INTRAMUSCULAR INJECTIONS:

A COMPARISON OF TWO TEACHING STRATEGIES

By

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Abstract

This comparative study was designed to compare two instructional techniques in teaching nursing students to administer intramuscular injections. Specifically, this study investigated student performance in the cognitive, psychomotor and affective learning domains using a performance checklist. Woodruff's (1967) Cognitive Model of Learning and Instruction provided the theoretical framework to support this study. The sample included a total of 47 second year students from one baccalaureate nursing program. Twenty nursing students comprised the experimental group and 27 students comprised the control group. The experimental group of students participated in simulated role-played situations during their laboratory instruction of injection administration. Data were collected using an investigator-developed performance checklist and analyzed using independent t-tests. The mean scores obtained on the checklists were compared between the experimental and control groups. The study findings indicated no statistically significant differences between the two groups. The study did find both instructional techniques to be equally effective.

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Chapter One

Introduction

Background to the Problem

Currently, 8,184 registered nurses graduate annually in Canada from either a baccalaureate or diploma nursing program (Statistics Canada, 1991). These graduates are expected by society to provide consistently competent and knowledgeable nursing care (Taylor & Cleveland, 1984). Therefore, preparing nursing students adequately for clinical practice is a challenge for all nurse educators.

Learning psychomotor skills for use in the clinical setting is an integral part of all basic nursing programs. Consequently, psychomotor skill acquisition and associated teaching strategies are of interest to nurse educators. Learning of these psychomotor skills occurs in the cognitive, affective and psychomotor domains of learning (Reilly & Oermann, 1992). Cognitive learning involves knowledge of concepts and principles necessary for decision making relative to performance of a given skill in a given client

situation (Bruner, 1960). "Affective competency requires [the use of] cognitive skills of choice and decision making and a pattern of behaviour reflective of commitment to the choice made" (Reilly & Oermann, 1992, p. 292). Psychomotor learning involves achieving skill with the motor movements inherent in the performance of psychomotor tasks (Bloom, 1956).

Traditionally, psychomotor skills have been taught using a textbook reading assignment and demonstration with a return-demonstration of the skill in a practice laboratory (Baldwin, Hill, & Hanson, 1991; Infante, 1985). The major emphasis has been on developing the necessary motor skills without the inclusion of important ancillary knowledge not directly related to skill performance. Ultimately, students will need to use a range of knowledge incorporating all three domains of learning when performing skills in real-life client situations. The teaching of the related knowledge and values important in carrying out a skill requires different instructional methods than those used for promoting mainly motor skill development.

One such specific skill taught in a practice laboratory that requires competency prior to practice

in the clinical setting is the administration of intramuscular (IM) injections. Traditionally, nursing students have been taught to administer IM injections by the demonstration-return demonstration method emphasizing mainly the psychomotor domain of learning (Baldwin, Hill, & Hanson, 1991; Infante, 1985). The administration of injections has been identified as one of the most anxiety producing skills learned by students (Bell, 1991; Kieffer, 1984; Kleehammer & Keck, 1990; Reilly & Oermann, 1985). To perform this skill competently, a broader method of teaching is needed to facilitate learning in all domains of learning.

Simulation is a teaching strategy that allows for skill learning in more than one domain of learning, while continuing to allow for patient safety, as does the demonstration-return demonstration method (de Tornyay & Thompson, 1987; Evans, 1989; Hanna, 1991; Infante, 1985). Demonstration-return demonstration allows students to practice in the laboratory and gain specific knowledge and skills. The use of simulation differs from the traditional method of demonstration-return demonstration in that students are allowed to

apply their learned knowledge, attitudes and skills in simulated realistic client situations by assuming roles as both clients and as nurses (de Tornyay & Thompson, 1987; Hanna, 1991). In so doing, students learn how to make clinical judgements about the clients' needs and feelings and respond to different sets of variables commonly found in the clinical setting. In more detail, de Tornyay and Thompson describe simulation as:

> A realistic representation of the structure or dynamics of a real thing or process with which the participator, as an active part of the experience, interacts with persons or things in the environment, applies previously learned knowledge to make responses (decisions and actions) to deal with a problem or situation, and receives feedback about responses without the direct real-life consequences. (p. 26)

Simulation, as a representation of a real-life situation, is believed to increase the transfer of learning to the clinical setting as a result of the inherent decision making process (Swendsen Boss, 1985). deTornyay and Thompson (1987) support Swendsen Boss' beliefs that by using simulated experiences, students are required to make decisions and to judge decisions made by others. Affective learning is facilitated by simulations as students are given the opportunity to role play and evaluate their practice during simulation

learning. When they participate as clients, they are better able to appreciate how clients want to be treated. When they participate as nurses, they are better able to appreciate how nurses may experience anxiety about administering injections, causing discomfort to clients and/or consideration of the consequences of their actions.

It is possible that the traditional instructional technique of demonstration-return demonstration fails to prepare nursing students adequately to administer injections in clinical practice. Using simulation as a teaching strategy has possibilities for assisting nursing students to learn to administer IM injections more effectively. The use of such an instructional strategy that more closely resembles the real life situation may facilitate opportunities for a synthesis of learning in all the domains of learning.

Problem Statement

Recently, a number of nurse researchers have focused their efforts on exploring psychomotor skill acquisition (Baldwin, Hill, & Hanson, 1991; Goldsmith, 1984; Gomez & Gomez, 1987; Megel, Wilken, & Volcek,

1987; Reilly & Oermann, 1992). While there are a number of related studies involving the acquisition of skills in the laboratory, little is known about the most effective teaching strategy to promote competence in nursing students' performance in administering IM injections. The administration of IM injections, a known area of high student anxiety, requires application of knowledge using all domains of learning to perform competently in actual clinical practice situations. Traditional demonstration-return demonstration focuses on the psychomotor domain. The question arises whether the traditional demonstration-return demonstration teaching strategy prepares nursing students adequately to administer IM injections in clinical practice.

Purpose of the Study

The purpose of this study was to compare the difference in the effectiveness of two instructional techniques in teaching nursing students to administer IM injections.

Hypotheses

1. There will be a significant difference in psychomotor skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist.
2. There will be a significant difference in cognitive skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist.
3. There will be a significant difference in affective skill learning between students who learn to administer IM injections through simulation and students who learn using the

traditional demonstration-return demonstration method of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist.

Definition of Terms

Demonstration-return demonstration. The performance of an IM injection in its entirety by the nursing instructor, occurring in the laboratory, followed by instructor-guided return performance of IM injections by nursing students on an inanimate object (Eaton, 1987).

Simulation. A realistic representation of clinical situations requiring students to role play IM injection administration in the laboratory where, in three situations students assume the role of the client, and in three different situations they assume the role of the nurse (deTornyay & Thompson, 1987).

Decision making. The ability to apply knowledge to a situation and choose one possible alternative when administering IM injections (Bloom, 1956).

Performance. The specific act of administration of IM injections in response to cognitive, affective and psychomotor learning as rated by the performance checklist (Reilly & Oermann, 1992).

Intramuscular Injection. Form of injection in which the solution is introduced into the body of a muscle (Potter & Perry, 1993).

Assumptions

1. Competence in psychomotor skills is necessary for nursing students to be accountable in their nursing practice.
2. Transfer of learning occurs between the laboratory and the clinical setting.
3. The goal of laboratory learning is to prepare students to perform competently prior to performing in the clinical setting and to enhance skill performance in the clinical setting.

Conceptual Framework

Woodruff's (1967) Cognitive Model of Learning and Instruction provided the conceptual framework for this study. According to Woodruff, cognitive learning is a

process that involves a constant interactional relationship between the formation and use of concepts. It provides an explanation for how people learn and how they use what they learn. The phases in Woodruff's (1967) model include concept formation and concept using processes (see Figure 1). It takes learning through a process of sensory intake, thinking, decision making, and doing. Therefore, as a learning and behaving model all domains of learning are addressed. Woodruff's (1967) model is relevant to the performance of administering IM injections using demonstration-return demonstration and simulation as a teaching strategy as it supports the opportunity for trial behaviours and performance of the skill through decision making behaviours. In addition, it takes into account the affective or feeling element of a learning experience.

Concept formation is derived directly from perception in the form of sensory intake (see Figure 2). Perception refers to the mental impression the learner receives as a result of stimuli from words, signs, numbers, external sources such as the environment, events, verbal interactions with others

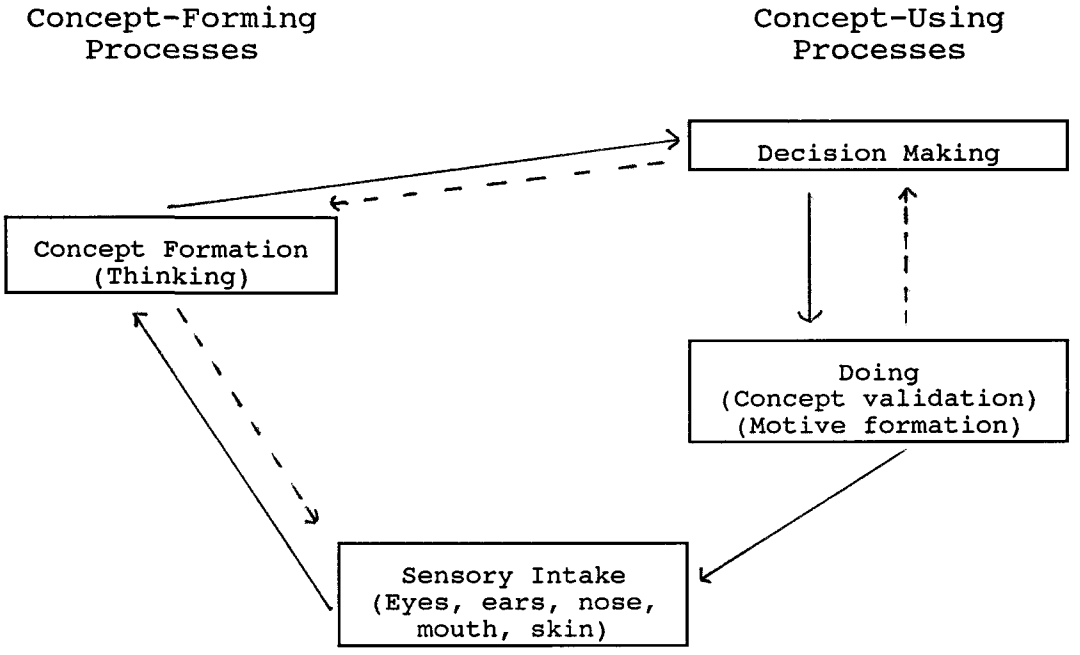

Figure 1. The Behaving and Learning Cycle (Woodruff, 1967, p.63).

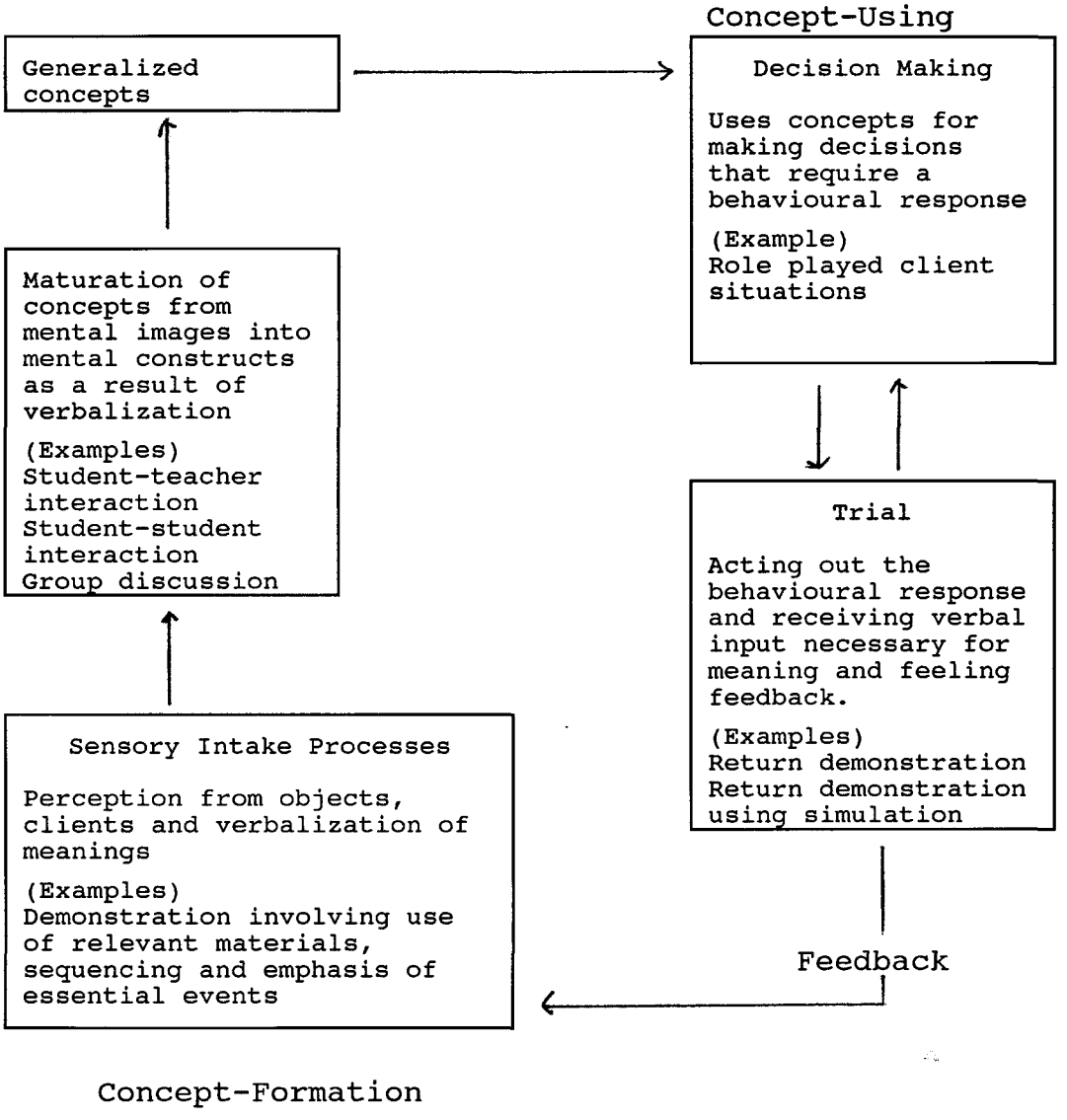

Figure 2. The Behaving and Learning Cycle (Woodruff, 1967, p. 71).

and his/her own feelings. The learner's perception is enhanced through the use of relevant reading materials, feedback, appropriate sequencing and emphasis of essential elements (Woodruff, 1967). To facilitate perception, demonstration by an instructor in the laboratory setting provides stimuli. While stimuli may be provided through the use of various visual and auditory media (Quiring, 1972), the demonstration of a skill by an instructor provides opportunity for verbal interaction between the instructor and the learner. Concept formation is described as the maturation of mental images into mental constructs. Although mental images are formed as a result of stimuli, the formation of mental constructs requires verbalization. Once the construct has been raised to the level of recognition, generalization to other situations can be made.

