Assessment of Patient Processing in Emergency Departments of Hospitals
By
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Abstract

The purpose of this research is to develop an ideal model of patient processing for

hospital Emergency Departments (EDs). Patients are harmed by process delay, not only

by wasted time, but also by unnecessary suffering and adverse medical outcomes. The

United States has nearly 5,000 EDs. These exist to provide emergency, medical care

whenever it is needed. Emergency Departments function as public safety nets, catching

people who have fallen prey to urgent illnesses or injuries. There has been increasing

discussion regarding the ability of EDs to provide timely care to patients with emergency

medical conditions. The inability to provide timely service results from overcrowded

conditions and has been implicated in poor outcomes for patients with certain medical

problems.

Patient processing of EDs was assessed using interviews and direct observation. The

study found several ways to expedite patient process. By applying the practical-ideal

model for patient processing allows hospital administrators to implement a

comprehensive, successful plan, without significantly changing their current process.

About the Author

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Table of Contents

Chapter 1
Introduction

The purpose of this research is to develop an ideal model of patient processing in Emergency Departments of hospitals. EDs are the most vital component of hospitals' inpatient business. EDs are right inside the front door of every hospital, and they generate thirty to forty-five percent of hospitals' total admissions and revenue (Shiver 2007). The flow of patients through any ED directly affects its quality of care, the safety and satisfaction of its patients, and its hospital's revenue; it is critical that the flow be efficient. For nearly two decades, ED crowding has been recognized as a growing problem (Asplin et al. 2003). ED crowding has become a major barrier to receiving timely emergency care in the United States.

The next chapter of this study reviews the literature pertaining to ED patient processing in hospitals to create an ideal patient processing model. This paper discusses the background of, and problems with**,** patient processing. Reviewing the literature will help in making an ideal model, by this researcher.

Scholarly literature documents three interdependent components of ED patient processing: patient input, –throughput, and –output (Asplin et al. 2003). This research uses these components to develop an ideal patient processing model. The research is based upon managing patient flow in Emergency Departments. It helps create an understanding of an ideal model of patient processing that provides healthcare administrators and policymakers with a solution to overcrowding. The goal of the ideal model of patient processing is to lay the groundwork for an organized research–, policy–, and operations management agendas that will alleviate ED crowding

Chapter 2
Literature Review

The purpose of this chapter is to review the literature pertaining to ED overcrowding in hospitals to create an ideal patient process model. This paper discusses the background and problems of ED overcrowding which could lead to inadequate patient processing.

Across the United States, hospital overcrowding is a significant problem for all types of health care organizations. What started as episodic incidents—for example, large numbers of ill patients flooding ED waiting rooms in the flu season—has become an everyday experience. Overcrowding has become so bad that more than six out of every ten hospitals across the country are operating at or over capacity (McCaig and Burt 2001). According to several central Texas hospital ED directors, overcrowding is a daily occurrence in hospitals. Further, overcrowding is not limited to hospitals either with certain features or in certain areas: overcrowding harms hospitals in academic, county and private hospitals alike, regardless of whether they are in urban and rural areas (Joint Commission Resources Inc 2004; McCaig and Burt 2001).

Because of the increased capacity at all levels of the health care delivery system, there has been increased pressure for tighter financial management and efficiency. Hospitals are faced with reduced flexibility and ability to accommodate the variations in demand that are occurring in their Emergency Departments (Joint Commission Resources Inc 2004).

Health care systems have been challenged to deliver high quality care with limited resources (Hall 2006). In the United States, large segments of the population have inadequate health insurance coverage, forcing them to rely on an underfunded public

health system. At the national level, the National Institutes of Health has projected a steady increase in expenditures over the next ten years, both in absolute terms and as a percentage of the gross domestic product. Total expenditures in 2005 amounted to $1.3 trillion of the gross domestic product. While expenditures as a percentage of gross domestic product held nearly constant between 1992 and 2000, they increased steadily from 5.2% to 13.1% in the 32-year period from 1986-1992 (Hall 2006). In light of an ageing population and increased costs of medical delivery, health care costs are projected to increase to 15.9% of the gross domestic product by 2010 (Hall 2006). These expenditures combined with decreasing revenues has lead to the closure of many EDs.

What is Emergency Department Overcrowding

The American college of Emergency Physicians defines Emergency Department overcrowding as a situation that identified the need for emergency services outstrips available resources in the ED (ACEP, 2000a). This situation occurs in hospital EDs when there are more patients than staffed emergency treatment beds and wait times exceed a reasonable period (ACEP, 2000a). During 2001, an estimated 107.5 million visits were made to hospital EDs, up from 89.8 million visits in 1992. This statistic represents a 20% increase in ED visits nation-wide. Hospital ED crowding has led to increased patient wait times. The average wait time was three hours in 2001, according to the Centers for Disease Control and Prevention, but now wait times can exceed 24 hours in some hospitals (McCaig and Burt 2001; Gearon 2004; Joint Commission Resources Inc, 2004).

Although patients come to the ED with a range of medical conditions, from mild injuries to serious traumas, patients are increasingly experiencing greater medical needs and more complex conditions. As the United States population ages, increasing number

of elderly patients are seeking care, treatment, and services in EDs, and their use of EDs far exceeds all other age groups (McLaughlin and Hays 2008). In addition, patient's who lack access to health care; either because they are uninsured, underinsured, or because an appointment cannot be scheduled with the family primary care physician for several weeks, resides in the ED to get the medical care (McLaughlin and Hays, 2008). Due to the Emergency Medical Treatment and Labor Act, a patient cannot be turned away based on their ability to pay, causing more people to visit the ED (Joint Commission Resources Inc 2004).

The lack of inpatient beds is one of the most commonly cited reasons for overcrowding in the ED. Therefore, when EDs become overcrowded, patients might be monitored in non-treatment areas such as hallways and corridors, while awaiting a bed. When patients are treated in the hallway, treatment space, equipment, and staff time is utilized, which puts strain on an overwhelmed unit (Derlet and Kravitz 2001). Overcrowding may also lead to the inability to appropriately triage patients, forcing patients to stay in the waiting area until a treatment bed becomes available (Joint Commission Resources Inc 2004).

ED overcrowding, over the past 20 years, has lead to the shrinkage of hospitals and hospital capacity (Derlet and Kravitz 2001). Many hospitals have closed or downsized because of managed care and there have been huge cuts in the number hospital beds. But ED use has surged. So increasingly, patients are then sitting and waiting in EDs because of the inability to get to a patient floor due to the lack of bed capacity (Gearon 2004).

