A DESIGN FOR A MULTI CENTER COHORT STUDY TO ASSESS CLINICIANS' PERFORMANCE IN ONTARIO'S EMERGENCY ROOMS

By

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ABSTRACT :

Quality of care in the Emergency Department may be influenced by several factors and Canada is in the process of training specialists in Emergency Medicine to improve and standardize emergency care. Emergency departments are increasingly used and there is a wide variation in the medical staff and in the organization of the departments. This proposal describes a design for a multi-centre cohort to answer the question: "Is there any difference in the quality of care provided in Ontario's Emergency Department (ED) by Emergency Room Physicians (EP), Casualty Officers (CO) and General Practioners (GP)?". The study is confined to 35 eligible hospitals, within 100 Km around Hamilton, with more than 300 beds, with an average visit in the ED of more than 100 visits/day, with full time medical coverage, supporting facilities and access to specialized consultations. Twenty-eight physicians will be selected randomly in each of the 3 physician categories, half of them will be in university affiliated hospitals. The outcome measure is the assessment of quality of care: 1) the "technical process" of care will be assessed using ten indicator conditions and the data will be collected by unobstrusive observation and chart review; 2) the "art of care" will be assessed by the ED nurse observer; 3) the "patient outcome" will be assessed two weeks after the ED visit by a phone interview done by a research assistant. Each physician will be observed during two shifts. Each case will be classified as urgent or non-urgent. More than 6 cases per physician need to be assessed to detect a 25% difference between the 3 groups with a risk alpha of 1% (two tailed) and a risk beta of 5%. An

analysis of variance will be used to detect a difference for the process score, the physician attitude score and the outcome score. The influence of six factors will be estimated with a multiple regression linear model: 1) university affiliation, 2) urgency of cases, 3) workload, 4) training level of physicians, 5) method of payment and 6) working hours in the ED. Also descriptive data on the structure of the ED will be studied. Thirteen months should permit the completion of the study.

RESUME:

La qualité des soins peut être influencée par de nombreux facteurs et actuellement le Canada est sur le point de prendre une décision quant à la formation des médecins travaillant dans les salles d'urgence. Les salles d'urgence sont de plus en plus utilisées et il existe une grande variabilité dans l'organisation et le recrutement des médecins. Ce projet décrit un design qui est une cohorte impliquant plusieurs centres pour répondre à la question suivante: "Existe-t-il une différence entre la qualité des soins fournie dans les salles d'urgence en Ontario par les médecins plein temps (Emergency Room Physicians), les médecins travaillant temporairement (Casualty Officers, CO) et les omnipraticiens (General Practitioners, GP)?". L'étude sera confinée aux 35 hopitaux répondant aux critères d'admission, situés dans un rayon de 100 Km autour d'Hamilton, avec plus de 300 lits, avec un taux de visites à l'urgence de plus de 100 visites/jour et avec en permanence à l'urgence des médecins sur place, des ressources techniques (Laboratoire, radio...) et la possibilité de consulter un spécialiste. Vingt huit médecins seront sélectionnés au hasard dans chacune des 3 catégories (EP, CO, GP), la moitié d'entre eux exerçant dans un hopital universitaire. L'évaluation de la qualité des soins comprend: 1) l'évaluation du "processus technique" en utilisant 10 "indicator conditions": les données seront recueillies par un observateur et également par la revue des dossiers médicaux; 2) la relation médecin-malade sera évaluée par l'infirmière-observateur; 3) "l'outcome" du malade sera évalué à l'aide d'un questionnaire administré par téléphone. Chaque médecin sera observé durant 2 rotations. Chaque cas sera classifié urgent ou non-urgent par l'obser-

vateur. Plus de 6 cas par médecin seront nécessaire pour détecter une différence de 25% entre chacun des 3 groupes avec un risque alpha de 1% et un risque beta de 5%. Une analyse de variance sera utilisée pour détecter une différence pour les 3 mesures utilisées. L'influence de six facteurs sera évaluée: 1) statut universitaire de l'hopital; 2) urgence des cas; 3) affluence dans la salle d'urgence; 4) niveau d'entrainement des médecins; 5) méthode de paiement, et 6) nombre d'heures de travail en salle d'urgence. Des données descriptives sur la structure des salles d'urgence seront également étudiées. Treize mois devraient suffire pour terminer le projet.

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TABLE OF CONTENTS

CHAPTER Page

LIST OF TABLES

LIST OF FIGURES AND CHARTS

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

The evaluation of quality of care in the Emergency Department is of increasing importance because of the growing utilization rate both for urgent and non-urgent cases. Several factors might influence the quality of care in the Emergency Department and the organization of the medical staff is the factor studied in this thesis.

In this first chapter the problem of quality of care in the Emergency Departments is explained with a description of the pattern of use and a description of the organization of the medical staff. Also, the design is briefly outlined.

Chapter II is a review of the literature on 1) the training in Emergency medicine; 2) the definition of quality of care and its application to Emergency Departments; and 3) the identification of possible confounders.

Chapter III is a description of the design and Chapter IV is the analysis section.

1.1 Pattern of use of Emergency Departments

The Emergency Department (ED) is only one component of the complex health care system which constitutes Emergency services. This study focuses on hospital Emergency Departments and does not consider the pre-hospital and the inter-hospital elements.

The ED has an important and growing role in primary health care

as reflected by the increasing number of visits. There was an increase of 66.9% between 1961 and 1966 at St. Joseph's Hospital in Hamilton, although the population of greater Hamilton increased by only 13.6% (65). This increase took place previous to the implementation of Ontario Medicare legislation (1969). In general hospitals in Ontario, the average number of visits per day in Emergency Department was: 64.74 (S.D. = 52.47) for 189 hospitals from January 1977 to September 1977 and 70.59 (S.D. = 55.27) for 199 hospitals from April 1979 to March 1980 (60). There then is an increased use of Emergency Departments in Ontario and it is not just related to the onset of medicare legislation.

The Ontario Ministry of Health published a survey on Emergency services in 1975 (41). Two hundred and ten (210) hospitals were included. The project team established a classification of visits to Emergency Departments' into 7 categories: 1) primary care particularly after physicians' office hours, but 24 hours per day for episodic care for patients with no family physician; 2) investigation, including X-ray and laboratory procedures; 3) special procedures and examinations (scheduled); 4) day care, including observation and minor operative procedures; 5) emergency assessment and stabilization of urgent cases; 6) treatment areas for hospital in patients for special procedures including recheck of casts and cystoscopy; and 7) follow-up management and re-examination of patients. This survey illustrates the pattern of use of ED: some patients use ED as if it were a physician's office, but others really need an emergency assessment.

When the patients were classified by degree of urgency, 5 to 10% were urgent (patient in need of immediate care within one hour); 45 to

50% were non-urgent (patient should not be released without assessment and/or care) and 35 to 50% were booked or deferred cases. The ratio of urgent to non-urgent cases is very small and, in 1973, from the 2,250,000 patients attending hospital Emergency Departments in Ontario, 200,000 required these services urgently.

When patients were classified by clinical areas, 40% were surgical (including trauma), 32% were medical (including cardio-vascular cases) and 28% were pediatrics, obstetrics, gynecology, poisoning and psychological.

Similar findings emerged from the studies of Vayda who found in Hamilton that: 1) trauma accounted for 50% of visits; 2) 67% of visits were made when usual sources of medical care may not have been available; 3) 5.6% were emergencies, 60.7% were urgent, and 33.7% were non-urgent (the definitions are given in section 3.4.1.1.c); 4) the proportion of emergency, urgent and non-urgent visits was approximately the same regardless of the time of day at which the visit was made. (63, 64, 65, 66)

Two important conclusions can be drawn from those studies: 1) the increased use of Emergency Departments reflects a need for a constant medical coverage; 2) Emergency physicians have to deal with a high proportion of non-urgent visits.

1.2 Organization of medical staff in the Emergency Departments

Although the Joint Commission on Accreditation of Hospitals (30) published established rules for medical staffing of Emergency Departments, the situation does not reflect these standards. The Joint Commission requires that all "services must be available 24 hours a

day, and medical staff coverage must be adequate to ensure that an applicant for treatment will be seen within a reasonable length of time relative to his illness or injury". In fact, "some community hospitals provide 24 hours on site physician coverage, but many others provide sporadic or limited coverage as suits the particular philosophy of the individual hospital's administration and medical staff. In an unpublished survey of non-teaching community hospitals of average size, 200-500 beds in Ontario, less than half had a physician on call and physically present 24 hours a day. Larger teaching hospitals have a supply of physicians-in-training and can provide more comprehensive, though not necessarily more skilled or experienced, coverage" (31).

The report of the project team on Emergency services and primary care from the Ministry of Health, Province of Ontario, October 1975 (41), provides estimates of the need for ED medical staff in relation with population size. It states: "a population base of 6,000 is the very minimum which is likely to assure availability of a physician on call at all times. A population of 60,000 appears to be the minimum which will support physician specialists...a population of at least one million should be considered as the base necessary to support the staff and facilities for all specialized medical services".

Different models of organization of medical staff in ED's have been described in the United States (2, 5, 6, 7, 8) by the Ontario Hospital Association (36), and by Murphy, 1975 (44). Each model depends on the caseload, the needs of the hospital, and the desires of the medical staff. Ideally, medical coverage should be provided by physicians with experience or training in Emergency care. The physicians

working in the ED fall in either of two categories: they are either from "inside" the hospital or from "outside".

The "insiders" have other activities in the hospital. They are either: 1) medical staff doing voluntary or mandatory rotation; or 2) house staff covering 24 hours, voluntary or compulsory, nurses, interns or residents.

The "outsiders" don't have any clinical activities in the hospital except in the ED. They are either: 1) a group of full time Emergency physicians (Alexandria plan, Virginia) (29) and this includes specialists in Emergency medicine; 2) a group of part time physicians who, while retaining their private practice, agree to staff the Department (Pontiac plan, Michigan) (29); 3) salaried physicians who can be full time or part time, also called casualty officers.

The most common arrangement in Ontario is the compulsory rotation of attending staff (36).

1.3 Need to measure quality of care in the Emergency Departments

Three reasons are identified to justify the need to measure quality of care in the Emergency Room: 1) physicians in the ED provide care to a substantial number of patients every day and in Ontario an average of 70.59 x 199 = 14,048 patients receive care every day in general hospitals; 2) the different levels of training of physicians working in the ED may be a source of variation in quality of care. (This concern manifested in Joseph Brant Hospital in Burlington in the fall of 1979. The team of general practitioners working in the Emergency Department requested the help of the McMaster University Health Care Regional Service Program to study the difference in care given by casualty officers

and general practitioners. This consultation was at the origin of this proposal); 3) the different models of organization of medical staff in ED may be a source of variation in quality of care and some people believe that part time physicians cannot maintain their skills to provide competent emergency care. There are no formal requirements from the Canadian Council on Hospital Accreditation regarding medical staff in the ED, but there is a trend to develop training in Emergency medicine and to staff ED with full time specialists in Emergency care able to handle life threatening situations.

In 1976, the College of Family Physicians of Canada and the Royal College of Physicians and Surgeons of Canada formed a joint committee to look at educational requirements, standards, training programs, and recognition of physicians working in the Emergency Room. In June 1980, at the first annual meeting of the Canadian Association of Emergency Physicians, two ways to certification were reported: one through the program of Family Medicine and the other through a Fellowship of the Royal College. It is thus apparent that training and certification are important current problems in Emergency care.

Actually there are no data to evaluate the quality of care across Ontario's ED because the evaluation depends mainly on local iniative (36). The only available information comes from the inquests following any suspicious deaths. But inquests are not an accurate measure of quality of care in the ED because the deaths may reflect an inadequate pre-hospital care and they may be independent of the quality of care given in the ED. Also it is an insensitive measure because inadequate care does not necessarily lead to death in the ED. The in-

quests submitted to the chief coroner for Ontario in 1979 were reviewed (42). Eight of them seemed to be associated with physician care and four of them were followed by recommendations to the physicians. Appendix B provides a summary of these 8 inquests.

In order to contribute to the solution of what constitutes appropriate training, the approach taken in this thesis is the development of a methodology which will facilitate the evaluation of the quality of care administered by physicians. This methodology will be applied to the actual situation in Ontario. The results will provide information on the influence of the level of training of physicians and on the organization of the Emergency Departments.

1.4 Design Outline

The study will be done in Southeast Ontario. It is a multicentre cohort design to answer the question:

> "Is there any difference in the quality of care given in Ontario's Emergency Departments (ED) by Emergency Physicians (EP), Casualty Officers (CO) and General Practitioners (GP)?"

The hypothesis is that there is no difference in quality of care between the 3 physician categories as measured by 1) the proportion of cases with adequate clinical process; 2) the proportion of cases for which physician attitude is rated adequate or excellent; and 3) the mean patient outcome score.

Two secondary hypothesis will be tested: there is no difference in quality of care within physician category between: 1) university affiliated (UAH) and non-university affiliated hospitals (non-UAH); 2) urgent and non- urgent cases.

The major issues are the definition of the 3 physician categories and the identification of characteristics which might differentiate each category from the other; the definition of quality of care in the Emergency Department and the identification of possible confounders.

Twenty-eight (28) physicians will be randomly selected in each of the 3 physician categories and half of them (14) will be selected in non-university affiliated hospitals.

Each physician will be assessed in the handling of 6 cases. One hundred and sixty-eight (168) cases will be collected in each physician category, half being non-urgent.

This will allow the detection of a 25% difference between physician categories with a type I error of 1% (two tailed) and a power of 95%.

The cases will be selected prospectively. Any patients treated by one of the selected physicians and presenting for one of the 10 selected indicator conditions will be included.

Four sources of data will be used: 1) the ED record to measure physician technical process of care; 2) observation to supplement the ED record and to assess physician attitude; 3) the patient questionnaire to measure patient outcome; and 4) the physician questionnaire to evaluate self-assessment ability.

1.5 Definitions

The definition of the 3 physician categories is difficult because it includes different factors which must be highly correlated:

permanence of the position (temporary/regular), hospital size, level of training, number of working hours in the ER (full/part time), and methods of payment.

The Emergency Physician (EP) is defined as a physician who has chosen a career in Emergency medicine. He works exclusively, in an Emergency Department. He has had more than three years of clinical postgraduate training and successfully completed a training in Advanced Cardiac Life Support (ACLS). His degree of clinical involvement varies as he is also usually involved in teaching and research activities; and for these reasons the hospital where he is working is usually a large urban hospital. The physician background and his level of training can vary. EP can be physicians with training in internal medicine, surgery, pediatrics who did rotation in Emergency Departments. EP can also be certificants of the College of Family Practitioners and physicians graduated from a residency program in Emergency medicine (the "specialists"). In Ontario about 10% of the Emergency Departments are estimated to be staffed by about 146 Emergency physicians (16).

The Casualty Officer (CO) is defined as a physician working in the Emergency Room on a temporary basis while pursuing other more permanent career plans. Usually just graduated, he works in the Emergency Room full time for a couple of years or on a part time basis. He is often under contract with the hospital and gets a salary on an hourly or sessional basis. His level of training after graduation varies and usually he has successfully completed an approved training in Cardio Pulmonary Resuscitation (CPR).

The General Practitioner (GP) is primarily working in private practice of Family Medicine and the rotations in Emergency Room represent an interesting variation in professional activities, but it is not his primary occupation. His level of training can vary from one year of internship, to a residency in Family Medicine and the GP usually followed an approved training in Cardio Pulmonary Resuscitation.

The only element which differentiate the 3 physician categories is the career orientation. The EP chose Emergency medicine as a permanent career and it is a primary occupation. The GP is primarily oriented toward Family Medicine and the Emergency care is neither a permanent career nor a primary occupation. The CO can be considered as the undecided group which is temporarily committed to Emergency care which may be a primary occupation, but not a permanent career.

Figure 1.1 illustrates the possible pathways of EP, CO and GP to the Emergency Departments.

The definitions of the 5 levels of training has been arbitrarily established: it excludes medical students (interns or residents) working in the Emergency Room and it does not take into consideration the number of years in practice which, for many would be considered as a valuable form of training.

Level 1 will be physicians licensed to practice in Canada, who have not had more than three years of clinical postgraduate training;

Level 2 will be physicians with approved training in Cardio Pulmonary Resuscitation (CPR) or Advanced Cardiac Life Support (ACLS);

Level 3 will be physicians with three years of clinical postgrad-

uate training in internal medicine, surgery, pediatrics. This includes certificants of the College of Family Practitioners in Canada working in Emergency Departments;

Level 4 will be Fellow of the Royal College in internal medicine (including cardiology), surgery, anesthesia;

Level 5 will be physicians graduated from a residency program in Emergency medicine (specialists in Emergency medicine).

A full time physician has been defined as a physician having clinical activities in the Emergency Room at least 32 hours a week.

A part time physician is working less than 31 hours a week in Emergency medicine. This definition is arbitrary and the cutoff point of 32 hours may have to be revised when the distribution of hours worked per week in the ED will be obtained as a result of the survey. The assumption is that full time physicians are more likely to give better care as they see more cases and gain more experience.

Definition of the methods of payment

The Ontario Health Insurance Plan (OHIP) reimburses for any service provided in the ED and the money may go to a pool from which salaries are drawn, or to individual physicians paid for each act. Fee-for-service payment stipulates that each medical act is a discrete unit which is priced separately, often in accordance with the difficulty of the act and the time spent with the patient. The concern is that fee-for-service may be an incentive for unnecessary services, and rushed services. But on the other side, fee-for-service may result in a more efficient service.

1.6 Justification of the study

The main benefit of the study is to establish a feasible, reliable and valid procedure to evaluate the quality of care in the Emergency Departments.

There are 3 other possible consequences. The results of the study will provide information: 1) on the planning of Emergency Departments: the study includes a survey of 35 ED's in Ontario and the collected data on the structure, on the nursing and medical staff and on the organization of the ED will be useful descriptive data. Also the study will provide information on the mean waiting time for patients and on the workload in the ED; 2) on the medical staffing of ED: several factors which might influence the quality of care will be studied: physician category (EP, CO, GP), level of training, working hours, number of years in practice, method of payment, university affiliation of the hospital and urgency of the cases; 3) on the individual performance which can be a useful educational feedback to the physician.

Two possible negative consequences are foreseen: 1) the identification of an inadequate performance may lead to a deterioration of the relation between physicians, and between physicians and hospital's administration; 2) some physicians may find that quality of care assessment is a threatening experience and they may deny the possible benefits and refuse to participate.

Figure 1.1 illustrates the possible pathways of EP, CO and GP to the Emergency Department.

Table 1.1 summarizes the various elements of the definition of EP, CO and GP.

Figure 1.1 : Possible pathways of medical staff to the Emergency Department

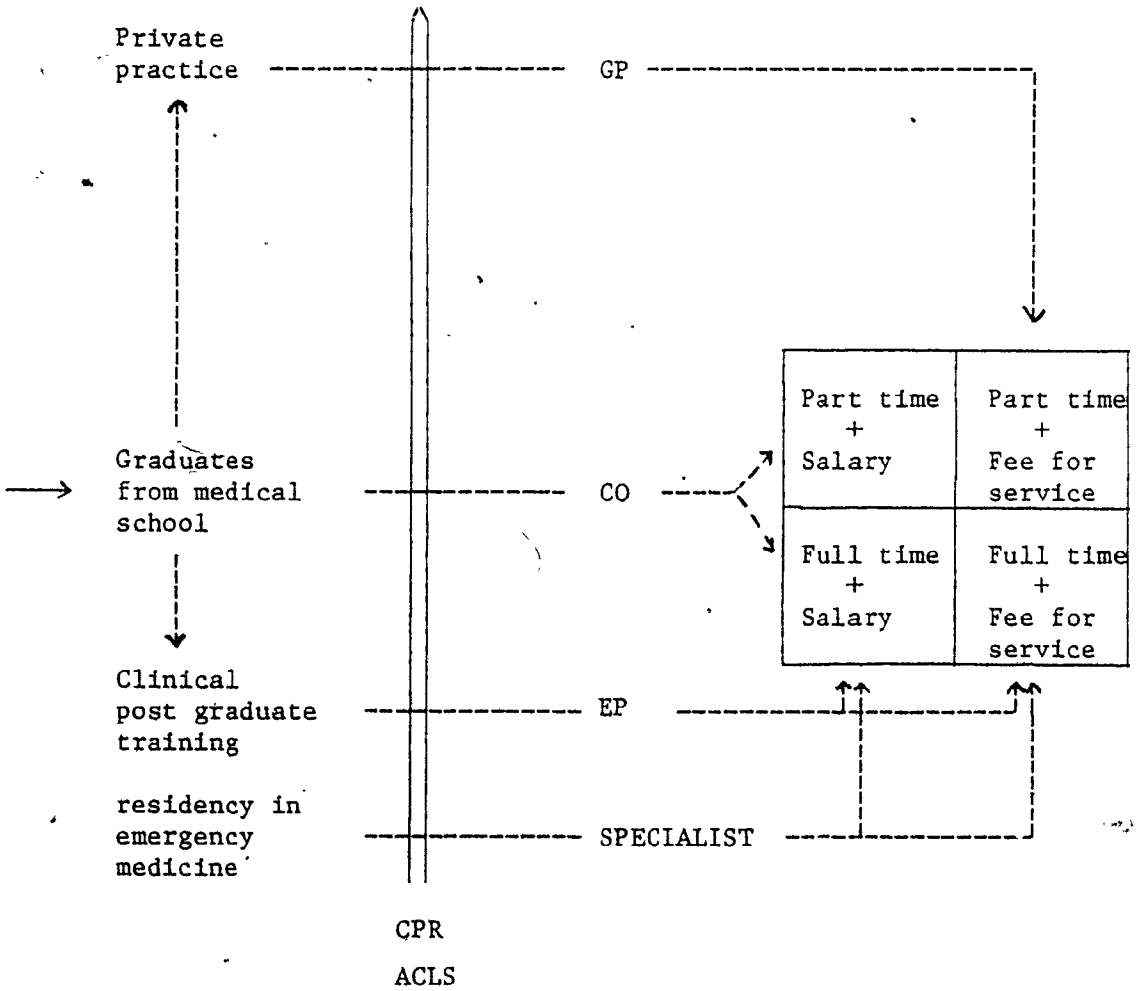


Table 1.1 : Level of training, employment, working hours and methods of payment of ED medical staff and relation with hospital size and location

Note : var.= variable
FFS = fee for service

MD	Level of training	Employment	Working hours	Method payment	Hospital size
EP	3, 4, 5	permanent	FT	salary F.F.S	large urban
CO	1, 2, 3	temporary	FT/PT	salary	var.
GP	1, 2, 3	permanent	PT	F.F.S.	var.