Concept formation is facilitated through verbal interaction between the student and the teacher (Woodruff, 1967). Although demonstration-return demonstration allows for student and teacher interaction, demonstration-return demonstration using simulation provides the added dimension of interaction with shared decision making among students and group

discussion. Having formulated concepts, the concept-using process begins. Learners are required to engage in concept using in order to test the concept and receive feedback for incorporation into the concept being formed. This use of concepts includes decision making and trial behaviours. Decision making occurs prior to a behavioural response. While the learner may make any one of the possible decisions, the importance of having made a decision is that it allows the learner to carry out an action, receive necessary feedback and subject the decision to value formulation. In other words, a student involved in a simulation experience is required to use the newly formed concepts as the basis for performance.

Decision making is strongly influenced by the use of return demonstration using simulation. By incorporating the roles, events, and consequences of a real situation or process (de Tornyay & Thompson, 1987), this teaching strategy provides the student with an opportunity for decision making. The administration of IM injections is an example of a nursing activity that requires the use of concepts for decision making in order to ensure safety in performance.

Concept use also incorporates a trial stage (see Figure 2). This involves acting out a conceptually based behaviour in response to decision making in familiar situations. Thus, in the provision of trial situations which make realistic demands on students, the learner is allowed to validate concepts and make necessary modifications based on feedback.

Trial behaviour is facilitated through the use of both return demonstration and return demonstration using simulation by providing an opportunity to manipulate real equipment. Although both instructional techniques allow for practice, return demonstration using simulation provides the opportunity for the learner to manipulate real equipment in relation to realistic situations. Feedback is provided through verbal interaction with the teacher and other students in both teaching strategies. Meaning resulting from the learning experience is necessary for concept formation, and feelings toward the experience become part of the concept (see Figure 3). Thus, a feeling of satisfaction toward the learning experience furnishes positive value which becomes part of the concept and provides motivation for further learning by increasing

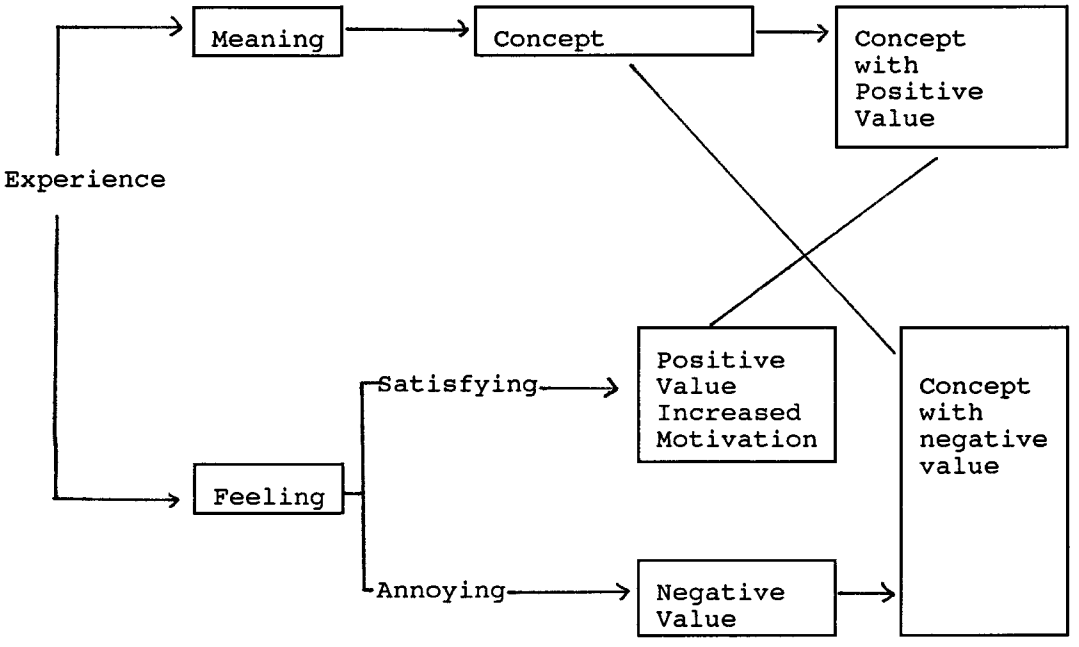

Figure 3. The Behaving and Learning Cycle (Woodruff, 1967, p.81).

learner interest in the subject matter. Simulation provides additional feedback in the form of feelings and attitudes generated for the learners as they assume roles as clients and as nurses.

Simulations using role played client situations provide students with the opportunity to examine the usefulness of their decisions thereby enabling them to make any necessary modifications (Woodruff, 1967). They are also able to experience the meaning and feelings as part of affective domain learning. To teach nursing students to administer IM injections, the use of both demonstration-return demonstration and demonstration-return demonstration using simulation should promote student learning. Although both strategies are designed to facilitate the learning and behaving stage of perception, demonstration-return demonstration using simulation provides learners with the opportunity to make conscious decisions and trial behaviours in a variety of realistic situations. Therefore, Woodruff's (1967) model is an appropriate organizing framework for this study to evaluate students' learning in the performance of IM injections.

Summary

This chapter has introduced the study by addressing the background to the problem, problem statement, purpose, hypotheses statements, definitions, assumptions, and conceptual framework. Chapter Two will present a review of the related literature. Chapter Three will describe the research methodology and Chapter Four will present and discuss the study findings. Finally, Chapter Five will present the summary, conclusions, implications and limitations.

Chapter Two

Literature Review

Overview

This chapter presents the non-research and research based literature relevant to teaching nursing students to perform a psychomotor skill. The literature review is organized according to the following four sections: 1) using the laboratory to learn psychomotor skills; 2) transfer of learning from the laboratory to clinical practice; 3) teaching students in laboratory settings to administer injections; and 4) alternate methods of teaching nursing students psychomotor skills. The similarity of the reviewed articles contributes to an overlap among sections. Therefore, articles discussed in one section may be relevant to more than one section.

Using the Laboratory to Learn Psychomotor Skills

A consensus prevails in the literature that a controlled laboratory setting enables students to practice their skills before performing them on clients. Most nurse educators feel that achieving

competence in the controlled laboratory setting can reduce student anxiety as well as address patient safety (Bell, 1991; Cook & Hill, 1985; Corder, 1991; Cowan & Weins, 1986; Hallal & Welsh, 1984; Hanna, 1991; Haukenes & Halloran, 1984; Infante, 1985; McAdams, Rankin, Love & Patton, 1989). Unfortunately, much of the literature related to laboratory use consists of articles which state ideas or opinions with limited reports of research studies regarding the teaching and learning of psychomotor skills in a laboratory setting.

Hallal and Welsh (1984), in a descriptive study, examined student evaluation of a competency laboratory where students learn psychomotor skills. Students practised skills at their own rates and were responsible for scheduling a testing date with a laboratory coordinator. Students were required to successfully complete a written test of theoretical principles prior to qualifying for testing in motor skills. It was reported that students felt more comfortable in the clinical setting and faculty found the students less anxious, more skillful and self-confident than reports from students who did not practice or have testing in the competency laboratory.

These results were obtained from questionnaires administered to students before and after the competency laboratory experience.

Infante (1985) addressed the desirability of greater use of the college laboratory for beginning students. The importance of the laboratory to provide "real experiences" in which students could learn was emphasized. Based on her descriptive investigative study and on her search of the literature, essential elements of a laboratory concept evolved. The essential elements identified included: objectives for activities, competent guidance, practice for skill learning, opportunity for problem solving, opportunity for observation and participation of integrative activities. Despite identifying these elements, Infante did not describe how to operationalize the elements in a laboratory format.

A synthesis of the nursing literature reveals a common agreement about the advantages of a learning laboratory. In addition, as discussions about clinical placements becoming less available to students and expressions of ethical concerns about practising on clients, alternatives to teaching psychomotor skills in

the clinical setting were adopted. These concerns support continued use of the laboratory.

In contrast to literature discussions about the advantages of learning skills in a structured laboratory, Gomez and Gomez (1987) found the clinical setting to be a better "laboratory" when contrasted with the college laboratory. They compared proficiency and confidence in a sample of 63 baccalaureate nursing students in monitoring blood pressure in a laboratory and clinical setting. Students whose experience was in the clinical setting scored significantly higher on the accuracy and confidence index (tools developed by the investigators) than students who practised in the laboratory as determined by the Mann-Whitney U test. These findings occurred despite the fact that students who practised in a clinical setting on a post-partum floor were evaluated in a nursing home. The potential degree of difficulty for obtaining blood pressure measurements between these two client groups may have negatively affected the results which could potentially have been more significant. Despite this limitation, the findings favoured the clinical setting. Gomez and Gomez recommended that practice conditions for learning

include all the actual environmental conditions and constraints when a skill is performed. Therefore, they contend that practising of psychomotor skills in realistic situations is more effective for skill performance.

A study by Love, McAdams, Patton, Rankin and Roberts (1989), using a sample of 77 second year baccalaureate nursing students, compared the learning of psychomotor skills in a self-directed manner with learning the same skills in a structured laboratory. Using an Objective Structured Clinical Evaluation tool (OSCE) developed by the investigators, no difference was demonstrated between the two groups in testing of their ability to perform skills. That is, there was no difference between psychomotor skill performance of students who learned in a self-directed manner and those taught in a structured clinical laboratory as determined by the OSCE. This tool was based on accomplishment of objectives that were not comprehensive. Although the results supported the validity of a laboratory using self-directed learning as a teaching method, it was not found to be preferred by nursing students.

Further student support for learning in a structured laboratory setting was recognized in a survey that followed the previously described study of 59 baccalaureate nursing students (McAdams, Rankin, Love & Patton, 1989). Students' preference for a structured laboratory as opposed to self-directed study was evident. Self-directed study involved independent reading and/or the use of audio-visual equipment. Reasons given by students for a structured laboratory included an opportunity to observe and be observed by experts, and the chance to listen to experts who can "give tips and point out pitfalls" (p. 794).

Generally there has been support among nursing students and faculty for a structured laboratory to learn psychomotor skills. Elements to be included in the laboratories have been identified but there is limited documentation regarding the most effective ways to operationalize these elements.

Transfer of Learning from the Laboratory to Clinical Practice

Some nursing literature confirms the importance of frequent practice of psychomotor skills in the

laboratory setting (Boyd, McKiel & Murphy, 1983; Coxson & Gillin, 1988; Gomez & Gomez, 1987; Infante, 1985). Furthermore, there is evidence that practice in the clinical setting should closely follow the initial learning of a skill (Mogan & Thorne, 1985). In their study of students' perceived success in injection-giving, Mogan and Thorne found that "the sooner students were able to apply their newly learned injection skill to a patient, the more confident they felt in their ability to apply the skill" (p. 56).

Feedback in relation to psychomotor skill acquisition is another important issue addressed in the literature. It seems that repeated practice without feedback does not enhance student performance, and may, in fact, inhibit it (Gomez & Gomez, 1984; Milde, 1988). There is strong evidence that students find one-to-one feedback on their performance from instructors and feedback from other students beneficial (Baldwin, Hill, & Hanson, 1991; Cook & Hill 1985; Day & Payne, 1987; Hanna, 1991).

One recent nursing study that directly addressed both the issue of transfer of learning and the issue of anxiety involved "preclinical skill evaluation" (Bell,

1991, p. 222). Preclinical skill evaluation involved evaluation of a psychomotor skill to validate performance prior to clinical application. The purpose of this study was to identify the anxiety profile of 30 volunteer undergraduate nursing students when learning female catheterization. The study also sought to determine the effect of preclinical skill evaluation on students' anxiety and performance when applying the skill in a client situation for the first time. In this study, all students participated in a structured laboratory and, prior to clinical application, one half of the group participated in preclinical skill evaluation while the other reviewed a videotape of the procedure. Anxiety was measured by the State-Trait Anxiety Inventory (STAI), skill proficiency by a checklist developed by the investigators and self-confidence by student self-report. All students' first time performance of the selected skill in the clinical setting was evaluated by clinical instructors. While the anxiety-reducing benefit of preclinical skill evaluation did not result in significantly better first-time psychomotor performance in a client situation, self-report of the students did indicate

less anxiety and more self-confidence about performing the skill. The students who only viewed the videotape of the skill prior to clinical application reported higher anxiety when performing the skill in the clinical setting. Findings supported "preclinical skill evaluation" as an effective strategy for reducing anxiety related to the initial transfer of skill learning from a laboratory to a clinical setting and for enhancing student self-confidence. The limited sample size and evaluation of only one skill, preclude making generalizations. However, the findings are in accord with other researchers (Boyd, McKiel & Murphy, 1983; Coxson & Gillin, 1988; Gomez & Gomez, 1987) who cite the importance of practice in a learning laboratory prior to clinical application.

In summary, the literature relating to the learning of psychomotor skills in the laboratory and the transfer to the clinical setting demonstrates a need for adequate practice. In addition, appropriate feedback, along with prompt clinical application of the newly learned skills, is desired.

Teaching Students in Laboratory Settings to Administer Injections

Students are required to make many decisions in relation to the complex skill of administering IM injections. The skill is often emotionally loaded and tends to be symbolic of being a nurse. DeYoung (1990) suggested that an environment of complex, dynamic and changing conditions can be created to make laboratory learning of skills more "real-life" (p. 178).

Consistent with this idea, Benjamin et al. (1984) used extraneous conversation as a distractor while assessing nursing students' skill performance in administering IM injections in the laboratory. Fifty nursing students in a generic baccalaureate program were randomly assigned to two groups in a laboratory setting. Extraneous conversation was used as a distractor during skill demonstration of IM injections for an experimental group of 25 students while 25 students in a control group were not verbally distracted. These skill demonstrations were done in a laboratory setting, videotaped and performance was evaluated against a checklist. There was no significant difference between the control and

experimental groups' performance in the laboratory using a Chi-square analysis. However, students who were exposed to extraneous conversation in the laboratory performed at a higher level in the clinical setting than students who were not exposed to the distractor. These researchers identified that nursing students need to learn psychomotor skills in the context of a situation that more closely resembles the clinical environment.

