EFFECTIVENESS OUTCOMES OF PREADMISSION TESTING FOR PRESURGICAL PATIENTS

By

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A prospective control study comparing elective surgical patients who had some or all of their presurgical testing done before admission with those who were tested after admission, was done at a 300 bed teaching and referral hospital in Vancouver, British Columbia. The intent of the study was to determine whether or not a program of preadmission testing (PAT) resulted in fewer inappropriate admissions and fewer delayed, postponed or cancelled surgical procedures. In addition, the amount of repeated testing was compared in the two groups. A matched subsample of 62 pairs from an overall sample of 90 PAT and 277 nonPAT patients admitted during an eight week period, was examined. Some interviews with surgeons, anesthetists, head nurses and significant others, also were carried out.

It was found that preadmission testing did not significantly effect surgical workflow nor result in fewer inappropriate admissions. Preadmission tested patients, on the other hand, were far more likely to have tests repeated and had more venipunctures than patients who were tested after admission.
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CHAPTER I

INTRODUCTION

Substitution of outpatient care for inpatient care is a popular issue at present. Outpatient testing, done for diagnostic and screening purposes, has been promoted as one area where substitution is both appropriate and cost-effective. In the United States, outpatient testing has been fairly common for at least two decades. Ambulatory testing was offered by some institutions to either completely replace an episode of hospitalization, as is generally the case of diagnostic evaluation for medical patients, or to partially substitute for one, as is generally the case in diagnostic work-ups and screening for surgical patients. The latter was the more common approach encouraged by government, insurance carriers or individual institutions.

Preadmission testing for surgical patients has so far been a rarity in Canada. Very few programs exist, and those that do exist, are either quite new or relatively informal. The Victoria General Hospital has, perhaps, the most formalized program. Its objectives are to provide for both preadmission testing and early identification of potential discharge problems. Ultimately, the hospital hopes to reduce preoperative length of stay. In the lower mainland, some form of preadmission testing is offered by three hospitals for patients scheduled for admission for elective surgery: the Vancouver General
Hospital, Shaughnessy Hospital and the Acute Care Unit of the University of British Columbia Health Sciences Centre Hospital (ACU-HSCH). The Vancouver General Hospital allows physicians to submit screening and diagnostic tests done by outside laboratories while at the Shaughnessy Hospital and the ACU-HSCH patients are asked to come to hospital prior to admission in order to have routine testing done.

Preadmission testing, whenever it has been found, has generally been used in connection with elective surgical admissions. In these situations the function of the testing may be either a diagnostic or a screening one, or both. Programs may be set up to promote effectiveness or efficiency, or various degrees of the two, depending on who sets up the program and what interests are considered. Table 1 serves to illustrate some of the potential goals that may be of interest to the various individuals or groups involved. Other goals may exist but these are the most likely motivators for planning and implementing preadmission testing programs.
### TABLE 1: GOALS CONSIDERED BY VARIOUS INDIVIDUALS AND GROUPS WHEN SETTING UP A PREADMISSION TESTING PROGRAM

<table>
<thead>
<tr>
<th>GROUP/INDIVIDUAL</th>
<th>EFFECTIVENESS GOALS</th>
<th>EFFICIENCY GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insurer (private or government)</td>
<td>• provide care in the most appropriate setting</td>
<td>• reduce cost of care by eliminating unnecessary admissions and shortening length of stay</td>
</tr>
<tr>
<td>Community</td>
<td>• increase number of available beds by reducing inappropriate admissions and shortening length of stay</td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>• decrease delays in operating room work-flow due to unavailable, unexpected or abnormal tests results</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• avoid inappropriate surgical admissions, cancelled/postponed surgical procedures due to abnormal test results</td>
<td>• reduce costs in ancillary departments by handling more tests during &quot;normal&quot; working hours</td>
</tr>
<tr>
<td>Surgeon</td>
<td>• improve access to hospital beds by decreasing length of stay and avoiding inappropriate admissions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• have test results available earlier in hospital stay</td>
<td></td>
</tr>
<tr>
<td>Patient</td>
<td>• provide an opportunity to become familiar with hospital prior to admission</td>
<td>• reduce losses in wages or time by shortening time spent in hospital</td>
</tr>
</tbody>
</table>
Much controversy exists as to the actual success of preadmission testing in reducing length of stay. This is the efficiency outcome most often studied. The interest of this study, however, was in the effectiveness goals from the hospital point of view. The questions considered were:

(i) Does preadmission testing (PAT) lead to fewer inappropriate surgical admissions since more evaluation and screening is done prior to hospitalization?

(ii) Are there fewer postponed or cancelled surgical procedures after patients enter the hospital in the preadmission tested group, that are due to unavailable, unexpected or abnormal test results?

(iii) Does preadmission testing (PAT) improve the workflow in the operating room since delays due to unavailable, unexpected or abnormal test results are more likely to be avoided by early testing? and,

(iv) Is there an adverse effect in that it may be more likely that tests are repeated after admission?
The hypotheses to be tested are:

1. Preadmission testing results in fewer inappropriate surgical admissions due to unexpected or abnormal test results compared with the standard method.

2. Preadmission testing results in fewer postponed or cancelled surgical procedures due to unavailable, unexpected or abnormal test results compared with the standard method.

3. Preadmission testing results in fewer delayed surgical procedures due to unavailable test results compared with the standard method.

4. Preadmission testing does not result in more repeated presurgical laboratory tests than the standard method.
CHAPTER II

REVIEW OF THE LITERATURE

In the United States the concept of preadmission testing goes back to the 1940's but the earliest reference found to an actual program, was to a project undertaken through Blue Cross of Maryland in 1965. A review of the project concluded that shorter length of stay resulted for surgical patients who had their testing done prior to hospitalization. In 1967 the Health Planning Council of Central Iowa, in cooperation with professional groups and insurance carriers, introduced preadmission testing into Des Moines' six general hospitals. PAT was seen as a means "to alleviate the current hospital bed shortage." This goal was only minimally achieved due to low use of the program. The low use was attributed to incomplete coverage by the insurance companies and the reluctance of surgeons to use the program.

Shorter length of stay was the object of a 1969 study by Fogel where outpatient radiological work-ups were scheduled for patients undergoing operations such as hernia repairs, hemorrhoidectomies, cholecystectomies and excision of neoplasms. Routine laboratory testing was done after admission because it was felt that this could effectively be done later. The average length of stay in the study group was found to be shorter and in addition, when test results indicated cancellation of surgery, these cancellations were usually early enough to allow for the booking of another
patient in the time slot. Automated multiphasic testing began at a Utah hospital in 1968, and when done prior to admission, was found to reduce preoperative length of stay.

With the introduction of the Professional Standards Review Organization in the United States, the pressure for substituting outpatient for inpatient care increased. Boaz writes:

In 1972 Congress legislated the establishment of Professional Standards Review Organizations (PSRO's) to assure that medically necessary services would confirm to recognized professional standards and would be rendered in the most appropriate setting.

Presurgical testing was one form of medical service which could be provided in an alternative setting. Proceeding on the assumption that PAT would in fact reduce length of stay and allow for smoother workflow in the admitting department, a Detroit hospital began, in 1973, testing for elective medical and surgical admissions. In addition, Feurig writes:

Realistically, the hospital also has the objective of preparing itself for any anticipated future requirements and controls that may be applied to its operations.