CHAPTER II

LITERATURE REVIEW

2.1 Training in emergency medicine

2.1.1 Historic

The first residency program in emergency medicine was developed in 1970 at the University of Cincinnati. Fifty (50) other programs have since been started, and the majority of new programs after 1975 are located in California, New York and Illinois (10). The first Emergency Medicine Specialty Certification Examination (EMSCE) was conducted by the American Board of Emergency Medicine (ABEM) in 1977 (32,39).

In Canada, 5 training programs in Emergency medicine are currently offered (16). The University of Western Ontario has a 2 year program. At Queen's University, 4 positions are offered for the 3 year program. At McGill University, 12 positions are available for the 2 year program, and 26 physicians were graduated since 1970. At the University of Calgary, 3 positions are offered annually and 2 physicians were graduated. The information from the University of Ottawa is not yet available. Of the graduates of these programs, only 6 are currently practicing in Ontario. Because the number of specialists would be too small, it is not feasible to include a fourth physician category (specialists) in this proposal. They will be considered as EP's.

2.1.2 Educational objectives.

The review of the educational objectives for Emergency physicians

(3, 4, 16, 29, 33, 35) shows the similarity with the training required for primary care physicians. The educational objectives which distinguish the Emergency medicine program from the Family Medicine program are 1) the emphasis on knowledge and skills for life-threatening situations, and 2) requirement for familiarity with the emergency medical services system (transportation, communications, facilities) and with Emergency Department management (legal/ethical considerations, personnel, equipment, space usage, budget...).

The aim is to train physicians to be able to be "action oriented", capable of alternating between minor and major illnesses presented in an episodic fashion: in a setting where "decisions must be made rapidly, based upon clinical assessments and readily available laboratory tests, radiographs, and electrocardiographs" (33).

2.1.3 Rationale

The creation of a new and separate specialty in Emergency medicine to provide a high quality of care in Emergency Departments is based on the evidence that training is a valid indicator of quality of care (19, 43, 46, 49). Payne and Lyons, in 1972 (46), observed that patients who were treated by "modal" specialists (specialist for the specific disease the patient has) received higher quality of care than patients treated by other physicians. In this study, the authors studied 3,316 hospital discharges by retrospective chart review using a list of explicit, objective, disease specific criteria for 16 diagnostic categories. The study involved 506 physicians from 22 general hospitals in the state of Hawaii. The sample of physician represented 52% of the

physician population and it was not a random sample. The Physician Performance Index (PPI) used to evaluate individual performance is "a weighted percentage of hospital service criteria items observed. The hospital service criteria are specific items recommended for optimal care and include the history, physical examination, laboratory and roentgenology, special procedures and/or therapy components in the process of optimal care. The criteria panels applied weights of importance to each specific item. Any PPI for a given diagnostic category is the sum of the observed item weights divided by the sum of the maximum possible weights for that case, or the weighted percent of criteria items observed". In 1976, Rhee (49) studied a sample of 454 physicians from the Hawaii study (2,517 patients presenting 15 diagnostic categories). Using the PPI, the author found 1) that physicians with longer formal training provide higher quality of care than those with shorter formal training ($p = .001$); 2) physicians who have been in practice between 6 to 15 years provide a higher quality of care and time in practice accounted for 2% of the total variance; 3) the organization of the setting in which care is provided has more influence than the education and training that physicians had attained.

But the arguments for establishing a new and separate specialty in Emergency medicine are much more than educational and Wood (68) decribes the situation as a "hot issue". In favour of the new specialty 3 elements are emphasized:

1) there is a lack of adequate training in medical schools for technical procedures of resuscitation, and there is an increasing amount of knowledge in Emergency care; 2) because of the high and increasing ad-

mission rate in the ED, because of the estimates of the Ontario Ministry of Health already mentioned, there is a need in Canada for 400 physicians to limit their work in Emergency Rooms 3) the heterogeneous training of Emergency physicians may be a source of variation in quality of care. On the other side, several problems may result from this new orientation: 1) general practitioner may lose an interesting variation in professional activities, a source of continuing medical education, a source of new patients and then of income; 2) some Emergency Rooms have marked seasonal variation in admissions and need temporary staff (ie. North of Ontario, Niagara Falls in the summer time) and, concurrently, sometimes the admission rate is too low to justify specialized staff. It is estimated that ED's need an admission rate of at least 20,000 visits/year (55/day) to provide the salary of 4 full time physicians receiving an annual salary of $50,000. Three elements seem to weaken the justification of a specialty training in Canada: 1) more than one-third of ED visits are non-urgent cases; 2) there is an emphasis of primary care physicians to cover the need of the population; 3) there are fewer large urban cities than in the United States, where the number of trauma (knifings, shootings...) is usually higher.

2.1.4 North American experience

In 1979 and 1980, Anwar published a survey on career choice of trained Emergency physicians (10, 11). Two hundred and twelve physicians who had completed their residency in Emergency medicine were sent a questionnaire; 145 answered (68%). This survey includes every graduate from all programs in Emergency medicine in the United States and Canada. Four findings are interesting: 1) there is an almost

geometric increase of graduates in Emergency medicine per year and this may reflect the increasing need for specialists 2) less than 10% of physicians work fewer than 40 hours per week 3) for the 132 Emergency physicians working 40 hours per week or more, 86 (65%) were in medical school hospitals with an academic affiliation, and they remain primarily in urban areas 4) just 35% of the graduates in Emergency medicine have gone exclusively into clinical emergency medicine.

2.2 Measure of quality of care and application to the Emergency Department

The concept of quality of care is a value judgment and it may be influnced by a tremendous number of factors: political, economical.... but in the context of this study only the "medical" factor is of interest. There is no existing absolute measurement of clinical performance. Quality of care can only be inferred from the interpretation of a number of different measurements that gives a "profile". Appraisal of quality of care may be directed to three aspects which can present a complex inter-relationship: assumed prerequisites for quality care (facilities, organization, staff, standards); elements of performance; and effects of care on outcomes (53). This classification was formulated by Donabedian (20) in terms of structure, process and outcome.

2.2.1 Structure of the Emergency Departments

Emergency Departments include 1) human resources (physicians, other health professionals); 2) material resources (defibrillator, laboratory, X-rays...); and 3) clerical resources (ED record, control register).

Murphy (44) proposed a classification of Emergency facilities

into four grades and only one of which is relevant here. The primary Emergency facility (PEF) is the highest grade. This is characterized by having 24 hour on-site physician and nurses coverage in the ED, 24 hour capability in the operating room, X-ray, laboratory and blood bank area, a minimum of a four-bed intensive care unit, cardio pulmonary resuscitation supplies, defibrillator and monitor in the ER, specialists available on call, anesthesists available in 30 minutes, intensive care unit. This definition will be used in the identification of eligible ED.

In 1974, Gibson (24) published guidelines for Research and Evaluation of Emergency Medical Services and proposed several measures. Hospital resources measures: percent of hospitals with a physician in the ER at all times, with necessary equipment in the ER, with needed specialists on call within the hospitals at all times, in compliance with the requirements for accreditation. Hospital utilization measures: visits for each hospital per year, aggregate per 1,000 population, visits by injury type and severity rating, percent of visits for non-urgent and scheduled procedures, mean interval between arrival of patient and first encounter with physician and admission or discharge, average length of stay for Emergency Room admissions, distribution of visits by hour, patient characteristics..... Ambulance resources measures and utilization. Several of these measures will be used to describe the Emergency Departments involved in the study.

To identify which variables might be confounders of the quality of physician performance in patient care, the literature was reviewed to find evidence on hospital determinants (teaching status, size,

volume of patients, nursing staff) and on physician determinants other than training (physician method of payment). Since no single study included all these variables, it is not possible to estimate the extent to which they are dependent on one another or the amount of variance which could be explained by each. Also, no study specifically assessed the influence of the ED structure on the quality of care, and this limits the usefulness of the results for the present proposal.

a) Influence of teaching status

The Stanford study (58) included a representative sample of 1,224 hospitals in the United States and measured the quality of care by the postsurgical morbidity and mortality rates adjusted for case severity. With these measures, which may not be sensitive, the authors found that the distinction between teaching and non-teaching hospitals was negligible. They also reported that the relation of teaching status with quality of care varied with the type of operation performed probably because of the influence of inexperienced surgeons-in-training.

In a review of the literature, Palmer (45) concludes that "teaching hospital status alone cannot be relied on as an indicator of quality" and considerations must be given to major variations in quality among geographic locations.

b) Influence of hospital size

Several authors found the large sized hospitals to provide a higher quality of care (46, 49). In the Stanford study (58), the relationship between size and surgical outcome varied according to the type of surgery and in an intensive study of 17 hospitals, no consistent relationship was found between size and quality of care.

The relationship of size to quality is complicated because it is dependent on other related variables which may be more powerful predictors of quality (ie university affiliation). Rhee (49), in his study of the relationship between type of hospital and quality of physician performance, classified the hospitals in decreasing order: the large, urban and non-teaching hospitals provide the highest quality; then the large, urban, teaching hospitals; then the small, urban and rural community hospitals. (Rhee did not assess specifically the ED.)

c) Influence of patient volume

The differential effect of size measured by number of beds as opposed to patient volume has not been directly addressed, and it is difficult to study since other factors such as availability of staff, organization of workload are involved. Nevertheless, it seems reasonable to assume that it is difficult to achieve high quality unless there is a sufficient volume of patients (49).

d) Influence of nursing staff

The relationship of nursing staff organization to quality of care was assessed in the Stanford study (58) and the ratio of registered nurses to non-registered nurses in direct patient care was significantly related to better outcomes, even after controlling for teaching status of the hospital.

The effect of institutional characteristics on patient outcome is not proven, but it is reasonable to assume that they may have an indirect effect on the medical staff. Rhee (49) found that the type of hospital explains 12% of the variance in the quality of physician performance and the findings indicate that probably "large, teaching hos-

pitals, which require more organization and higher control, can attract more qualified physicians, in more productive years of practice".

e) Influence of physician method of payment

Rhee (49) did not find any statistically significant difference in quality of care, both for adjusted and unadjusted means, between the physicians on a prepaid practice and the physicians on a fee-for-service basis.

Hastings (27) did a study in Sault Ste. Marie to assess the health care provided to the employees of a steel company. Sixty-two percent of the 5,400 eligible employees chose to be cared for by a group of salaried doctors in a health centre and 38% chose independently practicing physicians paid on a fee-for-service basis. The two populations of patients were similar for several characteristics (age, sex, education, income...), but no information is given on the physicians (age, level of training, number of years in practice). The difference found in utilization between the two plans of payment may be attributable to other uncontrolled factors (type of practice). Also utilization is different from quality of care.

In 1973, Sibley (55), using the indicator condition approach, did not find any difference in quality of care, before and after the change from a fee-for-service system to a capitation system of payment. This study was done in five rural primary care practices.

In summary, there is no strong evidence that the structure of the hospital (and of the ED) might be a confounder for the physician quality of care.

The four strategies used to control for possible confounders are detailed in section 3.4.1.2, page 47.

2.2.2 Clinical process

a) Definition

The evaluation of the clinical process includes every activity of physicians and other health professionals in the management of patients. Brook (15) divided the process of care into the technical art which refers to the adequacy of the diagnosis and of the therapy, and into the art-of-care which relates to the milieu, manner and behaviour of the provider(s) reflecting the social and psychological interaction between patient and health professional. Barro (12) divides into two main components the evaluation of physician performance: technical skills (psychomotor and cognitive) and inter-personal skills. Almost all quality of care studies concentrate on the technical aspect of care, but both components are very closely inter-related and considered equally important by the medical profession and the general public. However, when Price (48) compiled a list of 116 qualities of physician: 87 positive or desirable and 29 negative or undesirable, the relative importance assigned to most factors by various representatives of the public differed from those assigned by physicians. "Thorough up-to-date knowledge in his own field of medicine" was ranked 18.5 by physicians. The general public rated "able to be his/her own teacher" 19.5 on the list and the physicians rated this second in importance.

In 1973, Pickering (47) published a report on the medical profession in Ontario and it was found that 64.2% of people were concerned

with considerations other than technical and the single, most important quality for which people look in a doctor is good human relations. Of those surveyed, 17.8% selected availability of service, 34.0% selected physician competence, 46.4% selected good human relations and 1.8% selected other qualities as being of primary concern. Also, among the 9.1% dissatisfied with their medical care, only 22.2% cited physician competence as a factor. It is not known what would be the distribution of answers if the study was carried out in Emergency Departments.

Both aspects: technical care and art-of-care will be assessed in the clinical process measures. The advantages of measuring clinical process is that it evaluates specifically what the physician does. But there are several limitations: i) the validity of process measures of quality of care can be questionned in view of the weak correlation between process and outcome (13, 28), although McAuliffe (40) criticized the design and the analysis of these studies. Two other studies, carried out in Emergency Departments reported higher correlation coefficient between process and outcome. Rubenstein (51) found a correlation of .38 ($p < .02$) between a weighted process score based on chart review, using an algorithmic method and a weighted outcome score based on a telephone interview with the patient. The study assessed the care of 73 patients with a confirmed diagnosis of urinary tract infection. Greenfield (26) examined the charts of 137 patients presenting in the Emergency Department for chest pain, and subsequently sent home. The process assessment using the criteria mapping technique focused on the decision to discharge; and poor outcome was defined as death or subsequent hospitalization within 21 days. With these measures, the cor-

relation coefficient was significantly high (.31 and p = .0062) (40); ii) virtually all quality assessment studies have evaluated the technical aspect and the measurement of the art-of-care is just beginning (15). The attempts to measure the inter-personal skills are reviewed by Barro (12) and it appears that only the area of physician-patient communication has been developed neglecting other aspects.

In this proposal the main research question is related to physician performance. It was decided to measure the technical process using explicit criteria; and to measure the art-of-care reflected by the physician attitude using the implicit judgment of an ED Nurse observer.

b) The standards for technical process of care are usually set up by the medical profession to reflect the state of the art in medical care. The judgment is either implicit when it relies on the subjective opinion of the judge or explicit when it relies on predetermined criteria set up by group agreement.

Brook (13) compared the two approaches using three medical conditions: urinary tract infection, hypertension and ulcerated lesion in the stomach or duodenum. For the first two conditions the cases were identified by a retrospective chart review of admission in the Emergency Department: 112 patients had a positive urine culture and 117 patients had a high diastolic pressure. The 75 patients with ulcerated lesion were identified by a retrospective study of X-ray reports. The medical record was abstracted for 303 (99.7%) patients and the patient interview completed for 297 (97.7%) patients. Using the implicit approach (at least 2 out of 3 judges rated the quality of care adequate after

reading a 2 page abstract of each case the author found: an adequate process of care for 23.3% cases; an adequate clinical outcome for 63.2% cases; and an adequate quality of care (process and outcome) for 27.1% cases. Using explicit criteria of optimal care (explicit process and explicit outcome judgment), only 1.4% of the cases met all the process criteria. For the three conditions the mean percentages of criteria fulfilled were respectively 52%, 58% and 35%. It was estimated that the outcome was acceptable for 39.6% patients with urinary tract infection and for 44.2% of patients with high blood pressure. This study demonstrates that the results of the quality assessment are determined by the method used. It was found that the scores for quality of care on process and outcome were lower when explicit criteria are used rather than implicit judgment. Similar findings are reported by Cole (20) who selected retrospectively 71 cases of chest pain, 100 cases of abdominal pain, 100 cases of wounds and 50 cases of sore throat admitted in the Emergency Department. A list of explicit criteria obtained by consensus of a physician panel was used for the explicit judgment. The adherence rates were respectively for each complaint: 20%, 33%, 25% and 14%. When the cases were submitted to the physician panel for implicit review, the proportions of adequate cases were respectively 49%, 65%, 49% and 57%.

Three sources of criteria can be identified: 1) statistical or empirical criteria which are derived from regional or national statistics on length of stay, current practices, complications, mortality; 2) normative criteria are derived from consensus: consensus of physicians on procedures that constitute good medical care for a particular condition (optimal care or general consensus criteria) or consensus of experts in

a particular disease or condition on efficacious treatment and achievable clinical results for that condition (essential or critical criteria); 3) scientific (validated) criteria result from clinical research that objectively establishes the efficacy of treatment and its clinical results in specific conditions. Statistical and optimal care criteria are not considered as valid (usually observed rates of adherence to optimal criteria ranged from 30 to 60% (53) and only essential and scientific criteria should be used.

In the evaluation of quality of technical care in Emergency Departments several approaches have been used: the indicator condition (59), criteria mapping (26), and algorithms (22, 34, 51). They all represent a bridge between explicit and implicit criteria as the criteria incorporates branching, allowing more flexibility to the assessment. Furthermore, they are a bridge between process and outcome as criteria are chosen for their relation with patient outcome.

The indicator condition is defined (57) as a disease complaint, injury or state that is reasonably frequent in the practices being studied and for which there is sound evidence of benefit from good medical care in some aspect of its management. Spasoff (59) selected seven indicator conditions and modified slightly the criteria developed by Sibley (56). One hundred episodes were assessed for each indicator condition, using a record abstract (five physicians were assessed in each setting on 10 cases for each indicator condition). The proportion of episodes of care judged adequate varied from 28 to 82% and the method was able to detect a difference in quality of care between Emergency Departments and family physicians' offices (the overall scores were respectively 53% and 40% in each setting and the difference was significative

$p < .01$).

Greenfield (26) developed criteria mapping to assess the management of chest pain in the Emergency Department. Its originality lies in the fact that it "incorporates the sequential decision-making process of the physician into the evaluation of medical care...Each criterion, item, or group of items leads to a subsequent decision or action based on a specific finding or value for that item". Of the 137 discharged patients, 111 (81%) were considered to have received adequate care. Twenty-six charts reflected inadequate technical process and 23 of the 26 patients (88%) had adequate outcome.

Looney, Roy and Anderson (34, 50,9) developed 12 algorithms to assess the quality of care in ED, but no data is provided to quantify the physician performance.

Frazier (22) developed an algorithm for the management of laceration. A sample of 1,400 cases was examined, consisting of 703 observed cases and 697 cases for which the provider had completed a laceration checklist. The author found an overall coefficient of "adequacy" of 79.8% for the medical record of the 703 observed cases, of 82.8% for the observer list, of 84.4% for the 131 physician checklists when the encounter was observed and of 79.1% for the 566 physician checklists when the encounter was not observed.

Rubenstein (51) used a weighted algorithm to assess the Emergency Room care of women with symptoms of urinary tract infection, and he used the physician performance index. He defined arbitrarily "poor" and "adequate" physician performance score after reviewing the relation of the PPI with the outcome score.

In conclusion, the increasing use of algorithms in Emergency quality of care is promising. The major disadvantages with this method are the time necessary for development and the difficulty of defining a score. The indicator condition approach will be used in this thesis.

c) Scoring of technical process

There is no uniformly accepted method for scoring. The debate turns around the use of ordinal scale: 2 point scale (26, 59), 3 point scale (9); the use of adherence score: proportion of explicit criteria met or proportion of cases meeting all the explicit criteria (13, 20); the use of weights for each technical process criteria (51); and finally, the use of a global score of clinical performance to aggregate process and outcome.

The use of the 3 categories indeterminate, adequate and superior as advocated by Sibley (57) wherein all minimal criteria have to be present to obtain the adequate score seems appropriate for the evaluation of technical process. It allows more variation in ruling than the dichotomous scale, and reduces assessor variation which can be seen when too many categories are used.

Spasoff (59) graded each episode of care either adequate or questionable, ignoring the category superior used by Sibley because he was interested in determining whether care of minimal adequacy was attained.

Greenfield (26) also used the 2 point scale: adequate/inadequate for the criteria mapping approach.

Anderson (9) adopted a three point scale after trying several methods of scoring systems to assess the cases, but the scoring system

is not reported clearly.

In Brook (13) the implicit judgment was rated on a 2 point scale (adequate/inadequate) and the explicit process was reported as a percentage of criteria met and this did not take into account the presence of the critical items.

