findings of the QTF. Considerable attention was taken to ensure a linkage between curriculum and instruction and the extent to which tests were integrated with instruction so as to adequately interpret achievement scores. It is only after these linkages have been assessed that one can interpret item response patterns to determine the extent to which the educational program has succeeded in facilitating knowledge acquisition.

The following steps were followed in test design development: (i) the syllabus author in discussion with the curriculum committee drafted learning objectives, (ii) the syllabus author drafted test questions, (iii) the curriculum and test instruments were reviewed by content experts and Steering Committee members to assess content validity of items, sampling adequacy, clarity of task, relevance of questions, value of knowledge, scoring
methods and competence levels, (iv) test questions were assessed to ensure they reflected syllabus content, (v) instruments were revised based on feedback, (vi) instruments were piloted with a sample of physicians to test the evaluation instruments, follow-up interviews and reliability testing, (vii) processing and analysis of pilot results, with assessment of reliability coefficient, construct validity, item analysis measures and difficulty index to ascertain effectiveness of all components of the test instrument, providing summary statistics and analysis of results, (viii) repeat test-taking with a real sample, (ix) repeat processing and analysis of larger pilot results, with assessment of reliability coefficient, item analysis measures and difficulty index to ascertain effectiveness of all components of the test instrument, providing summary statistics and analysis of results, (x) circulation of findings with recommendations for revisions of instrument and design of CME modules, (xi) revision of test instrument.

Initially a draft of the test instrument was sent to 15 content reviewers for general input at the same time the curriculum was being reviewed. The test questions were also reviewed by two project staff members in relation to the program's educational objectives, reference to the comprehensive curriculum syllabus (and original QTF source material) as well the Trainers' Handbook to ensure content validity. After the initial review, feedback and rewriting, I created a more systematic review guide for reviewers and provided project staff with an outline for designing the form. Each test item was referenced to a learning objective, and reviewers were asked to assess the test item's congruence with the learning objective, the relevance of the item to clinical practice and

42 The utilization of 15 content reviewers might be perceived as being excessive. Unfortunately, whiplash-associated disorder is a highly charged topic with many vested interests. Content reviewers included members of the target audience who had read the full QTF Report and had a special interest in musculoskeletal pain as well as a variety of medical and healthcare specialists, including epidemiologists, a physiotherapist, chiropractors.
to offer alternate distractors based on common misconceptions (see Appendix II: Objective Test Item Review).

This revised instrument was then piloted by seven family physicians. Testing time was recorded and the test questions and demographic form were reviewed for clarity. Editorial changes were made based on this initial feedback. With the purchase of scoring software, the test was modified further to facilitate scoring. Multiple choice questions (MCQ) involving a selection of more than one item answer (e.g., "Mark All Those Which Apply") were changed from a multiple choice question format to multiple true and false questions. Therefore, rather than making choices among a series of items within the same list of choices, each choice offered a natural dichotomy and was tested. Recent research on the use of multiple true and false format showed that MTF item format can be very effective in terms of reliability and validity (Frisbie 1992, discussed by Haladyna (237) p. 46 and Nitko. (239) p. 134) Haladyna (237) states that the format is also very efficient in terms of examinee reading time, increasing the number of questions that can be administered in a fixed period of time. After these changes two versions of the test were developed, the only change between the two tests being the question sequence to reduce instrumentation bias.

After a series of three CME events and statistical analysis, the test was further reviewed by both judgment and statistical methods to further assess item validity. Berk (236) p. 97 discusses three primary considerations when conducting an item analysis on an objectives-based criterion-referenced test: (i) the need for an editorial review to identify structural flaws and to determine whether they behave consistently (mean the same thing to different people), (ii) do the items measure their respective instructional and behavioural objectives, and, (iii) does the test differentiate between masters and non-
masters. To improve the test, we utilized Haladya' (237) p.129 43 item guideline (see Appendix II: Editorial Review Guidelines to Improve Test Construction) for accomplishing a comprehensive editorial review to reduce the likelihood of structural flaws that could distract test-takers or lead to confusion as to what is being asked. The editorial question being addressed was, does the test item clearly and accurately present the problem and the options? The test and the guidelines recommended by Haladya were sent to one reviewer noted for his expertise with test construction from UBC's Department of Educational Psychology and Special Education, resulting in some changes to the test instrument.

Physicians' knowledge about WAD was tested three times: immediately before the session, immediately after Module I and 2, the core whiplash sections, and in a delayed posttest six months following the workshop. The sequence of questions in the pre, post- and delayed posttest were changed to reduce possible instrumentation effect. The Modified MCQ-MTF test instrument had a number of purposes. It was used as an integral part of the curriculum as an advance organizer, and as a means to provide feedback to participants. It was also used for formative evaluation and summative purposes. The use of an item-response chart showing correct and incorrect responses to items on a criterion-referenced test provided an opportunity to check both the test and the quality of instruction. For instance, if an item was usually a good discriminator between pretest and posttests, however in one particular setting it was unsuccessful, then it may provide some evidence that there was possible weakness in the instruction. By looking at trends in the data, it may also be deemed that one area of the objectives was consistently not being

43 The reliability analysis revealed alpha co-efficient for the pretest of .83 with the standard error of measure (SE) of .042, the alpha co-efficient for the posttest and delayed test were similar .78 with the SE of .035 and .038, respectively. These findings contribute to the evidence that this instrument in the population studied is highly reliable and internally consistent.
adequately addressed in the training, necessitating changes to the training itself. This instrument was used as a dependent variable related to outcomes of knowledge acquisition and retention. The failure to address issues of test development can invalidate measures used in proximal or distal outcomes regardless of whether the instrument reports a high level of reliability.

**Rationale and Instrument Development to Assess Program Delivered Versus Program Planned**

The adequacy of the testing instrument and inferences made about knowledge gain and retention are not solely based on achievement scores, but also on “the degree to which empirical evidence and theoretical rationales support the adequacy and the appropriateness of inferences and actions based on test scores or other modes of assessment.” (226) For instance, if the learning material was never presented or presented poorly, the failure of the test measures may reflect on these confounding factors, rather than the planned intervention. Specific tools and strategies were employed to identify differences in the planned intervention versus actual intervention as well as to assess whether other factors could contribute to differences in test scores between groups. The creation of evaluation measures was therefore directly tied to address threats to internal validity. Without adequate attention to internal validity issues, issues concerning external validity and the generalizability of results would also be suspect (see Table 13 Actions Taken to Mitigate Threats to Validity). (226;240)
To address concerns about internal validity a series of evaluation instruments were developed. Some of these instruments were developed to guide and assess the test development process, whereas other instruments were developed to assess participants responses within and between CME events. The following instruments were created:

**Implementation Checklist:** A checklist instrument (see Appendix III:

Implementation Checklist) was designed to verify whether content material on the test
was discussed within the learning activity. This checklist was utilized by a research assistant or faculty member(s) attending a CME program. Feedback was provided to the instructors at breaks to alert them to gaps. In addition to ensuring the delivery of content, the checklist provided an opportunity for the researcher to note any major incidents or adverse events that could possibly impact test results. The instrument could also be used as a dependent variable related to the hypothesis. However, should there be large differences among content delivered within a specific CME event or between events, this instrument could also be used as an independent variable resulting in the need for covariance analysis.

**Collection of Common Questions:** The research assistant and speakers were asked to write down questions asked so the CME planners could determine further information needs of participants and provide the speakers with possible responses to these questions informed by the literature. These questions were directed to the Curriculum Committee with responses prepared and reviewed by members of the Steering Committee. Information sheets were prepared and distributed to speakers.

**Speaker Feedback Form:** To capture data on differences between programs, speakers were asked to complete a standardized evaluation form (see Appendix III: Speaker Feedback Form).

**Speaker Evaluation Form:** This instrument (see Appendix III: Speaker Evaluation Form) was adapted from one used by the Department of Health Care and Epidemiology at UBC and the Division of CME. The form was constructed using normative and historical standards. Dramatic differences in instructor evaluation would likely demonstrate significant confounding such as instructional bias differences in teaching methods, general teaching experience, experience with teaching the content or possibly
indicate selection bias such as the non-homogeneity of participants. This instrument was used as a dependent variable related to the hypothesis. However, should there be large differences among instructor evaluations, this instrument may also be used as an independent variable resulting in the need for co-variance analysis. Using a 5-point Likert scale, participants were asked to make judgments on the speakers' knowledgeable about the subject, ability to handle group discussions, ability to provide conceptual linkages among various topics in the course, and ability to relate to participants in a respectful manner.

As speakers were systematically selected as being "an educational influential" other questions could have been developed to further test the validity of the selection survey instrument, for instance, whether the participant knew of the speaker, whether this knowledge contributed to their decision to attend the program, whether the speaker exhibited EI characteristics (good communicator, humanist, having a strong knowledge-base) in a formal CME setting. These other questions were not asked as the number of instruments and questions being asked of the CME participants were already quite demanding.

**Course evaluation instrument:** This instrument (see Appendix III: Program Evaluation Form.) was adapted from one used by the UBC Division of Continuing Medical Education. The purposes of the course evaluation instrument were: (i) to identify needed curriculum changes to the program, (ii) to measure similarities and differences among the programs being offered (within the BCWI), and, (iii) to compare BCWI data with normative evaluation data of other CME programs. The course evaluation analysis was intended to help determine whether there are major differences in perception of the delivery and reception of the CME program. This instrument was used
as a dependent variable related to the hypothesis. Participants responded to the questions seeking participants feedback on program relevance, expectations, program format, perceived learning compared to other CME programs, and most effective and least parts of the program.

**Interviews of participants:** The BCWI in the early implementation phase conducted informal interviews of members of the audience to assess their response to the program (see Appendix III: Interview Guide: Following Initial Programs). The purpose of these interviews was to see if other factors should be considered on the evaluation form as well as to provide some initial feedback on the target audience’s response to the CME program to the Steering Committee.

**Demographic and CME Exposure Instrument:** The demographic instrument is specifically looking at a range of potential moderating factors identified in the behavioural diagnosis phase, that could contribute to differences within the target population. Factors considered were: age, year of graduation, number of years of practice, type of practice (general practitioner, emergency, specialty, full-time or part-time, solo, group), and average number of new whiplash patients per month. In addition, exposure to evidenced-based teaching and/or materials were assessed by self-report.

To address my previous frustration with the utilization of inadequate evaluation instruments, a new multi-purpose instrument based on a growing body of literature looking at commitment to change was developed. (34;35;241;242) Using David et al.’s (18) typology of categorizing interventions as being predisposing, enabling, and reinforcing, I wanted to create an instrument that could have multiple purposes and applications. I suggested some ideas to Marc Broudo and we developed an instrument that could be useful as a tool to facilitate knowledge retention by having physicians
reflect on the material learned (predisposing strategy), facilitate the translation of the material learned to how it might be applied to ones practice (an enabling strategy), and reinforce the participant’s intention to change by mailing a copy of their intended change 3 weeks post the CME session. As an additional reinforcing strategy, we collated responses from all participants and provided physicians with a summary of the intended behaviour change of their peers six months post the CME activity.

We called this instrument, ‘Memos-To-Myself’ (see Appendix III: Memos-To-Myself). Variations on this form and procedures used have since been replicated in two other studies since the BCWI. (242) Specifically we asked physicians to write down three things they planned on changing as a result of the learning activity. The form used was made in duplicate. One copy of the form was handed in anonymously after the sessions, and another copy was placed into a self-addressed envelope and mailed to the physicians three weeks after the workshop as a reminder of their intended change. This tool was also useful to CME planners for process evaluation. Responses provided CME planners with what take home messages were being considered by physicians, which provided an opportunity to evaluate whether the intended objectives were congruent with physicians’ information needs, and whether the messages they were taking home accurately reflected the information presented. Copies of all instruments developed can be found in the Appendices.

During the process evaluation phase CME planners used feedback derived from the instruments and methods described above to reflect on the linkages among program objectives, information needs of stakeholders, and assess and refine the sensitivity of instruments used.
Phase 8 PRECEDE-PROCEED: Impact Evaluation in the Context of Health Promotion Education

Green and Kreuter define impact evaluation as follows:

...assess the immediate effect of the program (or part of) has on targeted behaviours and their predisposing, enabling and reinforcing antecedents or on influential environmental factors. The clarity, specificity, and plausibility of the behavioural and educational objectives generated in Phase 3 and 4 of the PROCEDE process provide the foundation for evaluating program impact.

In the health promotion literature, the causal hypothesis is a set of ideas informed by the literature about how the health problem being addressed is brought about. Rossi and Freeman (243) define impact or intervention evaluation as an “attempt to translate conceptual ideas around the regulation, modification or control of behaviour or conditions into hypothesis on which actions are based.”

Chen (22) describes this phase of evaluation as the intervening mechanism evaluation. Although there might be multiple terms used, the purpose of this phase is to evaluate what factors in the causal chain have led to the program’s successes and failures. This is quite different from more traditional evaluation approaches that typically investigated end outcomes only and underrepresented or did not assess the complexities of intervention circumstances:

...traditional summative or outcome type of evaluation only provides information on whether a program succeeds or fails. However this type of information creates difficulties for policymakers. What does it mean if the program fails? Does it mean the program was implemented inappropriately? Does it mean the conceptualization of the problems was wrong? Does it mean that the theoretical rationale of the program was wrong? Different causes of failure imply different strategies for effective remedies. (22)

The creation of program theory helps to differentiate the details of causal processes that can serve as a basis for planning and evaluating educational interventions. There are a number of ways to map out conceptual linkages within a given program. One method is to create a “Program Logic Model.” The Program Logic Model represents a conceptual mapping of variables connecting program planning to program evaluation illustrating
linkages among various activities leading to the anticipated project’s outcome. The project logic model provides an overview of program planning steps leading to the evaluation, however typically does not attempt to explain or represent the constructs underlying program theory.

Chen (22) recommends that in planning intervention evaluations planners make a distinction between action theory and conceptual theory. Action theory is concerned with the linkage between a treatment variable and a causal variable, whereas conceptual theory is concerned with the linkage between the causal variable and the outcome variable (see Figure 14).

**Figure 14. Action Theory and Conceptual Theory: Intervention Evaluation Model (22)**

<table>
<thead>
<tr>
<th>Treatment Variable</th>
<th>Causal Variable</th>
<th>Outcome Variable</th>
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By separating these components it is possible to analyze potential reasons for program success or failure. Program failure could be a result of action theory failure where the treatment variable fails to affect the causal variable. Alternatively, if the treatment variable impacts the causal variable but fails to impact the outcome variable then the conceptual theory could be at fault. Chen (22) also suggests that program failure can be a result of both action theory and conceptual theory failure requiring a total revamping of the planned program. For instance, in a health promotion program targeting cardiovascular disease planners could focus on removing perceived barriers to exercise in the workplace and hypothesize that the removal of these barriers would encourage people
to participate in exercise which would result in a reduction of stress which is a risk factor for cardiovascular disease (see Figure 15).

Figure 15. Hypothetical Program to Reduce the Risk of Cardiovascular Disease.

<table>
<thead>
<tr>
<th>Strategies to change work environment</th>
<th>Opportunity for Exercise</th>
<th>Reduced risk for cardiovascular disease</th>
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Therefore action theory failure could occur if the strategies to change the workplace environment were unsuccessful, whereas program theory failure could occur if the planners were successful in removing barriers to exercise in the work environment and removal of these barriers did not attract workers at high risk of cardiovascular disease.

One of the problems with the use of this type of notation is that there is not a clear typology to help planners decide what sets of assumptions should be represented and what labels should be used to describe these intervening or causal variables. Depending on the question(s) being asked, each link in the causal chain may represent a series of proximal outcomes or what I call “conceptual endpoints”, each which could be explicated using Chen’s action theory and program theory model.

Donaldson (192) more recently discusses these intervening variables as being mediators and moderators which the planner believes influence program outcomes. Donaldson defines a mediator as “a variable that is affected by the program, which in turn affects the outcome of interest” and a moderator “as being a variable “that affects the
direction or strength of the relationships between the program and a mediator or a mediator and an outcome” (see Figure 16). Moderators could be intrinsic factors such as population characteristics including gender, age, ethnicity, socioeconomic status, and prior experience. Moderators could also represent controllable external factors such as the dose-response factor. The dose-response factor describes the level of strength of the intervention component (weak dose, moderate dose, strong dose) or the frequency and timing of repeated doses.

**Figure 16. Mediators and Moderators (192)**

Moderators could be conceptualized to influence hypothesized mediators at any point of the causal chain. Once mediators and moderators are conceptualized, evaluation instruments need to be constructed to test the program theory underlying the program implementation. Chen (22) describes two different approaches to analysis. The first approach uses a structural equation model to analyze a set of equations to represent direct, indirect and reciprocal relationships among variables. Alternatively, exploratory causal models use a “network of variables to represent underlying causal processes among the variables.” Unlike structural modeling approaches, the exploratory causal model does not construct the assumptions using mathematical equations, rather the variables are analyzed through the use of more familiar statistical procedures such as
multiple regression. Exploratory causal approaches although less rigorous are more intuitive and understandable to stakeholders and more likely to be utilized by stakeholders. (22)

There are a number of subtle factors that need to be considered in testing mediator variables. For instance, a negative test result may not in itself mean that the program does not influence the mediator. A null result might be related to the presence of a suppressor factor, where one mediator variable is effective and another mediator is counterproductive resulting in a null effect. It could also represent other issues such as the program dose (strength and/or frequency) or the lack of sensitivity of instruments used. (192)

Donaldson (192) provides a set of steps or procedures commonly used for analysis and recommends planners consider the types of analysis available when creating a conceptual framework for the planned intervention (see Table 34).