He was listing the PSRO legislation and its requirement for preadmission certification as an important reason for implementing preadmission testing at the hospital. However, the program did not succeed in its overall objectives of reducing length of stay and improving organizational efficiency, because of low use of the service by physicians.

Other studies report success in reducing length of stay through preadmission testing but, according to a careful review by Dumbaugh and Neuhauser, in terms of reducing length of stay "... the evidence of the effectiveness of PAT has not been established definitely." They criticized previous studies for their limited scope, lack of consideration
of institutional variables, questionable internal validity and questionable generalizeability. In discussing their own findings they stated:

The data on the 60 Massachusetts hospitals confirmed that a preadmission testing program has a negligible effect both on overall length of stay and on standard LOS (Std.LOS) of hospitals.\(^{10}\)

Barbaro, Shuman and Swinkola also maintained that "no study to date has demonstrated conclusively that a reduction in length of stay occurs because of preadmission testing."\(^ {11}\) They compared three hospitals, two using PAT and one using ambulatory prebed testing (patient tested prior to being taken to the nursing unit) and concluded that length of stay is dependent on hospital efficiency rather than the form of presurgical testing used.

In a letter to the New England Journal of Medicine, an administrator who was obviously an opponent to preadmission testing (and the fiscal outcomes of PSRO), contended that PAT did reduce length of stay at the Medical Centre at Princeton. When used in 52% of all the 1974 elective admissions, there was a 1.5 day reduction in length of stay. This was not a positive outcome for his institution however, because shorter length of stay translated into lost revenue, i.e., the same intensity of services was required by the patient over a shorter period of time.\(^ {12}\) Recognizing this potential consequence for American hospitals, one can see why, even though shorter length of stay might be a goal in theory, reality suggests it is unlikely to be an aggressively pursued option. In addition, an empty bed represents lost revenue. The *New York Times*, in a 1970 article, quoted a Blue Cross Medical Review physician as saying that even when patients were tested before admission "... some hospitals which often have empty beds on weekends, offered patients space on these days or kept them waiting for weeks."\(^ {13}\)
The issue of what actually determines length of stay is a complex one. Eastaugh's study reviewed various other studies and listed numerous conclusions by researchers of what these determinants are for surgical patients.\textsuperscript{14} He himself found federal ownership to be a significant factor in determining length of stay. The diagram below summarizes several of these determinants (other than PAT) mentioned by Eastaugh as well as Boaz, and Dumbaugh and Neuhauser.\textsuperscript{15} It is easy to see why it is difficult to isolate a cause and effect relationship between a particular program and length of stay.
Figure 1: Determinants of Length of Stay Identified in the Literature

INSTITUTIONAL CHARACTERISTICS
Functioning of Departments:
- Admitting
- OR Scheduling
- Operating Room
- Laboratory & Radiology
- Nursing

Bed Occupancy Rates

Nature of the Organization:
- profit/non-profit
- government-owned
- medical school affiliation

DISEASE CHARACTERISTICS
- single/multiple diagnosis(es)
- severity of symptoms
- urgency of situation
- perceived health status

SOCIO-ECONOMIC CHARACTERISTICS
- insurance coverage
- marital status
- financial status
- employment status
- living arrangements

REGIONAL CHARACTERISTICS
- location of hospital

PROVIDER CHARACTERISTICS
- physician training
- physician specialty
- number of years since graduation

HEALTH CARE SYSTEM
- reimbursement methods

PATIENT CHARACTERISTICS

PRE-OPERATIVE LENGTH OF STAY
An occasional reference to preadmission testing was found in non American sources. As early as 1968, an Australian article discussed delay in patients' investigations and suggested that preadmission clinics should be set up for patients scheduled for elective surgery.16 An English study by several medical staff members evaluated the impact on length of stay of a preadmission clinic. They concluded that "a considerable reduction in subsequent bed occupancy was shown" in the group who were evaluated in the clinic. The clinic provided for examination by the resident, consultation with the surgeon and anesthetist and if needed, referral to the medical social worker. The work-up was comprehensive and included all aspects of presurgical diagnostic work-up and screening.17 A Canadian survey of 125 orthopedic admissions, concluded that there could be a potential saving in inpatient days if preadmission investigations were used when appropriate and given that suitable hostel accommodation was available for the out-of-town patient.18

The literature on preadmission testing can be summarized as follows:

- there is little of it, and
- what there is,
  - is predominantly American,
  - is limited in scope,
  - focuses mainly on preadmission testing for surgical patients, and
  - is overwhelmingly concerned with impact on length of stay.
When objectives or outcomes other than shorter length of stay are mentioned, they are always considered as secondary objectives or incidental findings. Feurig mentions the following potential benefits of a preadmission testing program:

For the patient
- shorter waiting on admission day.
- avoidance of an unnecessary hospitalization.

For the physician
- an opportunity to have test results available earlier in the hospital stay.

For the hospital
- greater flexibility in scheduling patients to coincide with optimal times in the ancillary departments.  

Barbaro, Shuman and Swinkola indicated that of the various procedures identified in their study "PAT is the only one which can provide test results before admission and thus allow the option to cancel admission." They also state that PAT can have a positive effect on the workload of ancillary departments by giving them more control through scheduling tests at the most convenient time.

Dumbaugh and Neuhauser questioned the cost-effectiveness of preadmission testing for presurgical patients but in their summary conceded that:

Ideally, a PAT program will not only decrease LOS, but it will also redistribute workloads in the admitting and diagnostic departments. PAT could result in the elimination of untimely admissions, i.e., admissions that will be postponed after the preadmission tests show a change in the patient's health status, which makes surgery impossible at that time.
Okelberry adds the side benefit of permitting therapy earlier in the hospital stay. Treatment can be started immediately after hospitalization rather than 1-2 days later. Only the study by Feurig attempted to examine the responses of doctors and patients. Physicians and surgeons as a whole lacked commitment to preadmission testing, particularly physicians whose reimbursement in part depended on the patients length of stay. They cited inconvenience to patients (two or more trips to the hospital) and inconvenience to themselves (test results from laboratories outside the hospital were not accepted) as being significant disadvantages. Some patients also indicated that they found the additional trip(s) to be inconvenient. Because of the small numbers of patients actually admitted under this program, Feurig was unable to quantify the data obtained through his questionnaires.

Occasionally problems may result if preadmission testing leads to unnecessary duplication or more intensive testing. A local study done at the Lions Gate Hospital to determine whether there was generally much duplication of diagnostic tests when done both before and after admission concluded that there was no significant duplication. The study by Dumbaugh and Neuhauser, on the other hand, found that PAT patients had more preoperative tests done than patients who were tested after admission. They stated that for some reason (not identified), PAT patients "received a more intensive work-up, regardless of health status."
CHAPTER III

MAIN METHODOLOGY

Objectives of the Study

The objectives of this study are:

1. To determine the extent to which preadmission testing for surgical patients results in fewer inappropriate admissions due to unexpected or abnormal test results compared with the standard method.

2. To determine the extent to which preadmission testing for surgical patients results in fewer postponed or cancelled surgical procedures due to unavailable, unexpected or abnormal test results compared with the standard method.