The issue of weighting technical and inter-personal process is not clear cut. The use of weight is subjectively and arbitrarily determined as there is no universal rationale underlying such weighting. Rubenstein (51) used the concept of a physician performance index (37). The author reviewed seven sets of process criteria for the treatment of urinary tract infection in young women published in the literature. Arbitrarily a weight of 4 points was given to any criterion listed on all 7 lists; a weight of 3 if listed on six... If a criterion appeared on fewer than four lists it was excluded. Then the author weighted each branch of the decision tree to develop a decision index with values from 0 to 56.

In this proposal, the technical process of care will be rated on a two point scale and the inter-personal skills on a three point scale. Weights will not be used because they are arbitrary.

d) Data source for clinical process

Several sources have been considered using seven methodological criteria proposed as guidelines for process measures (62): 1) criterion validity 2) clinical credibility 3) accuracy 4) comprehensiveness 5) sensitivity to change 6) amenability to index construction 7) feasibility and cost. Each term is defined in Appendix A.

The chart review is the most common strategy (9, 13, 20, 26, 51,

59). It is feasible in the ED where usually the chart consists of a one-page sheet with different boxes for patient identification, date, time, complaint, vital signs....It is easy to abstract, at low cost and it is estimated that one visit can be reviewed in 10 minutes. Good record keeping is considered by some as part of quality of care and Lyons (38) reported some association between the amount of recording in the chart by physicians and the technical process of care. The Canadian Council on Hospital Accreditation (17) made specific recommendations for the ED patient clinical record, and it enumerated the informations to be recorded in the ED chart:

> "A patient's clinical record shall be kept for every patient receiving emergency services; it shall become an official hospital record. The patient's record shall contain: 1) adequate patient identification 2) information concerning the time of the patient's arrival, means of arrival, and by whom transported 3) pertinent history of the injury or illness including details relative to first aid or emergency care prior to his arrival at the hospital 4) listing of known allergies 5) <u>description of significant clinical, laboratory and radiological findings</u>; including vital signs as frequently as indicated, nurses' and physicians' assessments 6) diagnosis and treatment given 7) condition of the patient on discharge or transfer, and 8) final disposition, including time of discharge or admittance and instructions given to the patient and/or his family relative to necessary follow-up care."

The chart review is able to detect deficiency (13, 20) and to detect difference between care setting (59). It has also the advantage to be a reliable method (46).

Several criticisms counterbalance the advantages of using chart review and they all relate to validity. First, several authors are concerned by the fact that record keeping is not a measure of quality of care (23, 28, 50, 53). Second, there is the risk that the record may be incomplete in ED, where it is filled in a hurry, it is

often illegible and it reflects just a small portion of the care given to the patient. Frazier (22) found that only 27/703 cases (3.8%) contained adequate data to assess the care of laceration. In an attempt to improve records, a more structured and standardized ED record with "tick off" boxes for procedures done, has been implemented in some ED's, and such a project is underway in the Hamilton area. Frazier (22) introduced a one-page protocol for the care of open soft tissue injuries to increase efficiency and accuracy, and the missing data rate dropped from 20% to 1%. This strategy will not be used because of the risk of contamination (indirect influence of physician behaviour).

Another problem which often arises in ED is the poor organization of the storage of records. The ideal system would include a copy 1) for the physician 2) for the inpatient record 3) for the outpatient record, and 4) for the ED record. The ED record should be easily accessible if the patient is present several times at the ED. All these records (ED, inpatient, outpatient) should have a common identification number to ease the retrieval, but this is not a common routine.

In the proposal, the cases will be selected prospectively to avoid the difficulty of retrospective record retrieval. Also, to complete the information written on the record, an observer will note what has been done, asked and said to the patient during the visit, using a specific list of explicit criteria.

The use of <u>unobtrusive observation</u>, by Roy (50) and Frazier (22), is feasible as the usual ED visit requires a short observation time. It is a direct method which allows a prospective measure of process and

then outcome. It is a source of measurement of physician aptitude and attitude (inter-personal process of care). It may be a more complete source of information on the technical process of care: Frazier (22) observed 703 cases of laceration and found an overall rate of adequacy of 79.8% in the record and of 82.8% on the observer form (but the difference was not significant). Finally, trained and independent observer can get a high degree of agreement (19). The limitations of observation are related to observer bias and expectation bias in the physician who may change his behaviour because of observation. Frazier (22) compared 131 physician checklists of observed cases of lacerations and 566 physician checklists of non-observed cases and he found a significant difference of $p < .001$ between the two rates of adequacy, respectively 84.4% and 79.1%. Just one observer was involved and no information was given on the training and instructions to the observer.

In this proposal, observation will be used to complete the ED record to assess technical care, and to measure inter-personal skills. The magnitude of any Hawthorne effect is expected to be similar in each of the 3 physician categories, and this will not effect any existing difference.

Physician questionnaires have not been used in Emergency evaluation, but will be used in this proposal in an attempt to obtain a measure of self-evaluation.

2.2.3 Patient outcome

Barro reported several definitions of patient outcome (12). The definitions include six "process outcomes" (attitude toward the physician and the episode of care, attitude toward and understanding of

the condition, compliance, incurring or avoiding unnecessary risks in medical care, hospitalization, and cost of care) and 6 "patient end results" (death, disease, disability, discomfort, dissatisfaction and disruption).

Williamson (67) developed the concept of first assessing diagnostic outcomes (accuracy of diagnosis) to determine whether there is a need to examine the diagnostic process; then examining the therapeutic outcome to determine the need of assessing therapeutic process.

Five studies (9, 13, 24, 26, 51) evaluated the patient outcome after Emergency room care.

Greenfield (26) defined an adequate outcome as any status other than death or subsequent hospitalization for a condition related to the chest pain symptom within the 21-day period.

Brook (13) performed a patient interview to determine patient compliance and condition, five months after the initial ED visit, for 3 conditions.

Anderson (9) proposed an approach to evaluate the ED quality of care using the 9 measures of outcome proposed by Gibson (24). But these measures assess the whole emergency service rather than just the clinician impact.

Rubenstein (51) developed a structured questionnaire to be administered by telephone 2 to 4 weeks after the ED visit. The questions concerned satisfaction with treatment, persistence of chief complaint and specific urinary tract symptoms, understanding of medication and follow-up instruction, and understanding of the illness. An outcome score was calculated with the best possible score being 10.

The evidence is mounting that patients interview to assess the physical, social and emotional functions of the patient combined with chart review provide a more complete assessment of physician performance (53).

The major limitation of outcome measurements is that several factors influence patient outcome, and not just the clinical process. Sanazaro and Williamson (54) reported that of 6,300 end results of care attributed by internists to physician actions, 50% related to clinical effects (longevity, risks, change in the disease process or physical symptoms), 28% concerned psychological symptoms, attitude toward medical care, attitudes toward and understanding of patients' own condition and compliance; 12% pertained to patient functioning. The second limitation is the lack of validity studies (40).

In this proposal we opted for a subjective assessment of patient outcome using Rubenstein's questionnaire (51). The reason is that it is believed that it would not be feasible to obtain an objective measure of patient outcome, asking every patient to come back for a clinical reassessment.

The comments made on the use of standards score and weight in the previous section on clinical process are relevant also for outcome measures.

The decision to construct a physician performance score including process and outcome measures is difficult. It might appear ideal to have a global score to make a decision on the physician overall quality of care, but there are two major problems. First, information is lost when clinical process and patient outcome are aggregated. Second,

any strategy to aggregate score (mean score, weighting) is arbitrary.

In this proposal, it was decided to report subscores for process and outcome and then to leave the decision-maker give appropriate weight to each one.

In conclusion, it can be said that the decision to choose one type of data, one data source, one scale or one score is a trade off between several alternatives. Several limitations to quality of care assessment have been identified (14, 52) and in this proposal, to measure the quality of care provided in ED by the 3 physician categories, it was decided to use the following strategies:

1) the indicator condition approach will be used because it reflects the clinical decision making process;

2) the technical aspect of care will be measured against explicit criteria determined by consensus in a peer advisory group;

3) the art of care reflected by the physician attitude will be assessed using the implicit judgment of an ED-nurse-observer;

4) the patient outcome, which includes patient satisfaction, health status and knowledge, will be measured using a phone interview and a structured questionnaire, 2 weeks after the ED visit;

5) the data sources will be ED record, observation, patient and physician questionnaire;

6) ten indicator conditions will be selected, half the cases will be urgent and half the cases will be non-urgent to insure a representative patient sample;

7) the sample size will be over-estimated;

8) reliability and validity of the measures will be evaluated.

CHAPTER III

RESEARCH DESIGN

3.1 Question

This proposal describes a design to answer the question:

"Is there any difference in the quality of care given in Ontario's Emergency Department (ED) by Emergency physicians (EP), casualty officers (CO), and general practitioners (GP)?"

A difference of 25% will be considered as clinically significant, for each separate score.

The definitions used in the design are summarized in Appendix A.

3.2 Design

The design is a cohort analytic study. The sampling units are the physicians and their patients. The manoeuvre is the category of physicians. The measurement includes clinical process of care and patient outcome. The data source will include observation, chart review, patient and physician questionnaire. Explicit criteria will be used to determine the score for the technical process of care. Implicit judgment is used to score the interpersonal relationship.

The design is illustrated in figures 3.1.1 and 3.1.2.

3.3 Alternative designs

A randomized control trial would be a more powerful design to establish any difference in the care given by the three categories of physicians. Physicians would have to be randomly allocated to become EP, CO and GP, to control for any inherent confounder responsible for career

choice, and patients would have to be randomly allocated to physicians. The randomization of physicians is obviously impossible and the randomization of patients is not feasible because they go to the nearest ED whatever category of physician (EP, CO or GP) is working there. (see figure 3.2.1)

Two other designs, less powerful, could have been used: a prospective survey or a case control study.

In a prospective survey a sample of patients admitted in the ED is selected and then the physician is identified and the quality of care measured. This design is very similar to a cohort analytic except for the risk of imbalance in the number of patients cared for by EP, CO, GP. (see figure 3.2.2)

For a case control study an equal number of cases which received adequate and non-adequate care (some standards have to be defined a-priori) are selected and then the chart review identifies the physician category. Besides the risk of bias in selection of cases, the risk of imbalance exists here too. On the other side, the advantages are easiness and diminution in cost. (see figure 3.2.3)

A cohort analytic study is then the most appropriate design to answer the question. Cohort implies that the patients are selected before the manoeuvre and analytic implies the presence of a control group. It allows 1) the selection of an equal number of cases cared for by each category of physicians; 2) the stratification in urgent and non-urgent cases; 3) the use of an observer to complete the recording of the process of care, to assess physician attitude and to rate the apparent patient satisfaction; 4) the physician's self-assessment for

each case; 5) the patients follow-up 2 weeks after the ED visit. The disadvantage is the risk of not controlling for unknown confounders.

3.4 Details of design

3.4.1 Sample

3.4.1.1 Inclusion/exclusion criteria

a) Hospitals

The Canadian Hospital Directory of 1979 records 311 hospitals in Ontario; 254 are public, 39 are proprietary; and 18 are federal. 203 of the public hospitals (80%) are classified as general hospitals, and of those 57 (28%) have more than 300 beds. According to Statistics Canada, 1979, the public general hospitals with more than 300 beds have an average of 124 to 171 visits per day in the Emergency Department (60, 61).

The selection of hospitals will be based on six inclusion/exclusion criteria.

1. Hospitals with more than 300 beds

This restriction has two objectives: such hospitals are more likely to have similar structures (organization, staffing...) and the average admission rate in the ED will allow a sufficient flow of patients.

2. Hospitals located in a 100 Km. radius around Hamilton

This restriction is source of a selection bias, but the decision was taken for two reasons. The first reason is feasibility in terms of cost of travelling from ED to ED to collect data. The second reason is representativeness as 35/57 (61%) of general hospitals in Ontario with more than 300 beds are located in this area. Figure 3.3 illustrates the selected area.

Thirty-five of the 203 general hospitals (17%) comply with those two inclusion criteria. They are listed in table 3.3. Fourteen (40%) of these are university affiliated (UAH) hospitals (or partially affiliated hospitals).

This selection procedure can be interpreted as limiting the generalizability, but it is believed that the obtained list of eligible hospitals is representative considering feasibility constraints.

Four other inclusion criteria which relate to the organization of the ED and which are considered as prerequisites have been added:

1. medical staff is available on site and gives a 24-hour coverage, 7 days a week;
2. nursing staff is comprised of at least twice as many registered nurses (RN) on any shift than registered nursing assistants (RNA). The level of training of nurses may influence the quality of care and this selection criteria aims at controlling this factor;
3. consultants in the main specialties are available on call 24 hours a day and seven days/week. This is to insure that hospital care in the ED is comparable. The main specialties are: internal medicine (or cardiology, respirology), general surgery, orthopedics, radiology, anesthesiology, psychiatry, obstetrics-gynecology, pediatrics;
4. supporting services are available on call if required 24 hours/day and seven days/week. This includes: laboratory, X-rays, blood bank, electrocardiograms, ambulance.

As none of the information for those last 4 criteria is available, a survey needs to be done before final selection of the ED, but it is expected that most hospitals in this part of Ontario with more than

300 beds will meet those criteria.

b) Patients

Any patient presenting in one of the selected ED's will be included providing : 1) he/she must be able to speak English to facilitate the measure of patient outcome; 2) he/she must present with one of the 10 selected indicator conditions; 3) he/she must live in the area identified on figure 3.3, 100 Km. around Hamilton to facilitate patient follow-up; and 4) he/she has no booked appointment in the ED with one of the ED's physicians, because it would break the random flow of patients.

c) Indicator conditions (IC)

Several criteria have been established to select the indicator conditions.

1. They are frequent to provide an adequate sample size. The classification of presenting complaint associated with 2,608 emergency visits in Hamilton and published by Vayda in 1973 was chosen as a reference for frequency distribution. In April 1980, a group of ED physicians at Joseph Brant Hospital in Burlington classified a random sample of 100 charts of 1979 and the rank order of the complaints was found to be similar to Vayda's. Table 3.3 summarizes the two frequency distributions;

2. They cover both sex and different age strata of the population;

3. They are health states for which clinical actions can be expected to affect patient outcome;

4. They require different skills from the physicians: technical skills (laceration), behavioral skills (depression, anxiety);

5. They are relevant to emergency medicine, and this is very

important because the validity of the study depends on it. In the review of the literature on quality of care in the ED it was found that fifteen indicator conditions already have established explicit criteria for the technical process of care. These indicator conditions cover almost all the categories of Vayda and they are listed in table 3.4. They include the 7 indicator conditions developed by Sibley and modified by Spasoff et al, the 9 algorithms developed by Anderson et al and the 4 indicator conditions used by Cole. This list was reviewed with physicians working in Emergency Departments to assess its relevance and they suggested the addition of head injury, cardiac arrest and burns which are common complaints;

6. Half the cases will be non-urgent. The definitions of urgent and non-urgent cases is based on the classification of cases used by Vayda.

An urgent case (Emergency or urgent case for Vayda) is a condition which requires medical attention immediately or within a period of a few hours; time delay is harmful to the patient or there is a possible danger to the patient or to the ultimate outcome if not promptly medically attended. The disorder is acute, but not necessarily severe or life-threatening. The patient may, or may not, require hospitalization.

A non-urgent case is a condition which does not require the resources of an emergency service; symptoms are of long duration without sudden change in severity; referral for routine medical care is all that is needed. The disorder is minor and not acute. Routine care could have been provided in a physician's office or no medical care may have been required.

Some indicator conditions will always be urgent cases (cardiac arrest, coma), but others can be either urgent or non-urgent (depression, back pain). Each patient meeting the criteria of the indicator condition will be classified by the nurse-observer as an urgent or non-urgent case. The assumption is that physicians with more training in Emergency medicine are more likely to give a better care to urgent cases.

There is just one exclusion criteria. Any indicator condition for which there exists routine order (skull, X-rays for all head injuries) or standardized management (all patients with chest pains are admitted to intensive care units) will be excluded because it does not involve the clinician decision making. The final selection of 10 indicator conditions will be done by a peer advisory group following the guidelines of Chambers (18): one EP and one GP working in the ER for 3 to 5 years and one casualty officer. They will be selected for their credibility in the community, their interest in the study and for their availability. For each indicator condition, a consensus list of explicit criteria will be identified.

d) Physicians

One exclusion criteria will be applied: to maintain objectivity, the clinical staff involved in planning, data gathering and analysis will be excluded from the study. If a physician is working in more than one hospital, he will not be excluded as long as the previous exclusion criteria are respected.

There is no information on current medical staffing in Ontario's ED's, thus at the beginning of the study a survey of the 35 eligible hospitals will be done to collect precise information on the medical staff: number of physicians in each category, working hours and method of payment.

In 1980 the Ontario Hospital Association did a survey of 14 hosp-

pitals in Ontario, selected for their size, location, interest in ED organization, (Lynch, 1980). The study identified that the main model of organization is the compulsory rotation of attending staff, but there is no frequency given for each category.

As a first estimation, Dr. F. Bailey, Chief of the Emergency Department at McMaster University Medical Centre, provided information for 20 of the 35 eligible hospitals.

Table 3.5 summarizes the available information on medical staff in the 35 eligible ED. Although it is incomplete, this information provides some insight into the classification of the 3 physician categories.

Three possible contaminations were considered:

(i) will physicians (CO or GP) working in the same department with EP give a different care than CO or GP working alone? (ie) does the presence of an EP influence the standard of care in the ED and then influence the behavior of CO and GP? There is no evidence that contamination occurs, but the conclusion of the study will be more meaningful if the physicians are selected in ED staffed with just one category. This may not be possible (1) if there are no ED's staffed just with CO; (2) if the sample size requirement exceeds the number of available "pure staff"; and (3) if the majority of the eligible ED have a "double staff".

When complete information on ED's staff is obtained from the survey, the procedure for selection of physicians will be decided:

(1) if more than 80% of the ED (28/35) have a "pure staff" and if the sample size requirements can be met, the physicians will be randomly selected from the list of EP, CO and GP working in "pure staff's ED".

(2) in the other situation, the physicians will be randomly selected

from the total list of EP, CO and GP working in the eligible ED.

In both situations, the random selection of physicians is preferred to the random selection of ED and inclusion of all the ED staff because the physician sample is more representative. If the physicians were distributed evenly through the 35 eligible hospitals, a two stage sampling could be used to select one physician of each category in each Emergency Department.

(ii) will physicians working in an ED staffed with specialists in Emergency medicine perform differently? In the area studied, 3 hospitals have one specialist: the Toronto General Hospital, Etobicoke General Hospital and Sunnybrook Medical Centre. There is no evidence to justify the exclusion of those 3 hospitals and it is assumed the presence of a specialist in Emergency medicine will not contaminate the performance of EP, CO or GP.

(iii) will physicians working in a university affiliated hospital perform differently from physicians working in non-UA hospitals, because of contamination by the teaching environment and the presence of residents. There is no such evidence, but to reduce the eventual presence of a confounder, it was decided to select half the physicians in UA hospitals. Another reason for such a decision is that it reflects the proportion of UA hospitals in the eligible ED.

3.4.1.2 Determinants of care

The problem in the study was to identify factors which might affect quality of care and which are related to physician categories, but extraneous to the research question. In the design, four strategies

have been used to handle confounders:

(i) factors will be ignored when it is felt there is not enough evidence to suggest a relationship with the outcome of quality of care (ie. shift: day, evening, night);

(ii) two factors (size, patient volume) will be avoided by restricted inclusion criteria: the study will include only hospitals with more than 300 beds and consequently more than 100 visits/day in the ED. It is not to say there is enough evidence on the influence of size and volume of patients, but such a strategy is mainly used to obtain an homogeneous sample of ED, more likely to have identical structure, and because it is believed to be a representative sample of Ontario's ED;

(iii) two factors (university affiliation of hospital and urgency of cases) will be controlled for by stratified sampling: 1) half of the cases will come from UA hospitals. The influence of a teaching environment as a confounder of quality of care is controversial. Such a selection also reflects the classification of the eligible hospitals; 2) half of the cases will be urgent. There is no evidence that urgency of a case influences quality of care, but this proportion reflects the frequency distribution of cases in Ontario's ED.

The advantage of stratified sampling is to insure balance between groups and to allow comparison within physician category between UA and non-UA hospitals and urgent and non-urgent cases in the analysis;

(iv) five factors will be handled in the analysis. With this tactic, there is a risk of imbalance, but the actual state of knowledge does not justify the use of stratification. The 5 factors are: 1) level of physician training; 2) working hours: part time/full time; 3) method

of payment: salary/fee-for-service; 4) number of years in practice; and 5) workload in the ED.

There is always the risk of missing a determinant. For example, self-directed learning ability or clinical intuition may be the major determinants of quality of care. The best procedure to take care of unknown confounders is the randomized control trials, but for reasons identified earlier, it is not feasible in this situation.

Table 3.1 lists the independent variables included in the study as inclusion/exclusion criteria, and as stratification variables.

3.4.1.3 Sample size

Three comparisons will be made: 1) EP and CO; 2) EP and GP; 3) CO and GP. The sample size will be estimated to detect a 25% difference between physician categories with a risk alpha = 1% or 5% and a power of 80%, 85%, 90% or 95%.