The Emergency Department has become the safety net for many patients. The ED has been neglected throughout the years; not enough time was spent thinking about how to make it better. Now, that neglect is coming home to roost. Today's reality is that for many people, the ED has become their family doctor (Buesching, Jablonowski and Vesta 1985). The ED has also become a giant high-tech diagnostic and specialty care center in many communities, making it even more important for daily health care, causing more people to rely on the ED for treatment (Dershewitze and Paichel 1986). And if one does not have health insurance, seeing a specialist is almost impossible unless a trip is made to an ED. Mandated by federal laws the ED is the only part of the American health care system that has to treat all patients (Joint Commissions Resources Inc 2004).

When the ED becomes over-crowded, staff tends to reprioritize patient needs. Typically staff will address the patient's higher level needs because there is neither time, space, nor equipment to address the lower level needs (Derlet and Richards 2000). For example, when the ED is not at full capacity, a nurse has the time to provide patient education, explain written discharge instructions, and answer any question the patient might have. This is to ensure the patient is well informed of their illness and is aware of what s/he will need to do upon returning home. However, when the ED is crowded the nurse may only have the time to give the patient written instructions and forego the explanation. The patient's depth of understanding is then compromised and the patient will probably end back up in the ED for medical treatment (Derlet and Richards 2000; McLaughlin and Hays 2008).

Emergency Department Delays

Emergency Departments are the most challenged components of the health care system. According to a recent study by the American College of Emergency Physicians "A multitude of factors are responsible for delays including greater medical needs, prolonged ED evaluations, inadequate bed capacity, and redundant use of the ED by those with no other alternative to primary medical care" (ACEB 2000b pg 241). (In the year 2000, 108 million ED visits occurred in the United States, representing 39.4 visits per 100 people (ACEP, 2000a; McCaig and Burt 2001)).

Patients arrive at the ED through multiple channels including walk-ins and ambulances. A "good" physical layout of the ED is necessary in order to expedite patient flow. Depending on how quickly the patient can be "quick" registered (assigned a medical record number) and triaged (sorting of and allocation of treatment to patients) determines how fast the patient will be ready to be placed in a bed and be seen by a doctor (Hall 2006). The patients first contact is with a registration representative who will collect identification information and symptoms; the patients second contact is with a nurse who will triage (prioritize and stabilize) them. After a patient is placed in a treatment bed they are served by nurses and physicians, who may be specialized to particular injuries (e.g orthopedics) or specialized by level of urgency. Before treating the patient, tests (lab work, X-ray, CT scan, MRI, etc.) are performed to help diagnose the patient. Once emergency treatment is completed it may be necessary to admit the patient to the hospital, where the patient could be exposed to additional delays and processes.

Eventually, the patient goes through a discharge process, and their bed must be prepared for the next patient.

Medical care is delivered through a network of service stations, and there is a potential for delay in multiple locations. Emergency Departments also interact with general hospital care, as frequent source of queuing is the inability to place a patient in a hospital bed once treatment of completed in the ED (Hall 2006).

Patient Input, -Throughput, and -Output

A conceptual model of Emergency Department overcrowding can provide a practical framework that can be used to examine the factors that affect ED access, quality of care delivered, and improve and manage patient flow. Patient input is described as any condition, event, or system characteristic that contributes to the demand for emergency services (Joint Commission Resources Inc 2004). Patient throughput is described as the time it takes to provide emergency care and the length of stay of a visit in the ED (Bazzoli 2003). Patient output is the discharge process.

Patient Input

When creating a patient processing model, patient input should be a primary focus. The patient input component includes "any condition, event or system characteristic that contributes to demand for ED services" (Joint Commission Resources Inc 2004, pg 64). The component consists of patients seeking emergency care, unscheduled urgent care, and safety net care. Safety net care is a term used to describe a situation where the ED is the only accessible provider for a vulnerable population such as

the uninsured or Medicaid beneficiaries (Joint Commissions Resources Inc 2004). For example, Andersen and Laake's Behavioral Model of Healthcare Utilization Asplin et al. 2002 describes three factors that affect use of emergency care: patient need for health care services, predisposing factors that affect an individual's likelihood of seeking care, and enabling factors that affect an individual's ability to receive care. The inter-operations management concepts to patient flow among healthcare sites are referred to as acute care systems. An acute care system (is a branch of tertiary health-care where necessary treatment of a disease in which a patient is treated for a brief but severe episode of illness) includes "any delivery system component that provides unscheduled care" (Asplin et al 2002). The acute care system definition is a practical way of identifying the components of the health care system that contribute to, or are affected by, ED crowding. Although the patient processing model does not attempt to address patient- level factors that contribute to the decisions to seek ED care, it does describe interactions among components of the health care system and community that affect ED use (Schull, Szalai and Schwartz 2001).

In addition to the factors described in Andersen and Laake's Behavioral Model of Healthcare Utilization, an understanding of ED input must include the recognition that there are at least three general categories of care delivered in the Emergency Department: emergency care; unscheduled urgent care; and safety net care. The input component highlights these categories (Asplin et al. 2002).

Emergency care: The Emergency Department's most visible and essential role in the community is to treat seriously ill and injured patients. Past evidence indicates that the proportion of seriously ill and injured patients may be increasing. In an article based

on data from California, reported a 59 % increase in the proportion of ED cases classified as critical care visits during the 1990's and have been increasing ever since (Asplin et al. 2002). According to McCaig and Burt 2001, in a recent survey of frequent ED visitors, after hour clinics would suffice for emergency care facilities if the clinics would extend their operating hours to allow patients to choose another facility besides the ED.

According to Sochalski 2002, the Emergency Department frequently serves as a referral site for providers when it is determined that patient stabilization and admission are required. These patients may be referred to the urgent care centers, skilled nursing homes, home health care providers, and other sites. Although ambulatory clinics can admit patients with straightforward problems *directly* to the hospital, patients are often referred with complex problems to the ED for triage, stabilization, and initial diagnostic evaluation before admission. The concentration of diagnostic and therapeutic technologies available to the ED may contribute to these referral patterns for ambulatory patients.

Unscheduled care in the Emergency Department: The ED provides a significant amount of unscheduled care, often because there is inadequate capacity for this care in other parts of the acute care system. Many times, patients are sent to the ED because their clinic cannot quickly treat them for an acute problem or because other sources of after-hours care are unavailable (Vissers and Beech 2005). Alternatively, patients may schedule an appointment for an acute condition, but come to the ED because their symptoms worsen before treatment is available. The convenience of the same-day care also influences patient's decisions to seek urgent care. The availability of after-hours

care may create fewer conflicts with the patient's employment, educational, and family responsibilities (Asplin et al. 2002).