3. To determine the extent to which preadmission testing results in fewer delayed surgical procedures due to unavailable test results compared with the standard method.

4. To determine whether or not preadmission tested patients have more repeated presurgical laboratory tests than patients who have presurgical testing done after admission to hospital.
15.

Definitions

The following definitions were used and will apply in this paper:

**Elective surgical admission** - any patient admitted by a surgeon or any patient admitted by a physician where surgery is booked prior to admission.

**Presurgical testing** - all tests required by hospital policy plus the commonly ordered presurgical tests of electrolytes, BUN, creatinine, blood sugar, EKG, and chest x-ray, plus screening and typing for possible blood transfusion.

**Inappropriate admission** - the patient is admitted to hospital and because of findings on any of the above-mentioned presurgical tests or for some other reason, the patient is discharged without having surgery done.

**Preadmission testing (PAT)** - presurgical testing done before the patient is admitted to hospital; ambulatory testing; outpatient testing.

**Standard method (nonPAT)** - presurgical testing done after the patient is admitted to hospital, either on a prebed basis or after he arrives on the nursing unit.

**Unavailable test result** - information not in the patient's chart or already received by the operating room staff, at the point the patient is checked in by the operating room nurse.
16.

**Unexpected test result** - a test result that leads to prolonged or further testing, e.g. unusual antibodies found during screening for crossmatch purposes.

**Abnormal test result** - a test result which is abnormal by the hospital's definition and as a consequence, some action is taken.

**Postponed surgical procedure** - surgery not done as scheduled but done later in the same admission episode.

**Cancelled surgical procedure** - surgery neither done as scheduled nor done in the same admission episode.

**Delayed surgical procedure** - either an actual time delay or an inconvenience to the operating room staff after the patient has arrived in the operating room holding area.

**Actual time delay** - based on time recorded by the operating room nurse on the *Operating Room Nursing Record*. The "Anaesthetic Commenced" time is compared with the time scheduled on the operating room slate.

**Inconvenience** - a situation where the surgery starts at the scheduled time but a missing test result leads to some action after the patient has arrived in the operating room holding area.

**Contributing co-morbidity** - any pre-existing condition or characteristic listed by the surgeon or the anesthetist which is likely to have some bearing on the type and number of tests that are ordered. These include: conditions with systemic consequences, e.g. diabetes; conditions with some bearing on the patient's fitness for anesthesia, e.g. upper respiratory infection; previous conditions, e.g. old M.I.; possible conditions, e.g. possible asthma; and lifestyle related factors, e.g. heavy smoker.
Study Setting

Permission was obtained to undertake a study at the Acute Care Unit of the University of British Columbia Health Sciences Centre Hospital (ACU - HSCH). ACU - HSCH is a new facility of 300 general medical and surgical adult beds. In addition to being a hospital for the city, it also functions as a tertiary hospital for the province. Because of the latter function, it has a higher than average percentage of referred patients. Most physicians and surgeons on staff have admitting privileges at other hospitals and so can be selective in the types of patients they bring to the hospital.

ACU - HSCH has offered a preadmission testing service for elective surgical patients since the hospital opened in September 1980. The following instructions are contained in an information sheet prepared by the hospital and given out through the doctors' offices:

It is requested that all routine analysis, blood work and x-rays be done prior to admission. Patients may come to the Acute Care Unit within the seven day period preceding their admission, any weekday, Monday to Friday from 8 a.m. to 4 p.m. to have this done. No appointment is necessary.

Should the patient act on this request and come to the hospital before admission, the Admitting Department prepares all necessary papers and then directs him to the appropriate testing area. Tests other than blood work and urinalysis are rarely done, even though the service covers testing done by three areas (laboratory, cardiology, radiology). In the majority of cases, only a complete blood count (CBC) and urinalysis (U/A) are done.
The admitting and laboratory staff estimate that approximately one third of elective surgical admissions have some laboratory tests done prior to hospitalization.

If the patient does not come in for PAT, testing is carried out on the day of admission on a prebed basis, i.e. the patient is escorted to the laboratory prior to being taken to the nursing unit. At this time, unless additional tests are ordered, blood is taken for CBC and a urine sample is obtained for routine analysis. A specimen for blood type and screening is taken if the surgery scheduled for the following day is likely to require blood. An extra clotted sample is also obtained in case chemistry tests are ordered later in the day.

Once the patient has been seen by the resident (and occasionally after the anesthetist has visited the patient), further tests may be ordered on either category of patient. If further specimens are needed, the blood is collected later that day or on the following morning.

Reports of laboratory test results are handled in the following manner. All test results are entered into the hospital-wide computer system. Gross abnormalities are identified through programmed "panic limits" and the associate director of the laboratory personally contacts the doctor involved in such situations. For PAT patients, a coloured laboratory result sheet is sent to the admitting department within 24 hours of testing. This sheet is attached to the patient's admitting forms and goes to the nursing unit with the patient when he is hospitalized. A copy is also mailed to the referring doctor's office. For non-PAT patients, a
computer print-out is sent to the ward later that day or on the following morning. Should test results be needed earlier, the information, provided it has been entered, can be obtained via computer print-out.

**General Methodology**

A prospective control study was carried out over an eight week period. Based on rough estimates of elective surgical admissions and the ratio of PAT to nonPAT patients, it was expected at first, that approximately 150 PAT and 300 nonPAT patients would be followed over a six week period. After collecting data on all the elective surgical admissions for four weeks, it was found that 228 of these represented nonPAT patients while only 39 PAT patients (15% of the total elective surgical admissions) were in the study. At this point it was decided to extend the study by two weeks beyond the original six weeks (total = eight weeks), to continue to follow all PAT patients but to follow only one nonPAT patient for each PAT patient admitted. Each day that one or more PAT patients were admitted, an equivalent number of nonPAT patients were randomly picked from the appropriate admissions for that day. By the end of the second four week period, an additional 51 PAT patients were admitted for elective surgery and one PAT patient was cancelled for other than test-related reasons. (Data on this patient is not included in the study but the situation will be discussed in the final chapter of the thesis.) During the second four week period, a total potential sample of 230 nonPAT patients was available. The nonPAT sample resulted in only 49 patients, however,
because one patient incorrectly listed as nonPAT in the computer information, was moved to the PAT group when the error was discovered.

During the eight weeks therefore, a total of 548 patients were admitted for elective surgery. Of these, 90 patients had some or all of their tests done prior to admission while 458 had all their tests done after admission. Data was collected on all 90 PAT patients admitted but on only 277 of the nonPAT patients admitted. (Figure 2 summarizes the initial sampling method described above.)

Throughout the study period, a diary was kept of pertinent observations and comments. In addition, a number of employees and staff were interviewed at the end of the study. Eight surgeons were asked why they did or did not use PAT; five anesthetists and the head nurse of the operating room were asked about their experiences with delays or cancellations of surgery; and the four surgical head nurses and the surgical nursing coordinator were asked about presurgical testing in general.