The sample size calculation depends also on the variance within each physician, the variance between physicians in the same category and between the 3 physician categories. Two elements have to be estimated: the number of physicians in each category and the number of cases per physician.

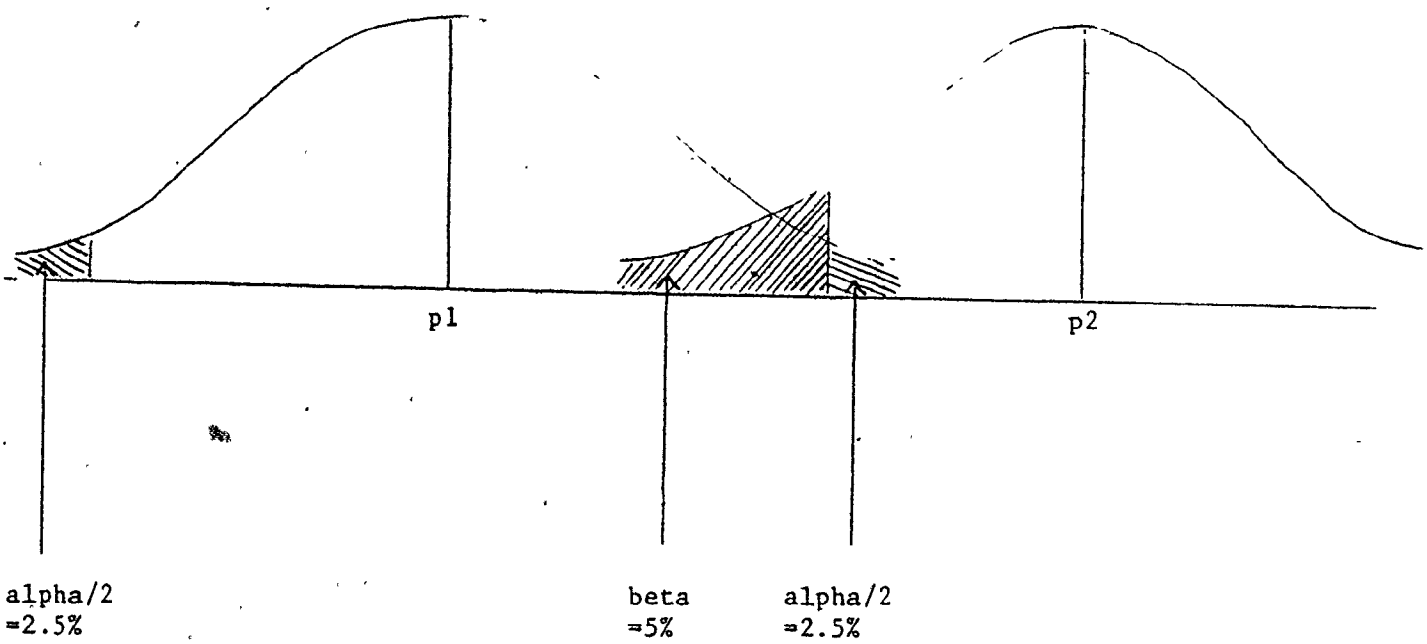
If, for example, the true percentage of cases adequately managed by CO's is p_1 and the true percentage of cases adequately managed by EP is p_2, the difference, delta, which would be clinically significant to detect is $d = p_2 - p_1$.

With a risk alpha = .05, there is 5% chance of concluding that there is a difference between EP and CO when there is none. Such an er-

roneous conclusion would incline people to modify the medical staff in ED when it may not be an appropriate decision. A two tailed test is selected because p_2 can be greater or smaller than p_1.

With a risk beta = 20%, there is 80% chance to conclude there is no difference when in fact there is one, and a real effect of physician category on quality of care would remain undetected.

Frequency distribution of scores for CO (p_1) and EP (p_2)



a) The variance within physician can be explained by several factors: the indicator condition, the urgency of the cases....For n independent cases, with a score of adequate or non-adequate, the proportion of adequate scores for one physician follows a binomial distribution, with a mean p and a variance p(p-1)/n. If the arcsin transformation is used to stabilize the variance, the scores vary from 0 to 90 degrees when the proportion of adequate score varies from 0 to 1.

Theoretically, the maximum expected variance is then 821, and it can be reduced with larger n, number of cases/physician.

For each physician, the adequacy rate is: $p_i = r_i/n_i$ with r_i number of adequate care and n, total number of cases. The transformed value is: $y_i = \arcsin \sqrt{p_i}$.

b) The variance between physicians in the same category has been estimated from the analysis of the scores of 19 physicians on 8 indicator conditions developed by Sibley, 1977. The analysis includes the scores on the 8 indicator conditions which are relevant to emergency care: otitis media, depression, urinary tract infection, knee injury, back pain, chest pain, headache and vaginal discharge. Table 3.6 summarizes the data used: proportion of adequate and superior scores for 19 physicians and 8 conditions.

For each physician and each condition is calculated $r_i = p_i \times n_i$ and then for each physician the overall adequacy rate is given by: $p_i = \Sigma\, r_i/\Sigma\, n_i$ where the sum is over indicator conditions.

For the first physician:

$p_1 = (.80 \times 10 + \ldots. + .42 \times 35)/156 = .5716$, and

$y_1 = \arcsin \sqrt{.5716} = 49.08$ degrees.

The overall mean for the transformed variable is:

$\bar{y} = \Sigma\, (n_i \times y_i)/\Sigma\, n_i$ or

$\bar{y} = 93489.64/1867 = 50.07$ degrees, which when transformed back indicates an overall adequacy rate of 58.71%.

The estimate of the variance between physicians is deduced from

the mean square between physicians or:

Between physician $\quad M.S. = \Sigma\, n_i\, (y_i - \bar{y})^2/18$ or

$$= (156\ (49.08 - 50.07)^2 \ldots .111\ (54.09 - 50.07))^2/18$$

$$= 50008.933/18 = 2778.274$$

For a random effects model the Expected mean square (EMS) is given by:

$$EMS = V\ (\text{within MD}) + n_o \times V\ (\text{between MD}) \text{ with}$$

$$n_o = (\Sigma\, n_i - \Sigma\, n_i^2\ /\Sigma\, n_i)/18 = 97.22.$$

We can deduce that:

$$V\ (\text{between M.D.}) = EMS - V\ (\text{within MD})/n_o$$

$$= (2778.274 - 821)/\ 97.22, \text{ or}$$

$$\underline{V\ (\text{between M.D.}) = 20.13}$$

This estimation implies several assumptions: 1) the variance between EP, between CO or between GP is assumed to be similar to the variance between the 19 general practitioners; 2) this estimate is assumed to be applicable to the modified indicator conditions, and to the measure of outcome.

For m physicians and n cases/physician, the variance of the mean score is defined by:

$$V(\bar{y}) = \frac{1}{m}\ (V.\ \text{between} + V.\ \text{within}/n), \text{ or}$$

$$V(\bar{y}) = \frac{1}{m}\ (20.13 + 821/n)$$

For a fixed alpha, beta and delta, the table of number of observations for t-test of difference between two means provides estimates for m, for varying values for n, number of episodes per physician.

Alpha is set at 1% and 5%

Beta is set at 80, 90, 95 and 99%

Delta is set at 30% and 25%.

The values of delta in degrees are: 20.29 and 16.12 (with p_1 = 58.71%, $\bar{y}_1$ = 50.07 degrees. If d_1 = 30%, p_2 = 88.71%, $\bar{y}_2$ = 70.36 degrees. If d_2 = 25%, p_2 = 83.71 %, $\bar{y}_2$ = 66.19 degrees).

Figures 3.4.1 to 3.4.4 illustrate the relationship between m and n for the different values of alpha, beta and delta.

In summary, we can conclude from the graphs that typical combinations of n and m are:

1) 8 physicians and 10 cases each or 27 physicians and 2 cases each, to detect a 30% difference with alpha = 5% and beta = 95%
2) 10 physicians and 12 cases each or 27 physicians and 3 cases each, to detect a 30% difference with alpha = 1% and beta = 95%
3) 10 physicians and 13 cases each or 27 physicians and 3 cases each, to detect a 25% difference with alpha = 5% and beta = 95%
4) 13 physicians and 13 cases each or 27 physicians and 5 cases each, to detect a 25% difference with alpha = 1% and beta = 95%.

c) <u>The variance between physician categories</u> is estimated using the book "Sample Size Choice" by R.E. Odeh and M. Fox, 1975 *, and it is summarized in Appendix C. With this method it was found that for 6 cases per physician, the smallest required number of physicians is 14 in each category to detect a 25% difference with alpha = 1% and beta = 5%.

d) <u>Number of physicians and number of cases</u>

To be able to detect a 25% difference between the 3 groups with

* Odeh, R.E., Fox, M.,: "Sample size choice; charts for experiments with linear models". Marcel Dekker, Inc., 1975

alpha = .01, two tailed test and with a power of 95%, it was decided to select: 28 EP's, 28 CO's and 28 GP's, each of whom is assessed on 6 cases, for a total of 3 x 28 x 6 = 504 observations. Half the physicians of each category (14) will be selected in university affiliated hospitals, and half in non-university affiliated hospitals.

The final sample size of physician is larger than what is required from the calculation in Appendix C. This will be a protection against an underestimation of the between physician variance. Such a sample is more representative, it will permit the detection of a smaller difference between categories and will allow the comparison within each physician category of university and non-university affiliated hospitals.

Table 3.8 illustrates the classification of cases by physician category, university affiliation of hospital and emergency of cases.

e) Number of indicator conditions (IC)

How many IC does noe need to assess quality of care in the Emergency Room? Arbitratily less than 5 do not seem enough to cover pediatrics and adult cases, psychological and surgical problems, "easy" cases as otitis media or, more difficult, such as diabetic ketoacidosis. On the other hand, more than 10 seem not feasible (cost, time). It was decided to select 10 indicator conditions.

f) Distribution of cases among indicator conditions

If 10 indicator conditions are selected as we need 6 cases per physician, each physician will be assessed on 0 or 1 cases for each indicator condition. The selection of more than 1 case for each indicator condition will be avoided.

The distribution of patients for each IC and for each physician is not planned because it would not be feasible to insure an equal distribution of the 6 cases across the 10 indicator conditions. An important assumption has then to be accepted: each IC has the same weight for the physician performance and if one physician is assessed on indicators 1 to 6, the performance will be the same as for indicators 5 to 10. This assumption is justified when it is considered that the question of quality of care is related to the group performance.

Using the data of Vayda, the average number of cases which can be observed during one working shift can be estimated. The estimates of the frequency for each indicator condition are respectively: 6.1% for otitis media, 5.9% for headaches and depression, 3.6% for urinary tract infection and vaginal discharge, 4.1% for chest pain, 19.4% for knee injury, 2.6% for back pain and 15.6% for laceration. The total frequency is 57.3% and for an average of 41 to 57 visits per shift, 23 to 32 cases could be assessed during one shift.

As the frequency distribution of complaints cannot be expected to be favourable, 2 working shifts will be anticipated for each physician. The observer will collect all the information on the patients seen by each physician during 2 shifts. It is expected to obtain more than 6 eligible cases per physician and all the information collected will be kept for the analysis.

3.4.2 Manoeuvre (physicians)

The influence of the physician category in patient care is considered as the manoeuvre, and 3 groups are compared by pair, EP/CO, EP/GP and CO/GP.

The definitions of EP, CO and GP are listed in section 1.5.

Each physician will be identified by a code number, composed of the following characteristics (to ensure anonymity).

1) physician number 0 to 28
2) hospital number 0 to 35
3) physician category CO = 0, GP = 1, EP = 2
4) working hours Part time = 0 Full time = 1
5) method of payment Salary = 0 Fee-for-service = 1
6) level of training
7) number of years in practice
8) number of years of clinical postgraduate training.

Appendix D summarizes the elements of the code number.

Compliance of physicians

The cooperation of physicians and the ED is essential. During the elaboration of the proposal several persons working in the ED, the Canadian Association of Emergency Physicians, the Ontario Hospital Association, the Ontario Medical Association and the Ontario Ministry of Health have been contacted and their unanimous interest is reassuring and their support will be asked.

If the study is funded, the 35 eligible ED's will be visited to meet the physicians, the Director of the Emergency Department and the Head Nurse. The research objectives will be explained, the role of the

observer clarified and the confidentiality of the results will be emphasized.

Following the meeting, a short explanatory letter will be sent to each physician asking for their informed consent. The group of non-volunteers will be compared with the group of volunteers on several variables: age, number of years in emergency practice, physician category, level of training, working hours, affiliation status of the hospital to detect any systematic difference.

3.4.3 Data collection

At the beginning of the study, the survey of the 35 eligible ED's will be done.

To measure quality of care, 4 types of data will be collected for each case: 1) chart review 2) observation of the encounter 3) physician's questionnaire and 4) patient's questionnaire.

Four measures are used for each case: 1) technical process of care because it is specifically related to what the physician does 2) subjective outcome measure because it is the most important end point 3) physician attitude because it is believed to be an important factor in patient satisfaction, and 4) self-assessment by the physician.

For each physician category the mean waiting time for the patient and the workload assessment will be reported as complementary measures of the ED organization, and to validate patient satisfaction.

3.4.3.1 Survey of the 35 eligible hospitals

The survey of the 35 eligible hospitals has 3 objectives: 1) verification of the structure of the hospital (number of beds, aver-

age number of visits/day at the ED);

2) data collection on ED's organization (availability of supporting services and medical consultants 24 hours/day, composition of the nursing staff, use of control register); and

3) data collection on medical staff (availability on site, number of physicians, training, working hours, method of payment).

Two additional questions will be asked in relation to the strategies used to evaluate quality of care in the ED.

The questionnaire in Appendix E is the proposed format to collect the information. A previous draft was sent to 7 hospitals in the spring of 1980, and the quality of the information received lead to the modification of the questions.

In the same questionnaire we asked the Director of the Emergency Department to qualify the degree of willingness to participate in a study on quality of care. One did not answer. Four directors said they were "willing" to participate and 2 said they were "somewhat hesitant", none said they were "very hesitant". This favourable reaction gives some estimate on the compliance of ED.

3.4.3.2 Observation

The decision to collect data through observation is taken because the positive aspects outweight the negative ones.

Five negative aspects are identified and solutions are proposed: 1) the main pitfall is the bias induced by the presence of the observer during the encounter: the physician may change his behavior knowing he is observed. This attention bias or Hawthorne effect can be manifested by more careful history taking, more complete exam, or better doctor-

patient relationship. The only solution to avoid this problem is to ask the observer to be unobtrusive and discreet, but hopefully the magnitude of the bias will be the same in each physician category and the difference in quality of care between physician category will remain unchanged; 2) the second problem is the blindness of the physician to the complaint observed, the criteria of adequate care and the questions asked to the observer (rating of attitude). To minimize this problem, the observer will have to be the only one to know in the ED what is observed during the 2 shifts with the same physician and every case handled by the physician observed will be recorded even if not eligible; 3) the selection of complaints may create a bias if the observer makes mistakes in the identification of cases and in the stratification in urgent and non-urgent cases. The best solution is to select and train experienced ER nurses as observers; 4) the selection of 2 shifts for observation of one physician may be biased. The schedule of observation of the 84 physicians will be planned in advance and it will not be the decision of the observer nor the physician; 5) the fifth problem is related to inter and intra observer variation. The observation of all cases can be done by one observer in 34 weeks and it would reduce inter observer variation. It was decided to train two observers to reduce the length of data collection, and to have them observe half the physicians in each category so the observer effect is orthogonal to the physician category. Two nurses will be trained in the ED at McMaster. They will observe in the presence of a tutor one physician during one shift and they will be trained until achievement of a 95% agreement. For each indicator condition an observation form including the explicit criteria

for technical process will be designed.

Eight advantages apply to the observation: 1) an obvious advantage is the assurance that the care is given by the selected physician and not be a resident for example in a teaching hospital; 2) the observer will be responsible for the identification of the eligible cases, and the classification in urgent and non-urgent; 3) another disadvantage is the recording of the lapse of time between admission in the ED and beginning of the encounter. This measure is not specific of quality of care as several extraneous factors can influence it (workload, severity of previous patient, organization of ED...). It will be used as a descriptive variable. It is an objective measure which may reflect the efficacy of the organization and which can influence patient satisfaction; 4) the observer will record the technical process of care. This is particularly important in the emergency situation where physicians don't have time to write detailed and complete notes. This is the main reason for the use of observation, but it is also felt that observation is the only strategy to assess the doctor-patient relationship; 5) the observer will rate the physician's attitude on a 3 point scale (poor to excellent). This rating is subjective and it incorporates verbal and non-verbal attitude: is the physician listening to the patient?, answering questions?, showing appropriate empathy? The observer will be trained for this rating; 6) the observer will rate the apparent patient's satisfaction on a three point scale, to validate the patient rating; 7) the observer will collect the physician's questionnaire for each case observed. It may be difficult to obtain the compliance of physician and the observer will have to use diplomacy and per-

sistence; 8) finally, the observer will forward the patient's name, phone number, and date of visit weekly to the research assistant who will plan the telephone interview of the patient with a standardized questionnaire for two weeks after the ED visit.

It was estimated that each observer will spend two shift(s) with selected physicians, and each of the two observers will be involved for 17 weeks. The schedule of observations will be planned monthly for ¼ of physicians using the list of days on call.

An example of the observation form is given in Appendix G.

A summary of the instructions for observers is given in Appendix F.

3.4.3.3 Chart Review

Chart review is included because it is the most common data source and it may appear an adequate alternative to observation.

All one-page charts will be reviewed, using the list of explicit criteria developed for each indicator condition. The scoring system for the technical process of care is adequate or inadequate.

The review of the one-page ED chart is estimated to require 10 minutes in average. For at least 504 charts (6 cases for each of the 84 physicians) the minimum time necessary is 10½ days or 2.1 weeks.

The major problem will be the dispersion of the charts in the different ED's, and the best solution would be to obtain one copy of the one-page chart (it could be done by the observer) with all the precautions to respect the confidentiality of the document. The review of all charts could be done in one block when all the cases are

collected. If this is unacceptable, the nurse abstractor will visit the ED involved at the end of the study. One ED can be visited daily and 35 days (7 weeks) will be planned.

3.3.3.4 Physician's questionnaire

For each selected case the physician will be asked to answer a short questionnaire. The two questions are listed in figure 3.5.

The first question will be used in the analysis to see if there is any relation between workload and quality of care. The assumption is that if the physician feels under pressure (high workload), this may influence the quality of care. The second question will be used to analyse the relationship between the physician performance as measured by the three scores and the physician self-evaluation. The objective is to determine if physicians are aware of their limitations.

The questionnaire will be pretested at McMaster.

Since no attempt will be made to externally validate the content of this questionnaire, caution will be exercised in the interpretation of the results.

To enhance the objectivity of the answer, the observer will not see the content of the form. A chart number will identify the case, not the physician name, and the cards will be collected in a sealed box by the observer. The answers will be coded later by the research associate.

3.4.3.5 Patient's follow-up

Two weeks after the visit at the ED, an independent, trained research assistant (not the observer) will phone the patient or the

parent and administer the questionnaire developed by Rubenstein in 1977.

Six questions are asked: 2 to measure patient satisfaction on a 3 point scale (0 to 2), 1 to measure health status on a 4 point scale (0 to 3) and 3 yes-no questions measure the knowledge about the disease, the treatment and the follow-up. The score is obtained by adding over these questions and has a maximum of 10. A copy of the questionnaire is in Appendix H.

The validity of the information can be affected by the expectation bias of the patient, and also by an Halo effect. But the magnitude of the biases is expected to be the same in the 3 physician categories and therefore it should not affect the comparisons. The patient will be told on the phone the answers to the questionnaire are confidential to increase their objectivity. To increase the compliance, the research assistant will be asked to call as many times as necessary to obtain an answer. If the patient dies in the meantime, the analysis will be done with and without a zero for the outcome measure. If patients are lost in the follow-up, the analysis will be done with and without the incomplete data. (The sample size calculation accounted for a 10% missing data).

3.4.4 Qualities of the measures

Reliability refers to the consistency in measurement and it affects the usefulness of the measurement, even if there is underlying validity.

In this proposal, inter observer variation will be measured between the 2 observers and the intra rater variation will be measured for the record abstractor.

The inter observer variation can be reduced by training and agreement of at least 90% will be the target. The 2 ED nurse-observers will be trained in McMaster Emergency Department with a tutor. They will record history, physical examination and management of the physician using the observation form with the list of explicit criteria for each of the 10 indicator conditions. It is estimated that one week (5 shifts) will provide enough cases for each of the 10 indicator conditions. The ED nurse-observer will also rate the apparent patient satisfaction and the attitude of the physician. Once a month, the observers will spend one day in the same Emergency Room and rate the same cases in the presence of a tutor. If the agreement as measured by Kappa is less than 90%, another training period will be organized to reach the target agreement. During the study, the agreement will be measured 5 times (month 0, and at the end of months 1, 2, 3, 4).

The intra rater variation (record abstractor) should be reduced to a minimum with training. ED's records are just one page and this should help to obtain at least an agreement of .90. Out of every one hundred records, a random sample of 10 will be drawn and rated again blindly by the chart abstractor. If the value of Kappa is less that .9, further training will be required. During the study, 5 values will be obtained.