In a study by Megel, Wilkin, and Volcek (1987), anxiety during parenteral medication administration was measured with a volunteer sample of 35 associate degree nursing students. Two tools were used: an injection skill list (developed by the investigators) and the State-Trait Anxiety Inventory (STAI). The skill list utilized in this study was not available and therefore, could not be evaluated for use in the current study. All students were exposed to the same instructional technique in terms of learning to administer subcutaneous (s/c) and IM injections. The STAI was administered to each student at a practice session and again before the performance of a return demonstration of the skill. Evaluation of all students occurred for

first time injection administration in the clinical setting. This evaluation occurred over two and one half months with an average of 64.8 days. No significant differences were found in the number of performance errors and level of anxiety between the laboratory performance and the first clinical performance. Students committed very few errors and their anxiety was found to be not particularly high.

From this study, anxiety and performance errors were found not to be significant issues in the administration of an IM injection. However, identifying sites for injections was found to be difficult for the students and it was recommended that students have more opportunities to practice identifying sites for injection. Limited generalizations may be made from this study due to the significant lapse of time between learning and application of the skill. In addition, s/c's and IM's were evaluated and the reported results did not differentiate between the two. It is unclear how much practice time each group had with each type of injection.

Boyd, McKiel and Murphy (1983) used 99 first year

diploma nursing students to compare three instructional methods of administering IM injections and anxiety. All students attended the same lecture and video-taped IM injection demonstration. Students were randomly assigned to one of three groups for supervised laboratory practice. Group one viewed the video-tape a second time, observed an instructor demonstrate the correct procedure, practiced but did not administer an injection. Groups two and three did not view the video-tape a second time, but observed an instructor demonstrate the correct procedure where the injection was administered to a mannequin. Students in group three did not view the video-tape a second time, but observed an instructor demonstrating the correct procedure and then each student administered an IM injection to a classmate. The STAI was used to determine anxiety before and after each student gave their first IM injection in the clinical setting. The results indicated no differences in overall skill performance regardless of the type of laboratory. However, students in groups two and three scored higher in manual dexterity than did group one. There were severe limitations to this study which preclude

generalization. The content and format for each laboratory group were vague and no indication was given of the amount of practice time each student was allowed. Despite the reported findings of improved dexterity, the tools used to determine improved performance was not explained. In addition, no STAI results were reported before or after students' administration of an IM injection.

Coxson and Gillin (1988) supported the findings of Boyd, McKiel and Murphy noting improved performance following extra practice with administering injections. Twelve nursing students were randomly selected in a diploma program to participate in a study which examined the effects of practice time on parenteral injection procedure. This study sought to determine if a teaching strategy involving extra practice followed by instruction improved students' performance and retention of the skill of IM injections. Utilizing skill checklists and questionnaires, the researchers found that the acquisition of the skill of administering IM injections can be developed and maintained with additional practice laboratory sessions. Due to the limited sample size, implications

from the study are restricted although the benefits of immediate feedback during practice sessions are reinforced by the authors.

A variety of instructional techniques have been used in the laboratory to teach nursing students to administer injections. Clearly, practising in laboratory situations that more closely resemble the clinical environment enhance students' learning. In addition, extra practice time for students with injections in a laboratory tends to improve student performance.

Alternate Methods of Teaching Nursing Students Psychomotor Skills

There are reports of the use of alternate methods for teaching nursing skills other than the traditional demonstration-return demonstration method. The use of simulations offers one way to develop the psychomotor skills required for practice in a particular setting. Simulations may take the form of the use of mannequins, students acting as "patients" or computer-assisted instruction. However, the implementation of simulations has taken many forms. Cowan and Weins

(1986) developed a "Mock Hospital" in the school laboratory using community volunteers as clients. The organization of this simulation experience was extremely difficult, time consuming and too elaborate to be practical. The study did not include the specific psychomotor skills the students performed.

Corder (1991) developed a simulated activity called "campus clinicals". Campus clinicals involved simulated clinical activities using a variety of client situations in the laboratory. Once again, no description of the specific skills to be performed by the nursing students was provided. Although no research was found to support campus clinicals, students have indicated a preference for learning in the laboratory using the simulations used in campus clinicals.

In a study by Baldwin, Hill and Hanson (1991), two strategies for teaching blood pressure measurement were compared with 17 first year nursing students. This study sought to determine if "mediated instruction" alone as compared to "mediated instruction" with faculty assistance provided in the laboratory was sufficient for students to practice and feel confident.

"A mediated simulation uses audio and/or visual media to present a problem, case or task to represent some aspect of an interpersonal encounter or to provide an avenue for analysis of a role played or other simulated situation" (de Tornyay & Thompson, 1987, p. 35). One group of students who had faculty assistance and mediated instruction within the laboratory demonstrated significantly more confidence in their ability to perform a blood pressure measurement than those who had no faculty contact while learning in the laboratory. It would seem from this study that faculty contact is an important factor for students when they learn to perform a basic psychomotor skill. The study was limited by the fact that the sample was small and the researcher-developed tool used in the study to measure self-confidence was a self-report instrument. Determination of reliability and validity of the instrument was not reported.

Role playing, as an example of a simulated activity, has been used to teach nursing skills and can foster learning in all three domains of learning (Reilly & Oermann, 1992). This activity usually involves one student assuming the role of a client

while the other assumes the role of a nurse (Infante, 1985). Role playing provides an opportunity for verbal interaction between two students participating with each other in making a decision. Students receive feedback from each other as well as feedback from other students and the teacher. Despite the potential implications of using various simulations as a teaching strategy, no consistent plan for implementation has been described. It was therefore, important to establish a plan for teaching nursing students to administer injections using simulations.

Summary

The literature review in this chapter indicated that learning a psychomotor skill in the laboratory setting enhances client safety, reduces student anxiety and is an efficient way to teach students. Little consensus exists about the most effective strategy for teaching IM injections to nursing students. Despite this issue being studied in only a limited number of nursing research studies, there are common elements emerging related to improving student skill performance. The common elements include allowing time

for frequent student practice, instructor feedback, providing situations that most resemble the clinical environment and an opportunity for prompt clinical application.

There is evidence in the nursing literature that simulations offer a valid means of teaching the knowledge, skill and decision making inherent in the performance of psychomotor skills as well as using the cognitive and affective domains of learning (Bell, 1991; Cook & Hill, 1985; Hanna, 1991; Lenburg & Mitchell, 1991; Ross, Carroll, Knight, Chamberlain, Fothergill-Bourbonnais & Linton, 1988). Based on the potential for facilitating decision making and the use of all three domains of learning in the performance of a psychomotor skill, the use of simulated situations to improve students' performance in clinical practice were tested.

Chapter Three

Methodology

Overview

This chapter describes the research design, setting, sample, data collection procedure, instruments used, and ethical considerations. A brief description of the procedures used in data analysis is also included.

Research Design

A quasi-experimental design was utilized in this study to compare the effectiveness of two instructional techniques used to teach nursing students to administer intramuscular (IM) injections. One group of subjects constituted the experimental group and was taught to administer IM injections by the instructional technique of demonstration-return demonstration using simulation. A second group constituted the control group and was taught to administer IM injections by the traditional instructional technique of demonstration-return demonstration.

The effectiveness of these two instructional techniques was determined by a rating on a performance checklist which compared the two groups on psychomotor skill performance, cognitive abilities and affective considerations during the students' first administration of an IM injection in the clinical setting.

Setting/Sample

The target population for this study consisted of second year nursing students in a university based baccalaureate nursing program (in British Columbia in September, 1993). This segment of the student body was selected because it represented the time period when students received IM injection instruction.

Selection criteria included male and female nursing students in their second year of the degree program. All those invited to participate were in pre-assigned laboratory groups designated as control and experimental groups. Designation of a laboratory group as experimental or control was dependent upon the instructor responsible for teaching the injection laboratories. In this study, it was decided that obtaining instructors to teach the experimental group

was more feasible than randomly assigning students to either group. Once an instructor agreed to participate in the instructional portion of the study, consenting students in his/her scheduled laboratory group became part of the experimental group. An anticipated total of 60 students was to constitute the experimental and 60 students the control group. This was based on Cohen's tables (1988), using a power of 0.7 with a level of significance of 0.05 and a medium effect size of 0.4.

Within the structure of second year, students are divided into two separate clinical sections: acute care surgery and acute care medicine. Each section is divided into six groups of 10-12 students within the laboratory setting. Therefore, there were six acute care surgical groups with approximately 10-12 students in each group and six acute care medical groups with 10-12 students each as a potential sample. For the purposes of this study, three groups of students and their instructors from the acute care surgical section and three groups of students and their instructors from the acute care medical section constituted the experimental group. Sixty of the remaining students

potentially could constitute the control group. Of the potential total of 120 students in the class, the final sample consisted of 20 students in the experimental group and 27 students in the control group.

Instruments

The following is a discussion of the tools which were used in this study. To measure the psychomotor, cognitive and affective learning components needed in the performance of IM injection administration, the experimental and control groups were observed during their first IM injection experience in the clinical setting by a nurse educator. Students were evaluated using the IM Performance Checklist developed by the investigator (Appendix A). The IM Performance Checklist consisted of 21 behaviours. Ten behaviours involved psychomotor learning, six behaviours involved cognitive learning and five behaviours involved affective learning. Each of the 21 behaviours was scored according to one of four categories: (1) performed above average or not applicable (N/A), (2) performed adequatedly, (3) not performed adequatedly, or (4) omitted. Total performance scores were based on marks allocated for each performance

category. "Performed above average" included the N/A criterion (which was accounted for in the analysis statistics by treating it as a missing value) and was given a total of four marks for every behaviour demonstrated. "Performed adequately" was awarded a score of three marks for each behaviour indicated, "not performed adequately" was given a score of two marks and "omitted" was allocated only one mark for each behaviour demonstrated.

The IM Performance Checklist included student behaviours categorized in each domain of learning and scored accordingly. Items 2, 3, 5, 13, 14, 15, 16, 17, 19 and 20 related to the psychomotor domain. Items 1, 4, 6, 7, 8 and 9 related to the cognitive domain. Items 10, 11, 12, 18 and 21 related to the affective domain. Many of the items listed may have been relevant to more than one domain but were assigned by the investigator as predominantly relating to one particular domain.

To establish content and face validity of this checklist, a review of the literature was conducted, followed by an expert review by three nurse educators. Initially, the IM Performance Checklist was pilot

tested with a group of fifteen instructors to establish interrrater reliability. The instructors participated by completing the IM Performance Checklist following observation of a role-played situation of a student administering an IM injection to a client. Difficulties using the tool were discussed following the role play and revisions made to the IM Performance Checklist. The main source of difficulty centered around the amount of prompting from the instructor that was acceptable to meet the category of performance. In order to establish interrater reliability, the investigator and instructors included in the study used the revised checklist to participate in a discussion, re-evaluation, and re-testing using role-played simulations.

The IM Performance Checklist was tested an additional four times using the same role played situation with all faculty who agreed to participate in the study to assist with interrater reliability. All faculty attended at least one or more sessions in order to continue to establish interrater reliability with the tool. Following each role played situation, discussions occurred between the investigator and

instructors determining consensus for performance criteria.

A second investigator-developed instrument used in this study was the demographic questionnaire which collected student information (Appendix B). Information collected included age, languages spoken at home, educational background and any previous experience students might have had with injections.

Data Collection Procedure

Approval was obtained from the University of British Columbia Behavioral Sciences Screening Committee, the Director of the School of Nursing (Appendix C) and the second year coordinator (Appendix D). The study began in September 1993 as students entered their second university year in nursing.

Preparation for Instructors.

Information letters about the study were sent to all second year faculty the first week of September (Appendix E). The following week, the investigator met with all faculty to explain the study, answer questions and invite faculty to teach the experimental groups.

Six of the 12 second year instructors assigned to teach the injection laboratories were required to participate in order to obtain the sample size for the experimental group. Faculty were asked to volunteer to teach the experimental group. Three faculty volunteered from the acute care medicine section and five from the acute care surgery section. As more faculty volunteered from the acute care surgical section than was required, all five names were placed in a hat and the first three names drawn taught the experimental group.

During the week prior to the laboratory activity for the experimental group, the investigator met with the instructors responsible for instruction in the laboratory to explain the instructional method for the administration of IM injections using simulation. Faculty were advised that all students who elected not to participate in the simulation could leave prior to the experimental group activities. Students who left would not miss any pertinent content related to the performance of injections.

Faculty were advised that all completed consent forms were to be submitted to the investigator. In addition,

all faculty who agreed to participate in the study attended at least one of the pilot testing sessions with the IM Performance Checklist. Faculty were informed that their participation was to be entirely voluntary. Student letters of information about the study (Appendix F) and letters of consent (Appendix G) were distributed and explained to faculty. They were requested to have available extra copies of these in the laboratory for students who decided to participate in the study.

Following the IM injection laboratory and the return demonstrations, students in both groups were observed during the first administration of an IM injection in the clinical setting by an instructor. This instructor in some instances may have been different than the one responsible for the laboratory instruction. The students' behaviours were recorded using The Performance Checklist.

Preparation for Students.

The scheduled activities for the IM injection laboratories were September 24th, 1993 and September 28th, 1993. Students were informed of the study by the

investigator at the beginning of one of their core nursing classes during the first week of the fall term. The investigator implementing this study was an instructor in the School of Nursing but was not associated with any teaching in the second year of the program.

Student participant consent forms along with information letters and demographic sheets were distributed at the beginning of the class. Students were advised to return the consent forms to their laboratory instructor if they chose not to return them at the conclusion of class. In addition, they were told that information letters and consent forms would also be available from second year faculty and in other laboratories prior to and including the injection laboratories. Students did not know whether they were in the experimental or control group and were asked not to share with each other what they learned during the injection laboratory. Demographic information on participants was completed during the beginning of any of the first scheduled laboratories during the first two weeks of classes and collected by instructors and submitted to the investigator.

Implementation.