Patients were not interviewed but some information about their reactions to various aspects of presurgical testing was obtained from the nursing, admitting and laboratory staff.
Figure 2: Illustration of How Initial Sampling Was Carried Out

2nd 4 weeks of study

PAT patients not admitted
n=1

all PAT admitted*
 n=51

PAT sample
n=90

1st 4 weeks of study

remaining nonPAT patients admitted*
 n=49

all nonPAT patients admitted
 n=228

PAT potential sample

PAT sample
n=90

nonPAT potential sample

nonPAT sample
n=277

* These groups are uneven despite the 1-1 selection because one patient originally listed as nonPAT, was found to have been preadmission tested.
Specific Methodology

Objective 1: To determine the extent to which preadmission testing for surgical patients results in fewer inappropriate admissions due to unexpected or abnormal test results compared with the standard method.

Hypothesis 1: PAT results in fewer inappropriate surgical admissions due to unexpected or abnormal test results.

Method: Each weekday morning for eight weeks, the names of all elective surgical admissions were obtained from the daily list compiled by the admitting department staff. Patients eliminated from the sample included the previously described patients entering primarily for diagnostic work-up and also, patients whose admission diagnosis implied a procedure which would be done in a location other than the operating room, e.g. diurnal tension curve. Patients entering hospital over the weekend were reviewed on Monday morning.

The study status of the patient was determined by looking for laboratory test results appended to the admitting slips or documents and by checking for any record of preadmission testing via the laboratory information available through the computer system. In the evening or on the following morning, each patient's chart was reviewed for the following information. (See Appendix I for a copy of the form used):
Patient-related: age, sex, marital status, occupation, address.

Diagnosis-related: primary diagnosis and contributing co-morbidity, doctor, consultations, surgical procedure.

Test-related: tests ordered and date ordered; tests done and date done.

Each patient was followed through to surgery or cancellation of surgery to determine the impact of testing. All charts of patients discharged without having surgery done were closely examined to discover the reasons for cancellation and the subsequent actions taken.

**Objective 2**: To determine the extent to which preadmission testing for surgical patients results in fewer postponed or cancelled surgical procedures due to unavailable, unexpected or abnormal test results compared with the standard method.

**Hypothesis 2**: PAT results in fewer postponed or cancelled procedures due to unavailable, unexpected or abnormal test results.

**Method**: In addition to patients who might have surgery cancelled outright, it was necessary to assess those situations where the surgical procedure was postponed during the particular episode of hospitalization under study. During the afternoon, the operating room slate was checked for the surgical procedure and booked surgery time. A list of the patients booked for the
following day was compiled. Information was collected as previously described. All charts of patients whose surgery plans were changed in any way, were closely examined to discover the reasons for the change.

**Objective 3:** To determine the extent to which preadmission testing results in fewer delayed surgical procedures due to unavailable test results compared with the standard method.

**Hypothesis 3:** PAT results in fewer delayed surgical procedures due to unavailable test results.

**Method:** Each patient's chart was followed until the identified laboratory results, EKG tracing, and any test specifically designated "to OR" or "pre-op" was actually in the chart. If any of these were missing, a visit was made to the operating room to coincide with the patient's arrival and the subsequent action of the operating room staff was observed. This was done in all cases subsequently included in the subsample described in Chapter V and was done personally by the researcher in all cases but one. (In this case the information was obtained from the clerk.) The availability of chest x-rays was not determined on an individual basis for two reasons -- this information was not accessible as laboratory results and EKG's (x-rays were usually sent directly to a specific operating theatre) and, more importantly, chest x-rays were rarely consulted by the anesthetist. If, however, a chest x-ray was specifically ordered by the anesthetist, the same procedure was followed. All actual time delays and
25.

Inconveniences were documented by the researcher. The time recorded on the Operating Room Nursing Record as "Anesthetic Commenced" time was used as the time surgery began.

Objective 4: To determine whether or not preadmission tested patients have more repeated presurgical laboratory tests than patients who have presurgical testing done after admission to hospital.

Hypothesis 4: PAT does not result in more repeated presurgical laboratory tests.

Method: The laboratory information entered into the computer was reviewed for the subsample of matched pairs described in Chapter V. The date and time of specimen collection was readily available either via computer print-out or video display. Charts were also reviewed to see if repeat blood work was specifically ordered. Because orders are written after the patient arrives on the nursing unit and routine samples are collected before this time, the number of venipunctures per patient was also counted.
CHAPTER IV

FINDINGS FROM MAIN METHODOLOGY

Findings Related to Age, Scheduled Surgery, Contributing Co-morbidity and Preoperative Length of Stay

As mentioned in the previous chapter, data was collected on 90 PAT patients and 277 nonPAT patients. PAT patients represented only 16% of the total elective surgical admissions during the eight week study period. Data on the two groups was more closely examined to see how the PAT group differed from the nonPAT group. The variables of interest chosen for comparison were:

- age,
- scheduled surgery,
- contributing co-morbidity, and
- preoperative length of stay.

Each of these variables is discussed briefly.
**Age:** Patients in certain age clusters were found to have particular tests ordered fairly routinely, irrespective of diagnosis, co-morbidity or preoperative length of stay. The patterns observed were:

- **Under 40:** CBC and U/A only.
- **40 - 49:** CBC and U/A. Occasionally electrolytes, EKG's and chest x-rays.
- **50 - 64:** CBC and U/A. Increased frequency of electrolytes and other chemistry tests, and chest x-rays. EKG's invariably ordered.
- **65 and over:** CBC, U/A, and EKG's. Chest x-rays, electrolytes, blood sugar, BUN, creatinine almost always ordered.

It was found also that patients in the PAT group were younger than those in the nonPAT group. The mean age of patients in the PAT group was 47.1 years while the mean age of those in the nonPAT group was 51.7. In both groups patients, whose preoperative length of stay was one day and who had no contributing co-morbidity, were the youngest subgroup while those whose preoperative length of stay was greater than one day and who had some contributing co-morbidity, were the oldest subgroup. On the whole, patients admitted for orthopedic surgery were younger; patients admitted for eye surgery, older.

**Scheduled Surgery:** The surgical procedures scheduled for each patient in the sample were examined. The sample information was then classified under nine surgical specialty groups. These groups were: orthopedics, dental
surgery, ophthalmology, general surgery, urology, gynaecology, vascular surgery, plastic surgery and chest surgery. The single largest group found under one speciality were patients admitted for orthopedic surgery. Thirty-nine percent (39%) of these patients had some or all of their tests done prior to admission. Patients in the ophthalmology, general surgery and urology groups also represented large numbers of elective surgical admissions but fewer of these patients were preadmission tested – 22%, 24%, 9% respectively. (See Table 2.)