Safety net care in the Emergency Department: Safety net care is the relationship between the ED and the vulnerable population. The vulnerable population consists of people who rely on the ED for primary care (Asplin et al. 2002). Although in most cases the ED shares this role with other safety net providers and clinics in communities, it is often the only open door for patient populations that experience substantial barriers to accessing unscheduled care. Disproportionate numbers of Medicaid beneficiaries and uninsured individuals frequently rely on the ED as their usual source of care, often because cost barriers interfere with receiving care elsewhere (Obrien 1999). The ED is not only a safety net for the community, but it also serves as an important safety net for the rest of the health care system. When other medical options in the system are exhausted, the ED is sometimes the only alternative for acute care. Recent reports from the Institute of Medicine and the General Accounting Office indicate the ED crowding is more prominent in communities with higher numbers of uninsured residents. These findings reinforce the important safety net role that EDs play in a community (Asplin et al. 2002).

Patient Throughput

Beyond identifying the components of patient input, patient throughput is crucial to the development of a patient processing model. Patient throughput is described as the time it takes to provide urgent medical care. The components of patient throughput include registration, turnaround times for the triage unit and physician examination, lab

tests and radiology exams, and diagnosis (Bazzoli 2003). The throughput component identifies patient length of stay in the ED as a contributing factor to ED crowding. Patient throughput also highlights the need to look internally at ED care processes and modify them as needed to improve their efficiency and effectiveness, especially those that have the largest effect on length of stay and resources use in the ED (Asplin et al. 2002).

There are two primary throughput phases documented in the literature. The first phase includes registration, triage, room placement, and the initial provider evaluation. The second phase involves diagnostic testing and treatment. Upon arrival to the ED for treatment the patient must first visit a "quick" registration station. This station allows for the patient to communicate with a human being about his/her symptoms and illness. There the patient is assigned a medical record number (Hall 2006). The patient is then directed to either the triage nurse (who determines the severity of the patient's condition) or the waiting room until called upon by the triage nurse. The triage nurse uses the **unit assessment tool** to determine where the patient should be directed (Hall 2006). Standardization of ED triage would facilitate a common understanding of the EDs patient workload. The literature identified that EDs have created innovative processes to quickly place patients in treatment rooms and initiating the physician evaluation. Several successful EDs routinely complete triage and room placement within ten minutes of patient arrival and the initial physician evaluation within ten minutes of room placement (Vissers, Jan and Beech 2005).

A **unit assessment tool** can be implemented to determine current capacity in ED units enabling the nursing staff to direct patients into the correct unit. The assessment tool uses real time data to identify when the unit lacks capacity to accept additional patients

without risking safety for patients and burnout for staff (Joint Commission Resources Inc 2004). The **unit assessment** tool works as follows- A data entry sheet is used to record registered nurse staffing, technician status, patient needs, and blocked beds. The unit color is entered into a grid, allowing real-time electronic monitoring of ED units. A preset range of numerical scores: defines each of the four colors (red, orange, yellow and green) which are assigned to patient's are as follows:

Red (Caution) - Red indicates the unit is working at the functional maximum level. The unit lacks capacity to accept additional work without risking safety for patients or burnout for staff. The response to red is for the staff and medical director of the unit to cap admissions (Joint Commission Inc 2004; McLaughlin and Hays 2001). Red is an indicator that this unit should be limited to patients who are the most critical with life threatening emergencies and requires immediate medical attention such as a coma, heart attack, stroke, diabetic shock, etc.

Orange (Late Caution) - Orange indicates that the unit is working right below the functional maximum level. The color orange indicates a warning that the maximum level could be reached easily if resources are not available. A response to orange should be to make added resources available to prevent moving to red. Orange is an indicator that this unit should be limited to patients who are in need of immediate treatment due to pain, but do not have life threatening situations, such as broken bones, large lacerations, amputations, high blood pressure, low blood sugar, etc (Joint Commission Inc 2004; McLaughlin and Hays 2001).

Yellow (Early Caution) -Yellow indicates early caution and that the unit is working at greater than 85% capacity. The unit has space to take patients but staff should

be aware of limited resources and administration should be watching closely to monitor any changes. Yellow is an indicator that units should be limited to patients with illnesses such as infectious disease and chronic illness, etc.

Green (Go) - Green indicates, go, the unit is working at 85% or less of maximum capacity as assessed. A response to green means units are available for patients. Green patients are the ones who are in the state that can wait for a bed and a physician to be available. These patients have any symptoms listed above; this unit is able to take severe to minor patients.

This tool can be used to assess and mange the patient flow process because the color grid is updated every few hours at a minimum, but often every few minutes.   The information is immediately available to the administrators, nursing staff, physicians, and registration staff (Joint Commission Resources Inc 2004). The colors also signal when a unit can accommodate more patients, therefore keeping the flow steady and accurate.

The second phase of the throughput component includes diagnostic testing and ED treatment. This phase will typically constitute the majority of a patient's total ED throughput time. Shortly after a patient arrives in the ED, the registration process occurs. A patient's entry to the hospital's data is recorded with a number that represents the entry of the patient into the information system to record a visit.   Each patient is assigned a unique identification number (Medical Record Number) on the initial visit that is used for all subsequent visits. Each visit is recorded as an "account" in the information system. After the patient has been medically examined complete registration takes place (by Patient Financial Services Personnel) allowing the patient to relay medical, insurance, emergency contact, and demographic information to registration representatives quickly

so medications and tests can be ordered (Hall 2006). Patient Financial Services (PFS) personnel's responsibility for gathering information about the patient and explaining financial obligations to the patient contributes to the reimbursement process of the medical visit. PFS personnel must have the patient sign general consent, distribute brochures, work with nurses to complete registration, initiate the patient chart, complete a limited financial screening and provide insurance information (Hall 2006; Green 1995; McGaig and Burt 2001).

While registration is taking place diagnostic testing should be in process. The lab provides a centralized service for a wide variety of tests. Phlebotomists come to the bedside to draw blood from the patient. Specimens, mostly blood in tubes, are received in the lab by pneumatic tube and hand carried by the phlebotomist back to central lab. Testing is then proceeded by the lab tests technicians. Lab turn-around time is about one hour for stat work and four hours for routine work. Results are often delivered electronically back to the ED for a faster turn-around and paper results are sent to medical records for the patient chart. Nurses then take the initiative to check the lab results in order to have a diagnostic work-up for the physician before s/he enters the patient room (Hall 2006).

Several other factors affect throughput times, including the cohesiveness of patient care teams, physical layout of the emergency department, efficiency and use of diagnostic testing, lack of inpatient beds isolation precautions, and delays in room cleaning. Although this list is by no means exhaustive, it identifies many important areas for improving ED efficiency (Hall 2006; Gearon, 2004).