Validity is concerned with the degree to which a test measures what it is supposed to measure. Several types of validity have been described and the main difficulty lies in the selection of criterion measure.

Content validity is demonstrated by showing how well the content

of the test samples the subject matter about which conclusions are to be drawn.

To insure content validity in the measurement of quality of care, the indicator conditions were selected to cover a representative sample of behavior to be measured and to reflect the frequency distribution of cases. Ten indicator conditions are selected to cover pediatrics, surgery, gynecology, psychiatry and medicine and to involve technical as well as attitudinal skills. Half the cases are urgent.

The content validity of the patient questionnaire developed by Rubenstein and used here is judged adequate because it covers the main areas of patient outcome: satisfaction, health status and knowledge of the disease, treatment and follow-up.

Concurrent validity is demonstrated by comparing the results with an adequate criterion reflecting the "truth", or the "gold standard", and there is not any available criterion to validate the measure of quality of care. The best available judgment of what constitutes appropriate technical process will be the selection of explicit criteria by the peer advisory group, for each indicator condition. The concurrent validity of the patient outcome is partially measured. Patient satisfaction with the physician will be validated against the measure of health status and the measure of patient knowledge.

3.4.5 Sequential steps of the study

The study is composed of 3 phases: preparation, data collection and analysis.

The preparation includes:

1) the visit of the 35 eligible ED's by the research coordinator to meet the physicians, the director of the Emergency Department and the head nurse. The purpose of the visit is to explain the study and to obtain an agreement to the presence of the nurse-observer and to the access to medical records. Also, the research coordinator will insist on the confidentiality of the process (the observers are health professionals), and on the anonymity of the physician in the data analysis (each physician is identified by a code number which is based on the physician characteristics). During this visit, the questionnaire proposed in Appendix E will be completed with the director of the ED, to obtain the data on structure, organization and medical staffing of the ED;

2) random selection of the 84 physicians;

3) setting up a peer advisory group to establish the list of 10 indicator conditions and to identify by consensus the list of explicit criteria for the technical process of care. The group will be composed of one EP and one GP working in the Emergency Department for 3 - 5 years and one casualty officer. As mentioned earlier, they will be selected for their credibility in the community, their interest in the research question and their availability. The chairman of the peer advisory group will not participate in the decision, but facilitate the discussion. He will be an experienced senior clinician. To define the 10 indicator conditions and to obtain a consensus on the 10 lists of explicit criteria, the group will need 10 to 20 weeks if it is anticipated that each indicator will require from 10 to 20 hours. The best

strategy would be to identify 1 full day every 2 weeks for each indicator condition. The criteria for the technical process will be pretested during the training period of the observers;

3) recruitment of 3 nurses: two experienced ED nurses for the observation and one experienced nurse record abstractor;

4) training of the 2 ER nurse-observers in McMaster Emergency Department with one tutor. They will be asked to identify eligible indicator conditions, to classify the cases as urgent or not-urgent, to record the technical process of care, to rate physician attitude and patient satisfaction. Simultaneously, the observation form and the physician questionnaire will be pretested, and the inter observer reliability measured a first time;

5) training of the nurse record abstractor and simultaneously pretesting of the abstract forms. The intra rater reliability will be measured asking the nurse to rate a second time all the charts of observed cases during the training period;

6) planning of the schedule for the 5 months of observation. About 21 physicians will be observed in one month, and the schedule of observation will be based on the schedule of the physician. A letter will be sent to each physician and Emergency Department to confirm the day.

Five months are necessary for this first step.

The data collection includes:

1) the observation of all cases and inter observer reliability study every month;

2) patient follow-up, using a telephone interview with a structured questionnaire 2 weeks after the ED visit;

3) record abstraction and study of the intra rater reliability every 100 records.

Seventeen weeks is the minimum required time and it was decided to anticipate 5 months for data collection.

Analysis

For each case a recording sheet, proposed in Appendix I, is prepared.

Three months will be allocated to this last step.

In total the study can be done in 13 months and the sequential steps are summarized in figure 3.6. It does not include the writing of the report which will be sent to each physician and each director of the Emergency Department.

3.4.6 Financial problems

The project cannot be done without funding. It requires the salary of 1) the project director for one year 2) one secretary part time for one year 3) two nurse-observers for 6 months including the training 4) one nurse record abstractor for 2 months 5) one research assistant to administer the phone questionnaire (504 patients), to code the data and do the analysis, full time for 6 months 6) the peer review group. There is also the cost of printing, the cost for phone calls, for travel and finally, the computer cost.

As a first rough estimate, the study requires $150,000.

3.4.7 Ethics

Quality of care studies raise the problem of ethics: 1) for the

patient, and 2) for the clinician.

For the patient, ethics are respected if the confidentiality of the data in the patient's chart is protected vigorously, and if the study does not interfere with the management of the patient. But the presence of an observer and the telephone follow-up might be contested. For this reason, the research protocol will be submitted to the Ontario Ministry of Health to determine if an informed consent form for each patient is necessary.

For the physician, ethics are respected if the confidentiality of the results are guaranteed and if the study does not limit the actions of the physician. Anonymity of the physician is extremely important and individual results will not be released, except if requested by the physician assessed.

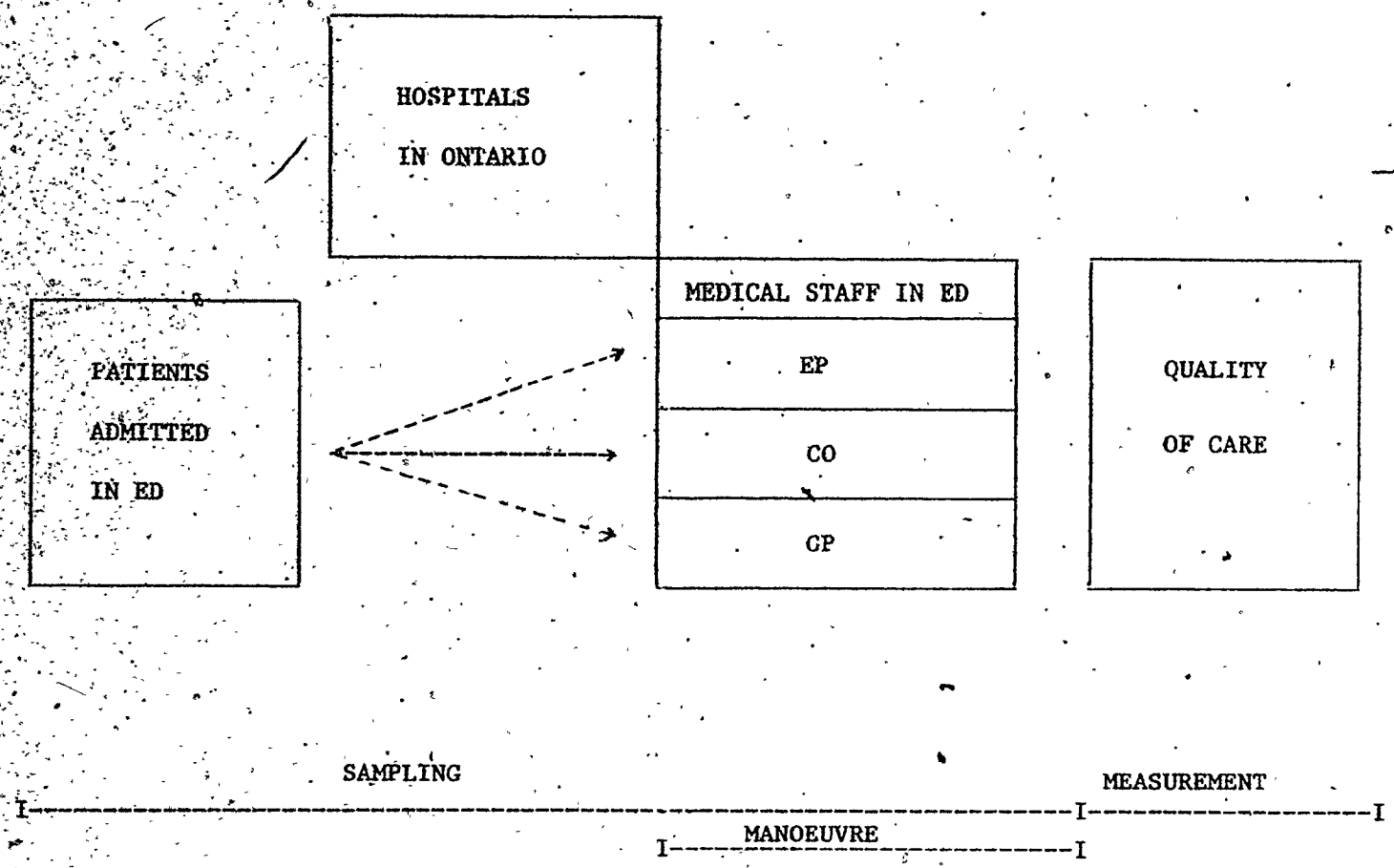


Figure 3.1.1 : Research design (simplified)

PATIENT	English speaking within 100 Km with one/ten indicator Half cases are urgent, half non urgent

HOSPITAL	300+ beds within 100 Km 100+ visits/day full time facilities

MEDICAL STAFF
Random selection of 28 EP, 28 CO, 28 GP In each category 14 are in University affiliated hospital, 14 in non-UAH

	EP		CO		GP	
	UAH (14)	UAH (14)	UAH (14)	UAH (14)	UAH (14)	UAH (14)
urgent						
non-urgent						

PHYSICIANS	EP, CO, GP UAH/NON UAH Salary/fee for service Full/part time Level training Years in practice

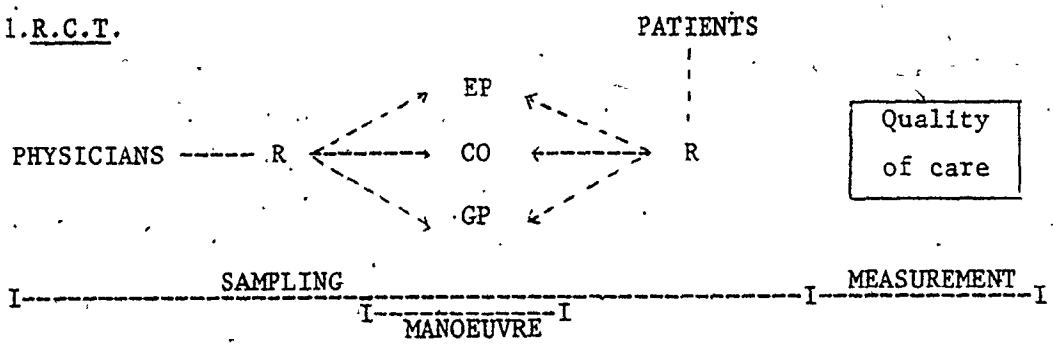
QUALITY OF CARE
Type of data: Structure, process outcome Data source: chart, observation, patient & physician questionnaire

I——SAMPLING——I——MANOEUVRE——I——MEASUREMENT——I

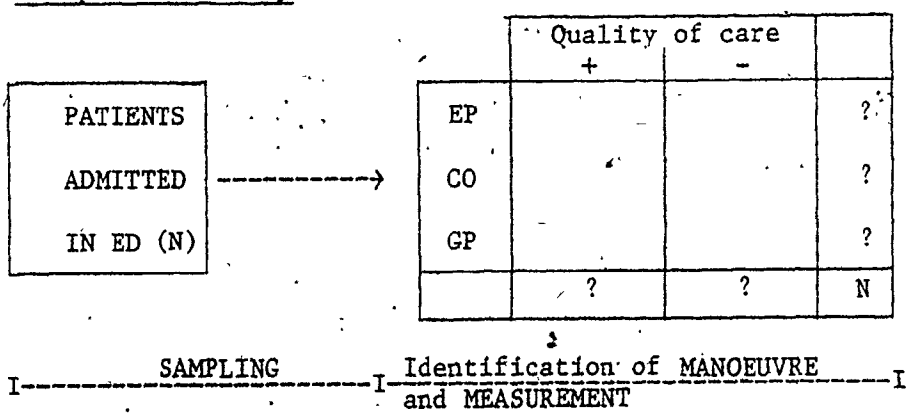
Figure 3.1.2 : Research design (details)

Figure 3.2 : Alternative designs

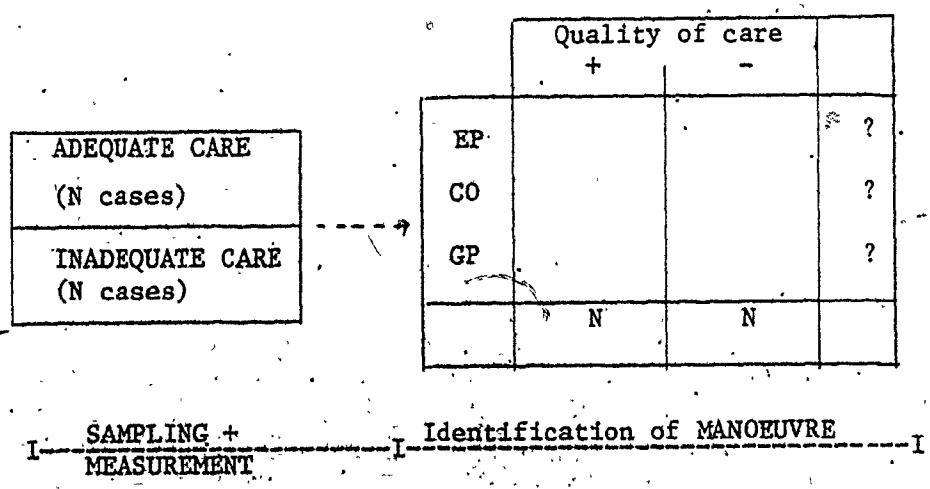
1. R.C.T.



2. Prospective Survey



3. Case Control



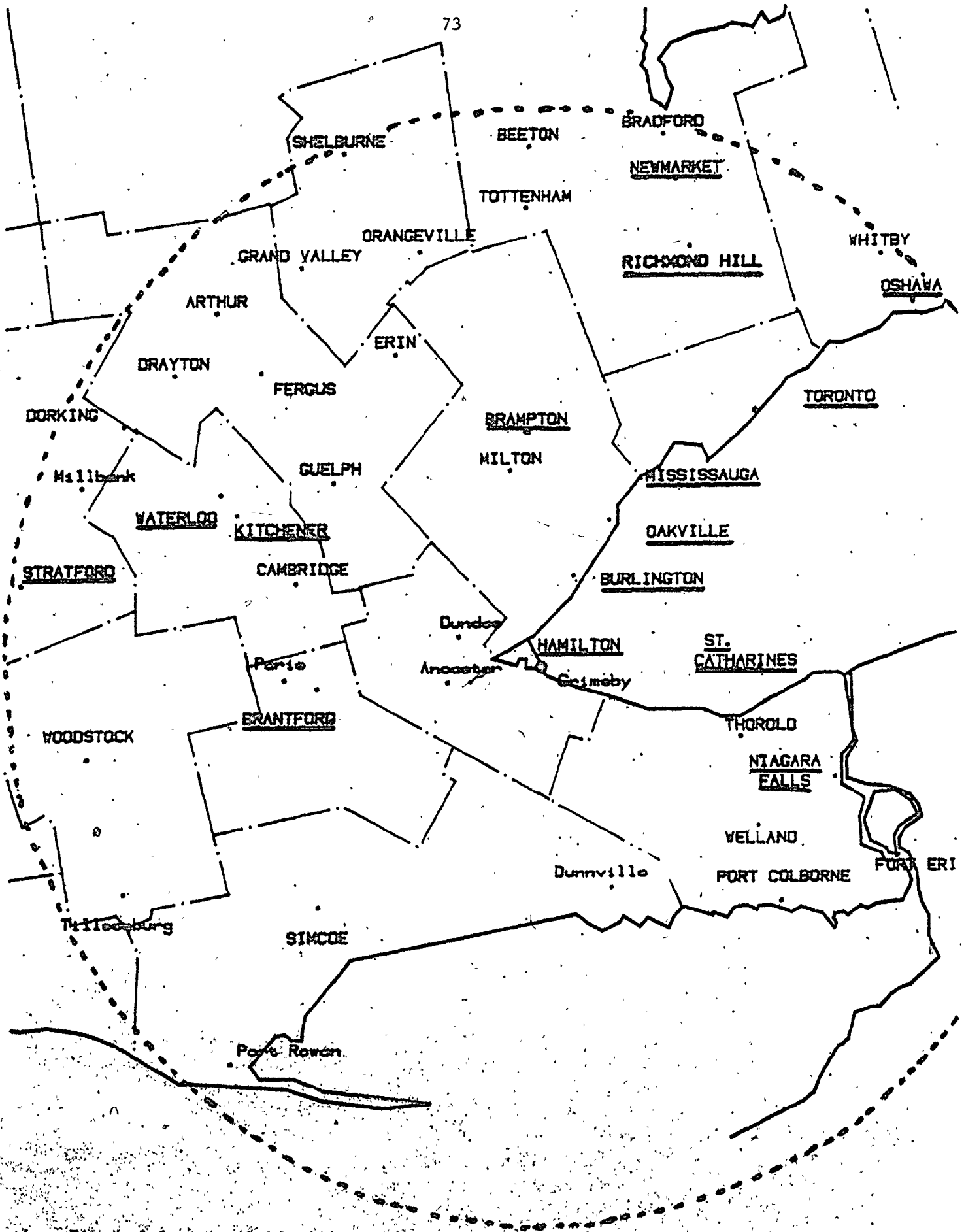


Figure 3.3 :Area within 100 Km fr

Figure 3.4.1 : Relationship between the number of cases/physician and the number of physicians for alpha=.05 and delta=30%

Curve # I : beta=99%
Curve # 2 : beta=95%
Curve # 3 : beta=90%
Curve # 4 : beta=85%

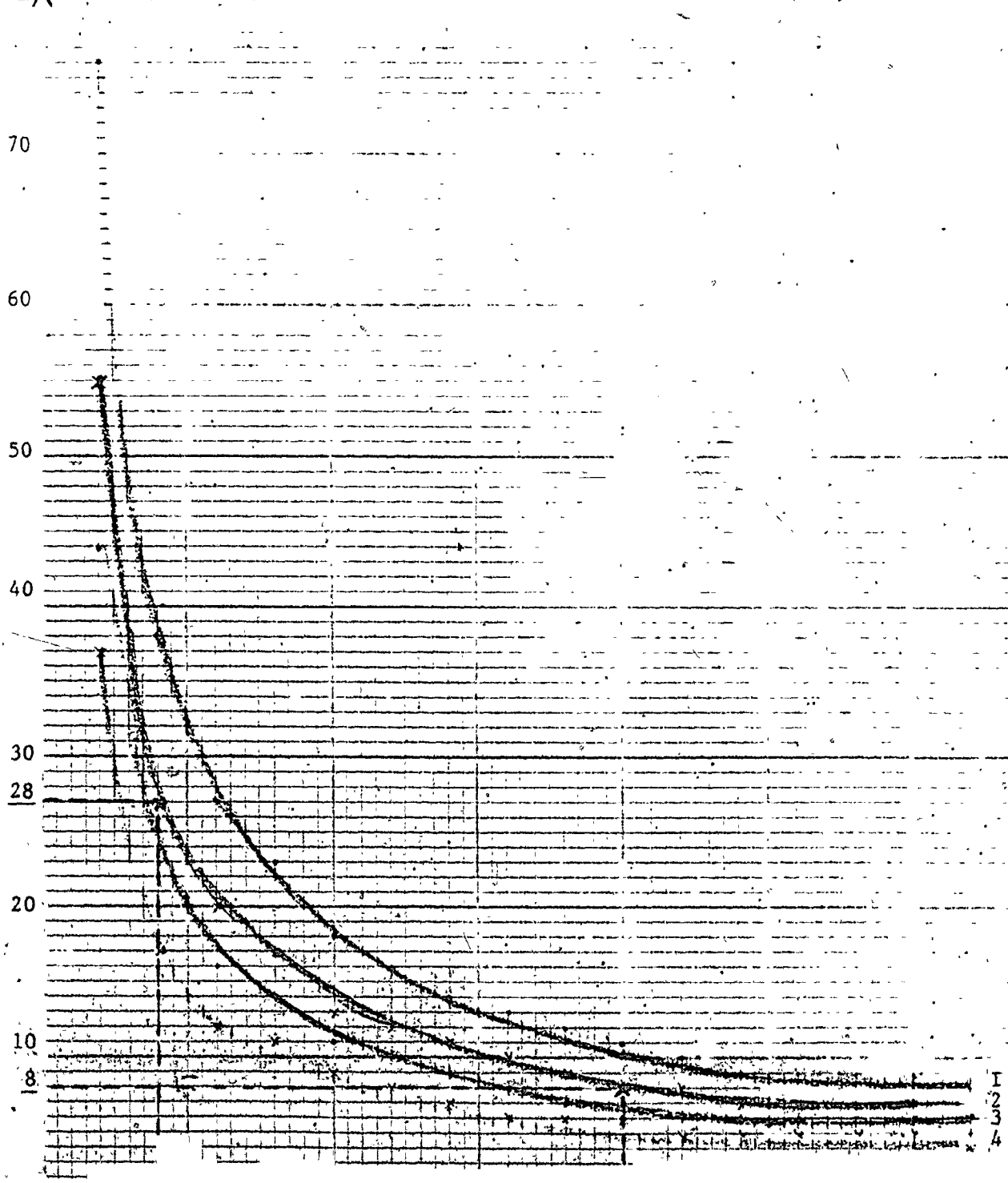


Figure 3.4.2 : Relationship between the number of cases/physician and the number of physicians for alpha=.01 and delta=30%