**Contributing Co-morbidity:** Among the PAT group, 29% of the patients had a condition which could influence the numbers and types of tests ordered. Among the nonPAT group, the percentage was the same. There was a difference, however, when preoperative length of stay was examined at the same time. Patients from this group with a preoperative stay of one day represented 26% of the total PAT group and 20% of the total nonPAT group; while those with longer preoperative stays represented 3% and 9% respectively.
TABLE 2: CLASSIFICATION OF PATIENTS RECEIVING AND NOT RECEIVING PREADMISSION TESTING BY SURGICAL SPECIALITY

<table>
<thead>
<tr>
<th>SPECIALITY GROUP</th>
<th>PAT</th>
<th>nonPAT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopedics</td>
<td>37 (41%)</td>
<td>58 (21%)</td>
<td>95 (26%)</td>
</tr>
<tr>
<td>Dental Surgery</td>
<td>11 (12%)</td>
<td>13 (5%)</td>
<td>24 (7%)</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>15 (17%)</td>
<td>52 (19%)</td>
<td>67 (18%)</td>
</tr>
<tr>
<td>General Surgery</td>
<td>15 (17%)</td>
<td>47 (17%)</td>
<td>62 (17%)</td>
</tr>
<tr>
<td>Urology</td>
<td>5 (6%)</td>
<td>50 (18%)</td>
<td>55 (15%)</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>3 (3%)</td>
<td>18 (6%)</td>
<td>21 (6%)</td>
</tr>
<tr>
<td>Vascular Surgery</td>
<td>4 (4%)</td>
<td>30 (11%)</td>
<td>34 (9%)</td>
</tr>
<tr>
<td>Plastic Surgery</td>
<td>0</td>
<td>5 (2%)</td>
<td>5 (1%)</td>
</tr>
<tr>
<td>Chest Surgery</td>
<td>0</td>
<td>4 (1%)</td>
<td>4 (1%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>90 (100%)</td>
<td>277 (100%)</td>
<td>367 (100%)</td>
</tr>
</tbody>
</table>

Preoperative Length of Stay: In the PAT group, 94% of the patients had a preoperative length of stay of one day while in the nonPAT, 85% of the patients had a preoperative length of stay of one day. The five PAT patients with prolonged preoperative stays were older patients (aged 55 - 71 years) and included two patients in the vascular surgery group, two patients in the dental surgery group and one patient in the ophthalmology group. Three of the patients had contributing co-morbidity and two did not. Of the 42 nonPAT patients who had a prolonged preoperative length of
stay, 17 patients (40%) were admitted for vascular surgery and 12 patients (29%) were admitted for general surgery, most of which was major abdominal surgery. The mean age of those patients with contributing co-morbidity (n=25) was 68.1 years and of those without secondary conditions (n=17), was 60.3 years.

Use of the PAT Program by Physicians and Surgeons

On examining the data collected during the first four weeks of the study, it was noted that 21 of the 41 physicians and surgeons who admitted patients for surgery during the period, made use of the PAT program. No doctor used the service for the majority of his patients. Only a small number of doctors used the service relatively frequently.

Observations and Findings from Interviews

Elective surgical patients admitted to the ACU - HSCH can conceivably have laboratory or other tests done on four or more separate occasions -- before admission, on admission, in the afternoon or evening of admission, and on succeeding preoperative days. Tests other than the CBC and U/A are rarely done before the patient arrives on the unit. Orders for tests are written after the patient is on the unit and has been examined by the surgeon, resident or medical student intern. Orders for the CBC and U/A are frequently not written. Additional laboratory tests are often requested.
The surgical head nurses and the surgical nursing director describe this presurgical testing system as "fragmented". Two head nurses stated that the system often resulted in test duplication and repeated venipunctures for the patients. One head nurse said that the nursing staff is not always certain if an order for blood work represents a new order or if it refers to the specimen already taken before the patient's arrival on the unit. One head nurse stated that her unit had considerable difficulty getting chemistry and cross-match tests completed in time for surgery, particularly for the early cases.

When asked why they did or did not use PAT, surgeons generally said that they used the program if convenient for themselves and the patients. Two surgeons said they also used the service if a patient's diagnosis was unclear or if fitness for surgery was in doubt. One surgeon stated he was not aware of the PAT program but said he would use it for "patients over 40 with fairly complex diseases in addition to their surgical problems".

The five anesthetists who were interviewed were asked about their experiences with unavailable or abnormal test results and about delays in the operating room. They generally stated that few problems occur with unavailable or abnormal laboratory results. EKG's were invariably done as required. Problems with unavailable chest x-rays were rarer than problems with laboratory tests, particularly since chest films were seldom consulted. When asked to rank delays due to unavailable test results with all other reasons for delays in the operating room, all the anesthetists indicated that test-related delays were a minor problem.
The head nurse of the operating room said that unavailable or abnormal test results led to inconveniences or actual delays in about 10% of their scheduled surgical cases. Actual time delays were less frequent than inconveniences to the nurse admitting the patient to the operating room. These inconveniences related mainly to unavailable test results. In such situations, the nurse is required to get the missing information or, failing that, consult with the anesthetist about what he wants done about the missing information.

Patients were not interviewed. Head nurses, admitting staff and laboratory staff were asked about comments made by patients about any aspect of presurgical testing. It appeared that patients coming in for PAT did not seem to mind doing so. For patients of doctors with offices in the hospital or on the campus grounds, there was little or no inconvenience. The head nurses stated however, that patients occasionally complained about "being poked twice". They also indicated that repeat venipunctures were done on patients in both groups.

Objectives of the PAT Program at ACU - HSCH

Written objectives of the PAT program at the ACU - HSCH were not available but on interviewing key staff members who had worked at the hospital since it opened, the following objectives emerged:
33.

- to avoid delays in operating room workflow due to unavailable test results,
- to allow for more efficient organization and staffing in the clinical laboratory, and
- to give patients an opportunity to become familiar with the hospital prior to admission.

The first objective coincides with one of the objectives of this study and will be discussed in the next chapter. The second objective has been met successfully according to the Associate Director of the Clinical Laboratory, in that PAT allows more tests to be handled on a routine basis during normal working hours rather than on an urgent basis. Whether or not the third objective was met was not investigated in this study.

Decision to Develop a Subsample of Matched Patients

As shown in this chapter, patients who are sent to the hospital for preadmission testing, represent a select group. On the whole PAT patients were found to be younger. This was largely due to the fact that a significant number of them (41.1%) were admitted for orthopedic surgery. Much of the orthopedic surgery at the hospital is done for sports-related injuries and these patients are generally young and healthy. Of three other speciality groups that represented significant numbers of elective surgical admissions -- ophthalmology, urology and general surgery -- fewer than 25% of the patients were preadmission tested. Patients admitted for vascular or gynaecological surgery were under-represented. No patients
admitted for plastic surgery or chest surgery had tests done prior to hospitalization. Patients with a preoperative length of stay of greater than one day were three times more prevalent in the nonPAT group. Patterns of practice of physicians and surgeons showed that about half of them used the PAT program and only a few of them used the program to any significant extent. Patients were sent in for preadmission testing mainly if it was convenient for them or the doctors.

Because of these preliminary findings, it was decided to develop a subsample of appropriately matched PAT and nonPAT patients. The hypotheses would thus be tested using this subsample. The matching process and a description of the subsample obtained is found in the next chapter.
CHAPTER V

SECONDARY METHODOLOGY AND FINDINGS

Methods Used to Obtain a Matched Subsample

Data on the patients in the PAT group was arranged according to the surgical specialties previously described. Further subgrouping according to scheduled surgical procedure was done in some of these specialty groups. (Table 3 shows the groups, subgroups and numbers of PAT patients in each.)