**Table 34. Important Assumptions Underlying Common Statistical Tests (192)**

1. The program causes the outcome (regressing the outcome variable on the program variable).
2. The program causes the mediator (regressing the mediator variable on the program variable).
3. The mediator causes the outcome variable (regressing the outcome variable on the mediator variable).
4. The mediator causes the outcome variable controlling the exposure to the program (regressing the outcome variable on both the program and mediator variable).
5. The mediated effect is significant.
Donaldson (192) represents program theory development as an iterative process (see Figure 17).

**Figure 17. Program Theory Development (192)**

There are several challenges to constructing a comprehensive theory-driven conceptual framework. Aside from methodological challenges in noting program theory, the development of theory-driven programs requires an upfront investment in time and human resources in program planning and in the creation of evaluation measures used. However, the failure to adequately address a more integrated planning and evaluation process can lead to inaccurate analysis of contributing factors leading to the program's success or failure. Basing results on very limited data collected presents the very real danger of creating false positives and false negatives leading to the creation of inaccurate conclusions about the impact of different types of interventions on behaviour change. (23)
Phase 8 BCWI: Reconceptualizing Impact Evaluation for CME Purposes

During the process evaluation phase the curriculum, program components and instruments were modified to reflect feedback received from participants and results of more extensive statistical analysis on data collected. However, at some point these modifications must end in order to have a program of interest stable enough so it can be evaluated with sufficient power to make judgments about the program’s impact on subordinate and distal outcomes.

The BCWI used several approaches during the curriculum development and evaluation planning process to explicate program theory underlying the curriculum process. With the assistance of members of the Research and Evaluation Committee a variety of instruments were created to link systematically the curriculum and program as planned to the outcome measures. A program logic model (244) presented a more linear representation of the program planning variables to the evaluation planned (see Appendix II: Program Logic Model44). A datalinkage framework45 (see Appendix II: Data Linkage Framework) was created linking the content of the QTF to the test items created to anticipated behaviour changes to physicians’ prescribing and referral practices. The use of responses from Memo-To-Myself gathered information about what physicians intended to change in their practice as a result of the learning activity and provided an indication of whether the intended program objectives were congruent with what messages physicians took home with them.

As the evaluation of the program was pragmatically-based rather than experimentally-based there was no randomization or control group to assess the impact of the knowledge

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44 Using the program proposal, and in discussion with me, Sheilina Dhanani created a schematic to represent the program phases.
45 The datalinkage model was developed with the assistance of ICBC evaluation staff.
acquisition and retention. This study utilized a serial pretest-posttest design with participants being their own control (see Figure 18).

**Figure 18. Repeating Pretest-Posttest Design**

<table>
<thead>
<tr>
<th>Pre-Test</th>
<th>Intervention</th>
<th>Post-Test</th>
<th>Delayed Post-Test</th>
</tr>
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<tbody>
<tr>
<td>O₁</td>
<td>X₁</td>
<td>O₂</td>
<td>O₃</td>
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<tr>
<td>O₁</td>
<td>X₁</td>
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This repeating design, as described by Campbell and Stanley (240) in their classic text, *Experimental and quasi-experimental designs for research*, is a much better design than an ordinary before and after design, as it controls for a number of threats including history, in that, if the same effect is repeatedly found (replicated across groups) the likelihood of history interactions is decreased and mitigates regression to mean effects.

To further assess the impact of the CME intervention, participants were invited to participate in a six month delayed posttest and asked to complete a six month post-CME survey (see Appendix III: Post CME Exposure Survey). The post-survey addressed issues of possible confounders, such as exposure to more information about WAD after the program. In addition, the post survey sought additional information from participants to assess the validity of constructs used in creating program theory. For instance, part of the program construction was based on the notion that physicians commonly use informal means of education. To gather further information about informal communication between physicians and the potential diffusion of the BCWI program we asked participants if they sought more information from colleagues about WAD and/or if they shared information they had learned with colleagues and to quantify how many times they sought or provided information about WAD.
The creation of the knowledge test, the program logic model and datalinkage framework helped to conceptualize some of the variables of interest and informed the creation of process and impact evaluation instruments. To assess the potential value of using a high level of instructional design in the creation of BCWI materials participants were asked about the utility and use of reference materials following the program. Participants using a Likert scale rated instructional elements including readability, ease of use, as well as perceived relevance of the materials to clinical practice.

The CME planners were also interested in assessing the impact of the BCWI on stakeholders. The BCWI was the first time many of the stakeholders had worked together towards a common purpose. Different stakeholders have different information needs, different expectations and different definitions of the project’s success. One of the common concerns about evaluations in general is that, for the most part, evaluations are not utilized by decision-makers. As part of the BCWI budget, contract funds were set aside to hire an external evaluator to assess the impact of the BCWI on stakeholders. The external consultant created an interview guide looking at a wide range of issues including: initial motivation to become involved with the project, original personal or organizational expectations, changes to those expectations, whether the original expectations were met, what constituted success for this project, did these expectations change during the course of the program, what unexpected positive/negative results arose, prior experience with collaborative projects, main strengths and weaknesses of the collaborative approach, and who was missing at the table. There were also a series of questions concerning PMRF, its effectiveness as administrator of the project, and problems or concerns about working with PMRF.
The ability to link administrative databases, ICBC claims database and Pharmanet, the provincial prescription database, provided an opportunity to design a two cohort randomized study to assess participants before and after referral and prescribing practices and to establish matched randomized controls to assess history and maturation threats to validity. The datalinkage also provided baseline data and an opportunity to pilot test the efficacy of using these administrative databases for research purposes.

The creation of some of the questions used in the instruments was based on a number of assumptions which were discussed with members of the research and evaluation team, however these assumptions were not formally schematically represented in the manner described by Chen, or later discussed by Donaldson. To demonstrate the utility of the modeling suggested by Chen and Donaldson, I have reconstructed some of these assumptions schematically. Each program component can be mapped out to uncover the assumptions underlying its use and linkages.

The first program activity participants were exposed to in the BCWI was the pretest. This was the first time pretests were used by the Division of CME as an integral part of the curriculum, rather than solely for “research purposes” (see Appendix I: Consent Letter). The pretest alerted the participants to what information was going to be addressed in the program and provided a set of expectations about the types of information considered important. Extrapolating from Professor Wright’s study (158) concerning the need to cue the reader to adopt different reading styles depending on the purpose of the test, we applied the same principle for program participants. The pretest provided participants with information about the type and level of information considered relevant.
and important to acquire. The immediate posttest was originally designed to provide the learner with immediate feedback on their test performance.

Participants were informed that the purpose of the pretest was an advance organizing tool in the brochure promoting the program. At the beginning the program one of the instructors or a research assistant reiterated the pretest purpose and reaffirmed that individual results would be reported only to them, and any publications arising from the BCWI would report aggregate results only and any link between unique ID numbers and participants would be destroyed after data collection. Using a concept map to show curriculum linkages, the pretest program component as a curriculum aid, was used to alert participants to the course material and to also to inform participants about the type and level of information is being evaluated (see Figure 19). Following the pretest, the next program component was a group discussion.

Figure 19. Program Component: Use of Pretest as an Advance Organizer

<table>
<thead>
<tr>
<th>Program Component #1</th>
<th>Advance Organizer</th>
<th>Program Component #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>Alerts participant to course content Engages past experiences</td>
<td>Group Discussion Identifying participants' perceived problems and challenges</td>
</tr>
<tr>
<td></td>
<td>Test Awareness Alerts participant to type and level of information being evaluated</td>
<td></td>
</tr>
</tbody>
</table>

Linkages between program components provide a more detailed look at the programming logic building identifying intervening variables and casual variables leading to proximal or distal outcomes. For instance, in Figure 20 the underlying purpose of the early group discussion concerning real world challenges practitioners face in their

46 Problems with the scoring software presented an obstacle to being able to provide participants with immediate feedback during the program implementation, in some cases results were sent to participants after the session.
clinic when dealing with patients presenting whiplash is related to three sub-objectives (i) to actively engage participants by identifying clinical relevance within their practice, (ii) to link these challenges to the course outline to further prepare participants to material to be covered, and, (iii) to build a sense of community and safety among participants by revealing and recognizing common problems and challenges.

**Figure 20. Use of Group Discussion to Increase Motivation and Attentiveness**

<table>
<thead>
<tr>
<th>Program Component #2</th>
<th>Clinical Relevance</th>
<th>Proximal Outcome #1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group Discussion</strong></td>
<td>Engages participants provides conceptual links of course outline to “real world” problems.</td>
<td><strong>Increased Motivation</strong> and <strong>High Level of Attentiveness</strong></td>
</tr>
<tr>
<td>Identifying participants' perceived problems and challenges and linking to course outline</td>
<td>Sense of Security Begins to build a sense of shared common problems and experiences</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program Component #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mini-Lecture</strong></td>
</tr>
<tr>
<td>Introducing Steering Committee, Evidence-based Medicine, Need for Clinical Judgment and Content</td>
</tr>
</tbody>
</table>

Each program component was linked to an intervening mediator. Table 21 shows the linkages between program components and mediators.
Using Chen’s concept of Action Theory and Conceptual Theory modeling one can begin to look at a variety of constructs underpinning the program plan. Figure 22 provides a different representation of the program logic and underlying program theory.
Figure 22. Action Theory and Conceptual Theory: Linking a Program Component to a More Distal Outcome

<table>
<thead>
<tr>
<th>Group Discussion</th>
<th>Increased Motivation &amp; Attentiveness</th>
<th>Knowledge Acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Theory Success</td>
<td>Program Theory Success</td>
<td></td>
</tr>
</tbody>
</table>

To further develop the representation of other variables considered in the BCWI one could use Donaldson’s concepts of mediators and moderators. Figure 23 considers what moderators were considered in the knowledge uptake process.

Figure 23. Moderators Considered for the Purpose of Knowledge Uptake

Intervening Mediators

Clinical Relevance

More Distal Outcome

Knowledge Uptake

Program Component #1

Pre-Test

Moderators
Number of whiplash patients in practice
Reasons for attending the course
Prior knowledge
Age (might be a proxy for other variables)
Perceived relevance of test questions to practice
Fit between questions and course content
Ease of use including readability, clarity of question, distractors used
Test anxiety

Program Component #2

Group Discussion

Clinical Relevance

Sense of Security

Increased Motivation & Attentiveness

Program Component #2

Mini-Lecture

Moderators
Instructional Design Components (cognitive ergonomics)
Fit with information needs of participants
Facility conditions, Timing, Speaker effects including speaker credibility
Concerns about EBM
Concerns about ICBC Funding

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Evaluation instruments described in Phase 7 were constructed in a manner to assess whether demographic variables and other potential moderator variables interacted with intervening variables.

In summary, both quantitative and qualitative research methods were used to assess the impact of the program. The program evaluation instruments were systematically developed and assessed to reduce the potential of confounders which could result in reaching inappropriate conclusions about the program's successes and failures. The PRECEDE-PROCEED Model provided the conceptual basis to assist in the creation of program theory. Modifications to PRECEDE-PROCEED in clarifying the conceptual links in the program construction and evaluation used led in our experience to improvements in program planning, evaluation and the creation of more extensive knowledge base about what variables and theories planners can consider in planning more efficacious CME programs.

**Phase 9 PRECEDE-PROCEED: Outcome Evaluation in the Context of Health Promotion Education**

Outcome evaluation is defined as the objects of interest addressing health status and quality of life indicators identified early in the planning process. However, Green and Kreuter state, "the ability to detect changes in impact or outcome variables depends heavily on the specificity of the standards, the precision of their measurement, the size of the effect, and the size of the population or sample on which the measures are taken." Baseline data should be compared with similarly gathered data from the period of the program or period following the program. From a health promotion perspective, Green and Ottoson (179) suggest the following questions should be addressed:
• What are the measurable results of the program efforts in the promotion of health behaviour?
• Has there been any change in attitudes of the clients towards the recommended actions or change in their ability to carry out the recommended actions, or change in resources and social support for such actions in the community?

Although Green and Kreuter discuss the need to address the ability to detect changes in impact or outcome variables issues such as the specificity of standards used, the precision of their measurement, the size of the effect, and the size of the population or sample on which the measures are taken, they have not provided sufficient detail to help planners address each of these issues.

The PRECEDE-PROCEDE Model employs systematic methods to identify and categorize contextual factors in the planning process. Similar systematic methods and rationales need to be employed to assist planners to address issues related to the specificity of standards used, and to improve the relevancy and precision of instruments used.

**Phase 9 BCWI: Reconceptualizing Outcome Evaluation for CME Purposes**

Both in the health promotion community and in CME programming, the ultimate goal for most educational interventions is to have a positive impact on health status. The BCWI intervention was primarily targeting physician behaviour change with the belief that changes to physicians' behaviour will result in improvements in patient care and patient health status.

As program theory becomes more developed and validated using qualitative and quantitative methods it will be easier to link program theory and physician behaviour change to improvements in patient outcomes. However, measuring patient health outcomes following educational interventions is methodologically challenging and complex. One of the challenges is the problem of having two different units of analysis,
one being the physician behaviour change, and the other being individual patient change. The Cochrane Collaboration on Effective Practice and Organization of Care (EPOCH) and a European consortium of health service researchers under the lead of Finn Borlum Kristensen, Danish Hospital Institute initiated a project in 1995 entitled, Changing Physician Practice (CPP)(245) to address some of these methodological concerns.

EPOCH and CPP suggest that a promising type of research design to consider for intervention research studies is cluster randomized trials. Cluster randomized trials collect and analyze two different levels of data. A cluster randomized trial involves randomizing groups of professionals as well as collecting individual patient data about the process and outcome of care. The CPP Report (245) provided an overview of different types of cluster randomized trials and the creation and use of statistical methods and standards to both guide the creation of cluster trials and analysis considerations. The use of cluster randomization trials may better address some of the methodological challenges when one is trying to analyze both the impact of guidelines on practitioners and patient outcomes.

However the fundamental problem of understanding how well an educational program was created and what program theory is underpinning its development will remain a confounding factor until better methods are developed to explicate and report on program theory. The PRECEDE-PROCEED Model represents an important step to addressing a range of factors to facilitate knowledge utilization. The continued evolution of the Model to facilitate the creation of program theory and suggested modifications should enhance research and practice in the area.
To help the reader assess whether the evaluation phases addressed each of The Standards established by JCSEE I have completed the evaluation checklist (see Appendix III: Program Evaluation Standards Checklist).

The next chapter provides an overview of lessons learned through the adapting the PRECEDE-PROCEED Model for CME purposes. In addition it presents an additional phase to the PRECEDE-PROCEED Model to better represent the curriculum development process.
Chapter Five

The Development of a CME Version of
The PRECEDE-PROCEED Model

In Chapter Four I analyzed the relationship between the PRECEDE-PROCEED Model, as it has been described in the health promotion field, and the British Columbia Whiplash Initiative (BCWI) which represented an application of this planning framework for CME purposes. In describing this application of the PRECEDE-PROCEED Model, I have attempted to demonstrate its value for CME, especially as the utilization of this model can help to meet some of the challenges facing CME. These challenges, discussed in detail in Chapter One, include the need to (i) involve other stakeholders, (ii) link needs assessment to population health needs, (iii) improve program relevance, and (iv) improve program evaluation.

However, I have argued that the PRECEDE-PROCEED Model, as it is currently constructed, provides insufficient conceptual and practical information to help CME planners integrate current research to create evidence-informed program theory, utilize current research to help select educational strategies and methods, and apply current pedagogical knowledge to the curriculum development process to improve program planning and evaluation.

To address these identified weaknesses in Green and Krueter’s PRECEDE-PROCEED Model, I am proposing the model be modified to include an additional phase that integrates program theory and proven instructional strategies (see Figure 24).
The proposed modification of the PRECEDE-PROCEED Model including the addition of a Phase 4(b): The Curriculum Development Phase linked to the Phase 4(a): The Educational and Organizational Diagnosis Phase. Phase 4(b) provides a representation of the curriculum development process and provides a conceptual bridge among various planning phases and activities from the identification of predisposing, reinforcing and enabling factors, to the creation of program theory, to the utilization of evidence-informed strategies in the curriculum development process, and the creation of informative evaluation instruments. Of particular importance, the proposed modification to the PRECEDE-PROCEED Model integrates and explicates the logic underlying The Standards established by the Joint Committee on Standards for Educational Evaluation. (166) Improving the assessment and reporting on key linkages between each program planning element and its actual implementation, I argue, will improve the quality of
research by more adequately addressing issues related to validity\textsuperscript{47}, reliability and generalizability. (17) p. 31

To understand the logic underlying the schematic I have labeled each arrow or arrows in the model to represent the direction of a set of action(s) among variables that CME planners need to address in the curriculum development process (see Figure 25).

Figure 25. Program Logic Underlying Modification of the PRECEDE-PROCEED Model

\textsuperscript{47} After the first release of The Standards in 1974, Stufflebeam (17) reports that a number of researchers published papers in which they independently examined "the congruence between the Joint Committee Standards and the Standards for Educational and Psychological Measurement and concluded that there is a high degree of consistency between these two sets of standards with regard to measurement.
In some cases the numbering relates to specific sequential activities. In other cases the numbering is used to capture a set of actions or inputs. Actions numbered 1, 2 and 3 form one such set, and Actions 8, 9, 10 form another set. Each set is related to an explicit particular action or activity.