Patient Output

Patient output describes the factors that prevent timely disposition of patients. The patients' ED care is completed, but patients are prevented from progressing to the next stage of care, being discharged out of the ED, admitted to an inpatient bed, or returned to a skilled nursing facility (Asplin et al. 2002). Emergency Departments are forced to keep admitted patients in a treatment bed until inpatient beds are available, effectively reducing the EDs capacity to care for new patients. Ongoing care for hospital inpatients that remain in the ED consumes nursing and physician resources and may delay evaluation of new patients causing "backflow" (Vissers and Beech 2005). A "backflow" of patients occurs when the patient cannot be placed from the ED to an inpatient unit because of a lack of available beds or other bottlenecks (i.e. room cleaning) (Trzeciak and Rivers 2003). This problem forces the ED to board (keeping a patient in a bed after he/she has already been medically treated) admitted patients until inpatient beds are available. Ongoing care for hospital inpatients that remain in the ED consumes nursing and physician resources and may delay evaluation of new patients. The causes and consequences of ED boarding of inpatients is one of the most important areas for immediate research and operational strategies to alleviate ED crowding (Derlet 2000; Gearon 2004).

Other factors contribute to inadequate boarding of patients in the ED- for example a lack of in-house waiting areas, which leads to delays in discharging patients because they are waiting to be discharged in a bed (Bazzoli 2003). The inadequate waiting areas cause the number of patients waiting in the emergency waiting room to increase due to the decrease in efficiency and inability to discharge patients in a timely fashion. Other

patients who must wait until the beds are ready may eventually leave without being seen by a physician due to the increase in wait times, or it may cause the patients illness and symptoms to worsen. This may cause the patient to return with a more costly treatment or the situation could even become life threatening (Bazzoli 2003). In a study of the San Francisco General Hospital Bindeman et al. 1991 found 15% of patients had left the hospital before being called for their examination and, almost twice as many patients who left without being seen reported at follow-up that their pain or the seriousness of their problem was worse.

After a patient is discharged from the ED, ongoing diagnostic and therapeutic services are often required. The availability of timely follow-up appointments in an ambulatory care system may create capacity problems; however, it now creates output bottlenecks rather than input demands for the ED (Frezza 2007). Time spent by ED providers arranging appropriate follow-up visits can undermine the efficiency of care and prolong ED length of stay (Bazzoli 2003). Furthermore, when adequate arrangements for outpatient follow-up care cannot be made, emergency physicians are more likely to admit new patients to the hospital.

Discharge Process

After nurses have completed patient treatment and diagnostic testing the physician can proceed with the diagnosis of the patient and the patient is ready to either be admitted as inpatient or discharged out of the ED. Movement of patients from the emergency areas to inpatient beds is critical. Given the high percentage of beds occupied at all times, it is important to discharge patients as soon as the patient is ready. Getting the beds

16

ready for new patients must be done quickly. Improving patient flow requires coordinated efforts to remove bottlenecks, such as creating housekeeping groups specialized for making the rooms ready and creating discharge waiting rooms so the patient does not occupy a bed while awaiting discharge instructions (Hall 2006 and Vissers; Beech 2005). The instructions should include: an explanation of the care the patient received in the hospital, a list of medications the patient should take (the dosage, times, and frequency), a list of potential side effects of any newly prescribed medications, a prescription for any newly prescribed medications, when to see the primary care physician for a follow-up appointment, home care instructions, diet, restrictions on bathing, wound care, as well as when the patient can return to work or school, or resume driving, signs of infection or worsening condition, such as pain, fever, bleeding, difficulty breathing, or vomiting, and an explanation of any services the patient will now be receiving, such as for a visiting nurse, and to include contact information (Hall 2006).

Conceptual Framework

Based on the literature, patient processing in the Emergency Department, Table 2.1 lists the problems with patient processing and links the categories to supporting literature. According to Shields 1998, 215, "practical ideal types provide benchmarks with which to understand (and improve) reality". In this case, the practical ideal type outlines the ideal elements with which all Emergency Department patient flow models should be based.

Table 2.1: Conceptual Framework for a Preliminary Ideal Model of Patient Processing in a Hospitals Emergency Department

Practical Ideal Type Category	Source
Input Strategies: To Control the Number of Patients Arriving in the Emergency Department ▪ Hospitals should set up their own primary care clinics if needed. ▪ Patients with non-emergency admission referrals from their physician should be directly admitted to the hospital without further examination by the emergency department.	ACEB, 2002a, ACEP, 2002b, Asplin et al. 2002, McCaig and Bert, 2001, Greene, 1995, Bindeman et al. 1991, Dershewitz and Paichel, 1986, Trzeciak and Rivers, 2003, Shiver, 2007, Joint Commission Resources Inc, 2004, Derlet and Richards, 2000, Frezza, 2007, Sochalski, 2002, Asplin et al. 2002, Aslpin et al. 2003, Bindman et al. 1992, Hall, 2006, Joint Commissions Resources Inc, 2004, Derlet, 2000, O'brien et al. 1999, Gearon, 2004, Schneider, Zwemer and Schwartz, 2001

Throughput Strategies: Expediting patient processing in the Emergency Department
▪ There should be an immediate short registration process as soon as the patient enters the emergency department.
▪ The patient should be triaged by a medical professional.
  a. The patient should be assigned one of the four colors (red, orange, yellow, and green) based upon the severity, red being most critical and green being the least critical.
  b. If the patient's condition allows (the colors of orange, yellow, or green) the patient should be sent to the waiting room.
  c. If the patient's condition is severe and is assigned the color red, the patient should be sent for immediate treatment.
▪ At one point the patient should go through a complete registration process.
  a. A patient with a color origin of orange, yellow, or green should go through the complete registration process while they wait for a bed.
  b. A patient with a color origin of red should go through the complete registration process at bedside when their condition allows.
▪ A patient should be seen based upon the rank within their color.
  a. A diagnostic process should take place.
  b. Appropriate treatment should be given to the patient.
▪ Physical layout of emergency department should facilitate patient flow.
	Asplin et al. 2002, Asplin et al. 2003, Richards and Kravitz, 2001, Hall, 2006, Buesching, Jablonowski and Vest, 1985, Bazzoli, 2003, Glaser and Traynor, 2008, Derlet, 2000, Derlet, 2001, Green, 1995, Dershewitz and Paichel,1986, McGaig and Burt, 2001, Vissers, Jan and Beech, 2005, Joint Commission Inc, 2004, McLaughlin and Hays, 2001, Gearon, 2004