During the regular laboratory activity, participants in the control group were taught IM injections by second year faculty using the technique of demonstration-return demonstration (Appendix H & Appendix I). Students practiced administering IM injections only into a sponge. One week following the regular laboratory, these subjects were required to perform a return demonstration of an IM injection in the laboratory and landmark accurately on a classmate to select the ventrogluteal and dorsal gluteal sites. No IM injections were administered to a "real" person in the laboratory setting. As part of the injection laboratory, students also learned to administer subcutaneous (s/c) injections and gave a s/c injection to a classmate.

The participants in the experimental group were initially taught using the same instructional technique as the control group (Appendix H & I). They were required one week later to perform the return demonstrations and landmark prior to performance in the clinical setting. In addition, each student in the experimental group was required to administer three IM

injections into a sponge during specific simulated client situations. The situations required students to make decisions regarding the site of the IM injection, the size of the needle to use and to consider the client's reactions and feelings. In addition, all students in the control groups practised at least three IM injections into a sponge before the conclusion of the laboratory. The instructions for using the simulations (Appendix J) and simulated client situations (Appendix K) were developed by the investigator and reviewed by peers and the supervisory committee.

Data Analysis

Measures of central tendency including means, ranges and standard deviations (SD) were applied to scores on the performance checklist and to the demographic data. Percentages were used to describe the demographic variables of gender, languages spoken and education. To address the research hypotheses, independent t-tests were used to compare the means of the experimental and control groups on the scores obtained on the checklists. An analysis of covariance to adjust for the covariates of age and education were

done for both the experimental and control groups. In addition, an F-test was done to examine differences due to age and education on the total scores of the IM Performance Checklist for the experimental group only.

Ethical Considerations

Approval was obtained from the University of British Columbia Behavioral Sciences Screening Committee and the Ethical Review Committee. Permission to access the students and the instructors was obtained through the Director of the School of Nursing and the second year nursing faculty coordinator. Voluntary cooperation was sought from the participating second year instructors. Those instructing in the experimental group agreed to remain for up to 30 minutes longer in the laboratory. Students were informed at the beginning of the school term about the purpose of the study and that their participation was voluntary. Signed consent forms were obtained from the participating students. In addition, students were informed that they could withdraw from the study at any time without jeopardizing their position or status in the nursing program. All

students participating in the study agreed to remain for up to 30 minutes longer in the injection laboratory or to arrive 30 minutes earlier depending on the site, to allow time for students to return to campus for other classes.

Summary

This chapter presented the methodology of the study. A description was given of the design, the setting and sample of the study were described and the instruments used for data collection discussed. The data collection procedure was described in detail and in addition, the ethical considerations and data analysis were discussed.

Chapter Four

Presentation of Findings

Overview

The findings of this study are presented in three sections. The first section provides a description of the sample of students based on demographic variables. The second section describes and discusses the study findings relative to the three hypotheses concerning student performance. Finally, the third section discusses the findings in relation to psychomotor, cognitive and affective performance.

Demographic and Descriptive Information

The sample consisted of first term, second year nursing students in a baccalaureate degree program. This term represented the time period when students received IM injection instruction and therefore were asked to participate in the research study. All students who participated were volunteers. A total of 47 students participated in the study with

20 in the experimental group and 27 in the control group.

The students in both the experimental and control groups are described according to selected information obtained. The following information was collected: age, gender, language usually spoken at home, level of education beyond grade 12 and any previous experience with injections.

Age.

The students ranged in age from 18-31 years. Age distribution of the students in the experimental and control groups is presented in Table 1 along with the means and standard deviations (SD).

Table 1

Age Description of Students

Age	18-21	22-25	26-29	30-33	Mean	S.D.
Experimental Group N=20	15	2	1	2	21.2	3.79
Control Group N=27	19	6	2	0	20.9	2.23

Seventy-five percent (75%) of the students in the experimental group and 70% of the students in the control group were between 18 and 21 years of age. Of

the remaining students, relatively similar percentages were in each group for between 22-29 years of age. Two students in the experimental group were between 30 and 33 years of age. Thus, the groups were homogeneous with respect to the characteristic of age.

Gender.

Although the majority of students in both groups were female, there was one male student in each group. Thus, the two groups were similar with respect to the characteristic of gender.

Languages Spoken.

The students were asked to identify the language(s) usually spoken at home. Therefore, more than one response was possible and this resulted in ten languages being indicated. The languages spoken by students in both the experimental and control groups are presented in Table 2. Specifically, the majority of students spoke English (n=41, 71%). This was followed by Chinese (n=6, 9%) and Punjabi (n=3, 5%). Each of the remaining seven languages indicated contained one or two students in each category. Given

the multi-cultural nature of the student population, the fact that ten different languages were indicated was what one might have anticipated. One must consider the fact that although the predominant language spoken was English, this may not truly reflect the primary languages used by the students at home and thus, not easily identify students for whom English is a second language.

Table 2

Languages Spoken by the Experimental and Control Groups

Language	Experimental N=20	Control N=27	% of All Students
English	17	24	71
Chinese	2	4	9
Punjabi	2	1	5
Korean		2	3
German	1		2
Gujerati			2
Pakistani		1	2
Tagalog		1	2
French		1	2
Spanish		1	2

Level of Education.

All the students are in their second year of university. The fact that the majority of students

indicated they had an education level beyond Grade 12 (n=29, 62%) was not suprising and interestingly four students indicated having completed previous degrees. Fifteen percent of students in the experimental group had previous degrees compared to 3.7% of students in the control group. The levels of education of the students are presented in Table 3 for both the experimental and control groups.

Table 3

Level of Education of Students Beyond Grade 12

	Completed 1-2 years	%	Completed 3-4 years	%	Previous Degree	%
Experi-mental Group	11	55.0	6	30.0	3	15.0
Control Group	18	66.7	8	29.6	1	3.7

Previous Experience with Injections.

All students indicated their only prior experience with administering injections consisted of being a recipient of an injection or observing an injection being administered. Only one student indicated previous experience with injections which was described as involvement with a clinic in Hong Kong where she

learned to administer injections. This student was in the control group.

Overall Performance

The purpose of the study was to compare the difference in the effectiveness of two instructional techniques in teaching nursing students to administer IM injections. Differences were evaluated in terms of performance in the psychomotor, cognitive and affective learning domains to test the three hypotheses. Following students' first administration of an IM injection in the clinical setting, all participating students were observed and rated by a nurse educator using the IM Performance Checklist. A checklist score for overall performance based on behaviours demonstrated involving all domains of learning was obtained for each student. In addition, scores were obtained in each of the three learning domains for those behaviours demonstrated. Student performance scores were obtained in the clinical setting beginning approximately two weeks following the instruction of IM injections and continued over a period of three months.

Differences in the sum of overall behaviours and between the two groups were analyzed using independent t-tests. Table 4 presents a comparison of the overall mean performance scores, SD, and the range of minimum and maximum scores. The highest possible score on the IM Performance Checklist was 84. The lowest possible score was 21.

Table 4

Overall Performance Scores				
	Mean	**S.D.**	**Minimum**	**Maximum**
Experimental Group N=20	63.60	5.21	49	72
Control Group N=27	63.85	5.78	50	79

The t-test for significance between the experimental and control group was -0.15 and p-value was 0.88 indicating no significant differences between the two groups. In this study, there was a difference of only 0.25 between the mean scores of the experimental and control group. Including education as a covariate changed the p-value to 0.69 indicating that the level of education as a covariate still resulted in no significant difference to the overall performance

score. Including age as a covariate changed the p-value for group difference to 0.81. This indicated that a student did not score higher in overall performance because of increased age.

Hypothesis One

The first hypothesis tested was: there will be a significant difference in psychomotor skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist. Data were collected using the IM Performance Checklist. All students were observed by an instructor and rated using the checklist following their first administration of an IM injection in the clinical setting. Table 5 presents a comparison of psychomotor performance scores between the two groups.

Table 5

Comparison of Psychomotor Performance Scores: Experimental and Control Groups

	Mean	S.D.	Minimum	Maximum
Experimental Group N=20	24.09	1.66	19.2	27.2
Control Group N=27	24.30	2.64	17.6	29.6

As can be seen, the mean scores for performance in psychomotor behaviours were very similar. The experimental group was 24.09 and for the control group 24.30. The difference between the two groups for psychomotor performance was not significant. The t-test was -0.30 and the p-value was 0.76. Including education as a covariate changed the p-value to 0.46 indicating that students did not perform at a higher level in the psychomotor domain due to having more education. Including age as a covariate changed the p-value to 0.65. This indicates that older students did not perform at a higher level in the psychomotor domain. Based on these findings, the first hypothesis was rejected.

Hypothesis Two

The second hypothesis tested was: there will be a significant difference in cognitive skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist. Table 6 presents a comparison of cognitive performance scores between the two groups.

Table 6

Comparison of Cognitive Performance Scores: Experimental and Control Groups

	Mean	S.D.	Minimum	Maximum
Experimental Group N=20	17.72	2.35	12	22
Control Group N=27	18.64	2.12	15	22

Once again it is noted that the mean scores for performance in cognitive behaviours between experimental and control groups were similar. The experimental group was 17.72 and for the control group

18.64. There was no significant differences between the groups in cognitive performance as measured by the IM Performance Checklist. The t-test for significance between the experimental and control group was -1.40 and the p-value 0.17. The difference between the two groups was not significant. Including education as a covariate changed the p-value to 0.23. This indicated that students with more years of education did not score significantly higher on the IM Performance Checklist with regard to cognitive behaviours than students with less years of education. Including age as a covariate changed the p-value to 0.16 which indicated that there was not a statistically significant increase in the score with regard to cognitive behaviours as the students' age increased. Based on the above results, the second hypothesis was rejected.

Hypothesis Three

The third hypothesis tested was: there will be a significant difference in affective skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method

of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist. Table 8 presents a comparison of affective performance scores between the two groups.

The mean scores for performance in affective behaviours were again very similar. The experimental group was 15.75 and for the control group 14.85. The t-test was 1.18 with a p-value of 0.24 indicating no significant differences between the two groups as measured by the IM Performance Checklist.

Table 7

Comparison of Affective Performance Scores: Experimental and Control Groups

	Mean	S.D.	Minimum	Maximum
Experimental Group N=20	15.75	2.51	12	20
Control Group N=27	14.85	2.61	7	20

Including education as a covariate changed the p-value to 0.34 indicating that more education did not account for a higher score for affective behaviours. Including age as a covariate changed the p-value to 0.25. This indicates that there was not a statistically significant higher score with regard to affective behaviours as students' age increased. Based on these results, the third hypothesis was rejected.

Overall Discussion of the Study

The findings resulting from the use of two selected instructional techniques on psychomotor, cognitive and affective performance will be discussed in relation to the conceptual framework, literature and hypotheses of the study.

Overall, the difference between the experimental and control groups of students for performance in the three domains of learning was not significant. There are many possible explanations for these findings.

Woodruff's (1967) model provides a framework for the process an individual has for the formation and utilization of concepts. The important processes in this interactional process include concept-forming and

concept-using. This interactional process occurs in the laboratory setting between students and instructors. The verbalization aspect is important for student learning as it was hypothesized that simulations would enhance this aspect. Although Woodruff's model is appropriate for the current study, it is possible that this study design did not reveal significant differences because of insufficient interaction between instructors and students.

The sample size may have been responsible for the lack of significant difference between the two groups. By using Cohen's (1988) tables for power analysis at a significance level of 0.05, the level of power for a sample size of 21 students per group yields an effect size of 0.30. The actual number of students who participated in the study was less than anticipated. This small sample would allow detections of the difference between the performance scores of the two groups only if the effect size was large.

The design of this study is consistent with studies reported in the literature in that students are generally taught skills in a laboratory setting followed by evaluation. Problems inherent in the

design are acknowledged and may provide some additional explanation for the statistically insignificant findings. As fourteen different nurse educators evaluated the students' performance, this may have resulted in inconsistencies in evaluation. These inconsistencies may have been sufficient to affect the results despite attempts made to establish interrater reliability through role-played situations. In addition, there were several instructors who taught the students in the laboratory setting and evaluated the same students in the clinical setting. This could have influenced the results in terms of instructor bias regarding the instructional techniques. Therefore, if one nurse educator taught and evaluated all the same students in the clinical setting, the results of the study may have been different.

Although efforts were made to establish interrater reliability, the IM Performance Checklist might not have been sensitive enough to detect existing differences between the two groups. Criteria for evaluation of each category on the Checklist to differentiate the level of performance of behaviours demonstrated by the students were not included with the

checklist. This may have led to inconsistencies with regard to evaluation of student performance among instructors. Content and face validity were established but other forms of validity and reliability were not determined. A further exploration of the checklist will be discussed under each of the three domains of learning.

Finally, it is also possible that the simulated situations used for teaching require additional development and testing. It is possible that the simulations were not appropriately designed to reflect enhanced skill, knowledge and value. Additional trial use of these situations might have allowed for revision and further development. Additionally, the nurse educators were using the role-played situation for the first time. It is possible that a more comprehensive teacher orientation concerning simulation theory and an opportunity to become skilled with the use of written simulations and role-played situations may have altered the study results.

Psychomotor Performance.

The analysis of data showed no significant

differences in psychomotor performance between the students in the experimental and control groups when taught by the instructional technique of demonstration-return demonstration and demonstration-return demonstration using simulation. A number of factors may have contributed to this result. A total of ten behaviours out of a possible 21 relevant to psychomotor performance were included on the IM Performance Checklist. It is possible that these behaviours reflected the effect of simulation on psychomotor skill learning but having no specific criteria on the IM Performance Checklist for each category may have contributed to a lack of differences. Further, all subjects were aware that their performance was being evaluated using a checklist and this may have created a Hawthorne effect which influenced the results. It is possible that the students' desire to perform well was a factor that influenced the results. As the actual time for practice with simulations was only one half hour, the lack of differences between the two groups may have been due to insufficient practice using simulated situations.

The current study is consistent with the findings

of Hallal and Welsh (1984) and Love, McAdams, Patton, Rankin and Roberts (1989) in establishing the effectiveness of teaching nursing student skills in a laboratory setting followed by evaluation. This study incorporated the recommendations of Gomez and Gomez (1987) to include many of the environmental conditions in the learning laboratory for learning psychomotor skills similar to the clinical setting. Including simulations as a teaching method involving practice conditions similar to the clinical setting, resulted in similar performance to that of traditional methods. Practising psychomotor skills in simulated situations is consistent with Woodruff's (1967) framework that includes the formation of concepts used to mediate behaviour in unfamiliar situations. Specifically, students learn new skills and apply them in different conditions.