To follow the logic being represented by the arrows one needs to recognize actions or activities taken prior to Phase 4(b), based on three assumptions:

Assumption #1. The identification of predisposing, enabling and reinforcing behavioural and non-behavioural factors has occurred in Phase 3
Assumption #2. The classification and prioritizing of these identified factors occurred in Phase 4(a)
Assumption #3. The classification and prioritizing of these identified factors leads to the creation of a sub-classification of objectives

**Phase 5 The Program Logic of the Curriculum Development Phase**

The arrows in Figure 25 represent the flow of activities (actions, tasks or activities) that are addressed in the curriculum development process. I have simply called these “Actions.” The identified predisposing, enabling and reinforcing factors become the building blocks for constructing the program and creating program theory. These building blocks (Actions 1-3) are inputs to the creation of program theory. The synthesis and reflection of a wide range of literature (CME research, medical education, health promotion, intervention research, pedagogical, behavioural science research, social marketing48) helps to identify evidence-informed or promising constructs and theories to guide the identification of effective intervening or causal variables and the selection of evidence-informed educational strategies (Action 4). Curriculum development is guided by explicating program theory and educational strategies selected and used with systematic methods to create meaningful curricular resources addressing issues related to

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48 Orlandi (284) describes “social marketing” in the context of changing of health behaviour as using the same organizational framework as industries use to sell products.
the credibility and relevancy of a given knowledge-base. With regard to CME the knowledge-base aims to inform clinical practice. CME planners as part of this synthesis process should also identify and integrate theories and research about knowledge uptake as well as theories and research about knowledge utilization. This would include attending to the structure and organization of instructional design elements that impact the quality of presentation including sequencing, typographical elements, referencing and indexing systems, the use and purpose of graphics elements, tables and charts, algorithms and clinical presentations reflecting on how these factors influence participant attention and motivation (Action 5). The next step is concerned with linking program theory to explicit program components and the selection of educational vehicles to be used to create the education program (Action 6). However, the education program’s scope and implementation success is also shaped by institutional factors (Action 7) and through an assessment of costs and other organizational factors the educational program is constructed. The arrows going in both directions represent the negotiating activity that is carried out between educators and their institutions. The delivery of the program is specifically targeting directly or indirectly predisposing, enabling and reinforcing factors identified (Actions 8, 9, 10). Hence, the monitoring and analysis of the implementation process clarifies the difference between program planned versus program implemented. Evaluation outcomes are therefore related to the program delivered and program theory actualized or reconceptualized (Action 11). The linkage between program outcomes and modifications made in the program delivery may lead to new theory generation.

On the macro-level this new curriculum development phase provides planners with a conceptual overview of the different activities that need to be addressed in the curriculum development process to create the education program.
On the micro-level, stakeholder involvement is needed to assess the relevance of the educational objectives to clinical practice, to assess the quality of research available upon which the desired changes are based, to identify key behavioural and non-behavioural barriers, and reflect on strategies considered to mitigate these barriers to knowledge uptake and knowledge utilization.Integral to this process is the need to integrate current knowledge about learning and teaching as a precursor to the construction of evidence-informed program theory.

As discussed above, evidence-informed curriculum development begins with the literature on knowledge uptake, as well as the literature on knowledge utilization. Knowledge uptake and knowledge utilization are not isolated activities, however they tend to be represented as dichotomous constructs, and need to be seen as complementary. As it is, researchers in neurocognitive sciences tend to focus solely on neurocognitive considerations of processing, whereas researchers and theorists involved in sociological and anthropological sciences tend to focus solely on socio-context factors. The best scenario, I believe, is to foster collaborative cross-discipline research to explore a synthesis of neurocognitive and sociocognitive factors contributing to knowledge uptake and knowledge utilization (see Figure 26).

Figure 26. Constructs of Knowledge Uptake and Knowledge Utilization
Biological cognitive processing factors can inform and assist in the generation of more robust theoretical program theory and enhance instructional design or human factor components. However, focusing excessively on internal biological or cognitive processing factors may result in missing the bigger picture. As Buckminster Fuller commented, there is nothing on the moon that indicates what gravitational effect it has on the earth.

An integration of research in human factors research, also known as cognitive ergonomics research, and cognitive sciences research could assist in identifying specific instructional instruments and strategies that can facilitate knowledge uptake. The creation of high quality curriculum and resource materials needs to incorporate both tacit and evidence-informed knowledge about instructional design elements such as sequencing, typographical factors, use of graphical aids, and materials production. The identification of this range of factors could lead to the development of enabling and reinforcing tools to facilitate knowledge retention and knowledge utilization.

Further research looking at differences in medical reasoning between novices and experienced practitioner could help educators more effectively assist undergraduate training efforts as well as teaching new content areas to experienced physicians. This is a particularly important area of research, especially as current logico-deductive training methods appear to be less valuable and are indeed possibly counter-productive in enhancing diagnostic skills.

**Relationship Between the Modified PRECEDE-PROCEED Model to Evaluation Standards**

The use of systematic methods in Phases 1 and 2 to conduct a social and epidemiological diagnosis of a health concern and in Phases 3 and 4 to identify and classify behavioural and non-behavioural factors provides a basis for evaluators to assess
how well planners identified population-based health needs and linked those needs to the
development of program objectives. Using systematic tools to construct curriculum
resources ensures greater accuracy, congruency and relevancy of the curriculum materials
in relation to the program objectives (and linkages to literature available), as well as to
other contextual attributes such as readability, utility of typographical and other
instructional design factors that could enhance or reduce the quality of the
communication.

It is only through the use of systematic methods and reporting on how planners
addressed each of the above factors that evaluators can make an informed judgment on a
program’s weaknesses and strengths that may have contributed to program’s successes
and failures. The care and attention to these factors and evaluation measures used
provided reality checks throughout the planning and implementation process.

The addition of the Curriculum Development Phase to the PRECEDE-PROCEED
Model builds on the strengths of Green and Kreuter’s original conception to better meet
evaluation standards known as, The Standards, established by the JCSEE. To
demonstrate how the modified PRECEDE-PROCEED Model may be able to better meet
these evaluation standards I have linked specific phases to a given standard suggesting
that one of more the activities involved in a particular phase helps planners address the
standard. I have labeled the Curriculum Development as Phase 4(b).

Utility Standards

The first set of standards are grouped under the classification of “Utility Standards.”
Utility standards are intended to ensure that the evaluation is relevant and addresses the
information needs of stakeholders. I have edited The Standards for the sake of brevity.
Table 35. Relationship of the Modified PRECEDE-PROCEED Model Phases to Utility Standards (166)

<table>
<thead>
<tr>
<th>Standard Group</th>
<th>Standard</th>
<th>Standard Description</th>
<th>PRECEDE-PROCEED Phase(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utility (U1)</td>
<td>Stakeholder Identification</td>
<td>Person involved or affected should be identified so their needs can be addressed</td>
<td>1, 2</td>
</tr>
<tr>
<td>(U2)</td>
<td>Evaluator Credibility</td>
<td>Persons conducting the evaluation should be trustworthy and competent to achieve maximum credibility and acceptance.</td>
<td>1</td>
</tr>
<tr>
<td>(U3)</td>
<td>Information Scope and Selection</td>
<td>To ensure that information collected be broadly selected, address pertinent issues and are responsive to needs and interests of stakeholders</td>
<td>1, 2, 3, 4 (a/b)</td>
</tr>
<tr>
<td>(U4)</td>
<td>Values Identification</td>
<td>The perspective, rationales, and procedures used to interpret the findings should be carefully described.</td>
<td>3, 4 (a/b)</td>
</tr>
<tr>
<td>(U5)</td>
<td>Report Clarity</td>
<td>Reports should clearly describe the program being evaluated, its context, purposes, procedures and findings, so that essential information is provided and understood.</td>
<td>1, 2, 3, 4(a &amp;b)</td>
</tr>
<tr>
<td>(U6)</td>
<td>Report Timeliness and Dissemination</td>
<td>Significant interim findings and evaluations should be disseminated to users so they can be used in a timely fashion.</td>
<td>7, 8, 9</td>
</tr>
<tr>
<td>(U7)</td>
<td>Evaluation Impact</td>
<td>Evaluations should be planned, conducted, and reported in ways that encourage follow-through of stakeholders.</td>
<td>All Phases</td>
</tr>
</tbody>
</table>

In *The Standards*, stakeholder identification is the first standard. Stakeholders are typically identified as those involved in or affected by a program evaluation. (166) p. 25

One of the failures of evaluations is that for the most part, evaluations are rarely used by stakeholders to make informed decisions about program continuance, program changes, or impact policy or regulatory activities. By identifying stakeholders’ information needs including program decision-makers will therefore increase the likelihood that the evaluation will be used. (166;224;246)

The PRECEDE-PROCEED Model as a community-based model incorporates this principle of participation in the program planning process for several reasons. At the macro-level the failure to attend to the principle of participation of stakeholders can result
in program failure at any or all levels of program development from planning, implementation to evaluation. As Green and Kreuter (176) state:

Failure to attend to this simple principle, even at its highest levels, is at once a foolish and serious oversight. It is foolish because participation requires mostly simple acts of courtesy and respect, along with the time needed to foster dialogue and, ultimately, trust. The oversight is serious because it often produces a threat to the proposed program. Continued failure to consult and reconcile differences fosters mistrust and undermines collaboration. p. 59

While the identification of stakeholders usually occurs in Phase 1 and 2, the involvement of credible stakeholders in planning and evaluation activities is critical to all phases of the PRECEDE-PROCEED Model to better address macro and micro issues of validity and acceptability. In the BCWI, the identification of stakeholders and involving them in the planning process helped to assess whether an educational intervention was the most suitable method\textsuperscript{49} to facilitate behaviour change. At the macro-level, stakeholder involvement helped to assess the perceived relevance of the program to the target audience. The failure to address issues of relevancy can result in program failure, as the lack of relevancy will impact physician motivation and the financial viability of the program.

Tremendous efforts can be made to construct technically a well-designed program, however, if there is no audience, there is no uptake or change. The strategic selection of stakeholders (including the evaluators) is of primary importance whether one is involved in planning community health programs or CME programming. Cervero and Wilson (131) describe program planners as being negotiators. In the BCWI it was clear that program planning is not simply a technical process, political factors and pedagogical differences need to be recognized and addressed. Group planning activities requires

\textsuperscript{49} For some practice changes organizational or structural-based interventions may be more cost-effective in producing certain types of behaviour change alone or in combination with educational interventions. (285-289)
exceptional leadership involving active participation of decision-makers and staff at various levels of planning or implementation. The members of the BCWI Steering Committee were high level politically astute, decision-makers and open to a broad range of discussion. The atmosphere at the meetings was friendly, engaging and conducive to brainstorming and thoughtful reflection. Based on stakeholder feedback the mix of stakeholders added to the sense of adventure in charting a new course in conceptualizing CME programming.

Utility standards as mentioned above are concerned with the identification of stakeholders’ information needs to ensure the program evaluation addresses areas of interest and is relevant, and then taking appropriate action to deliver this information in a timely fashion. The PRECEDE-PROCEED Model helps planners meet this group of standards by providing a systematic framework to (i) identify stakeholder and society population health needs in Phases 1 and 2, (ii) engage stakeholders in identifying and classifying behavioural and non-behavioural factors in Phases 3 and 4, and, (iii) provides a planning mechanism described in the Curriculum Development Phase that explicates program theory to build a more sophisticated understanding about what is being done and why. Each of these steps contributes to the development of process, impact and outcome evaluation measures. The creation of high quality informative process measures can provide stakeholders with preliminary findings in a more timely fashion.

In the BCWI, the development and utilization of the “Memos-To-Myself” as a formative evaluation tool provided immediate feedback to CME planners on whether the curriculum as planned and implemented actually resulted in the anticipated behaviour change desired. The collection and analysis of this data provided all stakeholders with early indications that the program was meeting intended objectives.
The involvement of non-traditional stakeholders, including consumers, can provide a better understanding of patient challenges that impact patients’ agreement and compliance with therapeutic and remedial regimes as well as address other patient-centred needs and issues. The importance of consumer involvement in health care decision-making and in the implementation of best practice is increasingly being recognized. (120;247-262) If the ultimate goal of CME is to improve patient outcomes, patients and consumer-based organizations representing patients are a valuable asset in the planning process and can assist in creating patient-centred evaluation measures.

The BCWI did not officially have an external consumer representative on the steering committee. As the executive director of the Physical Medicine Research Foundation, a consumer-based organization, and had experienced whiplash, I represented consumer interests in committee discussions. The development of patient education materials had further consumer input. However the utilization of patient education materials, in a similar way as the Memo-To-Myself instrument had multiple purposes. Patient education materials are enabling and reinforcing instruments for physicians. These materials were delivered after the course and provided physicians with an opportunity to read the educational messages embedded in the patient material and therefore acted as a reinforcing tool. Providing an exercise tear off “prescription” form was an enabling instrument that may have helped physicians encourage active exercise and provide some closure to the office visit.

Therefore the involvement of a broad-base of stakeholders in the planning process is paramount to determine the need for the program, to assess its marketability, to ensure program relevance to the physician, and through consumer participation, to ensure that patient information and emotional needs are being met.
Adopting Phases 1 and 2 of the PRECEDE-PROCEED Model helps address several challenges facing CME since the 1970s. The WHO has challenged the health professional community, and CME planners in particular, to link the continuum of medical education to population health needs. The PRECEDE-PROCEED Model arises from the community-based health promotion movement and is essentially an epidemiological-based planning model with a population health perspective. Our experience with the BCWI established a number of principles for facilitating this process. In the CME context it was recommended that the social and epidemiological diagnostic process should include an assessment of current education activities in undergraduate and residency training to better understand what is currently being taught. The involvement of these stakeholders provides opportunities to develop strategic partnerships in curriculum development, considering the continuum of medical education. Active participation in Phases 1 and 2 helps to refocus the continuum of medical education curriculum on priority population health issues.

If the ultimate purpose of CME is to improve health outcomes for patients, Phases 1-4(b) provide a broader context to identifying the determinants to the health issue(s) in question are and to consider a range of activities not solely limited to educational interventions focusing on physician knowledge acquisition and knowledge utilization.

**Feasibility Standards**

The next group of standards are “Feasibility Standards” to ensure that the program evaluation is realistic, prudent, diplomatic and frugal (see Table 36).
Table 36. Relationship of the Modified PRECEDE-PROCEED Model Phases to Feasibility Standards (166)

<table>
<thead>
<tr>
<th>Standard Group</th>
<th>Standard</th>
<th>Standard Description</th>
<th>PRECEDE-PROCEED Phase(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility</td>
<td>Practical Procedures</td>
<td>Procedures should be practical to keep disruption to a minimum. p. 65</td>
<td>1,5,7-9</td>
</tr>
<tr>
<td>(F1)</td>
<td>Political Viability</td>
<td>To facilitate cooperation, “and so that possible attempts by any of these groups to curtail evaluation operations or bias or misapply the results can be averted or counteracted.” p. 71</td>
<td>1, 2, 3, 4(a/b), 5</td>
</tr>
<tr>
<td>(F2)</td>
<td>Cost-Effectiveness</td>
<td>Evaluations should be efficient and produce information of sufficient value so resources expended can be justified. p. 77</td>
<td>1, 2, 3, 4(a/b), 5</td>
</tr>
</tbody>
</table>

The involvement of a broad-base of stakeholders including members of the target audience helps to ensure that evaluation procedures planned are not too intrusive. The new Curriculum Development Phase assists in the creation of curriculum-based tools that have multiple functions so that evaluation instruments become an integral part of the curriculum delivered (used for enabling or reinforcing behaviour) as well as for research purposes. The early participation of stakeholders addresses issues related to the political viability for the program. The Curriculum Development Phase helps build conceptual and practical linkages between stakeholder identified needs, the underlying program theory and how program components are linked to program outcomes. It is through this process that stakeholders can see what is being done and why to better understand and justify program planning and evaluation expenditures.

As the BCWI was charting new territory in program evaluation there was a need to reduce the many interesting questions that could be asked to those that were considered to be the most likely moderators or mediators to knowledge uptake or its utilization.
Propriety Standards

The next set of program standards are “Propriety Standards” to ensure that program evaluation is conducted legally, ethically and with due regard to the welfare of those involved in the evaluation and those affected by its results.

Table 37. Relationship of the Modified PRECEDE-PROCEED Model to Propriety Standards (166)

<table>
<thead>
<tr>
<th>Standard Group</th>
<th>Standard Description</th>
<th>PRECEDE-PROCEED Phase(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propriety (P1)</td>
<td>To ensure evaluations are designed to assist organizations to address and effectively serve the needs of the full range targeted participants. p. 83</td>
<td>1, 2, 3, 4(a/b)</td>
</tr>
<tr>
<td>(P2) Formal Agreements</td>
<td>Evaluation (what is to be done, how, by whom, when) should be agreed to in writing, so that these parties are obligated to adhere to all conditions of the agreement or formally to renegotiate it. p. 87</td>
<td>5</td>
</tr>
<tr>
<td>(P3) Rights of Human Subjects</td>
<td>Evaluation should be designed and conducted to respect and protect the right and welfare of human subjects. p. 93</td>
<td>1, 2, 3, 4(a/b), 5</td>
</tr>
<tr>
<td>(P4) Human Interaction</td>
<td>Evaluators should respect human dignity and worth in their interactions with other persons associated with an evaluation, so that participants are not threatened or harmed. p. 99</td>
<td>All Phases</td>
</tr>
<tr>
<td>(P5) Complete and Fair Assessment</td>
<td>The evaluation should be complete and fair in its examination and recording of strengths and weaknesses so that strengths can be built upon and weaknesses addressed. p. 105</td>
<td>4(a/b), 5</td>
</tr>
<tr>
<td>(P6) Disclosure of Findings</td>
<td>Evaluation should ensure that the full set of evaluation findings along with pertinent limitations are made accessible to the persons affected by the evaluation, and any others with expressed legal rights to receive the results. p. 109</td>
<td>All Phases</td>
</tr>
<tr>
<td>(P7) Conflict of Interest</td>
<td>“Conflict of interest should be dealt with openly and honestly…” p. 115</td>
<td>1, 2, 3, 4(a/b)</td>
</tr>
<tr>
<td>(P8) Fiscal Responsibility</td>
<td>Evaluator’s allocation and expenditure of resources should reflect sound accountability procedures and otherwise be prudent and ethically responsible, so that expenditures are accounted for and appropriate. p. 121</td>
<td>1</td>
</tr>
</tbody>
</table>
As noted in Chapter 3, legal, logistical and technical issues are typically well-addressed by CME planners and CME staff. The PRECEDE-PROCEED Model as a community-based planning model augments current procedures by fostering a higher level of accountability to a broader group of stakeholders engaged in program planning, implementation and the evaluation.