Because preoperative length of stay and contributing co-morbidity can influence numbers and types of tests ordered, patients with these characteristics were eliminated. This process left 62 PAT patients available for matching with similar nonPAT patients. As described in the previous chapter, a patient's age was found to influence, in a relatively predictable manner, the number and type of tests that are ordered. Age clusters were therefore selected on the basis of the patterns observed. These age clusters were: 14-39 years; 40-49 years; 50-64 years; and, 65+ years.

The profile sheets (see Appendix I) of the nonPAT patients were placed in order of admission. A match was first attempted in the same specialty subgroup and age cluster. If no match was found in the same week of admission, a match was sought in the previous week, then the following week,
### TABLE 3: SURGICAL SPECIALITY CHARACTERISTICS OF PATIENTS AND NUMBERS OF PATIENTS IN THE GROUPS AND SUBGROUPS

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Number (n=90)</th>
<th>Group % (n=90)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orthopedics Group Total</strong></td>
<td>37</td>
<td>41.1</td>
</tr>
<tr>
<td>Trauma-related knee surgery</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Foot procedures</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Other lower limb</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Arm and shoulder</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Dental Group Total</strong></td>
<td>11</td>
<td>12.2</td>
</tr>
<tr>
<td>Intraocular</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Extraocular</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Ophthalmology Group Total</strong></td>
<td>15</td>
<td>16.7</td>
</tr>
<tr>
<td>Cholecystectomy (no CBE)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Inguinal hernia</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Umbilical/Ventral hernia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Perianal/Pilonidal</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>General Surgery Group Total</strong></td>
<td>15</td>
<td>16.7</td>
</tr>
<tr>
<td>TUR</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hydrocelectomy</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Minor bladder procedures</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Urology Group Total</strong></td>
<td>5</td>
<td>5.6</td>
</tr>
<tr>
<td>Breast lump (malignant or non malignant)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>D &amp; C</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Gynaecology Group Total</strong></td>
<td>3</td>
<td>3.3</td>
</tr>
<tr>
<td>Varicose veins</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Vein graft</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Vascular Group Total</strong></td>
<td>4</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>Total Pat Patients</strong></td>
<td>90</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
continuing backward and forward in this manner until all the nonPAT potential samples were exhausted. Forty-eight (48) matched pairs were achieved at this point leaving 14 unmatched PAT patients. A second matching was then done in the following manner. First, if no corresponding age group match for a PAT patient could be found in a particular subgroup, the nonPAT patient closest in age with the same surgery was sought in the next lower age cluster. This process resulted in an additional five matched pairs. In the remaining nine cases, patients were matched in the same age group but across the entire surgical specialty group. Five orthopedic lower limb surgery matches, one ophthalmology match and three general surgery matches were achieved in this manner. Patients were not matched according to sex but representativeness for sex was looked for in the matched samples.

At the end of the matching process, the subsample was examined in terms of age and sex characteristics. The mean age in each of the two groups was 41 years (compared with the mean age of 47.1 years for the entire PAT sample and 51.7 years for the entire nonPAT sample). The PAT subsample consisted of 35 male patients and 27 female patients; the nonPAT subsample, 38 and 24 respectively. This male/female ratio coincided with the sex distribution in the entire sample. (Table 4 shows the age and sex distribution within the subsample.)
### TABLE 4: AGE AND SEX DISTRIBUTION WITHIN THE MATCHED SAMPLES

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>14 - 39</th>
<th>40 - 49</th>
<th>50 - 64</th>
<th>65 +</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>PAT</td>
<td>15</td>
<td>17</td>
<td>5</td>
<td>4</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>nonPAT</td>
<td>21</td>
<td>15</td>
<td>5</td>
<td>1</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

Findings

**Hypothesis 1:** PAT results in fewer inappropriate surgical admissions due to unexpected or abnormal test results.

Only one patient in the matched sample was found to be inappropriately admitted due to a presurgical test-related cause. Interestingly enough, this was a PAT patient whose potassium level was found to be low when she came in for her preadmission testing. Rather than postpone the admission and surgery, the surgeon attempted to treat the hypokalemia and bring the patient into hospital as scheduled. On admission the patient was found to be still hypokalemic and was discharged subsequent to the preoperative visit by the anesthetist. (See Table 5.)
TABLE 5: INAPPROPRIATE SURGICAL ADMISSIONS DUE TO ALL REASONS

<table>
<thead>
<tr>
<th></th>
<th>Patients discharged due to presurgical test-related causes</th>
<th>Patients discharged due to other reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAT</td>
<td>62</td>
<td>0</td>
</tr>
<tr>
<td>nonPAT</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>124</td>
<td>1</td>
</tr>
</tbody>
</table>

Hypothesis 2: PAT results in fewer postponed or cancelled surgical procedures due to unavailable, unexpected or abnormal test results.

No surgical procedures were postponed due to presurgical test-related causes. The previously discussed inappropriate admission was the only cancelled surgery due to test results.

Hypothesis 3: PAT results in fewer delayed surgical procedures due to unavailable test results.

Only one recorded time delay was found and this was in the nonPAT group. An unusually long delay (37 minutes) occurred because the electrolyte results, requested by the anesthetist, were not in the patient's chart when he arrived in the operating room holding area. Inconveniences that did not result in an actual time delay occurred on two occasions in each group. In the PAT group, one inconvenience involved a patient whose surgery had been moved ahead and the other involved a patient already in the operating theatre who had blood taken during surgery for crossmatch after it was discovered that none had been taken previously. In the nonPAT group, one inconvenience related to an absent EKG while the other involved CBC and U/A results missing from the chart.
but available through the operating room's computer. In the former situation, the anesthetist accepted an EKG strip done by an outside laboratory which was in the patient's chart. (See Table 6.)

### TABLE 6: DELAYS AND INCONVENIENCES DUE TO UNAVAILABLE PRESURGICAL LABORATORY TESTS

<table>
<thead>
<tr>
<th></th>
<th>Pat</th>
<th>NonPat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>62</td>
<td>62</td>
<td>124</td>
</tr>
<tr>
<td>Delays recorded</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Inconveniences</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Delays for other reasons were also noted. These reasons included: surgical procedures that took longer than anticipated to complete, late starting time for the first case, staffing shortages, turnaround time and surgeons who were late. It was found that delays due to test-related reasons were insignificant compared with delays due to other reasons. (See Table 7.)

### TABLE 7: REASONS FOR AND NUMBERS OF ALL DELAYS IN STARTING SURGERY

<table>
<thead>
<tr>
<th></th>
<th>Pat</th>
<th>NonPat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>62</td>
<td>62</td>
<td>124</td>
</tr>
<tr>
<td>Delays due to unavailable presurgical test results</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Delays due to all other reasons</td>
<td>23</td>
<td>25</td>
<td>48</td>
</tr>
</tbody>
</table>
Hypothesis 4: PAT results in more repeated presurgical laboratory tests.

The analysis indicated that there were more repeated tests in the preadmission tested group than the non preadmission tested group. The most commonly repeated screening test was the CBC. Eighteen patients had a CBC done twice and one patient had a third repeat (Hemoglobin only), compared with seven patients in the nonPAT group who had CBC done twice. Table 8 shows the numbers of patients who had some of their presurgical tests repeated.