The absence of difference between the two groups for psychomotor performance suggest that both techniques were equally effective for ensuring client safety. However, with further development of the simulated situations, simulation has the potential to

be more effective than traditional methods for teaching students to administer IM injections.

Cognitive Performance.

The study found there were no significant difference in cognitive performance during administration of an IM injection between students taught by demonstration-return demonstration using simulation and those taught by demonstration-return demonstration. One possible explanation for this finding may be that the six behaviours out of a possible 21 relevant to cognitive performance on the IM Performance Checklist did not reflect the effect of simulation. Given that this checklist reflects only the students' observable behaviours and does not incorporate students' explanations, it is probable that the experimental students may have improved their decision-making ability but the instrument failed to measure this fact.

The results of this study are not consistent with those of Infante (1985) and Cowan and Weins (1986) concerning the effectiveness of role-played situations for facilitating decision-making. Given that cognitive

learning requires the use of concepts in decision-making and trial behaviours (Woodruff, 1967), it is possible that the number of situations simulated during the practice session was not large enough to provide sufficient opportunity for decision-making and trial behaviours. Furthermore, since cognitive learning is dependent in part on feedback related to trial behaviours (Woodruff, 1967), it might be that discussion among the students and educators was insufficient. Having the students participate in role-played situations simultaneously may have provided less opportunity for individual student observation and therefore, less discussion following the simulations.

Affective Performance.

This study found that there were no significant differences in affective performance of adminstration of an IM injection between students taught by demonstration-return demonstration using simulation and those taught by demonstration-return demonstration. A possible reason for this finding may also have been the IM Performance Checklist. There were five behaviours out of 21 relevant to affective performance. These

five may not have represented the effect of simulation on affective learning. As students often do not truly emulate role played simulations, the student in the role of "nurse" may not have experienced the intended outcome. Therefore, affective performance behaviours on the IM Performance Checklist may not have reflected the students' learning. It is also possible that a more even distribution of items relevant to each domain would have reflected a difference in performance between the groups. Finally, the affective performance behaviours identified on the Checklist may have been too vague to enable objective judgements about the desired performance to be made. For example, item number 12 on the Checklist - accounts for clients' physical comfort in administering the injection. No specific criteria was identified for this category and in addition, the design of the study as previously discussed, did not allow for students' verbal responses.

Another possible explanation may be related to feedback during the trial behaviours as explained by Woodruff (1967). Instructors may have provided insufficient feedback to increase the affective

learning in students. The findings do not clearly reflect those of Reilly and Oermann (1992) and Infante (1985) who perceived that simulations and role-played situations were useful techniques for learning for students. However, verbal feedback from the students included many positive comments about the practice sessions using simulations.

Possible reasons for the results relate to a lack of specific criteria for affective performance behaviours and additional reinforcemnt from instructors. Potentially, increased refinement and revision of the role-played simulations may have altered the results, and simulations may prove to be more effective than traditional instruction for facilitating learning.

Summary

In this chapter, the sample was described according to the demographic information collected from the students. The findings were presented according to the three hypotheses concerning the effects of two selected instructional techniques on psychomotor, cognitive and affective performance of administering an IM injection.

The results were discussed according to the lack of differences in performance between students taught by demonstration-return demonstration and demonstration-return demonstration using simulation. However, in this study, both instructional techniques were found to be equally effective for teaching students to administer IM injections as demonstrated with almost identical mean scores on the performance checklist.

Chapter Five

Summary, Conclusions, Limitations and Implications

Summary

The impetus for this study came from a review of the literature indicating that, although a number of nurse researchers have focused their efforts on exploring psychomotor skills, there is limited documentation of effective teaching strategies to teach nursing students to administer IM injections. The study was designed to compare two instructional techniques on nursing student performance in the psychomotor, cognitive and affective learning domains following the administration of an IM injection. As a nursing activity, administering injections was identified as a highly anxiety producing skill. The established technique of demonstration-return demonstration was accepted as the appropriate technique for facilitating learning which focused primarily on the psychomotor and cognitive learning domains. Recent literature suggested that demonstration involving simulation was more effective because it enhanced

decision making and involved all three domains of learning.

Specifically, three hypotheses guided the study: (1) there will be a significant difference in psychomotor skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist; (2) there will be a significant difference in cognitive skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method of instruction during their first administration of an IM injection in the clinical setting as indicated by a rating on a performance checklist; and (3) there will be a significant difference in affective skill learning between students who learn to administer IM injections through simulation and students who learn using the traditional demonstration-return demonstration method of instruction during their first administration of an IM

injection in the clinical setting as indicated by a rating on a performance checklist.

Woodruff (1967) provided the theoretical framework to structure the study. This framework describes how individuals learn and behave which is relevant to the decision making process students initiate in the performance of administering IM injections.

All students participated in the regularly scheduled laboratory activities concerning injection administration. One group of students participated in an additional half hour involving role-played client situations. Further, all students were evaluated by nurse educators in the clinical setting following their first administration of an IM injection to a hospitalized client, and their performance of behaviours involving psychomotor, cognitive and affective learning was scored according to a checklist.

Two instruments were used to gather data for the study: (1) The IM Performance Checklist which was developed by the investigator to evaluate students' performance following their first administration of an IM injections in the clinical setting; and (2) The Demographic Information Sheet which was developed by

the investigator to identify demographic characteristics of the students.

Data were collected from a volunteer sample of nursing students in their second year of a baccalaureate program. There were 27 students in a control group and 20 students in an experimental group. Differences in the scores between the two groups were analyzed using independent t-tests. Additionally, the findings related to the demographic characteristics of the sample of students revealed information regarding age, gender, language(s) spoken at home and level of education beyond grade 12. The two groups showed homogeneity on these characteristics.

A comparison of the two groups showed no significant differences for performance in the three learning domains following the first administration of an IM injection to a client in the clinical setting.

Conclusions

Data analysis suggested the following major conclusions:

1) The two selected instructional techniques were equally effective for facilitating nursing

student psychomotor, cognitive and affective performance of administration of an IM injection to a client in the clinical setting.

2) There are several areas within the study design that may have accounted for a lack of significant differences in performance between the two groups.

Limitations

The following were limitations in this study:

1. Nursing students' learning may have been influenced by study outside the laboratory.
2. Practice outside the practice laboratory cannot be controlled and may have affected students' performance.
3. Variability in the teaching approach of the individual nurse educators teaching the injection laboratories cannot be controlled and may have affected students' performance.
4. The use of different nurse educators to teach the injection laboratories may have affected individual student learning.
5. Interrater reliability of the IM performance checklist was not established.

Implications

The nursing profession is categorized into four interrelated domains: clinical practice, education, administration and research. The implications of this study are most pertinent to the domains of nursing education and nursing research.

Implications for nursing education.

The findings of this study suggest a major implication for nursing education. Nurse educators are required to prepare graduates who have not only knowledge,skill and decision-making abilities, but the necessary attitudes and values important in carrying out the skill. Traditionally, the technique of demonstration-return demonstration has been used to facilitate nursing student knowledge and skill required for the performance of nursing activities. However, the findings of this study suggest that the use of simulation during return demonstration is equally as effective for facilitating student learning of these activities. The use of the technique of demonstration return-demonstration may be more cost-effective and

could be seen as preferable. When selecting simulation as an instructional technique, nurse educators may maximize student psychomotor, cognitive and affective learning by using a wide variety of simulated situations and providing faculty with comprehensive orientation concerning this technique. Additionally, time periods for group discussion could be scheduled following completion of each simulated situation. It is possible that if faculty became proficient in the use of simulated situations, simulation may be a more effective technique for teaching skill-based nursing activities than traditional techniques.

Implications for nursing research.

A number of findings in the study have implications for nursing research. The small sample size and the fact that the sample was obtained from only one nursing program limits the generalizability of the results. The limitations have been presented and present an opportunity to re-design and replicate the study to again test the hypotheses. Alteration of the study design and replication of the study would be useful to further the theoretical and empirical knowledge needed

to teach nursing students to administer IM injections.

By far, the majority of participants in the study indicated their primary language was English. Thus, a cross-cultural study could be designed to examine the relationship of using simulations as a teaching strategy among students whose primary language was not English and students whose primary language was English.

Finally, as decreasing the costs of education are of major concern to nursing, determining the most effective and efficient strategies for teaching student nurses is imperative. The knowledge base underlying such practice will come from research that focuses on identifying the most effective teaching strategies for teaching nursing students skills and thus, make valuable contributions to nursing research.

References

Baldwin, D., Hill, P., & Hanson, G. (1991). Performance of psychomotor skills: A comparison of two teaching strategies. Journal of Nursing Education, 30(8), 367-370.

Bell, M. L. (1991). Learning a complex nursing skill: Student anxiety and the effect of preclinical skill evaluation. Journal of Nursing Education, 30(5), 222-226.

Benjamin, G., Benson, R., Crim, B., Edgar, C., Kautsch, C., Langland, R. M., Flynt, T. D., & Raithel, J. A. (1984). Use of extraneous conversation in the teaching of nursing skills. Journal of Nursing Education, 23(3), 109-113.

Bloom, B. (1956). Taxonomy of educational objectives, classification of educational goals, handbook I: Cognitive domain. New York: David McKay.

Boyd, S., McKiel, E., & Murphy, J. (1983). Teaching injection technique: An experimental study of instructional methods. AARN Newsletter, 39(9), 7-8.

Bruner, J. (1960). The process of education. New York: Vintage Books.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). New York: Lawrence Erlbaum.

Cook, J., & Maynard Hill, P. (1985). The impact of successful laboratory system on the teaching of nursing skills. Journal of Nursing Education, 24(8), 344-346.

Corder, J. B. (1991). Campus clinical: An alternative clinical activity. Journal of Nursing Education, 30(9), 420-421.

Cowan, D., & Weins, V. (1986). Mock hospital: A preclinical laboratory experience. Nurse Educator, 11(5), 30-32.

Coxson, E. J., & Gillin, A. E. (1988). Practicing injection skills: A factor in developing nursing competency. Corrective and Social Psychiatry and Journal of Behavioral Technology Methods, 34(1), 6-12.

Day, R., & Payne, L. (1987). Computer-managed instruction: An alternative teaching strategy. Journal of Nursing Education, 26(1), 30-35.

de Tornyay, R., & Thompson, M. (1987). Strategies for teaching nursing (3rd ed.). New York: Wiley.

DeYoung, S. (1990). Teaching nursing. California: Addison-Wesley.

Eaton, S. (1987). Developing psychomotor skills. In R. de Tornyay & M. Thompson, Strategies for teaching nursing (3rd ed.) (pp. 59-67). New York: Wiley.

Evans, M. (1989). Simulations: Their selection and use in developing nursing competencies. Journal of Nursing Staff Development, 5(2), 65-69.

Goldsmith, J. W. (1984). Effect of learner variables, media attributes, and practice conditions on psychomotor task performance. Western Journal of Nursing Research, 6(2), 229-240.

Gomez, G., & Gomez, E. (1987). Learning of psychomotor skills: Laboratory versus patient care setting. Journal of Nursing Education, 26(1), 20-24.

Hallal, J., & Welsh, M. (1984). Using the competency laboratory to learn psychomotor skills. Nurse Educator, 9(1), 34-38.

Hanna, D. (1991). Using simulations to teach clinical nursing. Nurse Educator, 16(2), 28-31.

Haukenes, E., & Halloran, M. C. (1984). A second look at psychomotor skills. Nurse Educator, 9(3), 9-13.

Infante, M. (1985). The clinical laboratory in nursing education (2nd ed.). New York: Wiley.

Kieffer, J. S. (1984). Selecting technical skills to teach for competency. Journal of Nursing Education, 23(5), 198-203.

Kleehammer, K., Hart, A. L., & Keck, J. F. (1990). Nursing students' perceptions of anxiety-producing situations in the clinical setting. Journal of Nursing Education, 29(4), 183-187.

Lenburg, C. B., & Mitchell, C. A. (1990). Assessment of outcomes: The design and use of real and simulation nursing performance examinations. Nursing and Health Care, 12(2), 68-74.

Love, B., McAdams, C., Patton, D., Rankin, E. J., & Roberts, J. (1989). Teaching psychomotor skills in nursing: A randomized control trial. Journal of Advanced Nursing, 14(11), 970-975.

McAdams, C., Rankins, E. J., Love, B., & Patton, D. (1989). Psychomotor skills laboratories and self directed learning: A study of nursing students' perceptions. Journal of Advanced Nursing, 14(9), 788-796.

Megel, M. E., Wilken, M. K., & Volcek, M. K. (1987). Nursing students' performance: Administering injections in laboratory and clinical area. Journal of Nursing Education, 26(7), 288-293.

Milde, F. K. (1988). The function of feedback in psychomotor-skill learning. Western Journal of Nursing Research, 10(1), 425-434.

Mogan, J., & Thorne, S. (1985). Injection giving: the effect of time lapse between learning and actual practice on student confidence. Nursing Papers, 17(2), 49-58.

Potter, P. A., & Perry, A. G. (1993). Fundamentals of nursing: Concepts, processes, and practice (3rd ed.). St. Louis: Mosby-Year Book.

Quiring, J. (1972). Effect of timing of videotape feedback on sophomore nursing students' achievement of skill in giving subcutaneous injections. Nursing Research, 21(4), 332-337.

Reilly, D., & Oermann, M. (1985). The clinical field: Its use in nursing education. Norwalk, CT: Appleton-Century-Crofts.

Reilly, D., & Oermann, M. (1992). Clinical teaching in nursing education (2nd ed.). New York: National League for Nursing.

Ross, M., Carroll, G., Knight, J., Chamberlain, M., Fothergill-Bourbonnais, F., & Linton, J. (1988). Using the OSCE to measure clinical skills performance in nursing. Journal of Advanced Nursing, 13(1), 45-56.

Statistics Canada. (1991). Canadian nursing statistics. Ottawa: Author.

Swendsen Boss, L. (1985). Teaching for clinical competence. Nurse Educator, 10(4), 8-12.

Taylor, J., & Cleveland, P. (1984). Effective use of the learning laboratory. Journal of Nursing Education, 23(1), 32-39.

University of British Columbia School of Nursing. (1993). Nursing parenteral therapy guide. Vancouver, BC: Author.

Woodruff, A. (1967). Cognitive models of learning and instruction. In L. Siegal (Ed.), Instruction: Some contemporary viewpoints (pp. 55-98). San Francisco: Chandler.