The creation of enduring programs involve more extensive data collection, data reduction and analysis than typical “one off” programs and can be challenging during the initial implementation phase. However once systems are in place and most data collection processing automated the additional work involved is offset by the fact that the program is being repeated many times. More importantly, planners actually receive useful and informative information to identify program strengths and weaknesses and take corrective action. The BCWI did run into some technical glitches. The software purchased for scoring knowledge tests was fairly buggy which resulted in the pretest and immediate posttest results not being available to participants at the course as planned. These results were sent to participants shortly after the course.

Accuracy Standards

The last group of program evaluation standards are classified as “Accuracy Standards.” Accuracy standards are intended to ensure that evaluations reveal and convey technically adequate information about program elements to determine worth or merit of the program being evaluated.
Table 38. Relationship of the Modified PRECEDE-PROCEED Model to Accuracy Standards (166)

<table>
<thead>
<tr>
<th>Standard Group</th>
<th>Standard</th>
<th>Standard Description</th>
<th>PRECEDE-PROCEED Phase(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>Program Documentation</td>
<td>Program should be described and documented clearly and accurately</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A2)</td>
<td>Context Analysis</td>
<td>The context in which the program exists should be examined in enough detail, so that its influence can be identified and assessed.</td>
<td>1, 2, 3, 4(a/b), 5</td>
</tr>
<tr>
<td>(A3)</td>
<td>Described purposes and procedures</td>
<td>Purposes and procedures should be monitored and described in enough detail so they can be identified and assessed.</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A4)</td>
<td>Defensible Information Sources</td>
<td>Sources of information used in a program evaluation should be described in enough detail so that the adequacy can be identified and assessed.</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A5)</td>
<td>Valid Information</td>
<td>The procedures used for gathering information should be chosen so that they will assure that the information provided is valid.</td>
<td>1, 2, 3, 4(a/b)</td>
</tr>
<tr>
<td>(A6)</td>
<td>Reliable Information</td>
<td>The procedures used for gathering information should be chosen so that they will assure that the interpretation of the information obtained is sufficiently reliable.</td>
<td>1, 2, 3, 4(a/b)</td>
</tr>
<tr>
<td>(A7)</td>
<td>Systematic Information</td>
<td>The information collected, processed and reported in an evaluation should be appropriately and systematically reviewed and any errors found should be corrected.</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A8)</td>
<td>Analysis of Quantitative Information</td>
<td>Quantitative information in an evaluation should be appropriately and systematically analyzed so that evaluation questions are effectively answered.</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A9)</td>
<td>Analysis of Qualitative Information</td>
<td>Qualitative information in an evaluation should be appropriately and systematically analyzed so that evaluation questions are effectively answered.</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A10)</td>
<td>Justified Conclusions</td>
<td>The conclusions reached in an evaluation should be explicitly justified, so that stakeholders can assess them.</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A11)</td>
<td>Impartial Reporting</td>
<td>Reporting procedures should guard against distortion caused by personal feelings and biases of any party to the evaluation, so that evaluation reports fairly reflect the evaluation findings.</td>
<td>All Phases</td>
</tr>
<tr>
<td>(A12)</td>
<td>Metaevaluation</td>
<td>The evaluation itself should be formatively and summatively evaluated against these and other pertinent standards, so that its conduct is appropriately guided and, on completion, stakeholders can closely examine its strengths and weaknesses.</td>
<td>7,8,9</td>
</tr>
</tbody>
</table>
The Modified PRECEDE-PROCEED Model is particularly well suited to address "Accuracy Standards" established by the JCSEE. The utilization of multiple stakeholders, collecting data from multiple sources using multiple methods helps to address a range of accuracy-related standards. However, the Curriculum Development Phase specifically helps planners integrate data collected from the previous phases with knowledge gained from systematic reviews and promising research arising from different literature to construct evidence-informed or promising program theory, and then facilitate the creation of high quality, valid, reliable and relevant curriculum linked to the creation of evaluation instruments.

The care and attention to these conceptual linkages in the planning and monitoring processes during BCWI's program implementation, and formative evaluation helped identify weaknesses in the program implementation, and remedy them and account for differences between program planned versus program delivered. It is through documenting and reporting of these activities that CME planners and stakeholders involved with the BCWI program have greater confidence that the program outcomes were accurately assessed and can be attributed to the program delivered.

Other Program Evaluation Standards to Consider

The PRECEDE-PROCEED Model extends current program evaluation standards by considering the impact of institutional factors that are not specifically addressed in The Standards. Green and Kreuter (176) pp.188-217 suggest that institutional factors are also important to assess as they can have a tremendous impact on the ability of planners or evaluators to implement the program as planned.

Administrative, policy and regulatory factors influence the scope of a project and its ability to implement the program as planned. The lack of sufficient resources (human and
An important factor in educational programming is the need for adequate human and financial resources. In addition, organizational structures, regulations and policies can facilitate or hinder program implementation. Barriers to successful educational programming, implementation and evaluation can be due to incongruence between organizational values, and existing policies and regulations. Aside from technical know-how, programs can succeed or fail due to choices made in the stakeholder selection process. Group planning activities require exceptional leadership. The quality of leadership represented on the planning committee needs to be carefully addressed. Stakeholders represented on the planning committee not only need be credible to their various constituencies they must also have positions of authority and be influential with decision-makers. In addition the chair or co-chair of the planning committee must have
similar leadership qualities respected by stakeholders participating in the planning process.

Programs will rarely succeed if necessary human and financial resources are not provided. Having multiple stakeholders involved in program planning requires longer timelines. Collective and reflective practices involved in creating and testing of program theory can lead to new insights that may require a willingness to accept changes to planned activities. Therefore program failure may arise from the lack of flexibility within organizational structures to address program weaknesses or foster program innovation.

The principle of participation keeps all stakeholders informed about the program’s strengths and challenges throughout program development, implementation and evaluation. The BCWI experienced delays in the curriculum development process due to the extensive content review process and the number of revisions required. Using a Gannt charting process it was possible to identify what tasks were dependent on other tasks so that work could be coordinated efficiently. Flexibility with partners provided an opportunity to reduce the length of time planned for implementation. The end result was the program was planned, implemented and delivered within the timeframe established. A preliminary final report was issued once all programs were completed. The datalinkage study is based on a two year period, one year prior to the program and one year post. Technical programming difficulties by the owners of the administrative data (claims and pharmaceutical databases) producing unreliable outputs resulted in further delays in the final datalinkage study.

There are also a number of challenges and opportunities for implementing population-based, theory-driven educational programming for CME. This next section
looks at some of the challenges and implications of adopting the Modified PRECEDE-PROCEED Model to enhance CME practice and research.

**Structural Challenges to Implementing the Modified PRECEDE-PROCEED Model**

As discussed in Chapters One and Two, there are a number of structural and organizational factors that present challenges to facilitate changes in the continuum of medical education. Historically and currently, the continuum of medical education has not kept abreast of educational research except incidentally. Cross-discipline cooperation between Faculties of Education and Medicine is still a rarity rather than the norm. For the most part Deans of Faculties of Medicine and Associate Deans of CME have little or no training in the practice of, or research in, medical pedagogy or the education field. (174) The creation of large academic medical centres having multiple purposes and responsibilities, including extensive interests in medical research has contributed to a pedagogical quagmire and insufficient time, resources or motivation to address the problem of medical education. Medical teaching is still considered a poor cousin to medical research and rewarded with token awards other than faculty appointments. Moreover it is assumed that depth of content and research knowledge is equated with teaching effectiveness which is a dubious proposition.

Historically and currently, there are examples of successful implementation strategies that have resulted in curricular change and changes in direction. Discussed in Chapter One were examples of two strategic planning sessions in the CME research community that brought together a committed group of CME educators and researchers to identify challenges in the field and create some action plans to address these challenges. These meetings were supported by the Canadian and American Medical Association. In Chapter
Two, medical historians suggested that there were a number of predisposing, enabling and reinforcing factors involved in the creation of new standards in medical education at the turn of twentieth century. These factors included public and political concerns about the need for professional standards which led to the creation of regulatory and professional bodies and a growing awareness within the profession that changes were needed. Individual efforts failed to raise medical standards at the turn of the twentieth century. It was only through building partnerships with many stakeholders that a consensus could be reached and a coordinated action plan developed to raise medical standards in Canada and the United States.

Flexner's (263) report is believed to be the major catalyst for significant change to medical education. However this effort could not have happened without the help of the Commonwealth Fund that had the vision and resources, along with leadership support of the Canadian and American medical associations. In both these cases change relied on a number of factors including recognition of need, a vision, support by credible leadership, and resource allocation.

Since the 1930s with the release of Commission of Medical Education report there have been local and international efforts attempting to improve medical curricula. (3;56;75;264) Unfortunately these efforts have not been successful. Sork (265) suggests we can learn a lot from program failure. Both the World Federation of Medical Education and the World Health Organization for several decades have been relatively unsuccessful in facilitating curricular change in the continuum of medical education. I suggest that part of the problem with recommendations made by these organizations especially those related to the need for curricular change is the lack of a systematic framework to help educators actualize curriculum changes in a scientific manner and demonstrate its utility.
The BCWI experience reinforced the need to create a more informative nomenclature about what is known about knowledge uptake and knowledge utilization and sought systematic reviews to help guide us in the curriculum development process. The adoption of adult learning theory principles and problem-based learning activities as a component to program planning on the surface sound like a good idea. However good ideas do not necessarily translate into “best practices” given differences in medical reasoning across the continuum of medical education e.g. differences between novices and experienced practitioners. Therefore educational strategies selected would likely be different between undergraduate medical students versus doctors in practice. For example, in the BCWI one of the educational strategies was to have physicians in practice reflect on challenges they experience with patients presenting whiplash-associated disorders. In the undergraduate medical education program the intended outcomes were different as the objective was to expose medical students to current knowledge arising from the systematic review and providing an overview of diagnostic and management procedures.

The development of theory-driven educational programming informed by various literature may help create more constructive ways to systematically improve medical teaching and learning. The BCWI began this adventure in curriculum development and provided evidence that the PRECEDE-PROCEED Model can be adapted for CME purposes, however much more experimentation in planning and evaluating CME programs is needed to test the viability and acceptability of using this model to create curricular change. Kern, Thomas et al., (266) has proposed using elements of the PRECEDE-PROCEED Model as a planning tool for creating medical curricula using epidemiological principles. However, the BCWI experience suggests that the Modified PRECEDE-PROCEED Model may be more fully utilized to create theory-driven, evidence-informed curriculum.
Lewis and Sheps (65) have conceptualized the problem of medical education as being primarily a political problem. They have found a lack of leadership within government and the failure to recognize and address the many activities and responsibilities of academic medical centres in a more coherent way. They also claim that the other main contributor to this dilemma is the lack of leadership and governance within Faculties of Medicine.

Miller (78), on the other hand, has focused on the lack of collaboration between Faculties of Medicine and Education and believes the problem is more pedagogically-based and suggests that a primary problem is the fact that good researchers are not necessarily good teachers.

Obviously there is wisdom in both perspectives. Change in the continuum of medical education will require a recognition within government and regulatory bodies that changes are needed. Government bodies have a regulatory and fiduciary interest in ensuring medical competence. With health budgets representing the largest expenditures in provincial budgets there is clearly a window of opportunity to consider changes in current structures especially if such changes can better link the continuum of medical education to population health needs.

To fully actualize changes in the continuum of medical education that will impact CME programming and delivery will require changes in its funding and governance. The business and activities of medical teaching needs to be restructured in ways that foster and reward good teaching in meaningful ways tied to faculty appointments and tenure. Meaningful consumer representation in Faculties of Medicine structures with cross-discipline representation from Faculties of Education may contribute to greater
collaboration across disciplines and more public accountability within current governance structures.

**Specific Barriers to Implementing PRECEDE-PROCEED Model for CME Purposes**

There are a number of barriers to fully implementing the Modified PRECEDE-PROCEED Model for CME purpose. Deficiencies in CME infrastructure, resources and poor data collection systems (concerning medical error, physician incompetence, population health data) are barriers to gaining a more comprehensive understanding about a given health condition and the factors that contribute to differences within and between regions in prevalence, management and costs. The lack of population-based health data and the lack of promotion of such data keep health professionals out of the information loop. If physicians were made aware of population health data and public health priorities they could better understand the need for further education in a given area. Improvements in data collection could assist CME planners identify education priorities and could assist in marketing efforts by generating a greater awareness about the health concern.

The PRECEDE-PROCEED Model is based on the principle of participation, however there are challenges to the involvement of other stakeholders. Palumbo (267), Weiss (167;268), Sjoberg (269) and more recently Cervero and Wilson (131) warn planners and researchers about political and ethical issues inherent in program planning and evaluation research and the need to recognize that programs and their funding arise from a political context. Cervero and Wilson (131) and Sork (270) suggest planners need to act responsibly, which they define as acting ethically and democratically within the planning process. There are time and resource factors to consider. Involving many stakeholders requires a longer development time. The involvement of consumer groups seeking
validation of their symptoms may also be problematic. There are, however, a growing number of consumers involved with or interested in the consumer-based Cochrane initiatives (see Cochrane Consumer Network website http://www.cochraneconsumer.com/) who are actively interested in evidence-informed patient information. The Canadian Arthritis Patient Alliance and the Consumers Association of Canada are examples of such groups. The Canadian Institutes of Health Research have also expressed interest in consumer-centred initiatives, although no fund program has been created to support consumer-initiated education activities. Stakeholders with vested interests may actively attempt to influence or sabotage program efforts especially if there are perceived or real financial consequences to program outcomes. Political choices must be made. At the time the BCWI Steering Committee was formed the Cochrane Consumer Network did not exist. With a growing body of patients aware of the principles of evidence-based medicine there is a growing body of consumers with an interest in health services research.

The typology of predisposing, enabling and reinforcing factors has been used in different ways for similar and different purposes. In the CME context it has been used to conceptualize factors that inhibit or facilitate knowledge transfer, organizational change, and to categorize educational strategies. Further conceptual analysis is needed to provide a clearer understanding about these constructs. Both qualitative and quantitative research is needed to assist in theory generation regarding what factors hinder and facilitate knowledge utilization.

Without a national CME research dissemination strategy in Canada efforts of identifying and prioritizing behavioural and non-behavioural factors in Phases 3 and 4 (a), would result in a duplication of efforts by each CME planner and lessens the
likelihood of systematically building a developing knowledge-base in an efficient manner. In Phase 4(b), the lack of cross-disciplinary research or collaborative arrangements across faculties or disciplines hinders further testing of program theory. If the CME field adopted Chen’s concept of action theory success versus conceptual theory success, the linkages between physician behaviour change and whether these behaviour changes positively impacted patient health outcomes need to be further tested and validated. For instance, in the case of the BCWI, did the provision of realistic prognostic information to patients reduce fear and anxiety and result in less iatrogenic disability (see Figure 27)?

**Figure 27. Linking Physician Behaviour Change to Patient Outcomes**

<table>
<thead>
<tr>
<th>Realistic Patient Reassurance</th>
<th>Reduction of Fear &amp; Anxiety</th>
<th>Reduction of Iatrogenic Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Theory Success</td>
<td>Program Theory Success</td>
<td></td>
</tr>
</tbody>
</table>

Further qualitative work is necessary to establish the validity of this construct for patients with whiplash. The link between iatrogenic disability and patients' fears and anxiety about their condition has been discussed by several authors. (271) As program theory becomes more developed and validated using qualitative and quantitative methods it will be easier to link program theory, behaviour changes to improvements in patient outcomes.

In the Curriculum Development Phase one of the problems with creating and further testing theory-driven programs is the need to reduce the onerous amount of reporting.
required to demonstrate how all aspects of the planning process discussed above have been addressed. This includes the need to provide sufficient detail about program theory elements so that theoretical elements can be understood, replicated and tested in different populations. The level of full disclosure needed to help evaluators assess the quality of the program planning process and its evaluation would require book-size publications.

To facilitate the utilization and reporting, the Joint Committee for Standards in Educational Evaluation (166) produced an evaluation checklist. The checklist provides planners with a both a planning tool and a means to report on whether each standard was addressed and to what degree. There have been a number of checklists created for guideline planning and to address various aspects of guideline validity, however less developed are tools to assist researchers consistently report on theory-driven intervention research. In 1999, under the auspices of the Danish Institute for Health Services and Development, a report entitled Changing Professional Practice: Theory and Practice of Clinical Guidelines Implementation was released. (245) This report provides a developing framework, amalgamating some earlier efforts by the Cochrane Collaboration on Effective Practice and Organization of Care Group (EPOC) and current work of the Concerted Action of the Changing Professional Practice project (CCP) to provide researchers with some guidance concerning reporting on some fundamental information including how the clinical guidelines were created, description of participants and settings, types of interventions used, details on processes and outcomes including economic processes and outcomes, barriers and facilitators, and methods used.

Although reporting on these features is important, much more conceptual work is needed to pilot and test program theory to create a more robust conceptual understanding of what variables need to be addressed to facilitate knowledge uptake and its utilization.
Further enhancements to the Modified PRECEDE-PROCEED Model could include the creation of checklists to improve curriculum construction as well improve the ability of CME planners and researchers to comprehensively, yet succinctly report on educational program development and program evaluation.