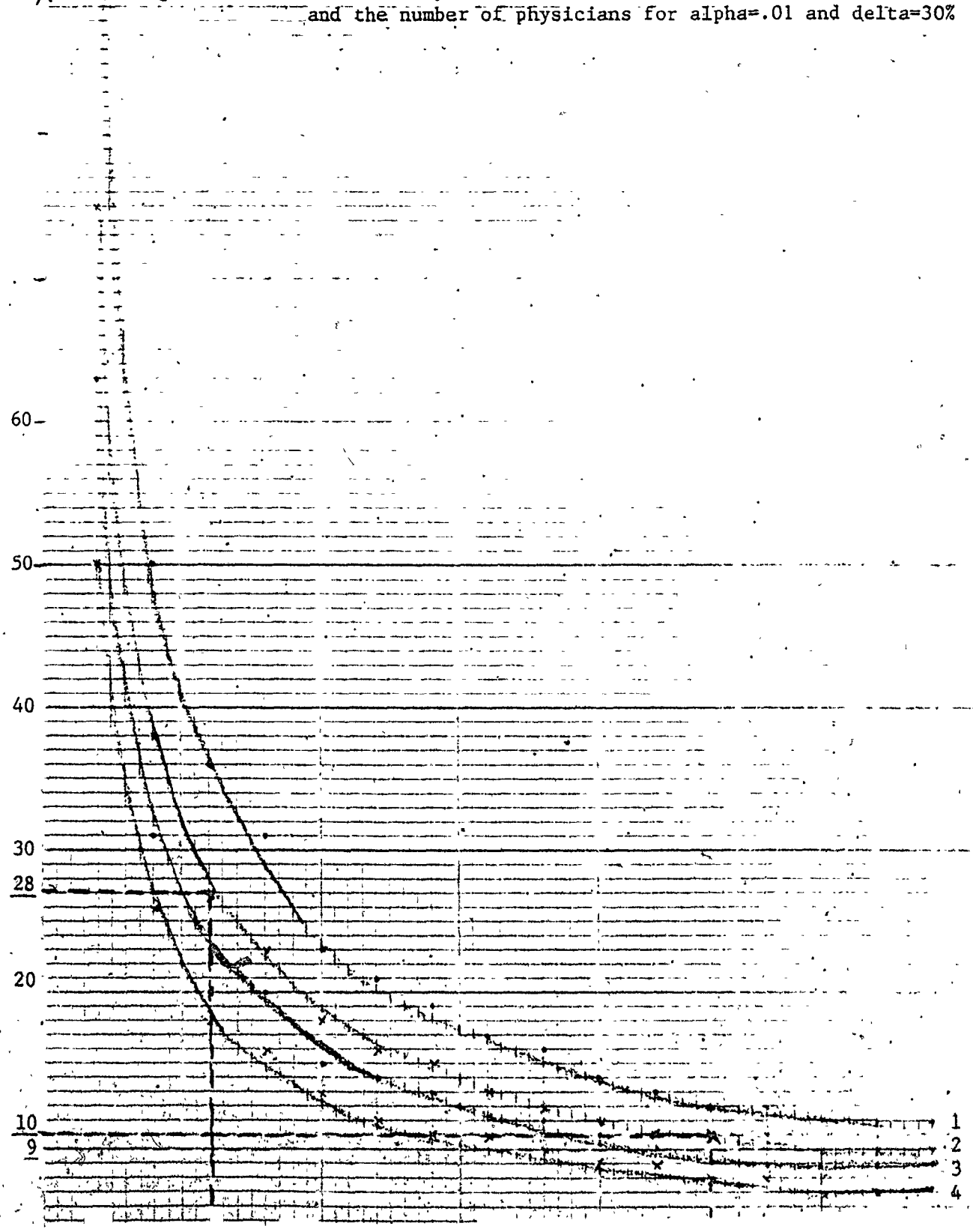


Figure 3.4.3 : Relationship between the number of cases/physicfan and the number of physicians for alpha=.05 and delta=25%

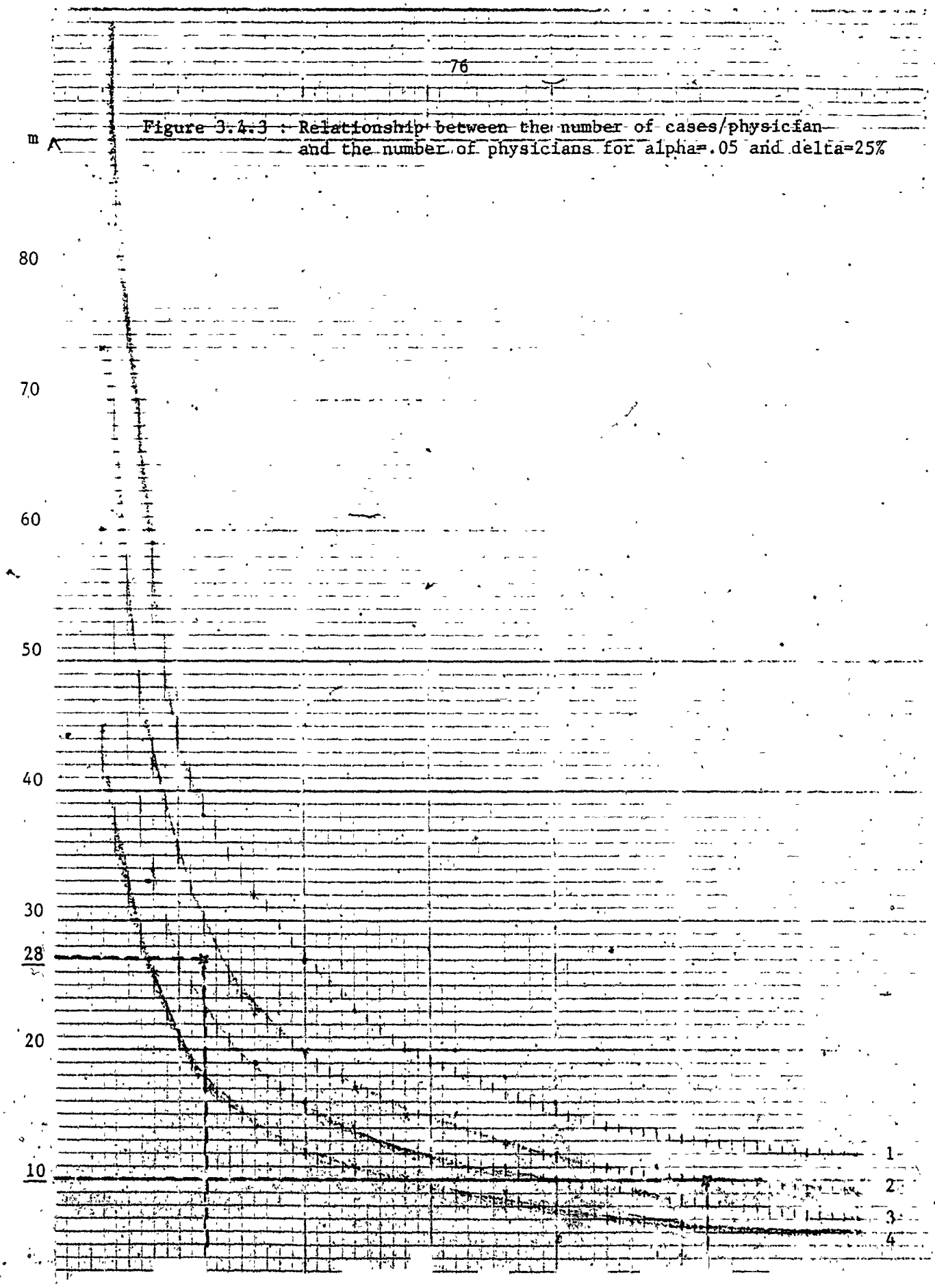


Figure 3.4.4 : Relationship between the number of cases/physicians and the number of physicians for alpha=.01 and delta=25%

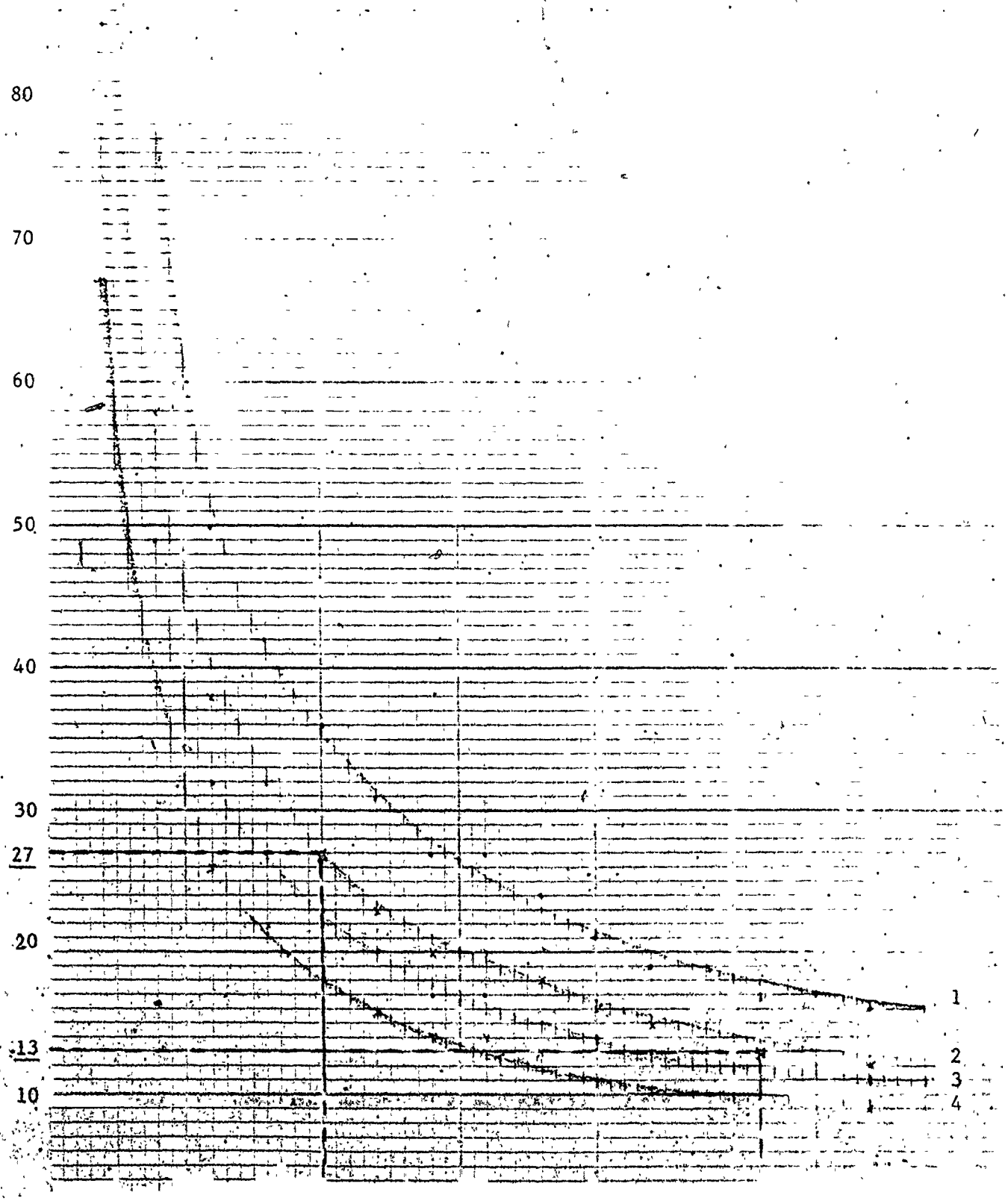


Figure 3.5 : The "orange" card for the physician's survey (3"x5")

RECORD NUMBER _____

How do you rate the workload at the present time ? (i.e. do you feel under pressure ?)

Heavy [| |] Light

What is your self-assessment for this case ?

Excellent [| |] Poor

PLEASE DEPOSIT IN SEALED BOX

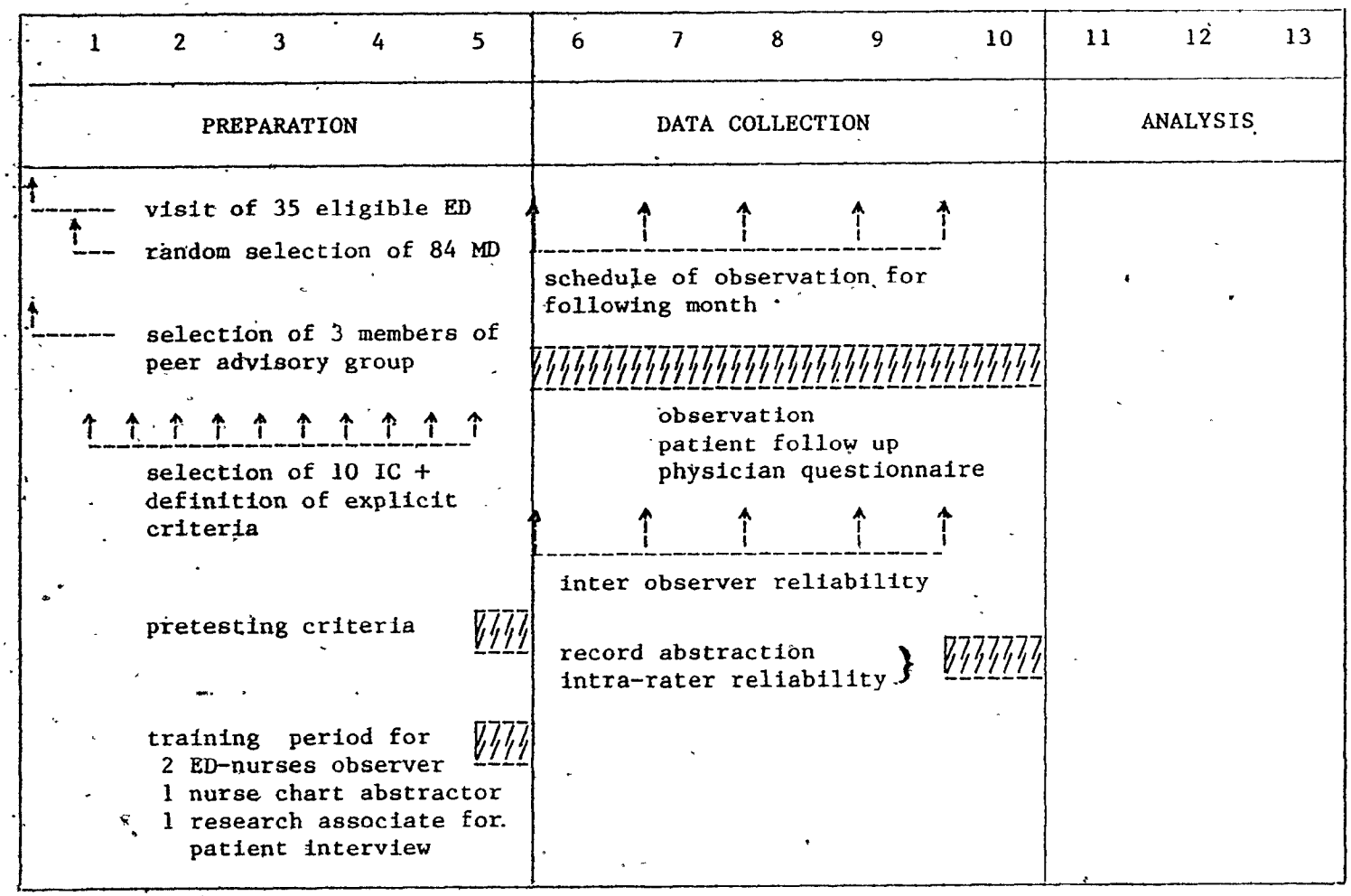


Figure 3.6 : Sequential steps (in month)

Table 3.1 : Independent variables included in the study as inclusion/exclusion criteria, as stratification variables and used in the analysis.

VARIABLES	INCLUSION/EXCLUSION CRITERIA	STRATIFICATION	ANALYSIS
HOSPITAL			
location	100 Km from Hamilton		
size	300+ beds		
admission rate	100+ visits/day in ED		
university affiliation status (UAH)		half non-UAH / half UAH	UAH/ non UAH
ED ORGANIZATION	full time coverage with all ED facilities		
PATIENT			
language	english speaking patient		
address	living within 100 Km		
complaint	with one of 10 indicator		
age,sex	specific for age/sex		
urgency		half urgent/ half non-urg.	urgent/ non U
PHYSICIAN	EP,CO,GP working on site non involved in study design	half in UAH / half in non-UAH	EP/CO/GP full/part time salary/fee for service training experience

Table 3.2 : Public general hospitals within 100 Km from Hamilton with more than 300 beds (Statistics Canada, list of canadian hospitals and special care facilities)
Hospitals underlined are University affiliated hospitals

LOCATION		HOSPITAL NAME	BEDS
BRAMPTON	1	Peel Memorial H.	450
BRANTFORD	2	Brantford General H.	436
BURLINGTON	3	J. Brant Memorial H.	501
HAMILTON	4	Hamilton Civic H.	1030
	5	McMaster University Medical Center	824
	6	St Joseph's H.	681
KITCHENER-WATERLOO	7	Kitchener Waterloo H.	696
MISSISSAUGA	8	Mississauga H.	495
NEW MARKET	9	York County H.	419
NIAGARA FALLS	10	Greater Niagara General H.	396
OAKVILLE	11	Oakville Trafalgar H.	392
OSHAWA	12	Oshawa General H.	680
RICHMOND	13	York Central H.	300
St CATHARINES	14	St Catharines General H.	554
STRATFORD	15	Stratford General H.	309
TORONTO DOWNSVIEW	16	York Finch General H.	310
ETOBICOKE	17	Queenway General H.	331
	18	Etobicoke General H.	508
SCARBOROUGH	19	Scarborough Centenary H.	524
	20	Scarborough General H.	807
WESTON	21	Humber Memorial H.	353
	22	West Park H.	314
WILLOWDALE	23	North York Branson H.	444
	24	North York General H.	586
TORONTO	25	Doctors H.	319
	26	Mount Sinai H.	592
	27	St Joseph's H.	592
	28	St Michael's H.	820
	29	Sunnibrook Medical Center	1121
	30	Toronto East General H.	572
	31	Toronto General H.	1089
	32	Toronto Western H.	758
	33	Wellesley H.	584
	34	Women's College H.	452
WELLAND	35	Welland County General H.	417

Table 3.3 : Presenting complaint categories (Vayda, 1973 and J.Brant H. personal communication, 1980)

Complaint category	Vayda 1973	J.Brant 1980
1. Injury, including abrasions, burns, bruises, sprains, suspected and proven fractures	19.4	34
2. Lacerations	15.6	16
Head and face	6.6	
Other areas	9.0	
3. Abdominal complaints	8.6	6
Abdominal pain	8.2	
4. Minor infection, including upper respiratory and gastro intestinal	7.2	11
5. Pain, soreness, tenderness, swelling (extremities)	6.4	4
6. Eyes, ears, nose, throat including foreign body and nosebleed	6.1	6
7. Emotional complaints including nervousness, headaches and alcoholism	5.9	1
8. Chest complaints	5.6	2
Chest pain	4.1	
9. Genito-urinary, including bleeding	3.6	1
10. Head	3.4	3
Head injury	3.2	
11. Skin, including eruptions and allergies	3.0	3
12. Overdosage and ingestion	2.7	
13. Back, including backache and injury	2.6	
14. Central nervous system, including convulsion, epilepsy, lightheadness, blackouts	2.6	3
15. Respiratory and cardio vascular, including dyspnea, asthma, arrythmia	2.6	2
16. Gastrointestinal, including bleeding	2.3	
17. Dental, including teeth and gums	0.8	
18. Suicide attempts	0.5	
19. Unclassified	1.0	8

Table 3.4 : Preliminary selection of indicator condition
Age strata is in bracket. M=male . F=female

INDICATOR CONDITION	Vayda's category	Available list of criteria
1. Acute abdomen	3	Anderson, Cole
2. Back pain (21-65)	13	Sibley
3. Bronchial asthma (severe attack)	15	Anderson
4. Chest pain (M,30+)	8	A, S, C, G
5. Depression (22+)	7	S
6. Diabetis (hypoglycemia and ketoacidosis)	19	A
7. Fracture (cervical, femur, forearm)	1	A
8. G.I. bleeding	16	A
9. Headache (21+)	7	S
10. Head injury	10	
11. Laceration/wound	2	A, C, F
12. Otitis media	6	S
13. Sore throat	6	C
14. Upper respiratory tract infection (acute)	4	A
15. Urinary infection (F,16+)	4	A, S
16. Vaginal discharge (16-40)	9	S

A= Anderson's algorithms, 1977
C= Cole, 1975
F= Frazier, 1979
G= Greenfield, 1977.
S= Sibley's indicator condition used by Spasoff, 1977