Appendix A

THE PERFORMANCE CHECKLIST

Code #: _____ Date: _____ # of times practiced IM's: _____

Site given: _____ # of s/c's given in clinical: _____

Student Behaviors	Performed Above Average or N/A (✓)	Performed Adequately (✓)	Not Performed Adequately (✓)	Omitted (✓)
1. Determines appropriate dose (i.e. considers medication, client, route, time)				
2. Washes hands before injection				
3. Performs 3 medication checks				
4. Selects appropriate needle size (i.e. considers amount and type of solution, client body weight factors)				
5. Draws up medication from ampule aseptically				
6. Identifies client				
7. Checks for allergies				
8. Selects appropriate site (i.e. considers client condition, diagnosis, preference, site last given)				
9. Landmarks injection site				
10. Respects client's preferences about injection site				
11. Considers client's level of anxiety				
12. Accounts for client's physical comfort in administering the injection				
13. Swabs injection site prior to injection				
14. Injects medication at 90°				
15. Aspirates prior to injection				
16. Removes needle quickly				
17. Massages site following injection				
18. Assesses client's affective response to injection				
19. Disposes of used equipment properly				
20. Washes hands after giving injection				
21. Communicates with client in a professional/therapeutic manner as appropriate				

Appendix B

DEMOGRAPHIC INFORMATION

Please provide the following information about yourself:

1. Age: _____

2. Gender: (circle one)

   a. Male b. Female

3. Language(s) usually spoken at home (circle all that apply):

   a. Chinese
   b. English
   c. French
   d. German
   e. Greek
   f. Indo-Pakistan
   g. Italian
   h. Japanese
   i. Portuguese/ Spanish
   j. Scandinavian
   k. Other, please specify _____

4. Highest level of education (circle one):

   a. Completed Grade 12
   b. Community College/Technical School
   c. Attended university: 1 - 2 years
   d. Attended university: 3 - 4 years
   e. University degree

5. Experience with injections prior to learning laboratory (please explain):

_____

_____

_____

_____

Appendix C

Letter to Director of the School of Nursing

TITLE OF THE STUDY: **INTRAMUSCULAR INJECTIONS: A COMPARISON OF TWO TEACHING STRATEGIES**

INVESTIGATOR: **LINDA MCKINNON** **271-4553**

FACULTY ADVISOR: **ANNA MARIE HUGHES** **822-7437**

Dear Dr. Willman:

As a part of my Master of Science in Nursing degree at the University of British Columbia, I am conducting research comparing instructional techniques and their effect on student learning of intramuscular injections using a quasi-experimental design. The instructional techniques selected for teaching intramuscular injections for this study are the traditional demonstration-return demonstration and an experimental demonstration-return demonstration using simulation.

The traditional technique of demonstration-return demonstration emphasizes mainly psychomotor skill learning. Literature supports instructional techniques that more closely simulate the real client situation may more adequately prepare nursing students for performance in clinical situations. To facilitate learning in all three domains of learning, I plan to involve students in simulated realistic client situations where they assume roles as clients and as nurses.

I am requesting permission to invite the 1993 second year students and their clinical instructors to participate. Permission from the second year faculty and coordinator will also be obtained.

The study will take place during the regularly scheduled injection administration laboratory and during the students' first administration of an intramuscular injection in the clinical setting. I plan to have students in each of six laboratory instructors' groups be the experimental group and students in six laboratory instructors' groups be the control group. Additionally, all instructors will be required to complete a performance evaluation for each student in the clinical setting using a perfomance checklist. The laboratory time will need to be extended by approximately one half hour for the experimental group and their instructors.

All second year students will be invited to participate in the study and they will be informed that they may withdraw from the study at any time. Student consents will be obtained and students will be advised that confidentially will be maintained.

I look forward to hearing from you. Please contact me or my faculty advisor for any questions or concerns.

Sincerely,

Linda McKinnon, B.S.N.

Appendix D

Letter to Second Year Coordinator

TITLE OF THE STUDY: **INTRAMUSCULAR INJECTIONS: A COMPARISON OF TWO TEACHING STRATEGIES**

INVESTIGATOR: **LINDA MCKINNON 271-4553**

FACULTY ADVISOR: **ANNA MARIE HUGHES 822-7437**

Dear Mrs. Dewis:

As a part of my Master of Science in Nursing degree at the University of British Columbia, I am conducting research comparing instructional techniques and their effect on nursing student learning of intramuscular injections using a quasi-experimental design. The instructional techniques selected for this study are the traditional demonstration-return demonstration and an experimental demonstration-return demonstration using simulation.

The traditional technique of demonstration-return demonstration emphasizes mainly psychomotor skill learning. Literature supports instructional techniques that more closely simulate the real client situation may more adequately prepare nursing students for performance in clinical situations. To facilitate learning in all three domains of learning, I plan to involve students in simulated realistic client situations where they assume roles as clients and as nurses. To facilitate learning in all three domains of learning, I plan to involve students in simulated realistic client situations where they assume roles as clients and as nurses.

I plan to conduct a study involving the second year baccalaureate students and their clinical instructors in the fall of 1993. I propose to have six instructors work with an experimental group and all faculty involved in clinical evaluation of all participating students using a performance checklist.

The study will take place during the regularly scheduled injection administration laboratory and during the students' first administration of an intramuscular injection in the clinical setting. The laboratory time will need to be extended by approximately one half hour for the experimental group.

The amount of teacher time for the experimental group involved would be a total of approximately two and a half hours in addition to his/her regularly scheduled laboratory activities. During this time, orientation to the instructional technique and performance checklist would occur. Those instructors in the experimental groups will spend an additional half hour in the laboratory. In addition, approximately one half hour would be required for the remaining second year instructors to have the use of the performance checklist explained. This checklist will be used to evaluate student performance in the clinical setting.

I would like to have ten minutes to address the entire class of second year students to explain the study at the beginning of all their core nursing courses during the first week of the fall term.

All second year students will be invited to participate in the study and they will be informed that they may withdraw at any time. Student consents will be obtained and students will be advised that confidentiality will be maintained.

I look forward to hearing from you. Please contact me or my faculty advisor for any questions or concerns.

Sincerely,

Linda McKinnon, B.S.N.

Appendix E

LETTER TO SECOND YEAR FACULTY

TITLE OF THE STUDY: **INTRAMUSCULAR INJECTIONS: A COMPARISON OF TWO TEACHING STRATEGIES**

INVESTIGATOR: **LINDA MCKINNON 271-4553**

FACULTY ADVISOR: **ANNA MARIE HUGHES 822-7437**

Dear Faculty Member:

As part of my Master of Science in Nursing degree at the University of British Columbia, I am conducting research comparing instructional techniques and their effect on student learning of intramuscular injections using a quasi-experimental design. The instructional techniques selected for teaching intramuscular injections for this study are the traditional demonstration-return demonstration and an experimental demonstration-return demonstration using simulation.

The traditional technique of demonstration-return demonstration emphasizes mainly psychomotor skill learning. Literature supports instructional techniques that more closely simulate the real client situation may more adequately prepare nursing students for performance in clinical situations. To facilitate learning in all three domains of learning, I plan to involve students in simulated realistic client situations where they assume roles as clients and as nurses.

The study will take place during the regularly scheduled injection administration laboratory on September 24th and 28th, 1993 and during students' first administration of an intramuscular injection in the clinical setting.

Your participation would involve using an additional instructional technique if working with an experimental group of students when teaching the laboratory. In addition, all faculty will be required to complete a

performance checklist for all second year students during their first administration of an intramuscular injection in the clinical setting.

Orientation for faculty for the experimental group involving simulations will take approximately one half hour. Orientation for all faculty for completion of the checklist will take an additional one half hour. Instructors for the experimental group will have laboratory time extended by one half hour.
To ensure anonymity of students, a code number will be placed on the checklist and known only to the investigator.

Implementation of the planned activities with the students will constitute your consent to participate in the study. Your participation in the study is entirely voluntary and you may withdraw at any time. Your time and cooperation will be greatly appreciated.

I look forward to working with you. Please contact me or my faculty advisor for any questions or concerns.

Sincerely,

Linda McKinnon, B.S.N.

Appendix F

INFORMATION LETTER FOR STUDENTS

TITLE OF THE STUDY: **INTRAMUSCULAR INJECTIONS: A COMPARISON OF TWO TEACHING STRATEGIES**

INVESTIGATOR: **LINDA MCKINNON** **271-4553**

FACULTY ADVISOR: **ANNA MARIE HUGHES** **822-7437**

My name is Linda McKinnon. I am a Registered Nurse and a graduate student in the Master of Science in Nursing program at the University of British Columbia. For my Master's thesis, I am investigating methods of teaching intramuscular injections to learn what strategies are most effective for teaching students to administer injections.

You are invited to participate in this study. There will be no risk or discomfort to you. For the purpose of this study, you will be involved with one of two instructional methods during your regularly scheduled injections laboratory. You may be required to remain in the laboratory for up to 30 extra minutes. In addition, you will be observed during the administration of an intramuscular injection in the clinical setting by an instructor using a performance checklist. Enclosed is a demographic sheet which you will be asked to complete and return to your laboratory instructor.

Your participation in this study is entirely voluntary. Further, you may withdraw at any time from the study without prejudicing your education or class standing. To ensure your identity on The Performance Checklist, a code number will be assigned and your name will be known only to the investigator. Your name will not appear in any study findings or reports.

Because of the importance of this study, your time and cooperation will be greatly appreciated. In order that students do not know what group they are in, you are asked not to discuss what you learned in the injection laboratory with your classmates. If you have any questions or concerns, please call me or my faculty advisor.

Thank you for your assistance.

Sincerely,

Linda McKinnon, R.N., B.S.N.

Appendix G

PARTICIPANT CONSENT

TITLE OF THE STUDY: **INTRAMUSCULAR INJECTIONS: A COMPARISON OF TWO TEACHING STRATEGIES**

INVESTIGATOR: **LINDA MCKINNON** **271-4553**

FACULTY ADVISOR: **DR. ANNA MARIE HUGHES** **822-7437**

This certifies that I agree to participate in the above study. I understand the purpose of the study is to compare effective teaching strategies for teaching nursing students to administer intramuscular injections. I have had the study explained to me and I have had opportunity to contact either the investigator or faculty advisor for any questions or concerns that I have. I acknowledge receipt of a copy of this consent form.

I understand that my participation is voluntary and that I may withdraw at any time from the study without prejudicing my education or class standing. I understand that the information obtained will be kept confidential by the investigator and that a code number will be assigned to my name for use with The Performance Checklist. I am aware that I will receive no money for my participation and that there are no risks involved to me.

I agree to spend up to approximately 30 extra minutes in the injection's laboratory, if necessary, to be evaluated by a checklist during my first intramuscular injection administration in the clinical setting, and to complete the demographic sheet.

SIGNATURE: _____DATE: _____

Appendix H

Student Guide

INJECTIONS
STUDENT MODULE
1993-1994
(Length 4 hours)

DATE: _____ TIME: _____ LAB SITE: _____

RATIONALE

The safe administration of parenteral medications requires an understanding of related principles and rationale and their application in the preparation and administration of injections in a variety of clinical situations.

OUTCOMES

Upon lab completion you will:

1. Understand basic concepts related to injections
   - 1.1 distinguish between the subcutaneous route and the intramuscular route for injection
   - 1.2 explain the rationale for aspiration
   - 1.3 explain the appropriate use of massage
   - 1.4 provide rationale for site rotation

2. Know the standard equipment required for administering an injection
   - 2.1 select needles and syringes appropriate for subcutaneous/intramuscular injection
   - 2.2 select the needle and syringe appropriate for the subcutaneous injection of insulin

3. Know the injection sites appropriate for subcutaneous and intramuscular injections
   - 3.1 name three common sites acceptable for most subcutaneous injections

3.2 name the four accepted intramuscular injection sites
3.3 name the anatomical landmarks for each site

4. Apply the principles of asepsis
4.1 wash hands before and after the preparation/administration of any medication
4.2 draw up medication from vial or ampule aseptically
4.3 swab the injection site

5. Demonstrate the technique for the safe administration of subcutaneous and intramuscular injections
5.1 manipulate syringe and vial/ampule
5.2 select and inspect site for injection
5.21 three sites for subcutaneous injections
5.22 four sites for intramuscular injections
5.3 use appropriate angle of penetration to ensure proper deposition of medication into appropriate tissue
5.31 45° - 90° angle for subcutaneous injections
5.32 90° angle for intramuscular injections
5.4 demonstrate appropriate needle insertion technique using dart like motion
5.5 aspirate prior to injection as appropriate
5.6 inject medication while stabilizing syringe
5.7 remove needle quickly supporting the tissue
5.8 massage site if appropriate
5.9 use Z track technique when indicated
5.10 carry out procedure in a smooth, confident manner

6. Demonstrate professional communication skills
6.1 explain planned intervention to the client
6.2 communicate plan with other members of the health care team
6.3 document procedure on appropriate record(s)

7. Demonstrate effective organization
   - 7.1 carry out the steps of the procedure in an orderly sequence
   - 7.2 organize the client's environment

8. Ensure client comfort
   - 8.1 provide privacy
   - 8.2 rotate injection sites
   - 8.3 incorporate measures to reduce pain or discomfort
   - 8.4 evaluate the effectiveness of the medication

9. Ensure the safety of the client, self, and others
   - 9.1 adhere to the five 'R's of medication administration
   - 9.2 adhere to the three medication checks
   - 9.3 assess the client for allergies
   - 9.4 make correct drug calculations (ensure correct dosage)
   - 9.5 select equipment according to client needs
   - 9.6 take precautions to avoid injury during ampule opening
   - 9.7 begin procedure again if blood is aspirated
   - 9.8 dispose of needles and syringes in a safe manner
   - 9.9 establish a safe environment for the client once the medication has been administered

10. Incorporate principles of teaching and learning
    - 10.1 provide client with information related to the purpose and effects of the medication
    - 10.2 establish strategies for the client to identify when he/she may require further medication if it is ordered on a PRN basis

11. Demonstrate judgement and professional accountability
    - 11.1 use the narcotic record appropriately
    - 11.2 evaluate the effectiveness of the medication
    - 11.3 evaluate the effectiveness of own technique
    - 11.4 recognize breaks in aseptic technique and acts appropriately

REQUIRED PREPARATION

Prerequisite Knowledge & Skills

Review

1. N130/131 Medication administration
2. N230/231 Infection Control: Surgical Asepsis Module

Read

Required Readings

Curren, A., & Munday, L. (1990). Math for meds (6th ed.). San Diego: Wallcur Inc.