In Phase 5 Administrative and Policy Diagnosis, the Physical Medicine Research Foundation suffered from similar human and financial resource challenges that face many CME departments. To create innovative programming CME Departments or other CME providers requires initial seed funding to help identify priority health issues in their region, to cultivate and bring together stakeholders to assess the relevance of the health condition, and to collectively engage them in a planning process to identify predisposing, enabling and reinforcing factors that contribute positively or negatively to the health issue. Creating evidence-informed, enduring programs requires a significant investment in program planning and a time commitment of at least one to three years depending on evaluation methods used. Although these commitments in time and planning are unusual the creation of more enduring programs using multiple formats provides Divisions of CME with a variety of revenue streams including symposia. In many cases health issues in one region or province are similar to other regions or provinces, therefore additional resources can be sought to create national CME programs rather than to conceive of a program as being a one-time event, or just related to a specific region or province.

In Phases 7 and 8 Process and Impact Evaluation, further conceptual work is needed to improve the creation of more informative evaluation instruments for CME programming. With the creation of a more robust conceptual framework for CME and the development of theory-driven CME programming there is a tremendous opportunity to systematically create a range of tools which might better link theory to practice. One of
the most promising elements of the BCWI experience was the creation of multi-purpose instruments which can be used as an integral part of the curriculum to facilitate and reinforce behaviour change as well as be useful for process and impact evaluation purposes.

In Phase 9 Outcome Evaluation, measuring patient health outcomes following educational interventions are methodologically challenging and complex. EPOCH and CPP suggest that a promising type of research design to consider for intervention research studies are cluster randomized trials. Cluster randomized trials collect and analyze two different levels of data. A cluster randomized trial involves randomizing groups of professionals as well as collecting individual patient data about the process and outcome of care. The authors of the Danish Institute for Health Services Research and Development Report, Changing Professional Practice (245) provide an overview of different types of randomized cluster trials and the creation and use of statistical methods to both guide the creation of cluster trials and analysis considerations. The use of cluster randomization trials may better address some of the methodological challenges when one is trying to analyze both the impact of guidelines on practitioners as being one unit of analysis as well as patient outcomes being a second unit of analysis. However the fundamental problem of assessing the quality of the educational program in relation to its underlying theory will remain a confounding factor in understanding program successes and failures.

The utilization of the PRECEDE-PROCEED Model represented an important step in addressing many of the challenges facing CME. The continued evolvement of the model to facilitate the creation of program theory is to help CME planners to better understand
the activities that need to be addressed in order to translate the behavioural and non-behavioural factors into evidence-informed curriculum.

**Encouraging Government and Foundation Investment**

If CME planners begin to use Phase 1 and 2 of the PRECEDE-PROCEED Model to guide their needs assessment process, CME planners will be able to demonstrate to government and other funders that their planning activities and programs are directed to priority health concerns using persuasive information considering the economic burden of illness. I believe CME developers can successfully argue that further investment in CME is warranted given the improved likelihood of having a positive impact on health care and the more professional approach to development, implementation and evaluation. The involvement of a broader base of stakeholders including consumers in CME planning can also demonstrate CME’s commitment to the recognition that the ultimate purpose of CME is to improve patient health outcomes.

Setting a CME agenda based on population health needs would result in quite a different range of CME programs than typically developed. For instance, to better address the needs of people with chronic health conditions, musculoskeletal conditions such as osteoarthritis, the leading cause of long-term disability in Canada would become an area of major focus. This type of programming would necessitate the creation of enduring, comprehensive programs targeting different audiences and require the collaboration of medical, allied healthcare practitioners and consumer organizations.

To facilitate this process the following actions could be taken by national or international bodies. National or international bodies could produce a web-based list of predisposing, enabling and reinforcing factors planners could consider in their planning activities as a way to broaden planners and researchers’ conception of variables to
consider. As theory-driven research methods are applied these variables can be tested and prioritized, with the results of the studies linked directly to the variables, along with invitations for further studies of areas under analyzed.

There is currently an application before the Canadian Government’s Networks of Centres of Excellence (NCE) to establish a national centre of excellence for continuing education of health professionals. Such a centre could provide an opportunity to involve health professionals, consumers and other stakeholders in planning national continuing education programs on priority health issues as well as gather expertise from other disciplines to improve pedagogical practices. One of the functions of this new body could be the creation of web-based planning resources for CME planners such as an up-to-date summary of behavioural and non-behavioural factors contributing to knowledge uptake and knowledge utilization.

In typical one-time episodic CME programs, there are simply insufficient resources to address a range of activities to develop an evidence-informed curriculum development process. However, this need not be the case for the development of more enduring programs. The creation of an enduring program provides an opportunity to apply a more systematic approach to curriculum creation, test development and provides an opportunity for curriculum renewal through formative data collection. In enduring programs, instruments that could be conceived as summative in nature (impact instruments) are also formative (process instruments), allowing planners to respond to preliminary and ongoing data collected in prior sessions.

Funding partnerships need to be created to reduce the reliance on single funders. In addition, as recommended by Katz et al. (99) barriers are needed to reduce the potential perception of, or possibility of bias, of industry support for educational programming.
Without changes in government investment in CME there will be little incentive or ability for CME departments to create more innovative and promising educational programming. Although CIHR has taken initiatives in funding research in knowledge translation, there is no direct funding mechanism in place to build infrastructure capacity to support CME program planning and program implementation.

Tied to this investment in CME infrastructure, research and practice is the need to improve data collection in population health and physician competency. A stronger alignment is needed between research investment and the economic burden of illness. Without a realignment of research investment to population health concerns or the economic burden of illness on society, there will be insufficient knowledge generated to inform better practices.

The creation of multi-agency comprehensive educational programs also requires special leadership qualities and a safe environment conducive to brainstorming. All partners at the BCWI planning table were considered as equal partners in the planning process. As the result of a careful selection of stakeholders for the BCWI, considering professional affiliations, academic position, knowledge and experience, each of the Steering Committee members brought a unique skill and experience set that contributed to program planning process.

The BCWI has demonstrated, in a number of areas the feasibility and adoptability of using the PRECEDE-PROCEED Model to facilitate the creation and utilization of program theory in planning and conducting an impact evaluation of a CME program. In addition, the BCWI has provided some pragmatic tactics and tools to facilitate this process. Among the strongest points of its contribution, over the traditional models of CME, is the recognition that contextual factors play a critical role both in knowledge
acquisition, as well as knowledge utilization and educational programming needs to address behavioural and non-behavioural factors that inhibit or facilitate the desired change (245;272-279), rather than solely focus on knowledge dissemination. The modified PRECEDE-PROCEED Model accomplished this by assisting planners to systematically consider contextual factors not considered in any systematic way through the use of more traditional Tyler-based curriculum models and provided CME planners guidance on how to technically and conceptually improve the curriculum development process. To better link theory to practice sufficient conceptual linkages need to be made between all components of planning and their relationship to addressing the validity of measures used in program evaluation.

However, as mentioned earlier, there is still much to be done to develop and extend the utility of the Modified PRECEDE-PROCEED Model for CME purposes. The next Chapter provides some recommendations arising from the BCWI and this analysis of historical and current forces that have contributed to create the CME system we have in place. In a summary form it addresses the question of what has been learnt from this activity and how can it be applied to improve CME practice and research.
Chapter Six
Challenges and Recommendations for Reconceputalizing CME

As discussed in the introduction to this dissertation, CME leadership is increasingly under pressure from within and outside the profession for its work to be more effective, accountable and responsive to an expanding group of stakeholders concerned with health care issues. (1-5) Challenges reported in the literature include the need for CME to: (a) improve the quality and cost-effectiveness of health care (8), (b) address priority health issues informed by current population health data rather than just those needs identified by physicians (3-5;8;9), (c) reduce medical error and enhance physician competence (6;7), (d) encourage physician, allied health professional and other stakeholder participation in CME planning (4;6), (e) improve the relevance of programs offered (3), (f) improve pedagogical practices and provide a greater variety of proven efficacious education interventions (4) pp. 10-11 (6) p. 212, (g) create a more comprehensive "continuing" education program, instead of the current practice of 'episodic instruction' (9) and, (h) conduct more intervention research to identify factors that enhance or hinder behaviour change. (10;11)

In this thesis, I have argued that the failure of CME to meet these challenges is a result of historical, structural, organizational and pedagogical factors that have contributed to the creation of an under-resourced and underdeveloped field of practice and research. In response to this situation I have attempted to demonstrate, by drawing on the CME program devised as part of the British Columbia Whiplash Initiative, the benefits of working with a modified versions of the PRECEDE-PROCEED Model that could greatly strengthen the quality of CME development, implementation and evaluation.
Chapter One provided an overview of the many challenges facing the CME field and introduced the argument that many of these challenges are a result of a system-based failure in current planning, implementation and evaluation. Although systematic reviews of RCTs had provided a body of evidence that demonstrate certain types of CME interventions are more effective than others in knowledge transfer and utilization and facilitating physician behaviour change, the lack of conceptual framework has been a continuing major barrier to understanding this phenomenon, and creating a more systematic approach to uncovering factors contributing to knowledge transfer. From both within and outside the profession there has been a growing recognition that CME needs to develop a more robust conceptual framework aimed at assisting designers, developers, directors and instructors in creating more effective CME.

In Chapter Two, I presented an historical lens on the organizational, political, socio-economic, administrative, legal and pedagogical factors that have contributed to the creation of a medical education system that is founded on structures, attitudes and beliefs about learning prevalent at the turn of the twentieth century. I argued that one of the major forces shaping medical education was the rapid investment in biomedical research at medical schools since World War I that has led to the creation of large academic medical centres and has reduced the time and motivation to address pedagogical matters. Although there have been many government, professional organization, and non-profit organization funded reports calling for curricular change since the Flexner Report, change has been slow. There have, however, been three major shifts in curriculum in medical education occurred since the 1950s, a movement towards an organ-system based method of teaching arising from curricular reform at Case Western Reserve University, the development of problem-based learning at McMaster University and Michigan State University, and more recently, partially arising from the PBL experience.
has been the development of evidence-based medicine. In addition many professional and
accreditation bodies have called on medical educators, and CME planners, to adopt adult
learning principles in the program planning process. I argued that some of these
curricular reforms are problematic and more work is needed to integrate and encourage
cross-disciplinary research to build a more robust conceptual model to facilitate the
development of a more coherent evidence-informed curriculum development process, and
knowledge transfer to influence CME design and implementation.

In Chapter Three, I presented the prototypical planning model recommended by
accreditation bodies for training CME planners and staff founded on Tyler’s Curriculum
Model. I argued that this planning framework lacks the sophistication needed to identify
program strengths and weaknesses in a way that can systematically build a body of
knowledge to improve program development as well as enrich our conceptual
understanding about learning and teaching. This set the stage for the introduction of a
new model capable of inspiring and guiding a more thorough and systematic approach to
CME.

In Chapter Four, I described the PRECEDE-PROCEED health promotion planning
model, how it is conceptualized and presented by its developers and used in the health
promotion field. Using the BCWI as a case study, I described how the model was adapted
for the purpose of planning, implementing and evaluating an evidence-informed CME
program. However I also argued that the PRECEDE-PROCEED Model, as currently
constructed, provided insufficient conceptual and practical information to help planners
integrate current research to create evidence-informed program theory, utilize current
research to help select educational strategies and methods, and apply current pedagogical
knowledge to the curriculum development process to improve program planning and evaluation.

Hence in Chapter Five, I went on to present a modification to the PRECEDE-PROCEED Model to provide a conceptual bridge among various planning phases and activities from the identification of predisposing, reinforcing and enabling factors, to the creation of program theory, to the utilization of evidence-informed strategies in the curriculum development process, and the creation of informative evaluation instruments. In addition, the proposed modification to the PRECEDE-PROCEED Model addressed the underlying principles found in *The Standards* prepared by the Joint Committee on Standards for Educational Evaluation as to what a comprehensive evaluation should address. (166) I have also argued that the proposed improvements to the PRECEDE-PROCEED Model will improve the quality of research by more adequately addressing issues related to validity, reliability and generalizability.

However, I have noted that there are still structural factors that hinder cross-discipline communication, collaboration, and knowledge transfer among various faculties and departments that are barriers to developing a better understanding about what knowledge is, how it is acquired, what factors influence its utilization in order to improve medical teaching across the continuum of medical education. I have suggested that changes in medical education and continuing medical education will likely require changes to current structures for delivering education. These changes include reestablishing the importance of medical teaching and creating mechanisms for rewarding "good teaching behaviour" as a more viable alternative route for faculty appointment and tenure then it is currently. They speak to how, over the last twenty years, there has been a growing recognition, within the profession and government stakeholders of a need to work
collectively to create a more systematic body of pedagogical knowledge that can improve teaching and learning.

Borrowing conceptual and research tools from social scientists and other researchers in the behavioural sciences, coupled with a growing interest in qualitative methods, there is a growing body of research concerned with theory generation and the development of theory-based planning models. The benefit of this type of planning has been demonstrated by social scientists investigating factors that facilitate health behaviour change such as those researchers investigating the utility of The Health Behavioural Model.

This thesis has presented the case that the PRECEDE-PROCEED Model, which has been shown to be a robust model for facilitating changes in health behaviour in lay populations, may also be applicable to improving educational planning and evaluation concerned with changing physician behaviour. (Doctors are people too!)

The PRECEDE-PROCEED planning process based on principles and practices utilized in the field of epidemiology and community health planning has other features that could be very beneficial to medical educators and CME planners. Linking the continuum of medical education to population-based health outcomes and the economic burden of illness would help bridge the gap between what doctors learn versus what they need to know to practice. In addition, I have asserted that this linkage would provide a stronger rationale for governments and other funding bodies to invest in CME research and practice.

However to link CME programming and medical education to be more responsive to community health needs would require improvements in data collection systems to track
and capture data on issues related to medical error, physician competence, public health data, ambulatory and hospital health utilization data.

In Canada, retrieving comparable data across provinces and territories is still fraught with challenges. Some progress has been made with developing national standards for data capture in hospitals, however capturing ambulatory data is much more elusive. Each province has developed its own methods of data collection for administrative purposes resulting in a lack of standards and protocols and has made it very difficult to access, analyze and compare provincial data. However, positive changes are happening. In May 1999, the Canadian Population Health Initiative, an initiative of the Canadian Institute for Health Information in cooperation with the federal/provincial/territorial advisory committees on Population Health and Health Services, Health Canada, and Statistics Canada, convened the first National Consensus Conference on Population Health Indicators to create a roadmap to agree on initial measures of the health of Canadians, factors that affect health and the performance of the health system. (73) One of the outcomes of this consensus conference was the initial development of health indicator definitions and data sources. Currently these definitions do not include issues related to health professional competence or medical error. Nor has it analyzed gaps between current knowledge and practice, although these factors could be considered.

The Canadian Medical Association, national and provincial Ministries of Health, regional health boards, and universities with institutes concerned with health promotion are already involved with this initiative. By inviting other stakeholders including deans of medicine and allied health care schools, and directors of professional education into this planning process these stakeholders would be exposed to current work in the field and its applicability to curriculum development. The recent establishment of the CIHR Institute
for Population and Public Health will provide new funding opportunities. The CIHR Institute of Population and Public Health will support research on the complex interactions (biological, social, cultural, environmental) which determine the health of individuals, communities, and global populations; and into the application of that knowledge to improve the health of both populations and individuals. This funding opportunity is directed at research concerned with health promotion policies and strategies (individual, community, and population based); related health outcomes research; health determinants. The aim is to elucidate the multi-dimensional factors that affect the health of populations and lead to a differential prevalence of health concerns, methods and practice; education, information management, communications; disease, injury and disability prevention strategies at the individual and population levels; identification and study of special populations (e.g., rural populations); health policy formation at community, regional, provincial, national and international levels; relation to health outcomes; multiple interventions research to determine the best combination of interventions, providers, and conditions to address population health issues. In addition CIHR has developed a separate funding stream to support research concerned with knowledge translation and continuing education in the health professions.

Although these funding initiatives will facilitate research activities, funding is also needed to support and foster changes to the creation of more relevant medical education curriculum. The Canadian Health Services Research Foundation (CHSRF) has a mandate to support management and policy research in health services to increase the quality, relevance, usefulness and application of this research for health-system policy makers and managers. To accomplish this CHRSF funds management and policy research in health services and nursing; supports the synthesis and dissemination of research results; and supports the use of research results by managers and policy makers in the health
system. Given this mandate, CHRSF in partnership with CIHR, IPPH and Ministries of Health might consider providing funding opportunities to facilitate the creation of population-based medical curriculum informed by systematic reviews of literature that would have relevance to both doctors in training and doctors in practice.

A major concern discussed in the thesis is the incoherent manner by which research areas are currently funded (e.g., the inverse relationship between economic burden of disease and current funding). To better address population-based health issues will require a realignment of research funding to support research that is directed at addressing those health conditions that are economic burdens to society. Without research investment in these areas, there will not be a strong body of literature to inform curriculum content. Canada having a different accreditation infrastructure than the USA (fewer players and no commercial interests) has an opportunity to support changes to current CME practices. Government leadership and funding can support CME providers explore innovation in CME practices recognizing conflicts inherent in industry sponsored CME.

With sufficient infrastructure support discussed above, the proposed planning process provides an opportunity for CME planners and researchers to address each of the above challenges. A primary purpose of the creation of theory-driven CME programs is to build a systematic body of knowledge aimed at improving the quality and cost-effectiveness of health care. As an epidemiological-based planning model it is well-suited to identify and address priority health issues informed by current population health data rather than just those needs identified by physicians. In addition, as part of its needs assessment planning process it recognizes the need to identify and reduce medical error and adverse medical events. As a community-based model its planning framework is constructed in a manner
to encourage physician, allied health professional and other stakeholder participation in CME planning.

The proposed planning process by focusing on population-based health issues and enhancing curriculum construction will improve the relevance of programs offered both to society and to practitioners. The recommended modifications to the PRECEDE-PROCEED Model are specific regarding the need to improve pedagogical practices and provide a greater variety of proven efficacious education interventions as well as to create a more comprehensive continuing education program, instead of the current practice of "episodic instruction."