<table>
<thead>
<tr>
<th></th>
<th>Numbers of patients who had tests repeated</th>
<th>Numbers of patients who had no tests repeated</th>
<th>Total n</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAT</td>
<td>27</td>
<td>35</td>
<td>62</td>
</tr>
<tr>
<td>nonPAT</td>
<td>9</td>
<td>53</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>88</td>
<td>124</td>
</tr>
</tbody>
</table>

P(x^2 = 27.84) < .001

PAT patients were three times as likely to have some test repeated after admission. This outcome was found to be statistically significant (p < .001) and is likely to be significant from a practical point of view as well.
An analysis was also done to determine how many venipunctures were repeated. As shown in Table 9, a significantly greater number of venipunctures were repeated in the PAT group compared with the nonPAT group (p < .001).

### TABLE 9: REPEATED VENIPUNCTURES BY CATEGORY OF PATIENT

<table>
<thead>
<tr>
<th></th>
<th>One venipuncture only</th>
<th>More than one venipuncture</th>
<th>Total venipunctures</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAT</td>
<td>26</td>
<td>36*</td>
<td>62</td>
</tr>
<tr>
<td>nonPAT</td>
<td>51</td>
<td>11</td>
<td>62</td>
</tr>
<tr>
<td>Total</td>
<td>77</td>
<td>47</td>
<td>124</td>
</tr>
</tbody>
</table>

* Represents 34 patients who had 2 venipunctures done and 2 patients who had 3 venipunctures done.

\[ P(x^2 = 27.92) < .001 \]
Discussion

Inappropriate Surgical Admissions: Surgery Cancellations, Postponements and Delays

At the ACU - HSCH, the form of presurgical testing does not appear to have a significant effect on appropriateness of admission. Even when all the study patients were considered (N=367), only one additional inappropriate admission related to presurgical testing was found among the non-PAT group.

Again, there was no significant difference in the two groups when it came to effect on postponement or cancellation of surgery. In questioning five anesthetists on this subject, generally it emerged that, based on their perception, surgery was rarely cancelled or postponed because of unavailable or abnormal test results. In the total sample (N=367) only one additional case was found where surgery was cancelled due to tests and in this case, the intent of the particular test was diagnostic rather than screening.

No significant difference was found in terms of either actual time delays or inconveniences due to tests being unavailable on the patient's arrival in the operating room. After interviewing the anesthetists, it became apparent that they considered delays or inconveniences due to unavailable test results to be a relatively small problem. It should be
recognized, however, that from an anesthetist's point of view, a delay due to unavailable test results rarely poses additional workload while from the nursing staff point of view, it generally does. The nursing staff in the operating room are charged with rectifying the omission or seeking out the anesthetists to make a decision on missing test results.

In relation to the issue of delays in general, it should be stressed that what was being examined was time delays and inconveniences at the operating room level. Problems prior to this point have not been examined, though one head nurse had mentioned that her unit experienced considerable difficulties getting some test results before surgery.

Repetet Laboratory Tests

PAT patients had significantly more tests repeated than nonPAT patients; in fact two and one half times as many patients had their CBC tests repeated. In reviewing the charts, repeated tests could rarely be interpreted as intentional. Almost invariably, tests were found to have been repeated because routine tests could be done on either a PAT or prebed basis without a specific order and other tests were generally not ordered until after the patient had been examined by the resident. The nursing staff consequently either were not sure if the order meant a test was to be repeated and chose to 'commit rather than omit', or did not check to see what had been done and ordered all the tests listed. The nonPAT group was less likely to have repeat orders carried out because the data supervisor in the laboratory checked for possible duplicate orders before repeating a
test. Since a clotted specimen was taken for these patients in anticipation of further tests, fewer venipunctures were needed provided enough blood was available for the requested tests and the quality of the specimen was acceptable. In general, one would expect more repeated tests in a teaching hospital as compared with a non teaching hospital particularly when some tests are ordered by the admitting doctor and others are ordered by residents and medical students.

Findings Related to the Objectives of the PAT Program at ACU - HSCH

The data suggests that preadmission testing for presurgical patients in itself, has little effect on one of the hospital's objectives -- avoiding test-related delays in the operating room. In addition, the positive impact on laboratory workflow may not be as great as perceived since venipunctures and tests are more often repeated for PAT patients. Since patients are sent for preadmission testing mainly if convenient, it is understandable that they are generally accepting of this form of presurgical testing. However, they might consider PAT less 'convenient' if they realized that repeat venipunctures are often required.

The flexibility in presurgical testing methods is desirable from a doctor's point of view but it causes difficulties for the nursing staff. There is some 'confusion of systems' with regard to laboratory testing and this often leads directly to some repetition of tests. \[27\]
Answering the Questions Considered at the Outset

At the beginning of the project, four questions were considered. The findings of this study suggest the following answers to these questions:

(i) Does preadmission testing (PAT) lead to fewer inappropriate surgical admissions since more evaluation and screening is done prior to hospitalization?  No

(ii) Are there fewer postponed or cancelled surgical procedures after patients enter the hospital in the preadmission tested group, that are due to unavailable, unexpected or abnormal test results?  No

(iii) Does preadmission testing (PAT) improve the workflow in the operating room since delays due to unavailable, unexpected or abnormal test results are more likely to be avoided by early testing?  No

(iv) Is there an adverse effect in that it may be more likely that tests are repeated after admission?  Yes
CHAPTER VI

POLICY CONSIDERATIONS

In providing a service to a patient within the health care system, alternative means are often available for the delivery of that service. For the service of presurgical testing, three such alternative approaches have been mentioned -- before the patient is admitted (PAT), at the time the patient is admitted (PBT), or later in the preoperative period. It has also been identified that several interests could be considered when determining the objectives of a program for carrying out presurgical testing. Each individual or group involved may have a different idea of what the goal of that program should be. The insurance carrier (private or government), the hospital and the provider all may have different targets in mind. The patient, as the recipient of the service, may have different goals as well. Goals may either stress efficiency or effectiveness. Ideally they should do both.

According to the literature, the primary goal for PAT programs in the past has been to decrease the length of hospital stay. Considerable controversy exists as to whether or not this goal has been successfully achieved to any significant extent. Hospitals that are reimbursed on an occupancy basis have no incentive to reduce length of stay. Leaving a bed empty and providing the same amount of care over a shorter period of time
represents lost revenue to them. Doctors who are likely to receive lower fees if their patients stay in hospital shorter periods of time or are likely to have their patients or themselves inconvenienced, are unlikely to cooperate fully with a preadmission testing program. Patients who are fully insured and whose hospital stay does not represent lost wages are also unlikely to be tempted with repeat visits to a hospital prior to hospitalization in order to save inpatient time. It is not surprising therefore, that past PAT programs which were aimed at reducing length of stay have met with questionable success. Until some incentives are built in, or at least until some of these disincentives are removed, it is improbable that future PAT programs will be successful on a voluntary basis.

In addition to a questionable commitment to the goal of reducing length of stay, previous programs can be criticized for their narrow application. Insurance companies often did not cover prehospital tests if the patient was not subsequently admitted and surgery was done. In situations where insurance carriers expanded their coverage to all outpatient diagnostic services, a higher degree of success could be expected. In a recent American article describing such a situation, Sr. Patricia Clare writes that, contrary to some earlier fears, their outpatient diagnostic program did not jeopardize quality, place unwelcome burdens on the patient nor result in decreased revenue to the hospital because of empty beds or to the physicians because of lost fees. The key element in their approach was cooperative planning. She states:

> Although the physicians, the insurance companies, and the hospital have had differences of opinion, they were able to cooperate to develop and implement the program.28
In British Columbia, tests done for diagnostic and screening purposes are covered by insurance regardless of where they are carried out.