Output Strategies: Patient discharge
▪ The patient should be discharged from the emergency department.
  a. If needed a patient should be discharged to the floor.
  b. A secondary waiting room inside the emergency department should be established to maximize bed capacity.
  c. Clinical technicians and nurses should be on stand-by to prepare beds for next patient as soon as the prior patient is sent to the secondary waiting room.
	Asplin et al. 2002, Asplin et al. 2003, Vissers and Beech, 2005, Greene, 1995, Shaw, Selbest and Gill, 1990, Joint Commission Resources Inc, 2004, McGlaughlin and Hays, 2008, Hall, 2006, Bindman et al. 1991, Dershewitz and Paichel, 1986, Derlet, 2000, Derlet, 2001

Chapter 3
Methodology

A set of interviews will help to develop an ideal patient processing model. The general outlines of this ideal model were discussed through the review of the literature. The first step to improving patient flow is to accurately assess its problems. After evaluating the literature about the elements and problems with patient processing in the ED an ideal patient processing model can be created. Many tools can be used to assess patient processing and manage patient flow.

The units of analysis for this study are Emergency Department directors of several hospitals in the central Texas region. The sources of evidence are direct observations and focused interviews. Through interviews with ED directors and direct observation this study will identify the elements of an ideal patient processing model. The point of this research however, is to offer opinions and suggestions to current ED patient processing practices; therefore, forming opinions based on the literature and applying those opinions to the conclusions drawn are an essential part of the process.

In order to develop an ideal patient processing model in comparison to the Practical Ideal Type constructed through a review of the literature, an Operationalization Table has been created. Table 3.2 summarizes the methodology utilized in this research and how it connects to the conceptual framework.

Table 3.1: Operationalization Table of a Preliminary Ideal Model of Patient Processing in the ED of Hospitals

Practical Ideal Type Category	Focused Interview Questions	Measurement
Input Strategies: To Control the Number of Patients Arriving in the Emergency Department	**Director of Emergency Department**	
▪ Hospitals should set up their own primary care clinics if needed.	▪ How would you rate the importance of an after hour clinic (additional to the ED) available for minor emergency patients.	Explain
	▪ At what point should a hospital decide they need to open a clinic to accommodate the number of minor emergency patients?	Explain
	▪ Should the number of patients seen per physician during peak operating hours in the emergency room be the litmus tests to deciding on the operation of a new clinic?	Explain
	▪ Should the clinic be in-house or in another location?	Explain
	▪ Do you think the benefits out way the costs of having a facility in-house rather than having one off campus?	Explain
▪ Patients with non-emergency admission referrals from their physician should be directly admitted to the hospital without further examination by the emergency department.	▪ Should patients being admitted to the hospital by their physician be seen by an emergency room physician before they are sent to the floor, or is there no need?	Explain
	▪ Do you think a physician referred-patient should be at minimum triaged independently of the emergency room to insure that they do not have an emergency situation?	Explain
	▪ Under what condition should an emergency medical professional examine the referred patient?	Explain
▪ Open-ended Questions	▪ Based upon your experience can you identify three other elements that will contribute to patient input?	Explain

Table 3.1: *Continued*

Practical Ideal Type Category	Focused Interview Questions	Measurement
Throughput Strategies: Expediting patient processing in the Emergency Department	**Director of Emergency Department**	
▪ There should be an immediate short registration process as soon as the patient enters the emergency department.	▪ Do you think it is a good idea to have an immediate short registration process or do you recommend a complete registration at the time of entry?	Explain
	▪ Do you think there are time saving benefits associated with having a patient electronically register themselves at a kiosk or tablet PC?	Yes or No Explain
▪ The patient should be triaged by a medical professional.	▪ What other solutions do you have to get patients registered quickly?	
a. The patient should be assigned one of the four colors (red, orange, yellow, and green) based upon the severity, red being most critical and green being the least critical.	▪ What is your opinion on a color ranking system for incoming patients based upon severity of their condition?	Yes or No Explain
b. If the patient's condition allows (they are assigned the colors of orange, yellow, or green) the patient should be sent to the waiting room.	▪ Do you feel a color coded ranking system would help expedite patient bed placement?	Explain
c. If the patient's condition is severe and is assigned the color red, the patient should be sent for immediate treatment.	▪ Based upon your knowledge and experience do you think the triage nurse should have the authority to make a decision whether or not blood should be drawn and urine should be taken?	Explain
▪ At one point the patient should go through a complete registration process.	▪ If yes, should the procedure be done in the triage room by the nurse?	Explain
a. A patient with a color origin of orange, yellow, or green should go through the complete registration process while they wait for a bed.	▪ Do you feel this will expedite patient processing?	Explain
b. A patient with a color origin of red should go through the complete registration process at bedside when their condition allows.	▪ What is the best/fastest way to collect information from a patient?	Explain
	▪ When is the best time to complete the registration process?	Explain
	▪ At bedside?	
	▪ While they wait for a room?	Explain
▪ A patient should be seen based upon the rank within their color.	▪ At what point should you see orange to green patients in an overcrowded emergency department?	Explain
a. A diagnostic process should take place.	▪ At what point would you consider a green patient to wait too long in an overcrowded emergency department?	Explain
b. Appropriate treatment should be given to the patient.	▪ What is the best timely manner to see a light colored patient?	Explain
	▪ In your opinion what is the ideal diagnostic process?	Explain
▪ Physical layout of emergency department should facilitate patient flow?	▪ What are the elements of a "good" physical layout?	Explain
▪ Open-ended questions	▪ Based upon your experience can you identify three other elements that will help contribute to patient throughput?	

Table 3.1: *Continued*

Practical Ideal Type Categories	Focused Interview Questions	Measurement
Output Strategies: Patient discharge	**Director of Emergency Department**	
▪ The patient should be discharged from the emergency department. a. If needed a patient should be discharged to the floor. b. A secondary waiting room inside the emergency department should be established to maximize bed capacity. c. Clinical technicians and nurses should be on stand-by to prepare beds for next patient as soon as the prior patient is sent to the secondary waiting room.	▪ Do you think that in order to free up bed space, a patient who is slated for discharge shall be moved from their bed to a secondary waiting room to await their discharge instructions?	Yes or No Explain
	▪ Do you think a secondary waiting room would increase the number of bed space at any given time?	Yes or No Explain
	▪ Do you have provisions to ensure that emergency room beds are prepared for incoming patients at a timely manner so valuable bed space is not tied up?	Yes or No Explain
	▪ In order to expedite turnover of beds should a system be in place where clinical technicians and nurses are on stand-by to prepare the beds for the next patient?	Yes or No Explain
	▪ If yes, what should the system entail?	Explain
▪ Open-ended Questions	▪ Based upon your expert experience do you have any other suggestions on how to expedite the patient discharge process?	Explain

Focused Interviews

Focused interviews will be utilized to both clarify information gathered through direct observation, and to develop and refine the ideal model of patient processing in the ED. Specifically, interviews with the directors of central Texas EDs will provide insight to the current priority level of patient processing in the EDs. Focused interviews typically consist of open-ended questions, which allow for the interviewee to present his or her own opinions or solutions to the problem being studied.