Further development and testing of the model would assist CME planners and researchers to conduct more intervention and qualitative research to identify factors that enhance or hinder behaviour change. However, the framework needs to be rigorously tested and would require further development to better address some methodological issues related to the testing, reporting of, and publishing theory-driven educational programming in cost-effective and efficient ways to enhance the applicability of the model for regular CME planning purposes as well as to improve intervention research activities. Currently there is no standard for reporting program theory components used in intervention research to facilitate further testing of program components or to succinctly report or assess the linkages between program theory, curriculum construction, program implementation and evaluation measures used.

The application of the PRECEDE-PROCEED Model to the BCWI has clearly demonstrated the feasibility and adoptability of this planning framework for CME purposes. The BCWI experience, moreover, has led to the creation of new multipurpose tools and instruments to facilitate curriculum development and enhance knowledge
acquisition and its utilization. There is much work to be done to improve CME practice and research. I hope that CME planners and intervention researchers will consider this framework to further develop and test its utility in creating and testing theory-driven CME programs to systematically inform CME research and facilitate best practices in the field.

This thesis focused on the theoretical and practical aspects of adapting the PRECEDE-PROCEED Model for CME purposes. Manuscripts are currently being prepared to discuss research arising from the BCWI experience. This includes specific papers reporting on knowledge uptake and retention (pre-post and six month delayed post), program and stakeholder evaluation, the development and utilization of Memo-To-Myself, and the data-linkage study investigating changes in prescribing and referral practices.

**Postscript**

In the Introduction to this thesis I discussed the personal impact of the seminal text, *The Physician as Learner: Linking Research to Practice* (6), stating that reading the text inspired an adventure for myself and other involved in the curriculum development and program evaluation process, through articulating a common goal to bridge the gap between health professional practices and current research using the best educational practices available.

The adventure is continuing. Lawrence Green and Martin Kreuter the originators of the PRECEDE-PROCEED Model are currently writing the 4th Edition to their textbook, *Health Promotion Planning: An Educational and Ecological Approach* which will be published by McGraw-Hill in 2004. Green and Kreuter have asked permission to use my
proposed modification in their text as well as reporting on the BCWI adaptation of the PRECEDE-PROCEED Model for CME purposes.
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Appendices

Appendix I: Administrative and Pre-implementation Documents

BCWI Committee Members
Research Committee Terms of Reference
Consent Letter
Background to Research Activities
Educational Influential Survey

Appendix II: Curriculum Construction Instruments

Program Logic Model
BCWI Content and Procedural Objectives
Objective Test Item Review Form
Editorial Review Guidelines to Improve Test Construction
Data Linkage Framework

Appendix III: Program Evaluation Instruments

Implementation Checklist
Demographic Form
Memo To Myself
Interview Guide – Following Initial Programs
Knowledge Test
Speaker Evaluation Form for Delegates
Speaker Feedback Form (Speaker Completes)
Program Evaluation Form for Delegates
Post CME Exposure Survey
Diffusion Survey
Program Evaluation Standards Checklist Completed for BCWI

Appendix IV: Sample Materials

Sample Protypical Program Evaluation Form for Delegates
Sample Speaker Feedback Form
BCWI Features Instructional Design
Neck Specific Exercise
Appendix I: Administrative and Pre-implementation Documents

BCWI Committee Members

BCWI Steering Committee

Murray Allen MD (Chair) Consultant in musculoskeletal disorders, Private Practice

Stephen Barron MD, CCFP, FCFP (Co-Chair), Representative of BC College of Family Physicians

Hugh Anton MD, FRCPC Chief of Staff, BC Rehabilitation Society, Head, Physical Medicine and Rehabilitation, UBC

Marc Broudo BA, MA Associate Director, Division of Educational Support and Development, Faculty of Medicine, UBC

Andrew Chalmers MD, FRCPC Associate Dean, Undergraduate Education, Faculty of Medicine, UBC

Bruce Fleming MD, FRCPC BCMA-ICBC Liaison Committee

Stefan Grzybowski MD, CCFP, MCI Sc Director of Research, Department of Family Practice, UBC

David S. Lirenman BSc (Med), MD, FRCPC, FACP Associate Dean, University of British Columbia

Stan Lubin BA, MSc, MD, CM, MPH, FCFP Program Director, UBC Family Practice Residency Program and Associate Professor, Department Family Practice, UBC

Carl Whiteside BSc, MD, CCFP, FCFP Director, Rural Planning Program, Department of Family Practice, Distance Education Coordinator, UBC

Marc White, Executive Director, Physical Medicine Research Foundation

Curriculum Committee

Murray Allen MD
Hugh Anton MD, FRCPC
Stephen Barron MD, CCFP, FCFP
Marc Broudo BA, MA
Stan Lubin BA, MSc, MD, CM, MPH, FCFP

External Content Review

In addition to members of the Steering Committee

Steve Beerman BSc, BRS, MD, CCFP
David Cassidy DC, PhD, FCCSC
Jamie Naismith MB, BS
Margareta Nordin Med DrSci
Martin Shoemaker PhD, ABPP, FAClinP
Mike Stanger BSc, MD, CABO, FRCPC

Medico-Legal Module Only

Pierre Forcier MD, FRCS(C)
Helen Low BA, LLB
Peter M. Wilcock BA, LLB

Research Committee

Marc White (Chair)
Hugh Anton MD, FRCPC
Stephen Bath PhD
Marc Broudo BA, MA
Susan Chunick BSc(PT), MSc
Sheilina Dhanani BA, MHA
Bruce Fleming MD, FRCPC
Stefan Grzybowski MD, CCFP, MCI Sc
Lorne Halabiski PhD
David S. Lirenman BSc (Med), MD, FRCPC, FACP
Sam Sheps MD, MSc, FRCPC
Research Committee Terms of Reference

The mandate of the B.C. Whiplash Initiative's Research Committee is to:

Create and implement a comprehensive Research Program which will provide on-going feedback to enhance program development, adaptation and implementation of the continuing medical education materials and intervention strategies.

Assist in the development of instruments (demographic, attitudinal and knowledge) and logistics to measure the effects of the educational interventions developed by as proposed by the Curriculum Committee.

Monitor and evaluate the impacts of the continuing medical education materials and intervention strategies.

Primary Mandate:

To develop, coordinate and where applicable, implement a research strategy to test the hypothesis that the BC Whiplash Initiative will result in an increase in knowledge and change in the behaviours and skills of physicians, leading to appropriate diagnosis and management of people presenting with Whiplash Associated Disorders, enhancing the quality and cost-effectiveness of patient care.

Areas of Responsibility:

The Research Committee is responsible for the development, piloting and if required, refinement of instruments, data collection procedures and data analysis with regard to changes in physician knowledge, skill, behaviours and practice patterns and changes in patient knowledge and understanding, attitude towards pain, coping/management and symptom-relief strategies.

Line of Authority:

The Research Committee makes recommendations to the Steering Committee. The Steering Committee has the ultimate authority.

Revision (April 30, 1997)
BC Whiplash Initiative
Continuing Medical Education Sessions

CONSENT LETTER

I give my consent to the BC Whiplash Initiative to use existing administrative data from PharmaNet and ICBC to study practice patterns of physicians with respect to Whiplash management, who have participated in the Whiplash educational programs. I understand that individual identities will remain anonymous and that following data collection, anything linking the identifier with individual physicians will be destroyed.

Name (Please Print)

MSP Number

Signature

Date

Site at which Course Taken

Appendix I: BCWI Consent Letter
Research into the effectiveness of the WAD CME programs is one of the primary objectives of the BC Whiplash Initiative.

**Pre- and Post-CME Tests**

One method of measuring this effectiveness will be by determining what new information CME participants gain and what existing knowledge is reinforced, through participation in the WAD programs.

As you read through the materials provided to you, you come to further understand the importance and value of pre- and post-education testing. It is hoped that pre-CME testing will facilitate advance cuing of the participants, to the educational materials to be presented in the CME program and allow the participants to determine the level of their knowledge base prior to the start of the learning process. The post-CME testing will reinforce the materials taught, permit participants to determine the changes in their knowledge-base, and facilitate reflective thinking, once they leave the CME programs.

All comprehensive CME programs will include a 20-25 minute pre-CME test and a 20-25 minute post-CME test, to be completed by all CME participants.

**Data Linkage**

A second method of measuring the effectiveness of the CME programs will be by utilizing existing administrative datasets at ICBC’s Claims Division and PharmaNet to compare behaviors prior to, and following, exposure to the WAD CME program.

As you will see, the consent form assures CME participants that the process we are following, for data extraction and data comparisons will ensure the anonymity of individual identities. This anonymity will occur as a result of data aggregation. Once physician participants provide their consent and agree to participate in the study, they will be grouped together as one cohort, and information which identifies individuals will be eliminated. We will request ICBC’s Claims Division to provide aggregated data from their administrative records, on the practice patterns of the physician cohort, as related specifically to their patients who have presented with WAD symptoms as a result of a MVA. The data from ICBC will include the frequency of patient visits to physicians for WAD symptoms, and referrals to other health care providers for WAD symptoms. PharmaNet will then be asked to provide aggregated data from their administrative records, on the frequency and types of drugs prescribed by the physician cohort, as related specifically to their patients presenting with WAD symptoms as a result of a MVA.

By determining the macro trends in the CME participants’ practice behaviours before and after the CME programs, the Research Component will be able to determine the effectiveness and value of the BCWI and other similar CME programs to be developed and delivered to your colleagues.
On-Site Procedures

The chart below provides a sample of how the Research Component can be presented and implemented on-site at the CME session.

<table>
<thead>
<tr>
<th>Facilitator Presents the Global Objectives and Importance of the Research Component and the Pre- and Post-CME Tests</th>
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<tr>
<td>Value of Pre- and Post-CME Tests explained to CME Physician Participants by RA</td>
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<tr>
<td>Research Component of BCWI explained to Participants by RA</td>
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<tr>
<td>Participants provide Consent to Participate in the Study</td>
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<td>Participants complete Pre-CME Test</td>
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<td>Consent Form and Tests are collected</td>
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<td>Tests Scanned as CME program is delivered</td>
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<tr>
<td>Interviews with selected participants during lunch hour</td>
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<tr>
<td>Following completion of Module 2, the Post-CME Test is completed</td>
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<tr>
<td>Tests Scanned and Analysed</td>
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<tr>
<td>Following case discussions, Results of pre- and post-CME tests presented</td>
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Once you have introduced yourself and the BC Whiplash Initiative, it is critical that you share the value of the Research Component for the BC Whiplash Initiative and for the participants present, and that you emphasize the importance of completing the pre- and post-CME tests.

After you introduce yourself and the BC Whiplash Initiative, the Research Assistant (RA) will re-iterate the value of the pre- and post-CME tests and describe the Research Component of the program. If participants require any clarification, this is the time the RA and facilitator can provide that. The process of actually writing of the tests and completing the consent form can then occur. It is crucial that this happens close to the start of the program, before any learning materials from the modules have been distributed. While the CME materials are being distributed, the tests will be scanned and a preliminary analysis will occur.

When the CME program is close to completion, but approximately 90 minutes are remaining, the post-CME test can be introduced and completed. Once they are collected, the RA will scan these tests and compare the pre-CME and post-CME results. Before you close the program, the RA will provide pre-CME and post-CME test results, on a group basis, so that participants as a group, can see what new materials have been learned and existing knowledge reinforced.

The participants should also be informed that a delayed post-CME test will be sent to them within 3 months of the CME program, which should be returned to the UBC’s Division of Continuing Medical Education.
Educational Influential Survey

SURVEY

Identification of "Educational Influentials"

The first three paragraphs that follow are an attempt to describe the behavioral characteristics of physicians as they interact with their colleagues on an informal basis during the course of a typical day in practice. These characteristics have been derived from a prior survey of over three hundred physicians. Most physicians demonstrate these characteristics throughout their careers. However, as with any human interaction, some physicians demonstrate such behavior more often and more consistently than others. What we would like to learn from you is which physician(s) (family physician, specialist) in your area best fit the descriptive paragraphs that follow.

Please read each paragraph carefully and indicate the name(s) of the physician(s) that best fit each description. You may write the names of up to three physicians for each paragraph. The same physician may be named in more than one paragraph. Remember, all information on this survey is strictly confidential.

Paragraph A

They convey information in such a fashion as to provide a learning experience. They express themselves clearly and to the point - provide practical information first and then an explanation or rationale if time allows. They take the time to answer you completely and do not leave you with the feeling that they were too busy to answer your inquiry. They enjoy and are willing to share any knowledge they have.

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Paragraph B

They are individuals who like to teach. They are current and up-to-date and demonstrate a command of medical knowledge. They demonstrate a high level of clinical expertise.

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Paragraph C

They are "caring" physicians who demonstrate a high level of humanistic concern. They never talk down to you; they treat you as an equal even though it's clear they are helping you.

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Appendix I: Educational Influential Survey
This paragraph is specifically related to whom you seek clinically relevant musculoskeletal information.

**Paragraph D**

They are health professionals (physicians, specialists, therapists) in your community that you seek clinically relevant information about musculoskeletal problems.

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**DEMOGRAPHIC INFORMATION:** In this section we would like to know something about you and your practice.

1. In which year did you graduate? *(Fill in the box and the appropriate circles)*
   - 19__

2. Did you take a: *(fill in all that apply)*
   - O rotating internship
   - O straight internship
   - O family practice residency
   - O other residency

3. Is your practice: *(check all that apply)*
   - O group
   - O solo
   - O rural
   - O regional
   - O metropolitan

*Rural* is defined as those 40 kilometres away from a regional medical centre with a population of 2,500 or less and fewer than 20 practicing physicians; or communities which are 80 kilometres away from a regional medical centre which have up to 6,000 people. *Regional* communities include Nanaimo, Kelowna, Prince George, Kamloops, Chilliwack, and Sechelt. *Metropolitan* communities include Greater Vancouver and Victoria.

4. Are you
   - O male
   - O female

5. Do you have hospital admitting privileges?
   - O yes
   - O no
   - if yes, please list the hospital(s)

6. Do you work in an emergency room?
   - O yes
   - O no

7. Are you a member of the BC College of Family Physicians?
   - O yes
   - O no

Are there any other comments or suggestions you would like to make about continuing education needs related to whiplash or other musculoskeletal issues?

Thank you for your assistance

---

Appendix I: Educational Influential Survey
Appendix II: Curriculum Construction Instruments

Program Logic Model

**PHASE I**
**CURRICULUM DEVELOPMENT**
- Training the Trainers Workshop Materials Research and Development
- Grand Round Materials Research and Development
- Half and Full-Day CME Program Materials Research and Development
- Telemedicine - Audio-Conferencing Materials Research and Development
- World Wide Web Home Page Materials Research and Development

**PHASE II**
**EDUCATIONAL INFLUENTIALS**
- Identify Educational Influentials through survey to all family physicians in BC
- Select and Recruit 20 Educational Influentials from 15 Regions in BC
- Train Selected Educational Influentials April 1997
- Educational Influentials provide CME Programs. Other physicians (selected by their peers through the survey) invited to attend CME programs in their Regions, to provide input and feedback on current materials and the development of additional resource materials

**PHASE III**
**CURRICULUM IMPLEMENTATION**
- Training of Trainers: Comprehensive one-day workshop addressing content, effective presentation techniques, program marketing and media relations
- Grand Rounds: 94 One hour Grand Rounds throughout BC presented by the BC College of Family Physicians
- CME Programs: 25-35 Half and Full-Day Continuing Medical Education programs throughout the province of BC, implemented by the UBC’s Division of CME
- Telemedicine - Audio-Conferencing: 2 One Hour Teleconferences delivered to 30 rural sites throughout BC by the UBC’s Rural Training Program, Department of Family Practice
- World Wide Web: Multi-Media, Interactive BC Whiplash Initiative Home Page, containing BCWI curriculum materials and a variety of other resource materials on WAD, content expert names, discussion groups, simulated case studies

**PHASE IV**
**RESEARCH AND EVALUATION**
- Family Doctors, Emergency Physicians, Undergraduate Medical Students, Family Practice Residents become aware of the BCWI as a source for education, training and resource materials on Whiplash Associated Disorders
- Family Doctors, Emergency Physicians, Undergraduate Medical Students, Family Practice Residents access BCWI events and materials
- Family Doctors, Emergency Physicians, Undergraduate Medical Students, Family Practice Residents gain new knowledge or re-enforce existing knowledge about appropriate practices for WAD
- Family Doctors, Emergency Physicians, Undergraduate Medical Students, Family Practice Residents change their attitudes and behaviors regarding WAD, as reflected in changes in the following indicators: diagnostic investigations, referral patterns, pharmaceutical and therapeutic interventions
- Potential Long-Term Outcomes: Better Patient Care following WAD Injury, Appropriate Diagnosis and Management of WAD injury by FPs, EMPs and SMP, Appropriate utilisation of services and costs associated with WAD Injuries
BCWI Content and Procedural Objectives

WAD Module I and II

• Obtain a thorough accident dynamics history
• Relate the key history features of the collision dynamics the injury exposure
• Describe the pathology related to physical neck trauma that occur in WAD
• Describe the physiological stages of injury healing that occurs for WAD
• State the natural course of injury for WAD
• Identify biopsychosocial and iatrogenic factors that may influence prognosis.
• Identify the key diagnostic features used to differentiate WAD 0 – IV
• Take the patient’s clinical history including: timing of symptom onset, location of symptoms, severity of symptoms, functionality of body parts, predisposing factors to injury complaints
• Physically examine a patient for neck injury and associated signs of WAD
• List the indications for investigative methods
• Identify which tests have false positive and false negative findings
• Explain the complication of tests and investigations
• Categorize WAD treatment options by treatment phase according to recommended, inconclusive evidence or not recommended
• Implement an effective treatment plan for WAD 0 – IV
• Formulate and execute a discharge plan
• Monitor and evaluate the progress of WAD 0 – IV
• Implement an effective treatment plan for WAD 0 – IV
• Formulate and execute a discharge plan
• Monitor and evaluate the progress of WAD 0 – IV
Editorial Review Guidelines to Improve Test Construction
(from Haladyna (237) p. 129-30)

General Item Writing (Procedural)
1. Use either the best answer or the correct answer format.
2. Avoid complex multiple-choice (Type K) items.
3. Format the item vertically not horizontally.
4. Allow time for editing and other types of item revisions.
5. Use good grammar, punctuation, and spelling consistently.
6. Minimize examinee reading time in phrasing each item.
7. Avoid trick items, those that mislead or deceive test takers into answering incorrectly.