Table 3.5 : Estimation of medical staff in the 35 eligible Emergency departments
(* indicates the presence of a specialist
v indicates the presence of the physician category)

HOSPITAL NAME	MEDICAL STAFF		
	EP	CO	GP
1. Peel Memorial H.			
2. Brantford General H.			30
3. J. Brant Memorial H.		6	20
4. Hamilton Civic H.	10		
5. McMaster University Medical Center	7		
6. St Joseph's H.	5		
7. Kitchener Waterloo H.	11		
8. Mississauga H.			33
9. York County H.			v
10. Greater Niagara General H.		26	3
11. Oakville Trafalgar H.			v
12. Oshawa General H.	4		
13. York Central H.			
14. St Catharines General H.			v
15. Stratford General H.			v
16. York Finch General H.			
17. Queenway General H.			
18. Etobicoke General H.*	v		v
19. Scarborough Centenary H.			
20. Scarborough General H.			
21. Humber Memorial H.			
22. West Park H.			
23. North York Branson H.			
24. North York General H.	v		
25. Doctors H.			
26. Mount Sinai H.			
27. St Joseph's H.	5		
28. St Michael's H.			
29. Sunnibrook Medical Center *	2		
30. Toronto East General H.			
31. Toronto General H. *	4	v	
32. Toronto Western H.			
33. Wellesley H.	4		
34. Women's College H.			
35. Welland County General H.	4		

Table 3.6: Proportion of adequate and superior scores for 19 physicians and 8 indicators conditions (25)

MD \ IC	#1	#6	#7	#8	#14	#15	#17	#22	p_j n_j y_j
1 p_i	.80	.82	.45	.22		.66	.54	.42	.5715
1 n_i	10	40	24	9		3	35	35	156
1 r_i	8.00	32.80	10.80	1.98		1.98	18.90	14.70	49.08
2	.80	.88	.63	0	0	0	.50	.18	.5829
2	5	17	8	1	1	1	4	11	48
2	4.00	14.96	5.04	0	0	0	2.00	1.98	49.78
3	.63	.75	.21	0	0	1.00	.60	.17	.4840
3	11	16	14	1	1	3	10	12	68
3	6.93	12.00	2.94	0	0	3.00	6.00	2.04	44.08
4	.91	.94	.44	.64	0	.70	.52	.19	.6437
4	36	35	29	14	3	10	25	21	173
4	32.76	32.90	12.76	8.96	0	7.00	13.00	3.99	53.37
5	.80	.75	.60	0			.33	.50	.5127
5	5	4	5	2			9	12	37
5	4.00	3.00	3.00	0			2.97	6.00	45.75
6	1.00	.83	.30	.16		1.00	.54	.48	.6151
6	17	24	20	6		4	11	25	107
6	17.00	19.92	6.00	.96		4.00	5.94	12.00	51.65
7	.67	.72	.35	.55	0	.5	.75	.39	.5692
7	34	11	17	9	2		29	28	134
7	22.78	7.92	5.95	4.95	0		21.75	10.92	48.97
8	1.00	1.00	1.00	.50			.67	.40	.7785
8	10	2	2	2			6	5	27
8	10.00	2.00	2.00	1.00			4.02	2.00	61.89
9	.74	.68	.45	.38			.66	.40	.5735
9	31	25	24	13			33	30	156
9	22.94	17.00	10.80	4.94			21.78	12.00	49.20
10	.50	.87	.42	.66		.80	1.00	.55	.6934
10	12	8	7	3		5	12	9	56
10	6.00	6.96	2.94	1.98		4.00	12.00	4.95	56.35
11	.68	.76	.27	.20	.67	.71	.64	.20	.5698
11	28	25	15	10	9	17	11	10	125
11	19.04	19.00	4.05	2.00	6.03	12.07	7.04	2.00	49.02
12	.78	.43	0	.50	.50		0	.50	.5212
12	9	7	2	2	2		1	2	25
12	7.02	3.01	0	1.00	1.00		0	1.00	46.20

(Table 3.6)

13	.44 16 7.04	.44 9 3.96	.36 11 3.96	.14 7 .98	.67 6 4.02	.50 8 4.00	.16 25 4.00	.30 10 3.00	.3365 92 35.43
14	.85 34 28.90	.50 16 8.00	0 2 0	.67 6 4.02	.69 13 8.97	.64 11 7.04	.47 19 8.93	.50 10 5.00	.6384 111 53.01
15	.43 37 15.91	.50 24 12.00	.35 26 9.10	.88 8 7.04					.4637 95 42.94
16	.57 30 17.10	.65 40 26.00	.59 27 15.93	.20 15 3.00					.5538 112 48.10
17	.74 39 28.86	.94 33 31.02	.62 26 16.12	.50 16 8.00					.7368 114 59.15
18	.67 36 24.12	.71 34 24.14	.53 36 19.08	.57 14 7.98					.6277 120 52.42
19	.74 39 28.86	.81 37 29.97	.42 24 10.08	.36 11 3.96					.6565 111 54.09
TOTAL									.5871 1867 50.07

Note : indicator condition # 1 is otitis media
6 is depression
7 is urinary tract infection
8 is knee injury
#14 is back pain
#15 is chest pain
#17 is headache
#22 is vaginal discharge

Table 3.7 : Estimates of m, number of physicians for increasing n, number of cases/physicians for alpha=.05 and .01 (two tailed test), a power of 99%, 95%, 90%, 80%, and a delta of 25% and 30%

n	$20.13 + \frac{821}{n}$	$SD(\bar{y}_j)$	30%;25% $\frac{\text{delta}}{SD(\bar{y}_j)}$	delta = 30%								delta = 25%							
				alpha = 5%				alpha = 1%				alpha = 5%				alpha = 1%			
				99	95	90	85	99	95	90	85	99	95	90	85	99	95	90	85
1	841.13	29.00	.7; .6	76	55	44	34	100	75	63	50	104	74	60	45		101	85	67
2	430.63	20.75	1.0; .8	38	27	23	17	50	38	32	26	59	42	34	26	77	58	49	39
3	273.80	16.55	1.2;1.0	27	20	16	12	36	27	23	18	38	27	23	17	50	38	32	26
4	225.38	15.01	1.3;1.1	23	17	14	11	31	23	20	16	32	23	19	14	42	32	27	22
5	184.33	13.58	1.5;1.2	18	13	11	9	24	18	15	13	27	20	16	12	36	27	23	18
6	156.96	12.53	1.6;1.3	16	12	10	8	21	16	14	11	23	17	14	11	31	23	20	16
7	137.42	11.72	1.7;1.4	14	11	9	7	19	15	13	10	20	15	12	10	27	20	17	14
8	122.75	11.08	1.8;1.4	13	10	8	6	17	13	11	10	20	15	12	10	27	20	17	14
9	111.35	10.55	1.9;1.5	12	9	7	6	16	12	11	9	18	13	11	9	24	18	15	13
10	102.23	10.11	2.0;1.6	11	8	7	6	14	11	10	8	16	12	10	8	21	16	14	11
11	94.77	9.73	2.1;1.7	10	8	6	5	13	10	9	8	14	11	9	7	19	15	13	10
12	88.55	9.41	2.2;1.7	9	7	6	5	12	10	8	7	14	11	9	7	19	15	13	10
13	83.28	9.13	2.2;1.8	9	7	6	5	12	10	8	7	13	10	8	6	17	13	11	10
14	78.77	8.88	2.3;1.8	9	7	6	5	11	9	8	7	13	10	8	6	17	13	11	10

Table 3.8 : Number of cases by physician category, university affiliation of hospital and emergency of cases

	EP		CO		GP		
	UAH (N=14)	$\overline{UAH}$ (N=14)	UAH (N=14)	$\overline{UAH}$ (N=14)	UAH (N=14)	$\overline{UAH}$ (N=14)	TOTAL
Urgent	42	42	42	42	42	42	252
Non-urgent	42	42	42	42	42	42	252
TOTAL	168		168		168		504

CHAPTER IV

ANALYSIS

The first part of the analysis is descriptive and will consist of: 1) description of the 35 eligible ED: structure and organization; 2) description of the characteristics of the randomly selected physicians; and 3) description of the frequency distribution of patient waiting time for the 3 categories of physician.

The second part is the analysis of the 3 measures of quality of care in the 3 physician categories. It involves the data collected by:

a) the observers on 1) technical process of care 2) physician attitude; b) the chart review on technical process of care; c) the physicians' questionnaire on self-assessment; d) the patient questionnaire on 1) satisfaction 2) health status, and 3) knowledge of disease, treatment and follow-up.

This analysis will investigate the question separately in university affiliated and non-U.A. hospitals and for urgent and non-urgent cases.

The third part is the analysis of the qualities of the measures: reliability and validity.

4.1 Descriptive statistics

4.1.1 Survey of 35 eligible hospitals

With the answers to the questionnaire (Appendix E), the following results will be given:

1) proportion of university affiliated hospitals (QS #1);
2) proportion of hospitals with all the facilities available (QS #3), and control register (QS #5);
3) frequency distribution of average number of visits/day (QS #4);
4) proportion of ED with a ratio RN/RNA superior to 2 for any shift (QS #6, 7) and proportion of ED requiring a special training for ED nurse (QS #8);
5) proportion of ED with medical staff available on site (QS #9);
6) proportion of ED requiring special training for medical staff (QS #10);
7) frequency distribution of the 3 physician categories (QS #11), and of the working hours (QS #12).
8) frequency distribution of the methods of payment (QS #13);
9) proportion of hospitals with quality of care evaluation (QS #14);
10) proportion of hospitals willing to participate in the study (QS #15);
11) proportion of hospitals meeting the six inclusion criteria; and
12) completion of table 3.5 on the medical staff in the eligible ED.

4.1.2 Description of physicians characteristics

For the university affiliated and non-university affiliated categories, 4 physician characteristics will be described: 1) proportion of physicians on salary or on a fee-for-service; 2) proportion of physicians working full time or part time in ED; 3) frequency distribution of the number of years in practice; and 4) proportion of EP, CO and GP working in university affiliated and non-university affiliated hospitals.

Also, the classification of physicians in the 5 levels of training will be analysed to group the physicians in 2 categories: high/low level of training.

4.1.3 Waiting time

For each physician category, the frequency distribution of waiting time will be displayed. A 25% difference between groups will be considered as significant clinically. The mean waiting time for CO, GP and EP will be analysed with a one-way analysis of variance. The critical value for F with 2,502 degrees of freedom is 4.61 for alpha = .01 (based on N = 504).

Also, the mean waiting time will be analysed for patients satisfied and non-satisfied with the organization of the ED.

4.2 Measure of quality of care (table 4.1)

For each physician category, 3 scores are computed for respectively the technical process of care, the physician attitude and the patient outcome. The clinically significant difference is for each one 25%. A rank order correlation will be computed to indicate the agreement between pair of measures: technical process vs. physician attitude, technical process vs. patient outcome and physician attitude vs. patient outcome. The 3 correlation coefficients can vary from - 1 to +1 and a test of the null hypothesis of zero rank correlation in the underlying physician population will be performed.

The technical process score is composed of the score obtained by record abstract and by the observation. The score is expressed as the proportion of cases rated adequate transformed using the arcsin

transformation: $y = \arcsin \sqrt{p}$.

The physician attitude score is expressed as the proportion of cases rated adequate or excellent, transformed using the arcsin transformation.

The patient outcome score is expressed as a mean.

The 3 scores will be analysed 1) using a one way analysis of variance to compare the 3 physician categories; 2) using a two way analysis of variance to study within each physician category the effect of (i) university affiliation of the hospital, and (ii) urgency of the casees.

4.3 Influence of physician characteristics

The between physician variance, for 83 degrees of freedom will be analysed for the relative influence of 1) physician category 2) full time/part time 3) salary/fee-for-service 4) high/low level of training 5) number of years in practice, and 6) university affiliated hospitals/non-UA, using a multiple linear regression approach.

For each factor the partial F and the coefficient of determination R^2 (proportion of the variance explained by the variable) will be reported. Since most of these factors are nominal, a series of "dummy" variables will be defined:

1) physician category is replaced by 2 dummy variables

$PC_1 = 1$ if GP

$= 0$ otherwise

$PC_2 = 1$ if EP

$= 0$ otherwise

2) working hours is replaced by a dummy

WH = 1 when full time

= 0 when part time

3) method of payment is replaced by a dummy

MP = 1 for fee-for-service

= 0 for salary

(If any physician opted out of the Ontario Health Insurance Plan (OHIP), they will be included in the fee-for-service category.)

4) training level of physician is replaced by a dummy

TL = 1 if "high" level of training

= 0 if "low" level of training

5) the number of years in practice is a continuous variable identified YP

6) university affiliation is replaced by a dummy variable

UA = 1 when university affiliated hospital

= 0 when non-UA hospital

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	df	SS	MS	F (R^2)
Between physicians	83			
Physician category PC_1	1			
PC_2	1			
Working hours WH	1			
Method of Payment MP	1			
Training level TL	1			
Years in practice YP	1			
University affiliation UA	1			
First degree interactions*	20			
Residual between	56			
Within physicians	420			
TOTAL	503			

* First degree interactions:

PC_1 x WH, PC_1 x MP, PC_1 x TL, PC_1 x YP, PC_1 x UA

PC_2 x WH, PC_2 x MP, PC_2 x TL, PC_2 x YP, PC_2 x UA

WH x MP, WH x TL, WH x YP, WH x UA

MP x TL, MP x YP, MP x UA

TL x YP, TL x UA

YP x UA

4.4 Qualities of the measures (table 4.2)

a) Clinical process

For the measures of technical process of care and of interpersonal skills, the ratio of the variance between physician and the total variance will provide a first estimate of the reliability.

The inter observer reliability will be evaluated five times using Kappa* as a measure of agreement between the two ED nurses for the rating of 1) the technical process score; 2) physician attitude.

The intra rater reliability (record abstractor) will be measured every one hundred records using Kappa* to measure the agreement for the rating of technical process.

There is no attempt to measure the validity of the process of care (technical care and art of care).

b) Patient outcome

The reliability will be estimated by i) the correlation between the scores obtained on two successive ratings by the patient questionnaire and ii) by the ratio of the variance between physician and the total variance.

The validity of the patient satisfaction with the physician encounter will be measured by the degree of agreement with the observer rating of the apparent patient satisfaction (Kappa*). The patient satisfaction with the ED organization will be validated against the mean waiting time (one way ANOVA).

4.5 Physician's self-assessment

The mean performance scores obtained by the physician will be analysed with ANOVA for the three levels of self-assessment. ANOVA will be also used for the three levels of workload.

* Kappa is defined as the proportion of agreement in nominal scale when the chance agreement has been removed: $K = \frac{Po - Pc}{1 - Pc}$, when P_o is the observed agreement and P_c, the chance agreement.

Table 4.1 : Summary of the dependent variables

SCORES	EP	CO	GP
Technical process overall urgent cases non-urgent cases UA Hospitals Non-UAH	proportion of adequate and arcsin transformation * ( )		
Physician attitude overall urgent cases non-urgent cases UA Hospitals Non-UAH	proportion of adequate or excellent and arcsin transformation * ( )		
Patient outcome overall urgent cases non-urgent cases UA Hospitals Non-UAH	mean score * ( )		
Patient waiting time	mean in minutes		

in ( ) correlation with i) workload
ii) physician self-assessment

* one way analysis of variance and regression analysis with the physician characteristics

Table 4.2 : Qualities of the measures

SCORES	RELIABILITY	VALIDITY
Technical process	inter-observer reliability* intra-rater reliability* for nurse abstractor ratio of the between physician variance and the total variance	
Physician attitude	inter-observer reliability* ratio of the between physician variance and the total variance	
Patient outcome	correlation between two successive ratings ratio of the between physician variance and the total variance	correlation between patient satisfaction with ED system and waiting time agreement between patient satisfaction with physician and rating by observer*

* Coefficient of agreement Kappa

CHAPTER V

CONCLUSION

In summary, for each physician category (EP, CO, GP), 3 scores will be used to make recommendations for the organization of medical staff in Emergency Departments: 1) a technical process score 2) a physician attitude score 3) a patient outcome score.

For each physician category, the 3 scores will be subdivided into:

1) an overall score for all the cases treated in the category;
2) a score for the urgent cases;
3) a score for the non-urgent cases;
4) a score for the cases assessed in university affiliated hospitals; and
5) a score for the cases assessed in non-university affiliated hospitals.

Three other measures will describe each physician category:

1) the mean waiting time for patient;
2) the correlation between the workload and each of the 3 scores; and
3) the correlation between the physician self-assessment and each of the 3 scores.

Table 4.1 summarizes the scores.

Table 4.2 summarizes the measures of reliability and validity.

If the study is carried out, it will be considered a success if the following criteria are met:

1) more than 70% of the physicians agreed to participate;

2) there is no difference between the volunteer physicians and the non-volunteers on the following variables: mean age, mean number of years in Emergency Department practice, mean number of years of clinical postgraduate training, the proportion of physicians in university affiliated and in non-university affiliated hospitals, the proportion of physicians full time and part time, the proportion of physicians on salary and on a fee-for-service basis;

3) when the members of the peer advisory group are assessed during the pretesting period, they in fact meet the explicit criteria defined by consensus as the essential care for each indicator condition;

4) the measures are reliable: (i) the two ED nurse-observers obtain an agreement score Kappa of more than 70% for the classification of cases into urgent and non-urgent, the rating of technical process, of physician attitude and of apparent patient satisfaction (after the training period and then every month of data collection); (ii) the record abstractor obtains an intra rater agreement score Kappa of more than 70% after the training period and then for 10 record abstracts every 100 charts; (iii) the research assistant obtain an intra rater agreement score Kappa of at least 70% for 2 successive ratings of the patient questionnaire during 2 successive phone interviews separated by one week; (iv) the ratio of the true variance (between physician) and of the total variance is at least 70% for the 3 scores;

5) the measures are valid: (i) the technical process score is significantly higher in the group of physicians rated by their peer as

giving an adequate technical care; (ii) the physician attitude score is significantly higher in the group of physicians rated by their peer as having an adequate or excellent attitude with patients; (iii) the patient waiting time is significantly lower in the group of patient satisfied with the ED organization; (iv) there is an agreement coefficient Kappa of at least 70% between the patient satisfaction with the physician encounter and the rating given by the observer for the apparent patient satisfaction. (There is no attempt to validate the other elements of the patient encounter.);

6) the 10 indicator conditions are frequent enough to provide the required sample size;

7) the anonymity of the physicians and of the patients is respected and the confidentiality of the data is maintained; and

8) the 84 observed physicians accept the validity of the indicator conditions and of the explicit criteria (this will be verified at the end of the study).

The interpretation of the results will be more meaningful and the recommendations much easier if each physician category obtain the same rank order on the 3 different measures and their five subcategories.

If the performance of the 3 physician categories are not uniform across the 3 measures, the conclusions will be descriptive and the decision-maker will have to decide which of the 3 measures: technical process, physician attitude or patient outcome, is the most important to justify the medical staffing of Emergency Departments: ie. shall ED be staffed with physicians with high technical process score or high

high physician attitude score or high patient outcome score?

The following results are anticipated:

1) there is no difference in physician attitude score between the 3 physician categories;
2) there is no difference within each physician category between cases assessed in university affiliated and in non-university affiliated hospitals; and
3) there may be a difference in technical process score and in patient outcome score for urgent and non-urgent cases. The EP, because of their career orientation, are more likely to have higher technical process score and higher patient outcome score for urgent cases than the 2 other physician categories. Such a difference is not expected for non-urgent cases.

APPENDIX A

DEFINITIONS

Emergency Department (1):

"A hospital outpatient care unit for the provision of medical services that are urgently needed to sustain life or prevent critical consequences and that should be performed immediately.

The names Emergency Room and Emergency Department are the most commonly encountered. Emergency care unit, emergency unit, emergency service, trauma centre, accident room, emergency clinic, and emergency ward are also used."

Hospital (61):

Public General Hospital: includes voluntary, provincial and municipal, usually not operated for profit. (254 in Ontario).

Propriatary: applies to a hospital owned by an individual or by private organization, operated for profit and recognized by Province as a "propriatary hospital". (39 in Ontario)

General Hospitals: provide primarily the diagnosis and short term treatment of patients for a wide range of diseases or injuries and is not restricted to a specific age group or sex. (203 in Ontario)

Rated Bed Capacity: is the number of beds and cribs that a hospital has been approved to accommodate on the basis of established standards of floor area per bed.

A university affiliated, or partially affiliated, hospital is a hospital with special arrangements with the university. Arrangements may vary from one university to another.

Definition of physician categories, page 8.

Definition of physician characteristics, page 10.

Definition of urgency, page 44.

Qualities of process measures (62):

criterion validity: process measures should exhibit statistical associations with the most accurate external measures of the attribute of interest, patient outcomes;

clinical credibility: the process measurement criteria must be credible to practicing health professionals if the results are to be acceptable;

accuracy: the methods for measuring clinical process should reflect the actual clinical process taking place;

comprehensiveness: items comprising the process assessment should include all clinically important aspects of the process of care;

sensitivity to change: process measures should be sensitive both to clinically-significant differences between the practice of different health care professionals and to improvement or deterioration in the quality of care over a period of time;

amenability to index construction: the resulting process measurements should generate numbers to which statistical analyses can be applied;

feasibility and cost: the process measures need to be sufficiently simple, acceptable, and inexpensive to be applicable in the relevant health settings.