While interviews can be more useful than surveys, in that they allow for greater clarification and expansion of issues and have a higher response rate, they are subject to

some of the same weaknesses (Babbie 2004, 262). Interviews can provide inaccurate information if the interview questions are poorly worded, or if respondents are questioned about issues of which they have little recollection (Babbie 2004, 262). Since patient process and overcrowding in EDs is an issue that is of current focus for most hospitals, interview respondents will be able to provide accurate information on the subject. To ensure that interview questions are properly focused, they will be based on the elements outlined in the preliminary practical ideal type.

Sampling

This research is focused specifically on central Texas hospitals Emergency Departments' patient flow; therefore, direct observation and the interviews conducted will be internal. A total of ten interviews were performed by professionals. The interviews questions were directed to Emergency Department directors of Central Texas Medical Center, San Marcos, St. David's Medical Center, Austin, Texas, St. David's South, Austin, Texas, St. David's Round Rock Medical Center, Round Rock, Texas, Seton Medical Center, Austin, Texas, Dell Children's Hospital, Austin, Texas, Brackenridge Hospital, Austin, Texas, South Austin Hospital, Austin, Texas, Cornerstone Hospital, Austin, Texas and Seton Medical Center at Hays, Kyle, Texas. Both observation and interviews were conducted by this researcher.

Human Subjects

Since the units of analysis for this study are directors of the ED in hospitals, the impact on the human subjects involved must be considered. There are no reasonably

foreseeable risks or discomforts to the subjects, as the subjects have voluntarily requested to participate in the interviews. Furthermore, the interviews do not pertain to sensitive, confidential, or personal information. The directors of the EDs serve as the interviewees in this study and will all benefit from the successful implementation of patient process planning in hospitals. All subjects have identified a need for addressing the issue of overcrowding, and have requested the opportunity to provide input on the subject. Although the information provided through the interviews is not of a confidential nature, subjects will *not* be identified in this report by name, only by position title. Participation in this study will be strictly voluntary. Any questions or concerns pertaining to the focused interviews should be directed to Shaina Trial. She can be contacted by phone at (361) 362-8992 or by email at st1127@txstate.edu. Additionally, this study received a formal exemption from full or expedited review by the Texas State Institutional Review Board, application number 2009L7199.

The following chapters will assess the information gathered through the focused interviews and direct observation and provide recommendations based on this information.

Chapter 4

Results

In this study focused interviews and direct observation design is used to develop an ideal model of patient processing of Emergency Departments. A review of the literature identified the problems with patient input, -throughput, and -output. Guided by the literature review, this research solicited opinions of health care professionals on the most ideal ways of processing patients through the ED. Through focused interview and direct observation, a more refined ideal model will be generated.

Patient Input

When creating an ideal patient processing model patient input should be a primary focus. The input component of ED crowding includes "any condition, event or system characteristic that contributes to demand for emergency services" (Joint Commission Resources Inc 2004, 64). Without having accurate knowledge of the elements of patient input, administration will not have the necessary incentive to ensure they have an accurate plan in place to control patient input. Controlling patient input can potentially alleviate overcrowding and allow for adequate patient processing in an ED.

Focused Interviews

There was a consensus among all of the ED directors who were interviewed. The need for an after-hour minor emergency clinic, in addition to the ED, was viewed as highly important. With the utilization of a minor emergency clinic patients with *actual* emergency situations would be seen and treated much faster. There would be fewer

patients to treat because the number of non-emergent patients would subside. The directors agreed that the clinic should be located in-house, but in another location of the hospital to differentiate. The point in which hospital administrators should open such a clinic would be based upon the percentage of non-urgent cases versus the urgent cases. If the percentages of non-urgent cases exceed the percentages of urgent cases then the minor emergency clinic should be opened. Not only do minor emergency patients slow down the patient flow process, but those who leave the ED without being medically screened by a physician are a huge liability to a hospital. The number of patients leaving the ED without being seen by a physician should also be taken into consideration. If these numbers are continually increasing it could be a sign of overcrowding and excessive wait times.

According to the directors of the Emergency Departments, in order to free up space in an ED, patients who have been admitted to the hospital by their primary care physician should not be evaluated by the ED physicians upon arrival. Patients who are being directly admitted into the hospital have already been evaluated by their physician, another evaluation would be a waste of time, and constitute an additional charge. If the patient's physician deems a medical screen necessary, then a **decision unit** separate from the ED should be in place to perform a medical screening examination to determine if the patient has an immediate medical concern. With a decision unit in place immediate needs can be accessed right then without being examined through the ED. In the same respect patients should only be evaluated in the **decision unit** if they are experiencing symptoms such as chest pain, shortness of breath, black-out spells, etc.

Based upon the director's professional knowledge a few good points were
construed on how to help control patient input. A quick triage process by experienced
nurses, provide all services in a timely fashion, decrease door to doctor time, adequate
staffing, equip the ED with all necessary equipment to medically treat patients, and have
supportive administration and leadership council.

Table 4.1: Patient Input-Results

Patient Input		
Patient Ideal Type Categories	**Interview**	**Director Responses**
▪ Hospitals should set up their own primary care clinics if needed.	Yes	10 out 10 Directors agreed that primary care clinics keep emergency departments free of minor emergency patients, and physicians will be able to tend to urgent care patients. 1. Central Texas Medical Center-Yes 2. St. David's Medical Center-Yes 3. St. David's South- Yes 4. St. David's Round Rock- Yes 5. Seton Medical Center- Yes 6. Dell Children's Hospital- Yes 7. Brackenridge- Yes 8. South Austin Hospital- Yes 9. Cornerstone Hospital- Yes 10. Seton Medical Center @ Hays- Yes
▪ Patients with non-emergency admission referrals from their physician should be directly admitted to the hospital without further examination by the emergency department.	Yes	10 out of 10 Directors agreed that direct admitted patients should not be examined through the emergency room, unless the physician requests a medical screening. 1. Central Texas Medical Center- Yes 2. St. David's Medical Center- Yes 3. St. David's South- Yes 4. St. David's Round Rock- Yes 5. Seton Medical Center- Yes 6. Dell Children's Hospital- Yes 7. Brackenridge- Yes 8. South Austin Hospital- Yes 9. Cornerstone Hospital- Yes 10. Seton Medical Center- Yes

Patient Throughput

Beyond identifying what components patient input may require patient throughput is crucial to the development of a patient processing model. Throughput is described as the time it takes to provide emergency care. Throughput components consist of patient registration, triage time, physician examinations, lab results and radiology exams, and diagnosis (Bazzoli 2003). The throughput component identifies patient length of stay in the ED as a potential contributing factor to ED crowding. Patient throughput highlights the need to look internally at the care processes and modify them as needed to improve efficiency and effectiveness, especially those that have the largest effect on length of stay and resources use in the ED (Asplin et al. 2002).