General Item Writing (Content Concerns)
8. Base each item on an education or instructional objective.
10. Keep the vocabulary consistent with the examinee’s level of understanding.
11. Avoid cuing one item with another; keep items independent of one another.
12. Use examples as a basis for developing your items.
13. Avoid overspecific knowledge when developing the item.
14. Avoid textbook, verbatim phrasing when developing the item.
15. Avoid items based on opinions.
16. Use multiple-choice to measure higher level thinking.
17. Test for important or significant material; avoid trivial material.

Stem Construction
18. State the stem in the question form instead of the completion form.
19. When using the completion format, do not leave a blank for completion in the beginning or middle of the stem.
20. Ensure that the directions in the stem are clear, and the wording lets the examinee know exactly what is being asked.
21. Avoid window dressing (excessive verbiage) in the stem.
22. Word the stem positively; avoid negative phrasing.
23. Include the central idea and most of the phrasing in the stem.

General Option Development
24. Use as many plausible distractors as are feasible.
25. Place options in logical or numerical order.
26. Keep options independent; options should not be overlapping.
27. Keep all options in an item homogenous in content.
28. Keep the length of options fairly consistent.
29. Avoid, or use sparingly, the phrase “all of the above.”
30. Avoid, or use sparingly, the phrase “none of the above.”
31. Avoid the use of the phrase “I don’t know.”
32. Phrase options positively, not negatively.
33. Avoid distractors that can clue test wise examinees; for example, avoid clang associations, absurd options, formal prompts, or semantic (overly specific or overly general) clues.
34. Avoid giving clues through the use of faulty grammatical construction.
35. Avoid specific determiners, such as “never” or “always.”

Correct Option Development

36. Position the correct option so that it appears about the same number of times in each possible position for a set of items.
37. Make sure there is one and only one correct option.

Distractor Development

38. Use plausible distractors; avoid illogical distractors.
39. Incorporate common errors of students in distractors.
40. Use technically phrased distractors.
41. Use familiar yet incorrect phrases as distractors.
42. Use true statements that do not correctly answer the item.
43. Avoid the use of humour when developing options.
<table>
<thead>
<tr>
<th>Core Enabling Educational Objectives of the BCWI</th>
<th>Question</th>
<th>Item - Objective Congruence</th>
<th>Relevance Level</th>
<th>Alternate Distractors</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the key diagnostic features used to include or exclude the various types of WAD.</td>
<td>Q # 5 - 13 The following series of questions...</td>
<td>Yes (Y) / No (N) / Unsure (U)</td>
<td>Essential (E) / Important (IV) OK / Not Relevant (N)</td>
<td>(Common Misconceptions)</td>
<td>Use Back if Necessary</td>
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<tr>
<td></td>
<td>Q # 5 General vague....</td>
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<td>Q # 6 Non-focal neck....</td>
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<td>Q # 7 Focal (point)....</td>
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<td>Q # 8 Non-radicular...</td>
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<td>Q # 9 Radicular deficits...</td>
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<td>Q # 10 Decreased range...</td>
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<td>Q # 11 Delayed onset...</td>
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<td>Q # 12 Immediate onset...</td>
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<td>Q # 13 Normal ROM...</td>
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<tr>
<td>Recognize inappropriate non-organic signs and symptoms of WAD and explain how signs and symptoms can magnify the appearance of WAD.</td>
<td>Q# 14 For the following options, please indicate...</td>
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<td>a. Dysphagia or</td>
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<td>b. Exaggerated or</td>
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<td>c. Discrepancy of</td>
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<td>d. Cog wheel arm</td>
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<td>e. Spasm</td>
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<td>f. Interscapular pain</td>
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<td>g. Dizziness</td>
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<td>h. Numb arm</td>
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<td></td>
<td>i. Wide area of</td>
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<td>j. Severe neck pain</td>
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<td>k. Focal neck pain</td>
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<td>l. Superficial neck tenderness</td>
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</table>

Appendix II: Objective Test Item Review Form
<table>
<thead>
<tr>
<th>QUESTION</th>
<th>ITEM - OBJECTIVE CONGRUENCE</th>
<th>RELEVANCE LEVEL</th>
<th>ALTERNATE DISTRACTORS</th>
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<tbody>
<tr>
<td>Q # 24 Bed rest</td>
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<td>Q # 25 Massage therapy</td>
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<td>Q # 26 Acupuncture</td>
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<td>Q # 27 TENS, ....</td>
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<td>Q # 28 Ultrasound</td>
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<td>Q # 29 Laser</td>
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<td>Q # 30 Spray and....</td>
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<td>Q # 31 Joint injections</td>
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<td>Q # 32 Soft tissue....</td>
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<td>Q # 33 Rest take it easy</td>
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<td>Q # 34 Short course....</td>
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<td>Q # 35 Long course....</td>
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<td>Q # 36 Education</td>
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<td>Q # 37 Reassurance....</td>
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<td>Q # 38 Stop work</td>
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<tr>
<td>Recognize WAD management options and categorize WAD II treatment options by treatment phase according to: effective (recommended), ineffective (not recommended), questionable (controversial).</td>
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<tr>
<td>Q #. 39 Regarding the...</td>
<td></td>
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<td>a. Muscle relaxant</td>
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<td>b. Opiate</td>
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<td>c. NSAID's</td>
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<td></td>
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<td>d. Acetaminophen</td>
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<td></td>
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<td>e. Anti-depressant</td>
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<td></td>
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<td></td>
<td>f. Opiate or</td>
</tr>
</tbody>
</table>
### Framework for Monitoring Activity Through ICBC-BCWI-PharmAnet Data Linkage

#### Section A

<table>
<thead>
<tr>
<th>What Is to Be Monitored on the PharmAnet Database</th>
<th>Specific Prescriptions Source: AHFS 1997</th>
<th>What Trends Are We Looking For?</th>
<th>Why Are We Monitoring This?</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Analgesics / NSAIDS</td>
<td>NSAIDS</td>
<td>Frequency of prescriptions for analgesics or NSAIDS should decrease for WAD I and II.</td>
<td>QTF states that analgesics or NSAIDS in combination with other treatment modalities were found to be of short-term benefit in WAD I and II presenting within 3 days of injury. The consensus based recommendation is that no medications should be prescribed for WAD I and that narcotic analgesics should not be prescribed for WAD I and II. Even though “not recommended treatment options” for WAD as outlined in the syllabus include the prescription of analgesics, sedatives and relaxants, treatment options for WAD that may be used, as outlined in the syllabus are: analgesics used on a very short time limited basis and NSAIDS on a time limited basis.</td>
<td>QTF on WAD Chapter 8.2.2 Page 6 Comprehensive Syllabus Pgs 70, 177</td>
</tr>
<tr>
<td>AHFS Classification: NSAIDS 28:06:04</td>
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<tr>
<td>Misc. Analgesics 28:06:92</td>
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<td>NSAIDS</td>
<td>Duration of the prescription should decrease.</td>
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<td></td>
<td>Diclofenac</td>
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<td>Diflunisal</td>
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<td>Etodolac</td>
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<td>Ibuprofen</td>
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<td></td>
<td>Indomethacin</td>
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<td></td>
<td>Ketoprofen</td>
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<td></td>
<td>Ketorolac</td>
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<td></td>
<td>Medofenamate</td>
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<td>Mefenamic Acid</td>
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<td></td>
<td>Nabumetone</td>
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<td>Naproxen</td>
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<td></td>
<td>Oxaprozin</td>
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<td></td>
<td>Phenylbutazone</td>
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<td>Piroxicam</td>
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<td></td>
<td>Sulindac</td>
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<td>Tolmetin</td>
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<td>Misc. Analgesics</td>
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<td></td>
<td>Acetaminophen</td>
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#### Section B

<table>
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<tr>
<th>What Is to Be Monitored on the PharmAnet Database</th>
<th>Specific Prescriptions Source: AHFS 1997</th>
<th>What Trends Are We Looking For?</th>
<th>Why Are We Monitoring This?</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td>Muscle Relaxants</td>
<td>Skeletal Muscle Relaxants</td>
<td>Muscle Relaxants should not be prescribed.</td>
<td>QTF consensus-based recommendation is that muscle relaxants should not generally be used in the acute phase of WAD.</td>
<td>QTF on WAD Chapter 8.2.2 Page 6 Comprehensive Syllabus Pgs 70, 177</td>
</tr>
<tr>
<td>AHFS Classification: Skeleton Muscle Relaxants 12:20</td>
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<td></td>
<td>Atracurium Besylate</td>
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<td>Doxacurium Chloride</td>
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<td>Metocurine Iodide</td>
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<td>Mivacurium Chloride</td>
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<td>Pancuronium Bromide</td>
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<td>Succinylcholine Chloride</td>
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<td>Vecuronium Bromide</td>
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<td>Orphenadrine Citrate</td>
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| Appendix II: Data Linkage Framework (Sample) |
### Appendix III: Implementation Checklist

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<thead>
<tr>
<th>Please Place a Check</th>
<th>Module I</th>
<th>Module II</th>
<th>WAD Diagnosis and Management</th>
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<tr>
<td>Introduction</td>
<td>WAD Natural Course of WAD Injury</td>
<td>QTF Proposed Classification of WAD</td>
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<td>Who is the BC Whiplash Initiative</td>
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<td>Module 1</td>
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<td>Mechanisms of Injury</td>
<td>Whiplash Definition</td>
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<td>Whiplash Claims Rate</td>
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<td>Factors Associated with Impact Dynamics</td>
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<td>Collision Process</td>
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<td>Proper Head Rest Adjustment</td>
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<td>Possible Injury Threshold</td>
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<td>Soft Tissue Injury, Sprains by Type</td>
<td>Imaging Studies</td>
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<td>Healing Times for 3rd Degree Injury</td>
<td>Need for X-rays</td>
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<td>What Do We Know About Natural Course</td>
<td>Imaging Studies</td>
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<td>Other Imaging Studies</td>
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<td>Prognosis Cont'd</td>
<td>WAD Management</td>
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<td>Biopsychosocial Factors</td>
<td>WAD Grade I Recommended Treatment Options</td>
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<td>Compensation - Litigation Factors</td>
<td>WAD Grade II or III Recommended Treatment Options</td>
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<td>Iatrogenic Factors</td>
<td>WAD Grades II or III Inconclusive Treatment Options</td>
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<td>WAD Grade I Not Recommended Treatment Options</td>
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<td>Grade II or III Not Recommended Treatment Options</td>
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<td>Important Points to Tell Patients</td>
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<td>What is the Rationale for Exercise</td>
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<td></td>
<td>Neck Exercises Should Include</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neck Specific Exercise Sampler</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Some Neck Exercises</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neck Exercises Continued</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patients Should be Advised</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physician’s Role in Communication</td>
<td></td>
</tr>
</tbody>
</table>

Appendix III: Implementation Checklist

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Demographic Form

BC Whiplash Initiative

Please print letters and number as shown in this example in uppercase. Do not touch the sides of the boxes.

Please mark your selected boxes with an 'X' as shown in this example.

Last Name
First Name
Your MSP Billing Number
Practice Postal Code

3. a) Have you had previous significant exposure to evidence-based teaching on Whiplash?
   - Yes  No  If yes, please check which type of exposure to evidence-based teaching on Whiplash and indicate the length of exposure (complete all that apply).
   - Grand Round  Length: ___ hrs
   - CME Program  Length: ___ hrs
   - World Wide Web  Length: ___ hrs
   - Other Exposure  Length: ___ hrs  If other, please specify (eg Spine 1995 Special Edition, QTF Report on Whiplash Associated Disorders)

b) How knowledgeable are you with the content of Spine 1995 Special Edition QTF Report on Whiplash Associated Disorders?
   Please circle: 1 2 3 4 5 6 7

Not at all  Extremely Knowledgeable

4. You are a:
   - General or Family Practitioner  CCFP Certificant
   - Specialist:
     - Rheumatology  Orthopaedics  Sports Medicine  Physical Medicine
     - Emergency  Full-time  Part-time
   - Other  If Other, please specify

5. Please describe your current practice (mark all that apply).
   a) Time  Full-time  Part-time  Locums
   b) Where  Hospital-based (eg ER)  Community-based
   c) Style of Practice  Solo  Group
   *please specify if Specialty Clinic (eg Sports Medicine)

6. Year of Graduation from Medical School:

7. Number of years in practice:

8. On average, how many NEW whiplash patients do you see per month?
   Please specify number if > 9

Revised 08/30/98  Please submit this page to the Research Assistant

Appendix III: Demographic Form
A MEMO TO MYSELF

1. In order to assist you in making this learning activity of more value to you, take a moment to consider the most important aspects of the material presented and discussed.

2. Please write down 3 things in the space at the bottom, that you will do when you return to your practice, as a result of this learning activity. *Do not put your name on the sheet.

3. Place the top copy of your memo into the envelope provided, address it to yourself and seal it. Return the sealed envelope to the co-ordinator. This will be mailed to you in a couple of weeks.

4. The remaining copy will be collected.

5. All responses are anonymous and will be collected to assist the organizers in evaluating the event.

A MEMO TO MYSELF

1.

2.

3.
Interview Guide: Following Initial Programs

Evaluation of Whiplash CME Programs – Interviews

1. How will this course affect your clinical practice? (Interview)
2. How will you modify your clinical practice (diagnosing, treating, managing, etc.)? (Form)
3. To what extent has the CME program met your needs to provide care to patients presenting with Whiplash Associated Disorders? (Interview and Form)
4. Are there gaps in your knowledge of Whiplash Associated Disorders? What are they?
5. Were the materials relevant to your practice? (Form and Interview)
6. How could this Whiplash CME program be improved? (Form)
Knowledge Test

8. to 30. For a case of Whiplash Grade II, some possible treatments are listed in the left column. In the right columns, indicate in which category it belongs. For this question, each item belongs in only one column, so choose the column that best represents this treatment.

<table>
<thead>
<tr>
<th>Treatment option</th>
<th>Considered to have value</th>
<th>Evidence Inconclusive</th>
<th>Considered harmful</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Muscle relaxant drug</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>9. Tranquilizers</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>10. Opiate analgesic until all pain is relieved</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>11. NSAID's first weeks</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>12. Long term maintenance drug of choice</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>13. Cervical pillow</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>15. Massage therapy</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>17. Cervical collar after 72 hours</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>18. Acupuncture</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>19. TENS, Interferential, or muscle stim</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>20. Ultrasound</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>21. Laser</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>22. Spray and stretch</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>23. Joint injections</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>24. Short course manipulation/mobilizations</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>25. Long course manipulation/mobilizations</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>26. Soft tissue injections</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>27. Rest take it easy</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>28. Education</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>29. Reassurance (realistic)</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
<tr>
<td>30. Stop work</td>
<td>a.</td>
<td>b.</td>
<td>c.</td>
</tr>
</tbody>
</table>

31. For a case of whiplash Grade I, choose four key management strategies.

a. Activity as usual.
b. Exercises, home based.
c. Stop work.
d. Muscle relaxants.
e. Education.
f. X-ray.
g. Reassurance.
h. Rest, take it easy.
i. Collar.
j. TENS, Laser, and/or ultrasound.
Speaker Evaluation Form

BC WHIPLASH INITIATIVE
SPEAKER EVALUATION

<table>
<thead>
<tr>
<th>Speaker Name:</th>
<th>Excellent</th>
<th>Average</th>
<th>Poor</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledgeable about the subject</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Handling of group discussions and questions</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Clarity of relationships between various topics treated in the course</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Audio-visual presentation</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Able to relate to participant in a way which promoted mutual respect</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Speaker Strengths:</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Speaker Weakness:</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please return this to the Research Assistant on-site, or mail to:

Appendix III: Speaker Evaluation Form for Delegates
**Speaker Feedback Form**

**SPEAKER:**

**LOCATION:**

**DATE OF CME:**

1. a) What elements in your presentation were particularly effective?
   
   b) What elements would you change?

2. What elements did you change from your May 9th presentation in Vancouver at UBC?

3. a) Do you have recommendations for other slides/overheads? If yes, please specify.
   
   b) Similarly, should any of the existing slides or overheads be modified or removed? If yes, which ones?

4. a) Did you have adequate time to cover the material?
   
   b) If not, what recommendations do you have?

5. a) Have you used the cases provided?
   
   b) Have you made up other cases?

   c) Would you like to share it with other presenters?

6. Did you present any videos?

   Which one(s)?

7. What props did you use for the presentation?

8. How useful was the Trainer’s Guide?

9. a) Have you incorporated any of the teaching methods mentioned in the manual?
   
   b) If yes, what worked and what didn’t?

   c) What style of teaching did you utilize?

10. What tips would you like to share with other presenters?

11. What other experiences that you had, would you like to share with others?

12. What would you be interested in contributing to the Trainer’s newsletter?

13. How can the administration of the programme be improved?

14. How can the delivery of the Research Component of the programme be improved?

15. Any other feedback you would like to share.
Program Evaluation Form

BC Whiplash Initiative
Whiplash Continuing Medical Education

<table>
<thead>
<tr>
<th>DATE:</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION:</td>
<td></td>
</tr>
</tbody>
</table>

- General or Family Practitioner
- Specialty Practice
  - Rheumatology
  - Orthopaedics
  - Sports Medicine
  - Physical Medicine
  - Emergency Medicine
  - Other, please specify

Year of Graduation: ____________________

DIRECTION: Please circle the number which reflects your assessment of each of the following aspects of this CME programme.