APPENDIX B

Summary of the 8 inquests on ED, submitted to the Chief Coroner in 1979 (42).

1. HAILEYBURY: -18 month old admitted for abdominal cramps + vomiting + severe restlessness
   -release from ED with gravol
   -death 40 minutes later (aspiration secondary to an acute bowel obstruction)
   -no recommendation for physician's care was made

2. QUEENSWAY CARLETON : -3 year old admitted for cough + difficulty in breathing
   -released with advice of cold air humidifier
   -death during the night (acute bronchitis)
   -no recommendations for physician's care was made

3. SUDBURY: -2½ year old admitted for fever and ear infection
   -10 visits in 3 hospital's ED in 2 weeks
   -died of brain abscesses
   -no recommendation for physician's care was made

4. HAMILTON: -12 year old admitted for unconsciousness + vomiting after head injury + hip fracture
   -admission to orthopedic ward
   -died 2 days later (contusion and swelling of brain)
   -recommendation for new guidelines for the procedure of admission and treatment of head injury

5. MISSISSAUGA: -41 year old admitted for hyperosmolar coma by diabetes
   -died 3 hours later in ED (metabolic complication)
   -recommendation for management of diabetic patients

6. ST. JOSEPH TORONTO : -90 year old admitted for high fever + abdominal pain + confusion
   -died 8 hours later, strangled by a restraint vest while waiting for admission
   -no recommendation for physician's care was made

7. BRANTFORD: -70 year old admitted for head injury
   -died a week later at home (aspiration pneumonia due to immobilization + fracture of odontoid with dislocation)
   -recommendation were made to physicians

8. GERALDTON: -unclear death by myocardial infraction
   -recommendations were referred to the Ontario College of Physicians and Surgeons

APPENDIX C

SAMPLE SIZE CALCULATION

The variance between physician categories is estimated using the book "Sample Size Choice" by R.E. Odeh and M. Fox, 1975. The sample size calculation is based on the analysis of variance for 3 groups so $f_1 = 2$ degrees of freedom and a same number of physicians in each group, m so $f_2 = 3(m-1)$ degrees of freedom.

The expected variance between physician categories is:

EMS = V (within category) + $m \times \Sigma\, d_i^2/2$ where d_i represents the category effect ($d_i = \bar{\mu}_1 - \bar{\mu}$).

For 6 cases/physician it was previously calculated that the variance within category is 20.13 + 821/6 = 156.96.

The F ratio defined as $F = \sqrt{\dfrac{m \times \Sigma\, d_i^2/2}{\text{V. within}}}$

becomes $F = \sqrt{m \times \Sigma\, d_i^2/313.92}$

If $\bar{y}_1 = \bar{y}_2 = 50.07$ degrees and $\bar{y}_3 = 70.36$ degrees the average is $\bar{y} = 1/3\ (50.07 + 50.07 + 70.36) = 56.83$ and then for a 30% difference, in any one physician group,

$$\Sigma\, d_i^2 = (70.36 - 56.83)^2 + 2\ (50.07 - 56.83)^2 = 228.76$$

and $F = \sqrt{m \times 228.76/313.92} = \sqrt{m/1.37}$

If $\bar{y}_1 = \bar{y}_2 = 50.07$ degrees and $\bar{y}_3 = 66.19$ degrees, the average is $\bar{y} = 55.44$, and then for a 25% difference,

$$\Sigma\, d_i^2 = (66.19 - 55.44)^2 + 2\ (50.07 - 55.44)^2 = 173.24$$

and $F = \sqrt{m \times 173.24/313.92} = \sqrt{m/1.81}$

For a fixed alpha and a fixed beta the book provides curves for which $F = \sqrt{m/1.4}$ and $F = \sqrt{m/1.8}$ are constant for $f_1 = 2$ and different values of f_2.

The smallest F value is given for $f_2 = \infty$, and the value for alpha = .01 and (1 - beta) = .95 is F = 2.6. The smallest m values are then respectively: $m = 1.4 \times 2.6^2 = 10$ and $m = 1.8 \times 2.6^2 = 13$

The smaller values for m will be selected if the computed $f_2 = 3(m - 1)$ is larger than the value f_2 obtained from the chart for $f_1 = 2$ and $F = \sqrt{m/1.4}$ for a 30% difference or $F = \sqrt{m/1.8}$ for a 25% difference. Increasing values of m will be given until the computed f_2 is larger than the f_2 obtained from the chart.

<u>For delta = 30%</u>

With m = 10, $f_2 = 3\ (10-1) = 27$ and $F = \sqrt{10/1.4} = 2.7$. On the chart f_2 is about 40

With m = 11, $f_2 = 3\ (11 - 1) = 30$ and $F = \sqrt{11/1.4} = 2.8$. On the chart f_2 is 8.

The smallest number of physicians is estimated to be m = 11.

<u>For delta = 25%</u>

With m = 13, $f_2 = 3\ (13 - 1) = 36$ and $F = \sqrt{13/1.8} = 2.7$. On the chart f_2 is about 40

With m = 14, $f_2 = 3\ (14 - 1) = 39$ and $F = \sqrt{14/1.8} = 2.8$. On the chart f_2 is 8.

The smallest number of physicians is estimated to be m = 14.

APPENDIX D

Physician code number

1. Physician number (PN) : 01 to 28	1,2	
2. Hospital number (HN) : 01 to 35	3,4	
3. Physician category (PC) : CO=0, GP=1, EP=2	5	
4. Working hours (WH) : part time=0, full time=1	6	
5. Method of payment (MP) : salary=0, fee for service=1	7	
6. Level of training (LT) : 1 to 5	8	
7. Number of years in practice (YP) : 01 to 99	9,10	
8. Number of years of clinical post graduate training (YT)	11,12	

APPENDIX E

Questionnaire for the Emergency Department

The hospital

1. Is the hospital affiliated to a University YES___ NO___

2. Number of beds in hospital _____

3. Are the following facilities available 24 hours/day and 7 days/week

   - ambulance YES___ NO___
   - X-rays YES___ NO___
   - electrocardiograms YES___ NO___
   - laboratory YES___ NO___
   - blook bank YES___ NO___
   - consultation to specialists (radiologist, surgeon, pediatricians, internists, psychiatrists, obstetric-gynecology, anesthesiology) YES___ NO___

The Emergency Room

4. Average number of visits to your Emergency Department per day ___visits/day

5. Do you record any information on the patients at the reception of the Emergency Department? YES___ NO___

   IF YES, which information do you record:

   - age YES___ NO___
   - sex YES___ NO___
   - presenting complaint YES___ NO___
   - follow-up YES___ NO___

(Appendix E)

Nursing staff	day	evening	night
6. Number of RN working on shift	___	___	___
7. Number of RNA working on shift	___	___	___

8. Do you require any special training for the nurses? YES___ NO___

IF YES, which training do you require? _____

Medical staff

9. Are the physicians on emergency duty actually in the emergency department, as opposed to on call? YES___ NO___

10. Do you require any special training for the physicians? (CPR, ACLS*) YES___ NO___

IF YES, which training do you require? _____

11. Number of : general practioners ___

casualty officers (under temporary contract) ___

emergency physicians (career oriented in emergency care) ___

12. How many work : 41 hours or more/week ___

33 to 40 hours/week ___

25 to 32 hours/week ___

17 to 24 hours/week ___

9 to 16 hours/week ___

8 hours or less/week ___

Appendix E)

13. Method of payment of physicians working in the Emergency Room:
    - contractual salary arrangement with hospital ____
    - fee-for-service for group practice ____
    - other, please specify _____

14. Quality of care evaluation: do you assess the quality of care provided in the Emergency Room? YES___ NO___

    IF YES, what method do you use? _____

    _____

    _____

    _____

15. How willing would your department be to participate in a study on the evaluation of quality of care in the Emergency Room?

    very hesitant___ somewhat hesitant___ willing___

    very willing ___

THANK YOU

* CPR = cardio pulmonary resuscitation

ACLS = Advanced Cardiac Life Support

APPENDIX F

Instructions for observer

1. YOU ARE THE ONLY ONE TO KNOW WHAT YOU ARE ASKED TO OBSERVE
2. When you meet the observed physician, identify the code number and use the first five numbers for each observation form and explain the questionnaire to be completed by the physician after each encounter
3. Observe only one physician during two working shifts
4. Record the observation of every patient seen by the observed physician
5. Place on every patient record an "orange card" with the patient record number
6. Begin observation immediatly when the patient enters the clinical treatment area
7. Record the time of admission and the time when the physician starts the encounter
8. Observe each patient continuously until the physician leaves the area to see another patient
9. Record history, physical and management on the appropriate observation form.
10. Rate the physician attitude
11. Rate the apparent patient satisfaction
12. GATHER THE ORANGE CARDS, completed by the physician, IN THE SEALED BOX
13. You need to observe at least 6 cases for each physician
14. You need to observe : 14 physicians in each category (EP, CO, GP) and to classify the cases as urgent or non-urgent.

APPENDIX G

Observation form

	PN		HN		PC	WH	MP	LT	YP		YT	
Physician code												
	1	2	3	4	5	6	7	8	9	10	11	12

Observer code : 1, 2 ____

Record number _____

Patient phone number _____

Patient name _____

Patient age _____

Patient sex : male=0, female=1 ____

Speak english : No=0, Yes=1 ____

Date of admission _____

Time of admission _____

Time of arrival of physician _____

Indicator condition : 01 to 10 (99 when non eligible) _____

Urgency : non-urgent=0, urgent=1 _____

(Appendix G)

HISTORY/PHYSICAL	MANAGEMENT
(list of explicit criteria with ✓)	

How would you rate the MD's attitude with the patient and/or family?

excellent [ ] [ ] [ ] poor

How would you rate the satisfaction of the patient and/or the family?

excellent [ ] [ ] [ ] poor

APPENDIX H

Patient Questionnaire (phone interview 2 weeks after ED visit) (From Rubenstein, 1977)

	For Code
Date: _____	
Record Number _____	
Are you satisfied	
1. With the system? (waiting time...)	
satisfied [2] [1] [0] unsatisfied	
2. With physician encounter?	
satisfied [2] [1] [0] unsatisfied	
3. Do you feel better?	
Do not feel better [0] [1] [2] [3] Feel completely better	
What do you know?	
4. Can repeat medicine name and dosage. Reports taking it — yes [1] no [0]	
5. Understands diagnosis — [1] [0]	
6. Can repeat follow-up instructions and reports keeping following appointment — [1] [0]	
TOTAL	

APPENDIX I

Recording sheet

Physician code		
Physician number : 01 to 28	PN	: 1,2
Hospital number : 01 to 35	HN	: 3,4
Physician category : CO=0, GP=1, EP=2	PC	: 5
Working hours : part time=0, full time=1	WH	: 6
Method of payment : salary=0, fee for service=1	MP	: 7
Level of training : 1 to 5	LT	: 8
Number of years in practice :01 to 99	YP	: 9,10
Number of years of clinical post-graduate training : 01 to 99	YT	: 11,12
Indicator condition : 01 to 10	IC	: 13,14
Urgency : non-urgent=0, urgent=1	UR	: 15
Record technical process score : inadequate=0, adequate=1	RTP	: 16
Observer technical process score	OTP	: 17
patient waiting time (minutes)	OWT	: 18,19,20
physician attitude : inappropriate=0, adequate=1, excellent=2	OPA	: 21
apparent patient satisfaction : poor=0, adequate=1, excellent=2	OPS	: 22
Physician : workload : light=0, fair=1, heavy=2	PWL	: 23
self-assessment : poor=0, good=1, excellent=2	PSA	: 24

(Appendix I)

Patient :	satisfaction with system : no=0, somewhat=1 yes=2	SS	: 25	
	satisfaction with physician (see 25)	SP	: 26	
	present health status : 0 to 3	HS	: 27	
	knowledge of drug : no=0, yes=1	KDR	: 28	
	knowledge of disease : no=0, yes=1	KDS	: 29	
	knowledge of follow up : no=0,yes=1	KFU	: 30	

APPENDIX J

Available list of explicit criteria
for nine indicator conditions

I.BACK PAIN (21-65)

2.CHEST PAIN (M,30+,excluding M.I.)

3.DEPRESSION (22+)

4.HEADACHE (21+)

5.KNEE INJURY

6.OTITIS MEDIA (2-12)

7.URINARY TRACT INFECTION (F,16+)

8.VAGINAL DISCHARGE

9.LACERATION

1 to 8 are adapted from Sibley,1977

9 is adapted from Frazier,1979

(Appendix J)

1. BACK PAIN (21-65 inclusive)

1. identification of physical stress	1	☐
2. present work status	2	☐
3. evidence of a preexisting condition (within last year)	3	☐
4. localization of pain	4	☐
5. pain radiating into legs	5	☐
6. examination of back a) deformity (scoliose)	6a	☐
b) range of motion	6b	☐
c) spasm or tenderness	6c	☐
7. straights legs raising ("bow string sign")	7	☐
8. neurological examination a) reflexes	8a	☐
b) sensory change	8b	☐
c) muscle strengh	8c	☐
d) dorsiflexion of foot	8d	☐
9. X-ray if diagnosis is not made	9	☐
10. IF NO neurological deficit, follow within 1 week	10a	☐
OR, consultation	b	☐
IF, neurological deficit, consultation	c	☐
OR, hospitalization	d	☐

ADEQUATE : 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 10

INADEQUATE : anyone missing

(Appendix J)

2.<u>CHEST PAIN</u> (M,30,excluding MI,acute coronary,pulmonary embolism)

1.pain description (anginal,pleuritic,cardiac)	1a	
and duration/location/precipitating factors	1b	
2.others symptoms : cough,sputum,haemoptysis, shortnes of breath	2	
3.physical examination : chest	3a	
heart (BP)	b	
abdominal	c	
4.ECG	4	
5.relevant Xrays	5	

3.DEPRESSION (22+)

Eligibility : an adult patient presenting with 3 or more of the following symptoms,or stated diagnosis of depression

1.feeling of depression	a	___
2.fatigue	b	___
3.sleep disturbance	c	___
4.apathy or "turned off"	d	___
5.stated nervousness	e	___
6.constipation	f	___
7.loss of libido	g	___
8.loss of appetite	h	___
9.irritability	i	___
10.musculo-skeletal discomfort	j	___
11.chronic recurring headache	k	___
12."vegetative" symptoms (passive,quiescent,functioning involuntary)	l	___

Grade II : depression with impairment of function (social,vocational or physical) which has been recognized by one of the following :

a)patient b)a concerned person or relative c)the physician

Grade III : patient is suicidal,psychotic or non-functional as determined by a),b) or c)

(Appendix J)

DEPRESSION

1. consultation or referral to psychiatrist (immediate if evidence of suicide)	1	
2. hospitalization (immediate if evidence of suicide)	2	
3. inquiry about drugs (prescribed or self-administered)	3	
4. medical history : family history, past illness, present complaint	4	
5. doctor's awareness of the presence or absence of problems	5	
6. physical examination	6	
7. follow up visit requested within a week	7	

ADEQUATE : 1 OR 2

3 + 4 + 5 + 6 + 7

(Appendix J)

4. HEADACHE (21+)

1. frequency, duration, severity within 12 months	1	
2. drug prescribed, self medication, the "pill"	2	
3. blood pressure	3	
4. fundoscopic examination	4	
5. consultation OR	5a	
follow up	b	
(6. skull X-Rays)	6	

ADEQUATE : 1 + 2 + 3 + 4 + 5

INADEQUATE : anyone missing

(Appendix J)

5. KNEE INJURY

1. inquiry regarding mechanism of injury	1	☐
2. functional inquiry regarding knee includes 1 or more of the following : a) swelling	2a	☐
b) locking	b	☐
c) grating or snapping	c	☐
d) pain on weight bearing or rest	d	☐
e) throbbing	e	☐
f) heat	f	☐
3. physical examination of knee joint includes at least 2 of the following : a) fluid present or not	3a	☐
b) ligaments intact or not	b	☐
c) menisci (cartilages) intacted	c	☐
d) quadriceps injured or not	d	☐
4. treatment includes		
IF fluid in joint --- aspiration	4a	☐
--- X-Rays	b	☐
---follow up for reassessment	c	☐
OR consultation	d	☐

ADEQUATE : 1 +
one from 2 +
two from 3 +
4 a) ,b) ,c) OR 4 d)

(Appendix J)

6. OTITIS MEDIA (2-12)

Patient complaint about ear

1. prescription of an appropriate antibiotic : 1 ☐

erythromycin
penicillin
sulpha
ampicillin
amoxicillin
hetacillin
cephalexin
dicloxacillin
cloxacillin

An inappropriate antibiotic would be : tetracycline
chloramphenicol
clindamycin
lincomycin

2. administration for at least 10 days 2 ☐

3. follow up visit requested within one month 3 ☐

ADEQUATE : 1 + 2 + 3

INADEQUATE : anyone missing

(Appendix J)

7. URINARY TRACT INFECTION (F,16+)

For purpose of the study, those patients who previously have had surgical management and investigation of urethrovesicle reflux problem are excluded

Eligibility : the symptoms include	a) frequency	a	___
	b) dysuria	b	___
	c) haematuria	c	___
	d) suprapubic pain	d	___
	e) flank or loin pain	e	___
	f) chills	f	___
	g) fever	g	___
	h) general malaise	h	___
1. urinalysis for albumin, glucose, and microscopy		1	___
2. mid stream urine (MSU) for urinalysis, culture and sensitivity		2	___
3. abdominal examination including an examination for costovertebral tenderness		3	___
4. pelvic examination		4	___
5. G.C. smear		5	___
6. prescription of an appropriate antibiotic for at least 10 days		6	___
7. follow up when report of culture ans sensitivity		7	___

ADEQUATE : 1 OR 2 + 6 + 7

INADEQUATE : anyone missing

(Appendix J)

8. VAGINAL DISCHARGE (F,16-40)

1. enquiry regarding the "pill"	1	☐
2. enquiry regarding recent use of antibiotic	2	☐
3. evidence of pregnancy, diabetes	3	☐
4. speculum examination of vagina	4	☐
5. swab of discharge for smear (microspic) and culture	5	☐
6. urinalysis	6	☐
7. treatment for each diagnosis :	7	☐
-trichomonas: flagyl, neotric, novonidazol		___
-moniliasis: monistas, mycostatin, nystatin, nilstat, canasten		___
-mixed infection: AVC or similar vaginal cream		___
-gonorrhea: penicillin, tetracyclin, ampicillin, streptomycin		___
-hemophilus or corynebacterium: topical sulphas, oral sulphas, ampicillin		___
-normal vaginal secretion: no treatment		___
8. follow up visit	8	☐

ADEQUATE : 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8

INADEQUATE : anyone missing

(Appendix J)

9. LACERATION

A) IF .wound involves finger or toe ___

.tissue lost more than .5 cm in width ___

.deep structure injury ___

.leg laceration more than 6 cm in length or with flap ___

.extremity wound with either :

-distal or lateral-based flap more than 1.5 cm in length ___

-multiple flaps ___

1. antiseptic solution and dressing 1 ☐

2. consultation 2 ☐

ADEQUATE : 1 + 2

B) IF WOUND CAUSED BY HUMAN BITE WITH

wound on hand or face or if more than 1 cm ___

1. antiseptic solution and dressing 1 ☐

2. consultation 2 ☐

C) IF WOUND CAUSED BY HUMAN BITE WITHOUT RESTRICTION

1. wound culture 1 ☐

2. check for drug allergies 2 ☐

3. give systemic antibiotic 3 ☐

4. check foreign body or devitalized tissue 4 ☐

IF YES : xylocaine (without epinephrine for finger, toe, penis) ___

(Appendix J)

(Laceration)

5.antiseptic preparation :scrub around wound only 5 ☐

+solution in and around

6.leave wound open 6 ___

7.apply topical antimicrobial 7 ___

8.apply dressing (except for scalp) 8 ☐

9.instruction for dressing change (except for scalp) 9 ☐

10.check tetanus immunization within 5 years 10 ☐

IF NONE : -check for high contamination by history ___

- tetanus toxoid a ___

+human tetanus immune globulin b ___

11.next appointment : 11 ☐

IF wound less than 48 hours old ,see in 24 hours a ___

IF wound more than 48 hours ,see in 2-4 days b ___

IF facial wound ,see in 2-6 days c ___

ADEQUATE : 1 + 2 when restriction

1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11

IF wound on scalp avoid 8 + 9

D) IF HIGH CONTAMINATION BY HISTORY (10^5+) GO TO 1

(Appendix J)

(Laceration)

E) IF WOUND CAUSED BY ANIMAL BITE WITH :

.wound above neck

.wound older than 8 hours --------→ GO TO 1

.laceration more than .5 cm

IF not through deep dermis :

1.antiseptic preparation:scrub around wound only 1 ☐

+solution in and around ☐

2.apply topical antimicrobial and dressing 2 ☐

3.instruction to keep dressing dry 3 ☐

4.check tetanus 4 ☐

5.GO TO 10 5 ☐

ADEQUATE : 1 to 11 when restriction (first three)

1 to 4 and 10 + 11 when not deep

F) IN ALL OTHER CASES (no human nor animal bite nor contamination)

1.no prescription of systemic antibiotic 1 ☐

2.GO TO 4 of situation C 2 ☐

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