Focused Interviews

According to Emergency Department director's, patient registration is a critical component of the patients visit. The ED directors suggest that a "quick" registration process upon arrival of the patient is necessary to develop a medical record number so that the patient's medical history, lab tests, X-rays, etc., can be located on one chart and can be referenced at any time. The first point of contact and "quick" registration process should be performed by a clinical professional; therefore, the patient's medical record number will be assigned, the patient will be registered into the computer system, and the patient will be examined by a medical professional all at the same time. Combining the "quick" registration process with the triage process will expedite patient processing. The complete registration process consists of the Patient Financial Services (PFS) gathering information about the patient and explains financial obligations to patients. PFS

representative's registration process is time consuming. If this process can be completed while the patient waits for a bed, needless delays can be avoided after the patient is placed in a treatment bed.

Emergency Department directors unanimously agree that a color ranking system to determine the severity of the patient's needs could expedite patient processing. The clinical staff would have a visual aid that would help them assess the patients' condition; in turn, expedite patient bed placement by determining who should be placed in a bed and in what order.

For starters, the ideal diagnosis process should consist of allowing the triage nurse to have the authority to make judgment on the severity of the patient's condition and determine if blood and urine samples should be taken in the triage unit. If it is necessary, the triage nurse with the proper training should take the samples from the patient and send them to lab so the specimen testing can begin while the patient waits in the lobby; therefore, when the patient arrives in the bed the nurse will have results in hand. Blood and urine collected at bedside would result in a patient waiting 45 minutes to an hour for the results to come back from the lab; spending unnecessary time in a bed. Other elements of an ideal diagnostic process includes, coordination of procedures (order the tests that take the longest first, so they can be well on the way or even ready by the time the faster tests are complete). All departments should readily available 24/7; they should be housed inside the ED and dedicated to the ED only. The use of protocols should be implemented. Nurses should have everything prepared and tests ordered before the physician comes in to examine the patient. Point of care testing and bedside testing

should be implemented, the ED should be appropriately staffed, and a mid-level

physician should be assigned to each ED physician (i.e. Physician Assistant or a Nurse

Table 4.2: Patient Throughput-Results

Patient Throughout		
Practical Ideal Type Categories	**Interview**	**Directors Response**
▪ There should be an immediate short registration process as soon as the patient enters the emergency department.	Yes	10 out of 10 Directors agreed that a quick registration process will allow for a faster patient flow. 1. Central Texas Medical Center- Yes 2. St. David's Medical Center- Yes 3. St. David's South- Yes 4. St. David's Round Rock- Yes 5. Seton Medical Center- Yes 6. Dell Children's Hospital- Yes 7. Brackenridge- Yes 8. South Austin Hospital- Yes 9. Cornerstone Hospital- Yes 10. Seton Medical Center- Yes
▪ The patient should be triaged by a medical professional. a. The patient should be assigned one of the four colors (red, orange, yellow, and green) based upon the severity, red being most critical and green being the least critical. b. If the patient's condition allows (they are assigned the colors of orange, yellow, or green) the patient should be sent to the waiting room. c. If the patient's condition is severe and is assigned the color red, the patient should be sent for immediate treatment. ▪ At one point the patient should go through a complete registration process. a. A patient with a color origin of orange, yellow, or green should go through the complete registration process while they wait for a bed. b. A patient with a color origin of red should go through the complete registration process at bedside when their condition allow.	Yes	10 out of 10 Directors agreed that patients should be assessed by a triage nurse after quick registration. 1. Central Texas Medical Center- Yes 2. St. David's Medical Center- Yes 3. St. David's South- Yes 4. St. David's Round Rock- Yes 5. Seton Medical Center- Yes 6. Dell Children's Hospital- Yes 7. Brackenridge- Yes 8. South Austin Hospital-Yes 9. Cornerstone Hospital- Yes 10. Seton Medical Center @ Hays-Yes 8 out of 10 Directors agreed that a color coded ranking system would be beneficial to the patient flow process and could expedite patient processing. They stated it would be a great way to identify patient acuity, by visual aid. 1. Central Texas Medical Center- Yes 2. St. David's Medical Center- Yes 3. St. David's South- Yes 4. St. David's Round Rock- Yes 5. Seton Medical Center- Yes 6. Dell Children's Hospital- Yes 7. Brackenridge- No 8. South Austin Hospital-Yes 9. Cornerstone Hospital- No 10. Seton Medical Center @ Hays-Yes

Table 4.2: *Continued*

Practical Ideal Type Categories	Interview	Directors Response
▪ Physical layout of emergency department should facilitate patient flow.	Yes	10 out of 10 Directors agreed this was a very important element that facilitates patient flow. Organization in which urgent patients need all resources available in a central location. 1. Central Texas Medical Center- Yes 2. St. David's Medical Center- Yes 3. St. David's South- Yes 4. St. David's Round Rock- Yes 5. Seton Medical Center- Yes 6. Dell Children's Hospital- Yes 7. Brackenridge- Yes 8. South Austin Hospital-Yes 9. Cornerstone Hospital- Yes 10. Seton Medical Center @ Hays-Yes

Practitioner). The ED should have its own phlebotomists, radiologists, respiratory therapists etc. housed in the ED unit and dedicated to the ED only. Quick nursing assessment should also be in place. ED directors suggested the elements of a good physical layout of an ED would be organized in which one has all resources available. The nurses' station should be in the central hub. The location of the ED should be close to surgical services, ancillary services, and it should be easily detectable and accessible from the outside.

Patient Output

Patient output is described as the factors that prevent timely disposition of patients. The patients' emergency care is complete, but they are prevented from progressing to the next stage, such as being discharged out of the ED, admitted to an

inpatient bed or returned to a skilled nursing facility (Asplin et al. 2002). Inefficient disposition of ED patients contributes to crowding for admitted and discharged patients.