Chapter 10 - Hypodermic Syringe Measurement
Chapter 11 - Reading Parenteral Medication Labels
Chapter 15 - Measuring Insulin Dosages
Chapter 13 OR 14 - Dosage calculation using "ratio and proportion" OR "Formula Method"

Potter, P. A., & Perry, A. (1989). Fundamentals of nursing: Concepts, process, and practice (2nd ed.) (pp. 390-407). Toronto: C.V. Mosby.

Locating Landmarks for IM injection sites (at end of this module).

View

CAI:
Larson, D. (1984). Calculating and preparing fractional medication dosages for injection. Philadelphia: J. B. Lippincott.

Video #___ - "Landmarking for IM Injections."

NOTES

Special consideration must be given to the preparation of heparin, insulin and intradermal injections.

HEPARIN is an anticoagulant used to alter clotting time and inhibit clot formation. Because of these anticoagulant properties, special consideration must be given to heparin injection to promote appropriate absorption and avoid causing trauma or bleeding at the injection site. The dosage of Heparin is expressed in USP (United States Pharmacopia) units.

1. Use the dosage strength that yields the smallest volume for the desired dose.
2. Bunch or stretch the skin, depending on adipose layer, to achieve an appropriate injection site.
3. Inject Heparin deep into the subcutaneous tissue of the <u>abdomen</u> where absorption is slowest.
4. Change the needle used to withdraw the heparin from the vial.
5. <u>Do not aspirate</u> - to prevent local tissue trauma.
6. <u>Do not massage</u> - apply gentle pressure to the injection site.
7. Rotate injection sites avoiding any areas which are bruised or scarred.

INSULIN is a natural hormone which controls blood glucose levels in the body. Diabetic clients whose pancreas is unable to produce adequate insulin may require injections of insulin. Clients will often receive a combination of different types of insulin to control blood glucose levels. Insulins are classified according to origin (animal or synthetic) and by action (rapid, intermediate or long acting). When preparing insulin for injection, careful reading of vial labels is essential to identify the origin and action of the insulin. Regular, unmodified insulin is clear. Other insulins are cloudy because of a protein which is added to slow absorption. Each type of insulin has a specific <u>onset</u>, <u>peak</u>, and <u>duration</u> time. Insulin is measured in <u>units</u> of biologic activity rather than a weighed volume and is generally supplied as U-100 (100 units/ml). Insulin is **<u>ALWAYS</u>** administered using an insulin syringe. eg. a U-100 syringe is used to administer U-100 insulin. It is administered subcutaneously with some alterations from the standard subcutaneous injection technique.

1. Use an insulin syringe only (27 G 1/2" needle). Use a "low-dose" syringe for dosages under 50 units.
2. Follow accepted method for mixing two insulins in the same syringe [draw up regular or rapid acting (clear appearance) prior to intermediate or long action (cloudy appearance)]
3. A 90° angle is generally used because of the short needle length (1/2"). Assess for adequate subcutaneous tissue and alter angle of injection appropriately (45-90°).
4. Aspiration is not performed.
5. Massage after injection is not performed as it may alter the absorption rate (remember onset, peak, and duration times).
6. Rotate injection sites and space injections 1" apart to avoid local tissue damage. Keep in mind that different sites may have different absorption rates.

Consult a medical surgical nursing textbook for more information re: site selection and rotations.

INTRADERMAL INJECTION is a route frequently used for skin testing ie. tuberculosis or allergy tests. Because the drugs are frequently potent, they are injected into the dermis where blood supply is reduced and absorption occurs more slowly.

1. Choose a site that is lightly pigmented, free of lesions and relatively hairless ie. inner forearm and upper back.
2. Select a tuberculin syringe.
3. Insert at an angle of 5° to 15°.
4. Aspiration is not necessary.
5. As the drug is injected look for a small bleb which should appear on the skin surface.
6. Avoid massage.
7. Document the precise location and time of injection to facilitate reading results.

Complete

Readiness Quiz

1. Name the three anatomical areas that are acceptable for most subcutaneous injections.

   a)

   b)

   c)

2. Discuss the rationale for the rotation of injection sites.

3. Discuss the rationale for massage at the injection site.

4. Describe the location of four intramuscular injection sites incorporating the anatomical landmarks. Give rationale for the choice of each site.

   a)

   b)

c)

d)

5. Discuss the nursing implications of aspirating the syringe prior to administration of an intramuscular injection.

LAB ACTIVITIES

1. Parenteral Medication Review

   a. Observe a variety of syringes and needles used for parenteral medication administration.

   b. Discuss the advantages and disadvantages of parenteral medication administration.

   c. Discuss nursing responsibilities related to parenteral medication administration.

2. Subcutaneous Injections

   a. Observe the demonstration of subcutaneous injection technique including:
      - the selection of equipment used for subcutaneous injection
      - withdrawing medication from a vial
      - landmarking subcutaneous injection sites
      - subcutaneous injection technique

   b. Practice manipulating the syringe and withdrawing medication from a vial.

c. Practice the technique for giving a subcutaneous injection using a sponge. Include swabbing the injection site, manipulating the syringe, choosing the angle of needle entry, stabilizing the needle, aspirating and injecting the medication.

d. Administer a subcutaneous injection of sterile normal saline to another student under the supervision of the lab instructor.

e. Review the modifications to the subcutaneous injection technique required for the administration of Insulin and Heparin.

f. Review the following case scenario.

Ms. D. is a 23 year old woman who is entering nursing school. She has come to your outpatient clinic to receive her immunization boosters. She requires DPT vaccine which is administered subcutaneously.

a. As you prepare to administer this medication what assessment data will you collect?

b. What site will you most likely choose? Name.

c. What are the anatomical landmarks which define this site?

d. What other sites are acceptable for subcutaneous injections?

She also tells you that she requires a TB test. This is given via the intradermal route.

e. How does this route differ from the subcutaneous route?

3. Intramuscular Injections

a. Observe the demonstration of intramuscular injection technique including:
   - equipment used for intramuscular injection
   - withdrawing medication from an ampule
   - landmarking intramuscular injection sites
   - intramuscular injection technique
   - Z-track injection technique

b. Working in pairs, practise landmarking the four accepted intramuscular injection sites. For each site you will be expected to:
   - position the client for the injection
   - identify anatomical landmarks
   - assess the site to ensure appropriateness for IM injection

c. Practice manipulating the syringe and drawing up the solution from ampules and vials.

d. Practice the technique for giving an intramuscular injection using a sponge.

You will **not** be administering intramuscular injection to each other during this lab time. An opportunity to give an IM injection may be made available through a skills focus session. Under no circumstance should you administer an injection, other than into a simulated material, without supervision.

Review the following case scenario.

Mrs. J. is a 35 year old client admitted to your unit yesterday after an appendectomy. You will be assessing her need for analgesia as part of your initial contact. Because she has been suffering from nausea when given her analgesic, the doctor has ordered Gravol 25 mg to be given with her

Demerol 50 mg IM q4h p.r.n. Discuss the application of the nursing process to the administration of Mrs. J.'s analgesic.

Documentation

Injections are recorded on the medication administration record as the injection itself is simply a route for medication administration. In the case of Heparin and Insulin, these medications may be recorded on separate medication records. It is important to document the site chosen for the injection so that sites may be rotated.

4. Discussion of Return Demonstrations

Enrichment Readings

Hahn, K. (1990). Brush up on your injection technique. Nursing, 20(9), 54-58.

Keen, M. F. (1990). Get on the right track with Z-track injections. Nursing, 20(8), 59.

Appendix I

Instructor Guide

INJECTIONS
FACULTY MODULE
1993-1994
(Length 4 hours)

DATE: _____ TIME: _____ LAB SITE: _____

RATIONALE

The safe administration of parenteral medications requires an understanding of related principles and rationale and their application in the preparation and administration of injections in a variety of clinical situations.

OUTCOMES

Upon lab completion, the student will:

1. Understand basic concepts related to injections
   - 1.1 distinguish between the subcutaneous route and the intramuscular route for injection
   - 1.2 explain the rationale for aspiration
   - 1.3 explain the appropriate use of massage
   - 1.4 provide rationale for site rotation

2. Know the standard equipment required for administering an injection
   - 2.1 select needles and syringes appropriate for subcutaneous/intramuscular injection
   - 2.2 select the needle and syringe appropriate for the subcutaneous injection of insulin

3. Know the injection sites appropriate for subcutaneous and intramuscular injections
   - 3.1 name three common sites acceptable for most subcutaneous injections

3.2 name the four accepted intramuscular injection sites
3.3 name the anatomical landmarks for each site

4. Apply the principles of asepsis
4.1 wash hands before and after the preparation/administration of any medication
4.2 draw up medication from vial or ampule aseptically
4.3 swab the injection site

5. Demonstrate the technique for the safe administration of subcutaneous and intramuscular injections
5.1 manipulate syringe and vial/ampule
5.2 select and inspect site for injection
5.21 three sites for subcutaneous injections
5.22 four sites for intramuscular injections
5.3 use appropriate angle of penetration to ensure proper deposition of medication into appropriate tissue
5.31 45° - 90° angle for subcutaneous injections
5.32 90° angle for intramuscular injections
5.4 demonstrate appropriate needle insertion technique using dart like motion
5.5 aspirate prior to injection as appropriate
5.6 inject medication while stabilizing syringe
5.7 remove needle quickly supporting the tissue
5.8 massage site if appropriate
5.9 use Z track technique when indicated
5.10 carry out procedure in a smooth, confident manner

6. Demonstrate professional communication skills
6.1 explain planned intervention to the client
6.2 communicate plan with other members of the health care team
6.3 document procedure on appropriate record(s)

7. Demonstrate effective organization
   - 7.1 carry out the steps of the procedure in an orderly sequence
   - 7.2 organize the client's environment

8. Ensure client comfort
   - 8.1 provide privacy
   - 8.2 rotate injection sites
   - 8.3 incorporate measures to reduce pain or discomfort
   - 8.4 evaluate the effectiveness of the medication

9. Ensure the safety of the client, self, and others
   - 9.1 adhere to the five 'R's of medication administration
   - 9.2 adhere to the three medication checks
   - 9.3 assess the client for allergies
   - 9.4 make correct drug calculations (ensure correct dosage)
   - 9.5 select equipment according to client needs
   - 9.6 take precautions to avoid injury during ampule opening
   - 9.7 begin procedure again if blood is aspirated
   - 9.8 dispose of needles and syringes in a safe manner
   - 9.9 establish a safe environment for the client once the medication has been administered

10. Incorporate principles of teaching and learning
    - 10.1 provide client with information related to the purpose and effects of the medication
    - 10.2 establish strategies for the client to identify when he/she may require further medication if it is ordered on a PRN basis

11. Demonstrate judgement and professional accountability
    - 11.1 use the narcotic record appropriately
    - 11.2 evaluate the effectiveness of the medication
    - 11.3 evaluate the effectiveness of own technique
    - 11.4 recognize breaks in aseptic technique and acts appropriately

REQUIRED PREPARATION

Prerequisite Knowledge & Skills

Review

1. N130/131 Medication administration
2. N230/231 Infection Control: Surgical Asepsis Module

Read

Required Readings

Curren, A., & Munday, L. (1990). Math for meds (6th ed.). San Diego: Wallcur Inc.

Chapter 10 - Hypodermic Syringe Measurement
Chapter 11 - Reading Parenteral Medication Labels
Chapter 15 - Measuring Insulin Dosages
Chapter 13 OR 14 - Dosage calculation using "ratio and proportion" OR "Formula Method"

Potter, P. A., & Perry, A. (1989). Fundamentals of nursing: Concepts, process, and practice (2nd ed.) (pp. 390-407). Toronto: C.V. Mosby.

Locating Landmarks for IM injection sites (at end of this module).

Enrichment Readings

Hahn, K. (1990). Brush up on your injection technique. Nursing, 20(9), 54-58.

Keen, M. F. (1990). Get on the right track with Z-track injections. Nursing, 20(8), 59.

View

CAI:
Larson, D. (1984). Calculating and preparing fractional medication dosages for injection. Philadelphia: J. B. Lippincott.

Video #___ - "Landmarking for IM Injections."

NOTES

Special consideration must be given to the preparation of heparin, insulin and intradermal injections.

HEPARIN is an anticoagulant used to alter clotting time and inhibit clot formation. Because of these anticoagulant properties, special consideration must be given to heparin injection to promote appropriate absorption and avoid causing trauma or bleeding at the injection site. The dosage of Heparin is expressed in USP (United States Pharmacopia) units.

1. Use the dosage strength that yields the smallest volume for the desired dose.
2. Bunch or stretch the skin, depending on adipose layer, to achieve an appropriate injection site.
3. Inject Heparin deep into the subcutaneous tissue of the abdomen where absorption is slowest.
4. Change the needle used to withdraw the heparin from the vial.
5. Do not aspirate - to prevent local tissue trauma.
6. Do not massage - apply gentle pressure to the injection site.
7. Rotate injection sites avoiding any areas which are bruised or scarred.

INSULIN is a natural hormone which controls blood glucose levels in the body. Diabetic clients whose pancreas is unable to produce adequate insulin may require injections of insulin. Clients will often receive a combination of different types of insulin to control blood glucose levels. Insulins are classified according to origin (animal or synthetic) and by action (rapid, intermediate or long acting). When preparing insulin for injection, careful reading of vial labels

is essential to identify the origin and action of the insulin. Regular, unmodified insulin is clear. Other insulins are cloudy because of a protein which is added to slow absorption. Each type of insulin has a specific onset, peak, and duration time. Insulin is measured in units of biologic activity rather than a weighed volume and is generally supplied as U-100 (100 units/ml). Insulin is **ALWAYS** administered using an insulin syringe. eg. a U-100 syringe is used to administer U-100 insulin. It is administered subcutaneously with some alterations from the standard subcutaneous injection technique.

1. Use an insulin syringe only (27 G 1/2" needle). Use a "low-dose" syringe for dosages under 50 units.
2. Follow accepted method for mixing two insulins in the same syringe [draw up regular or rapid acting (clear appearance) prior to intermediate or long action (cloudy appearance)]
3. A 90° angle is generally used because of the short needle length (1/2"). Assess for adequate subcutaneous tissue and alter angle of injection appropriately (45-90°).
4. Aspiration is not performed.
5. Massage after injection is not performed as it may alter the absorption rate (remember onset, peak, and duration times).
6. Rotate injection sites and space injections 1" apart to avoid local tissue damage. Keep in mind that different sites may have different absorption rates.