Locally, the programs to date have been directed mainly at goals other than shorter lengths of stay. The Vancouver General Hospital, by allowing physicians to submit tests from outside laboratories, hopes to avoid unnecessary delays and needless duplication. In addition, the hospital has recently opened a preadmission clinic where patients who may be at risk from anesthesia and surgery, can be evaluated by an anesthetist before entering hospital. The goals of Shaughnessy Hospital and ACU - HSCH are aimed at preventing delays in surgery due to unavailable test results and improving efficiency within the laboratory service. It appears the latter goal has met with mixed success. Whether this is a result of PAT or PBT or either program, is yet to be determined. Both PAT and PBT for presurgical testing have introduced added complexity for the nursing staff and have resulted in a certain amount of repeated blood tests and repeated venipunctures. In designing a presurgical testing system with a view to saving resources therefore, one must set up a clear communication system and a practical method of avoiding repeated tests. In terms of the effectiveness outcomes studied in this thesis, PAT was not found to be significant in avoiding delays, postponements, or cancellations of surgery nor inappropriate surgical admissions. The reason for this may be overall hospital efficiency which, as suggested by Barbaro, Shuman and Swinkola, makes the argument for the effectiveness of a particular program merely academic. On the other hand, the findings in this study could result from other hospital characteristics. The hospital is small, new and very
sophisticated in terms of technological aids to communication. The patients represent a select group and in some cases have been well investigated prior to their referral to the doctors who practice at the hospital. A high percentage of the patients are young, healthy patients who are referred to the Sports Medicine Clinic for injury-related reasons.

Even when looking at the entire sample (N=367), presurgical testing done prior to hospitalization, whether for purposes of screening or diagnosis, does not appear to offer significant potential benefits for the patients or the nursing staff.

On the other hand, hospitals, where the facilities are less technologically advanced or where potential patients are more likely to benefit from preadmission screening, may find that presurgical testing on an outpatient basis is an appropriate option. Where a pressure for beds exists, there still is a very real potential for shortening length of stay when PAT is used for both diagnostic and screening purposes provided the disincentives do not overshadow the incentives. Patients who are not at risk for anesthesia and also require little preoperative in-hospital preparation, can be admitted on the morning of surgery rather than on the previous day. The Vancouver General Hospital has such a system in the Urology service. Some patients who are expected to be discharged on the first postoperative day, are admitted on an extended day care basis. Such a program requires a change in system for preoperative preparation -- more patient teaching is required and a practical way for the anesthetist to do his preoperative assessment on the day of surgery (rather than the night before) must be found. A second potential approach to reducing
preoperative length of stay would be to do more presurgical diagnostic testing on an outpatient basis for those "patients with fairly complex diseases in addition to their surgical problems". Further studies would need to be done to investigate the feasibility of either of these approaches in a particular hospital.

The patient's point of view was not formally examined in this study. It is conceivable that, provided a system is convenient and/or appears to be beneficial, it is acceptable to the patient. On the other hand, if a patient was aware of the likelihood of repeated venipunctures, this might have a deterrent effect on his willingness to be preadmission tested. Only one patient in this study who was sent for preadmission testing was not admitted. If preadmission testing was a requirement rather than an option, one might find that more patients would fall into this category.

With reference to the screening function of presurgical testing, the push for screening healthy people has taken a change in direction over the past few years. Studies, including the comprehensive one done by the Canadian Task Force on the Periodic Health Examination, now question the appropriateness of general screening. Other studies as well have maintained there is "overscreening" of presurgical patients.

In addition, the question of how much attention is paid to routine screening tests was raised by three local laboratory physicians. They found that a significant number of physicians did not respond to abnormal urinalysis results. During the study at the ACU - HSCH, it was noted that results of chest x-rays routinely ordered for preoperative evaluation were rarely in the patients' charts at the time of discharge. In only one
unit was there any indication (the urology resident initialled all x-ray reports) that these results had been noted. In fact, some comments made in the discharge summary were in direct contradiction to the radiology report and few follow-up studies that were recommended were actually done.

The validity of presurgical screening and the question of who pays attention to test results was not an objective of this study, although questions in this regard arose during the research period. In the planning for any presurgical testing program, however, these issues should also be considered.

SUMMARY

The findings of this study indicate that PAT does not have a significant impact on operating room workflow nor inappropriate admissions at the ACU - HSCH. Because of the special characteristics of the hospital, generalizations are not necessarily appropriate. The findings also suggest that when more than one form of presurgical testing program is in effect simultaneously, benefits occur for some while problems result for others.

Cost-effectiveness of PAT and patient satisfaction was not examined in this study, although some information about the latter outcome was obtained from hospital personnel.

In planning a presurgical testing program, one must recognize the various interests that exist and the potential for conflicting goals. The type of program that is therefore most likely to promise success for all
interested parties, is the one that involves as many of them as possible in the planning of the program.
NOTES

1 Thomas L. Feurig, Development of an Evaluation Model for the Analysis of a Pre-Admission Testing Program at Harper Hospital, Detroit, Michigan, Diss. (Ann Arbor: The University of Michigan, May 6, 1974), (University Microfilms International 12309 AM).


4 The insurance carriers provided reimbursement only for tests performed on patients who were subsequently admitted to hospital for elective surgery.


8 Feurig, p. 17.


10 Dumbaugh and Neuhauser, p. 16.


19 Feurig, p. 10.

20 Barbaro, Shuman and Swinkola, pp. 382 and 380.


22 Okelberry, p. 74.

23 Feurig, pp 44-59.


25 Dumbaugh and Neuhauser, p. 18.

26 This was a patient whose surgery was cancelled 2 1/4 hours before the scheduled time due to glucosuria, hypertension, and an elevated blood digoxin level.

27 "Confusion of systems" was a descriptive term used by one of the head nurses during an interview.


29 Barbaro, Shuman and Swinkola, p. 383.


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APPENDIX I

STUDY NUMBER
STUDY STATUS

DATA COLLECTION SHEET: PREADMISSION TESTING STUDY

PATIENT'S NAME ________________________ UNIT # ______ WARD ______
ADDRESS __________________________________________________________
AGE ______ SEX ______ MARITAL STATUS ______ OCCUPATION __________________
DIAGNOSIS ____________________________ CONTRIBUTING CO-MORBIDITY _____________
SURGEON ______________________________ CONSULTATIONS ___________________________

PROCEDURE SCHEDULED __________________________

ADMISSION: __________________________________________
DATE SCHEDULED TIME SCHEDULED ACTUAL DATE ACTUAL TIME

__________________________
COMMENTS

TESTS: __________________________
TEST DATE & TIME DATE & TIME COMMENTS

SURGERY: __________________________
DATE SCHEDULED TIME SCHEDULED ACTUAL DATE ACTUAL TIME

__________________________
COMMENTS

GENERAL COMMENTS

________________________
DATE