1 = Unsatisfactory, 4 = Satisfactory, 7 = Exceptional.

To help us improve the effectiveness of CME programmes, please add comments where you feel they would be appropriate.

1. **PROGRAM CONTENT:** Relevance to my practice
   - 1 2 3 4 5 6 7
   - Comments: __________________________________________

2. **PROGRAM CONTENT:** Compatibility with my expectations
   - 1 2 3 4 5 6 7
   - Comments: __________________________________________

3. **PROGRAM FORMAT:** Lectures, Discussions, Audience Size, etc.
   - 1 2 3 4 5 6 7
   - Comments: __________________________________________

4. **PROGRAM STRUCTURE:** Length
   - 1 2 3 4 5 6 7
   - Comments: __________________________________________

5. **PERCEIVED LEARNING:** How would you rate the amount you have learned in this continuing medical education program compared to similar CMES?
   - 1 2 3 4 5 6 7
   - Comments: __________________________________________

6. **OVERALL RATING OF THIS CME PROGRAM:**
   - 1 2 3 4 5 6 7
   - Comments: __________________________________________

Appendix III: Program Evaluation Form for Delegates

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7. What was the most effective part of the program? Indicate why.

________________________________________________________________________

________________________________________________________________________

8. What was the least effective part of this program? Indicate why.

________________________________________________________________________

________________________________________________________________________

9. How could this program have been improved?

________________________________________________________________________

________________________________________________________________________

10. What are likely barriers to implementing QTF recommendations in your practice? Please comment on your choices.

☐ General disagreement with recommendations  ☐ Lack of confidence in recommendations

☐ Lack of knowledge about available healthcare resources in community, please specify

☐ Lack of other resources, please specify

☐ Lack of time to counsel patient  ☐ Need more training in patient counselling

☐ Lack of ongoing support, please specify

☐ Other, (and/or comments on selected choices)

________________________________________________________________________

11. What are likely barriers to implementing the CMA's policy on earlier patient return-to-work in your practice?

☐ Unsure of CMA's policy  ☐ Lack of time for patient counselling

☐ Lack of standard management plan (need for procedural guidelines, algorithms etc.), please specify

☐ Reluctance to contact employer, please specify areas of concern

☐ Unsure of resources available (work conditioning programs, functional capacity assessors etc.) please specify

☐ Other, please specify

________________________________________________________________________

12. Additional comments or suggestions:

________________________________________________________________________

________________________________________________________________________

13. Please list Topics for future programs as well as possible Teachers:

________________________________________________________________________

________________________________________________________________________

Please return this to the Research Assistant on-site, or mail to:
Post-CME Exposure Survey

Since the BCWI workshop you attended six months ago, have you had further exposure to evidence-based teaching on whiplash? Y N

If yes, please indicate the source of information:

Attended whiplash-related courses Y N If yes please list

Read whiplash-related journal articles Y N If yes please list

Other, please list:

Have you consulted with colleagues to further your knowledge-base about whiplash-associated disorders since the CME course? Y N If yes how many times? _____

Have you shared your knowledge about whiplash-associated disorders with colleagues since the CME course? Y N If yes how many times? _____

Have you used the BCWI Comprehensive Syllabus materials since the course? Y N If yes, how many times? _____

On average how many NEW whiplash patients do you see per month? ______

Rate the following characteristics of the BCWI Comprehensive Syllabus handed out at the course. (1 = Unsatisfactory, 4 = Satisfactory, 7 = Exceptional).

Presentation of material (graphics and layout) 1 2 3 4 5 6 7

Ease of use 1 2 3 4 5 6 7

Relevant to clinical practice 1 2 3 4 5 6 7

Would you recommend the Syllabus reference material to your colleagues? Y N

(please turn page over)
Since the workshop have you experienced any barriers to implementing QTF recommendations in your practice? Please comment on your choices.

- General disagreement with recommendations
- Lack of confidence in recommendations
- Lack of knowledge about available healthcare resources in community, please specify
- Lack of other resources, please specify
- Lack of time to counsel patient
- Need more training in patient counselling
- Lack of ongoing support, please specify
- Other, (and/or comments on selected choices)

Since the workshop have you experienced any barriers to implementing the CMA’s policy on earlier patient return-to-work in your practice?

- Unsure of CMA’s policy
- Lack of time for patient counselling
- Lack of standard management plan (need for procedural guidelines, algorithms etc.), please specify
- Reluctance to contact employer, please specify areas of concern
- Unsure of resources available (work conditioning programs, functional capacity assessors etc.) please specify
- Other, please specify

Additional comments or suggestions:

Thank You – your results will be sent to you within 60 days.
Diffusion Survey

Research into physician information-seeking behaviour shows that physicians use a wide variety of sources to improve their knowledge base. An important source of information is informal collegial communication. The purpose of this quarterly survey is to track this type of communication about patients presenting with whiplash-associated disorders.

Please jot down the characteristics of each discussion you have had with colleagues in which you have acted as a resource about whiplash-associated disorders:

<table>
<thead>
<tr>
<th>Date of interaction:</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td></td>
</tr>
<tr>
<td>Physical Findings</td>
<td></td>
</tr>
<tr>
<td>Diagnostics</td>
<td></td>
</tr>
<tr>
<td>X-rays</td>
<td>Other, please specify in space provided for additional comments</td>
</tr>
<tr>
<td>Management Issues</td>
<td></td>
</tr>
<tr>
<td>Mobilization</td>
<td></td>
</tr>
<tr>
<td>Activity levels</td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
</tr>
<tr>
<td>Medications</td>
<td></td>
</tr>
<tr>
<td>Adjunctive Therapies (physiotherapy, chiropractic, massage)</td>
<td>Other, please specify in space provided for additional comments</td>
</tr>
</tbody>
</table>

Name of Colleague (optional)

---

<table>
<thead>
<tr>
<th>Date of interaction:</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td></td>
</tr>
<tr>
<td>Physical Findings</td>
<td></td>
</tr>
<tr>
<td>Diagnostics</td>
<td></td>
</tr>
<tr>
<td>X-rays</td>
<td>Other, please specify in space provided for additional comments</td>
</tr>
<tr>
<td>Management Issues</td>
<td></td>
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<tr>
<td>Mobilization</td>
<td></td>
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<tr>
<td>Activity levels</td>
<td></td>
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<tr>
<td>Exercise</td>
<td></td>
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<tr>
<td>Medications</td>
<td></td>
</tr>
<tr>
<td>Adjunctive Therapies (physiotherapy, chiropractic, massage)</td>
<td>Other, please specify in space provided for additional comments</td>
</tr>
</tbody>
</table>

Name of Colleague (optional)
## Program Evaluation Standards Checklist

<table>
<thead>
<tr>
<th>Standard</th>
<th>Was addressed</th>
<th>Partially addressed</th>
<th>Not addressed</th>
<th>Not applicable</th>
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<tr>
<td>U1</td>
<td>Stakeholder Identification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2</td>
<td>Evaluator Credibility</td>
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</tr>
<tr>
<td>U3</td>
<td>Information Scope and Selection</td>
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<td></td>
</tr>
<tr>
<td>U4</td>
<td>Values Identification</td>
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<tr>
<td>U5</td>
<td>Report Clarity</td>
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</tr>
<tr>
<td>U6</td>
<td>Report Timeliness &amp; Dissemination</td>
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<td>U7</td>
<td>Evaluation Impact</td>
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<td>F1</td>
<td>Practical Procedures</td>
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<td>F2</td>
<td>Political Viability</td>
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<td></td>
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</tr>
<tr>
<td>F3</td>
<td>Cost Effectiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Service Orientation</td>
<td></td>
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<td>P2</td>
<td>Formal Agreement</td>
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<td>P3</td>
<td>Rights of Human Subjects</td>
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<tr>
<td>P4</td>
<td>Human Interactions</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>P5</td>
<td>Complete and Fair Assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td>Disclosure of Findings</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>P7</td>
<td>Conflict of Interest</td>
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<tr>
<td>P8</td>
<td>Fiscal Responsibility</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>A1</td>
<td>Program Documentation</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>A2</td>
<td>Context Analysis</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>A3</td>
<td>Described Purpose and Procedures</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>A4</td>
<td>Defensible Information Services</td>
<td></td>
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<tr>
<td>A5</td>
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<td>A6</td>
<td>Reliable Information</td>
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<td>A7</td>
<td>Systematic Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A8</td>
<td>Analysis of Quantitative Information</td>
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<tr>
<td>A9</td>
<td>Analysis of Qualitative Information</td>
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<tr>
<td>A10</td>
<td>Justified conclusions</td>
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<tr>
<td>A11</td>
<td>Impartial Reporting</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>A12</td>
<td>Meta-evaluation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**U6** - The Final Report was disseminated in a timely fashion, however, supplier programming, staffing problems and supplier defined coding issues has led to significant delays with the Data linkage Project.

**F2** - The Trial Lawyers Association of British Columbia believed the program was influenced by the industry sponsor and was being used as a vehicle to promote 'no fault insurance' and was critical of some of the QTF definitions and recommendations.
Appendix IV: Sample Materials

Sample Prototypical Program Evaluation Form for Delegates

EVALUATION PROGRAM

In order to qualify for Category 1 credit, please complete this form at the conclusion of the education activity.

TITLE: ____________________________________________

DATE: ____________________________________________

SPONSOR: __________________________________________

1. This program (please check all that apply):

   ______ Met stated objectives.
   ______ Will alter my practice performance.
   ______ Won’t alter, but convinced me I’m doing the right thing.
   ______ Will be relevant to my practice.
   ______ Will not be relevant to my practice.
   ______ Made me wish I’d stayed at home.
   ______ Satisfied my expectation.

   ___________________________ Excellent
   ___________________________ Very Good
   ___________________________ Good
   ___________________________ Fair
   ___________________________ Poor

2. The presentations were:

3. The facilities for presentations were:

4. (If applicable) The illustrative materials were:

5. Other comments:

   ____________________________________________
   ____________________________________________
   ____________________________________________

6. Suggestions for Future Activities:

   ____________________________________________
   ____________________________________________
   ____________________________________________
Sample Speaker Feedback Form

EVALUATION BY SPEAKER

(To be submitted by speaker, after the program, evaluating the audience and the facilities)

Please indicate your assessment of the program at which you spoke, using this scale:

1 = poor  
2 = fair  
3 = satisfactory  
4 = good  
5 = excellent

<table>
<thead>
<tr>
<th>The participants</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td></td>
</tr>
<tr>
<td>Enthusiasm</td>
<td></td>
</tr>
<tr>
<td>Involvement in discussion</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The room</td>
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<tr>
<td>Audiovisual equipment</td>
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</tbody>
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Diagnosis

Classification of WAD

The QTF could not find a consistent classification system for all clinical aspects related to WAD. As a result, the priority was to propose unambiguous descriptions, definitions and classifications to facilitate evaluating original data that would be helpful to the clinician, and to aid in making recommendations for research. One of the most important contributions of the Task Force is the Quebec Classification of WAD. Future research will determine whether refinement is required to enhance the discriminating properties of the classification and to establish the validity of the proposed categories.

Slide 19
What is this new classification?

<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical Presentation</th>
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<tbody>
<tr>
<td>0</td>
<td>No complaints about the neck</td>
</tr>
<tr>
<td></td>
<td>No physical sign(s)</td>
</tr>
<tr>
<td>I</td>
<td>Neck complaint of pain, stiffness, or tenderness only</td>
</tr>
<tr>
<td></td>
<td>No physical sign(s)</td>
</tr>
<tr>
<td>II</td>
<td>Neck complaints AND Musculoskeletal sign(s)*</td>
</tr>
<tr>
<td>III</td>
<td>Neck complaints AND Neurological sign(s)**</td>
</tr>
<tr>
<td>IV</td>
<td>Neck complaints AND Fracture or dislocation</td>
</tr>
</tbody>
</table>

* Musculoskeletal signs include decreased range of motion and point tenderness.

** Neurologic signs include decreased or absent deep tendon reflexes, weakness, and sensory deficits.
Your guide to Whiplash Recovery

New approaches to whiplash can help you recover more quickly.

This pamphlet describes what whiplash is and provides tips that will help you get better.

"Whiplash" is a term often used to describe any uneven movement between your head and body that injures your neck.

Muscles, ligaments, discs, nerves, or some combination of these may be hurt. Injuries to any of these soft tissues can produce similar symptoms. It’s not always possible to know what has been damaged, however treatment for soft tissue injuries are similar. Nerve damage can be identified by your physician.

Whiplash can be avoided or reduced with proper headrest adjustment. The top of the headrest should be level to or higher than your ears.

Your doctor can best assess what diagnostic tests might be useful. X-rays may be recommended to screen for bony injuries. CT and MRI scans are generally not useful in whiplash.

What is Whiplash?

What part is injured?

Can I prevent Whiplash?

What about x-rays and scans?
Are there other things that can cause neck pain besides a whiplash?

Neck and shoulder pain are not uncommon in the general population. Sitting without moving for long periods of time and lack of exercise can lead to symptoms that are similar to whiplash. It's important to keep your neck in shape, especially if you've already suffered a whiplash injury. There are also other disorders that can cause neck aches. Your doctor is trained to find them.

What's the recovery time?

Every case is different. Aches and pains are part of the body's reaction to trauma and stress. Most people can continue with their normal activities and work even though their symptoms may take weeks or months to subside. It takes time for your body to heal. Of those requiring some time away from work, most can return to their usual activities within weeks. Only 3–5% of patients remain on disability after one year.

What treatments are helpful?

Most whiplash cases respond to a simple approach:
- Keep generally active, and do some neck exercises
- Stay at work or return as soon as you're able
- Make time for activities that help reduce stress
- Keep a positive attitude

Ask your doctor for a Neck Exercise sheet.
The following are some recommendations:

- Use of narcotic painkillers or muscle relaxants are generally not recommended and may be harmful.
- Stay active. Prolonged rest or use of a collar weakens tissues and slows recovery. Many people do not require a collar.
- Neck manipulation by a trained professional may be helpful in the beginning, but is not recommended as a long-term treatment.
- Passive treatments such as hot/cold packs, acupuncture, massage, TENS or electro-stimulation methods are not recommended for prolonged periods. Most passive treatments should be combined with an active exercise program.
- Magnets or magnetic therapy have failed to show benefits in short or long term treatments.
- As a general rule-of-thumb, if any treatment is going to help, you should feel some improvement in days to weeks. If not, check with your doctor again.

It doesn’t mean just staying in bed. Complete rest promotes muscle and other soft tissue weakness, especially around injured tissues. It does mean avoiding activities that involve sudden or jerky movements. “Active rest” is OK, take a few breaks or a brief rest in order to do more activity afterwards. In general, walking, cycling, stairmasters, and even swimming may be appropriate, check with your physician.
Who's most likely to get Whiplash?

Studies show young women with flexible necks who are not very muscular, are more prone to whiplash. So too are frail or elderly people with neck arthritis. While these two groups are more prone to whiplash, their return to usual activities is generally about the same as others.

Is it in my head?

Most physical pain and suffering has a psychological component, especially when pain persists, it can sometimes cause fear, anxiety, and depression. That is normal. However, if you focus too much on your suffering, the fears and anxieties can actually make the problem worse. If you find yourself dwelling on pain and suffering, reassure yourself, and seek help from your doctor.

How do I know if I'm getting better?

Recovery from whiplash begins with increased function, even though you feel the same pain. If you are becoming more active, you are getting better. The pain is usually the last thing to go. Doing less will end up hurting more.

When should I return to work?

A recent study compared whiplash patients who were told to stay at work with those who were told to stay off work for two weeks. All other treatments were the same. The “stay at work” group did the best. There is something therapeutic about staying in the mainstream of your life. Losing the momentum of your usual activities could delay your recovery. Coping with some pain is not dangerous, and you will be better off in the long run.

Precaution: Most whiplash experts agree that exercise is generally safe and helpful during the healing process. Just in case, talk with your doctor to make sure it is safe for you.
Precaution: Most whiplash experts agree that exercise is generally safe and helpful during the healing process. Just in case, talk with your doctor to make sure it is safe for you.

Stop and contact your doctor if you notice:
- Dizziness, spinning feeling, vertigo, confusion, blurred vision, fainting episodes, or disorientation.
- Sudden pain shooting down the arm, or numbness and/or weakness in an arm or hand.
- Unusually severe or persistent neck pain.

These exercises can be done almost any time and any place.

For each exercise:
- When doing your neck exercises, do them smoothly, not with sudden jerks. Try to keep your mouth and jaw relaxed.
- Move your head as far as it will go and hold for about five seconds. Then move in the opposite direction.
- Try to be equal in your motions to each side, and if one side is stiffer, that is probably the direction you need to do more work on.
- Expect some discomfort.

For exercises #1–4 repeat about five times in each direction. Repeat the recommended exercises three to five times per day. Also consider some general exercises and aerobic exercises. It’s important to keep the rest of your body in shape, too!

1. Back & Forth (Flexion & Extension)
   - Tilt your head backwards as far as possible, hold for about five seconds. Then tilt your head forward as far as you can. Gentle pressure of your hands on your head may help.

2. Rotation
   - Rotate your head and upper body all the way to one side, hold for five seconds then rotate to the other side and hold for five seconds.
   - A little added pressure using your finger on your cheek may help to move all the way.

3. Side to Side
   - Tilt head and upper back sideways, let your head relax for five seconds, then move to other side and let your head relax for five seconds. Gentle pressure on your head may help to move all the way.

4. Diagonal
   - Turn head to one side, then look all the way up, then all the way down, repeat on other side. Repeat this set 5 times.

5. Rock & Roll
   - Lie on your back and roll your head gently to each side. Repeat this rocking motion about 20 to 30 times.