Consult a medical surgical nursing textbook for more information re: site selection and rotations.

INTRADERMAL INJECTION is a route frequently used for skin testing ie. tuberculosis or allergy tests. Because the drugs are frequently potent, they are injected into the dermis where blood supply is reduced and absorption occurs more slowly.

1. Choose a site that is lightly pigmented, free of lesions and relatively hairless ie. inner forearm and upper back.

2. Select a tuberculin syringe.
3. Insert at an angle of 5° to 15°.
4. Aspiration is not necessary.
5. As the drug is injected look for a small bleb which should appear on the skin surface.
6. Avoid massage.
7. Document the precise location and time of injection to facilitate reading results.

Complete

Readiness Quiz - Answers to the Readiness Quiz

1. Name the three anatomical areas that are acceptable for most subcutaneous injections.
   a. upper outer arm
   b. abdomen
   c. thigh

   * Any site with adequate subcutaneous tissue may be used; whether skin is pinched or not, angle of needle entry, and needle length are altered to ensure medication is deposited in subcutaneous tissue.

2. Discuss the rationale for the rotation of injection sites.

   Sites are rotated to prevent development of complications at the site such as lipodystrophy.

3. Discuss the rationale for massage at the injection site.

   Massage may be used to improve absorption at the injection site and promote comfort following the injection.

4. Describe the location of four intramuscular injection sites incorporating the anatomical landmarks. Give rationale for each site.

   a. dorsogluteal - landmarks include the greater trochanter and the posterior superior iliac spine.

- muscle is large so can tolerate larger amounts of solution.
- commonly used but not site of choice.

b. ventrogluteal
- landmarks include greater trochanter and anterior superior iliac spine.
- site of choice because can tolerate larger amounts (3 ml), is accessible from any position, and is free from major blood vessels and nerves.

c. vastus lateralis
- one hand breadth above the knee and one hand breadth below the greater trochanter on the outer aspect of the anterior thigh.

d. deltoid
- upper, outer arm below the acromion process.
- not a preferred site.
- only small amounts (0.5 ml.) may be given.

5. Discuss the nursing implications of aspirating the syringe prior to administration of an intramuscular injection.

   Aspiration is important in order to detect inadvertent puncturing of a blood vessel and avoid IV administration of a drug intended for IM administration.

ANNOUNCEMENTS

LAB ACTIVITIES

SCHEDULE 4 hours	
20 minutes	Parenteral Medications Review
80 minutes	Demonstrate sub-cutaneous injections Site selection for S/C injections and practice
20 minutes	Coffee
20 minutes	Administration of insulin, heparin, intradermal technique
90 minutes	Syringes for IM injection, landmarking, demonstration Practice landmarking for IM injection
10 minutes	Discussion of Return Demonstration

20 mins. to _____

1. Observe a variety of syringes and needles for parenteral medication administration (IM, S/C, intradermal)
   - variety of syringe sizes
   - needle gauge and length
   - insulin, TB syringe
   - ID parts of syringe to remain sterile

Advantages of Parenteral Administration
- faster
- more efficient absorption
- easy to administer to critically ill, unconscious client
- some drugs are destroyed by gastric contents, eg. insulin
- can be administered to patients unable to take p.o. meds, eg. when fasting

Disadvantages of Parenteral Administration
- painful
- tissue damage at injection site
- potential nerve damage with incorrect technique
- potential of IV injection if aspiration omitted
- medication irretrievable

Nursing Responsibilities Related to Parenteral Meds
- use of MAR or med cards
- verify original order if necessary
- 5 R's - drug, dose, client, route, time
- 3 medication checks
- check allergies
- identify client
- document - ensure site noted
  - evaluate effect of prn meds

80 mins. 2. Subcutaneous injections

to

Faculty will demonstrate S/C injection technique including:

Equipment
Syringe: insulin
tuberculin
1 - 3 cc syringe
Needle: 25 - 27 gauge
3/8 - 5/8" needle

Advantages/disadvantages
- slower absorption for high potency drugs, ie. insulin
- longer drug effects
- tissue irritability

Positioning
- sitting/standing/lying

Method
- withdraw medication from a vial (demonstrate injection of air into vial prior to med withdrawal)
- landmarking S/C injection sites - visually inspect, palpate for tenderness, hardness
- S/C injection technique: pinching skin elevates S/C tissue and may desensitize the area

- spreading skin allows needle to penetrate easier
- body weight and depth of S/C tissue layer provides guidance as to needle length, angle of entry and whether skin is pinched or spread prior to injection to ensure med is deposited in S/C tissue
  eg. for thin persons, 1/2" needle at 45°
  for obese person, 5/8" at 90° angle
- for the average sized client, skin can be pinched or spread
- do not aspirate and massage for heparin/insulin

Students will practice manipulation of equipment and use a sponge for practice of injection

Students will administer a S/C injection of sterile normal saline to another student under the supervision of the lab instructor
Faculty may choose to give the initial injection to a student volunteer

Discuss the case scenarios of Ms. D.

Ms. D. is a 23 year old woman who is entering nursing school. She has come to your outpatient clinic to receive her immunization boosters. She requires DPT vaccine which is administered subcutaneously.

Discussion of Case Scenario.

a. What assessment data will you collect?
   Assess for:
   - allergies
   - physical assessment of site

b. What site will you choose? Name.

   Site selected in arm due to accessibility

c. What are the anatomical landmark which define this site?

Anatomic landmarks
- outer aspect of upper arm - below acromion process or use axilla as a guideline

d. What other sites are acceptable for S/C injections?

Alternate sites
- abdomen from below costal margins to iliac crest
- anterior aspects of thighs
- scapular region of upper back
- upper ventral or dorsal gluteal areas

e. She requires a TB skin test intradermally. How does this route differ from S/C?

Differences between intradermal/subcutaneous routes
- site
- angle
- bleb appearance

Discuss administration of insulin and heparin using lab notes.

20 mins. COFFEE

to

90 mins. 3. Intramuscular injections

to

Faculty will demonstrate I.M. injection technique including:

Equipment:
- syringe
- 3 ml. needle
- 19 - 23 gauge (depending on viscosity of med.) 1 - 1 1/2" in length
- ampule

- alcohol swab
- withdraw medication from ampoule (proper opening)

IM Injection Technique
- angle of needle 90° to skin
- spread skin tightly or if muscle is small, grasp body of muscle
- use dart like motion
- massage site (stimulates circulation and ↑ drug distribution)

Landmarking I.M. injection sites

a. ventrogluteal - generally site of choice

Advantages/disadvantages
- chance of contamination away from rectum
- easily accessible, free of major blood vessels and nerves, and adipose tissue layer is thinner than buttocks

Positioning
- patient can be side lying with knee flexed

Method
- place palm/heel of hand over the greater trochanter
- use 2 fingers and place index finger over the anterior sup. iliac spine and then extend the middle finger toward the iliac crest which creates a triangle
- the injection site is located within the triangle
- inspect the site and palpate the site to determine presence of muscle tissue (have client move leg and feel for muscle movement to verify)

b. dorsogluteal

Advantages/disadvantages
- close to sciatic nerve and major blood vessels and bone
- med may be absorbed more slowly
- some clients may have a thick layer adipose tissue
- need to ensure adequate visualization of entire site

Positioning
- prone with toes flexed inward

Methods for Site Selection

i. Draw imaginary line between posterior superior iliac spine: point where curved ridge of iliac crest meets spine (skin may be dimpled) and greater trochanter (follow curve of buttock to hip indentation where hip and thigh join)

ii. Dividing buttocks into quadrants - is less accurate and increases risk of injury to sciatic nerve.
   - vertical line extends from iliac crest to gluteal fold
   - horizontal line medial fold to lateral aspect of buttock
   - injection site is upper outer quadrant (some sources specify upper outer aspect of upper outer quadrant)

c. deltoid

Advantages/disadvantages
- may not be well developed in many adults and most children
- for small volumes of medication

Positioning
- sitting/lying position

Methods for Site Selection

i. - palpate lower edge of acromion process
   - palpate the midpoint of the lateral aspect of the arm of a level in line with axilla - this forms a triangle
   - the injection site is in the centre of the triangle about 2 inches below the acromion process

ii. Place 1st finger across acromion process and 3 finger breadths below is site (lateral head of triceps muscle posterior aspect of upper arm)

d. vastus lateralis

Advantages/disadvantages
- generally large, well developed muscle without major blood vessels or nerves

Positioning
- back lying/sitting

Method
- located anterior lateral aspect of thigh from one handbreadth above the knee to one handbreadth below the greater trochanter
- middle 1/3 of muscle is best site
- width from midline of anterior aspect of thigh to midline of outer side of thigh

Z-track Injection Technique

Advantages/disadvantages
- used to minimize tissue irritation when giving irritating preparations
- change needle prior to injecting
- site of choice is large deep muscle such as ventrogluteal

Positioning
- depends on choice of muscle

Method - Demonstrate air lock procedure
- air lock technique may be used with both IM & SC injections (used with irritating solutions to prevent tracking in tissue)
- draw up 0.2 ml air to create air lock (some sources state volume of med must be adjusted to account for additional 0.2 ml of medication that usually remains in needle hub and would be given with air lock technique (Fundamentals of nursing: Human health & function, Craven & Hernle, 1992)
- ensure correct placement of bubble
- pulls overlying skin and S/C tissue 2.5-3.5 cm (1 1/2") laterally to side
- holding skin taut with nondominant hand inject into muscle (inject and aspirate slowly)
- leave needle inserted for 10 seconds to allow medication to disperse
- release skin post withdrawal

Working in pairs, the students will practice landmarking the four accepted IM injection sites. For each site, the students will be expected to:

a. position the client
b. identify anatomical landmarks
c. assess the site to ensure appropriateness for IM injection

The students will be given syringes, ampules, vials and sponges to practice manipulating the syringe, drawing up the solution from ampules and vials, and injecting.

The students will not be administering IM injections to each other during this lab time. An opportunity to give an IM injection may be made available through a skills focus session. Under no circumstance should you administer an injection, other than into a simulated material, without supervision.

Review the following case scenario (Mrs. J.).

Mrs. J. is a 35 year old client admitted to your unit yesterday after an appendectomy. You will be assessing her need for analgesia as part of your initial contact. Because she has been suffering from nausea when given her analgesic, the doctor has ordered Gravol 25 mg to be given with her Demerol 50 mg IM q4h p.r.n. Discuss the application of the nursing process to the administration of Mrs. J.'s analgesic.

Assessment:
- Pain - site, type, ppt. factors, etc.
- Effect of analgesia and antiemetic

Plan/Implement:
- Consider activity for day ie. ambulation, dressing change, ADL ie. meals
- Discuss how to check re. previous dose administered and need to validate assessment findings with R.N. staff
- Site of choice dorsogluteal

Evaluate:
- Consider onset of analgesia
- Evaluate objective/subjective data
- Record evaluation

Documentation

Administration of medications via the intramuscular, subcutaneous or intradermal routes is recorded in the appropriate places according to agency policy; for example, MARs, nurses notes, special medication records (heparin, insulin) and site rotation charts. Ensure the <u>site</u> is clearly documented.

10 mins. 4. Discussion of Return Demonstrations

to

Appendix J

Instructor's Guide for Experimental Group

Demonstration-Return Demonstration Using Simulation

The injection laboratory for the experimental group has the same format and includes the same content as the regularly scheduled laboratory. The laboratory will need to be extended by an extra one half hour. Students whose laboratory is at another site will need to commence at 0800 the day of the injections laboratory.

In order to facilitate nursing student learning of intramuscular injection administration, six simulations have been designed for use within each laboratory group. Following the scheduled content of the regularly scheduled laboratory and working in pairs, each student will assume the role of a nurse and of a client. Using the additional one half hour of laboratory time, one student in the role of the nurse will perform three simulated situations with a classmate involving intramuscular injections. Then, the students will switch roles and the opposite student will assume the role of the nurse and perform three simulated intramuscular injection administration situations. Each pair of students will perform the same situations concurrently.

The student role-playing the nurse will receive written information concerning client data and the student role-playing the client will have a response that the nurse does not know. During the students' performance, the instructor will observe the performance and provide feedback as necessary. Upon completion of each role-played situation, the instructor and all participants will collectively discuss the situation before proceeding to the next simulation. Discussion will include analysis of what decisions were made and the feelings generated.

Any student who chooses not to participate in the simulation exercises may leave and will not miss any content necessary for the performance of injections.

Appendix K

Simulation Exercises

Role play how you would administer the following injection administration simulations:

Simulation #1

Mrs. Yates is in the terminal stages of cancer of the liver. When you enter the room, she is in tears and moaning. After assessing her, you determine she is in need of an analgesic and decide to administer Demerol 75 mg. IM.

Client response:

"I'm so tired of getting poked with the needles when I hurt so much."

Simulation #2

Mr. Morgan is recovering from a drug reaction and has a rash over his trunk and lower extremities. He is experiencing nausea. After assessing him, you determine he is in need of an antiemetic and decide to administer Gravol 50 mg. IM.

Client response:

"I'm feeling so sick."

Simulation #3

Mrs. Weston is a frail, emaciated 86 year old woman recovering from a right total hip replacement. She is unable to lie on her right side and has to keep her legs abducted because of her surgery. She is complaining of pain. After assessing her need for an analgesic, you decide to administer Morphine 5 mg. IM.

Client response:

"Nurse it is so sore, I don't think that I can move."

Simulation #4

Mr. Richards is an 18 year old man recovering from burns to his upper back. He must lie prone to allow the skin grafts to heal. After assessing his need for an analgesic, you decide to give him Morphine 10 mg IM.

Client response:

"I am so glad that you are here nurse."

Simulation #5

Mrs. Dabbs is a 38 year old woman admitted from emergency following a motor vehicle accident where she sustained a fractured pelvis. She has received no medication for pain. Administer Demerol 75 mg. IM stat.

Client response:

"I can't move, don't tell me I have to roll over." (She is very tearful)

Simulation #6

Mr. Lipton is a 28 year old man who had his gallbladder removed yesterday. He has an upper abdominal incision and after assessing his need for an analgesic, you decide to give him Morphine 10 mg. IM.

Client response:

"Nurse, please could you give the needle to me in my leg? I find it doesn't hurt as much there."