Focused Interviews

According to the ED directors, to free up viable bed space and help facilitate faster patient processing; a secondary waiting room should be established inside the ED unit to accommodate patients who are slated for discharge and waiting discharge instructions. The secondary waiting room would increase the number of available beds at any given time allowing for the next waiting patient to be placed in a bed for treatment. There should be a system in place to ensure that ED beds are prepared for incoming patients in a timely manner so valuable space is not unnecessarily utilized. Technicians and nurses should be on standby to prepare empty beds for the next patient. The system should consist of a tracking board that indicates a patient has been discharged. The tracking board should display a symbol that signals the technician or nurse that the bed is ready for sanitation.

In order to expedite patient discharge nurses must have the patient's report completed and ready for the physician to review. A discharge rack should be in place at the nurses' station hub; therefore the patient charts are easily accessible and the physician is aware the patient is slated for discharge. The physician can then grab the chart and review it for patient discharge.
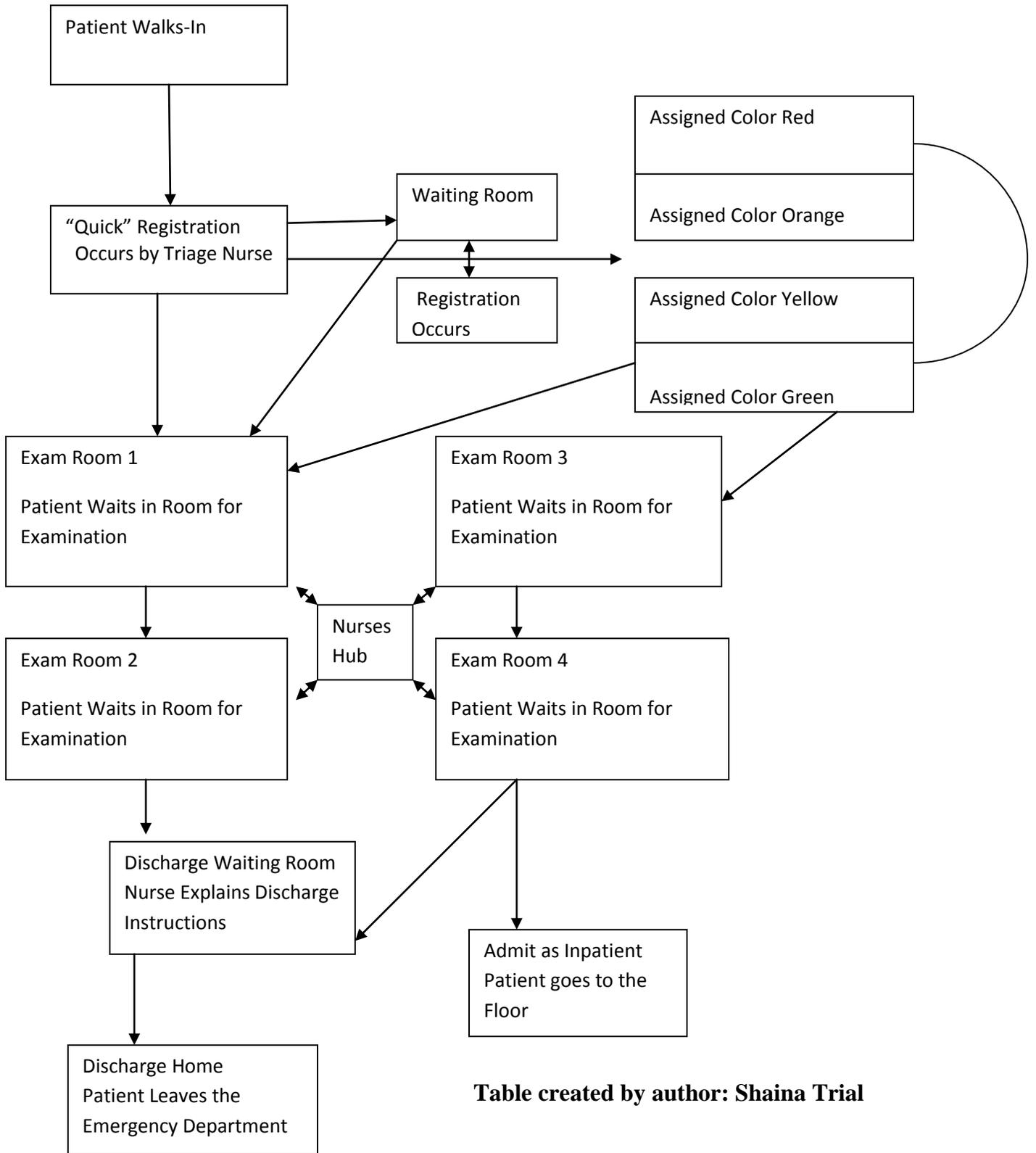
Table 4.3: Patient Output-Results

Patient Output		
Practical Ideal Type Categories	**Interview**	**Directors Response**
▪ The patient should be discharged from the emergency department. a. If needed a patient should be discharged to the floor. b. A secondary waiting room inside the emergency department should be established to maximize bed capacity. c. Clinical technicians and nurses should be on stand-by to prepare beds for next patient as soon as the prior patient is sent to the secondary waiting room.	Yes	7 out of 10 Directors agreed that discharging a patient home has its bottlenecks and a secondary waiting room would contribute to expediting patient output. They also agreed that clinical technicians and nurses should have a system in place to prepare beds for the next patient. 1. Central Texas Medical Center- Yes 2. St. David's Medical Center- Yes 3. St. David's South- Yes 4. St. David's Round Rock- No 5. Seton Medical Center- Yes 6. Dell Children's Hospital- Yes 7. Brackenridge- Yes 8. South Austin Hospital-Yes 9. Cornerstone Hospital- No 10. Seton Medical Center @ Hays-No

Accessing Patient Flow

This research helped to create an ideal model of patient processing with the use of

a flowchart. A flowchart is a pictorial representation of the steps in the patient flow

process (Joint Commission Resources Inc 2004). Particularly helpful in the beginning of

a process evaluation, a flowchart provides a common understanding of the process, helps

staff identify steps that cause rework or inefficiency, and gives a starting point for

deciding on actions that will improve the process. A flowchart can be used to identify

bottlenecks in the patient flow process. Indicators can be used to determine where in the

process the bottlenecks occur.   For example, if support services processes are suspected

of negatively impacting patient flow in the ED, indicators can be used to assess how

quickly laboratory and radiology tests results are being turned around, and how quickly

house-keeping is turning over inpatient beds, or how long it takes for patient to be

registered or admitted (Derlet 2001). The flowchart should incorporate the patient's

arrival to discharging home. The flowchart below, created by the author, indicates the

ideal patient processing model.

Model 4.4: Ideal Model Results

Patient Walks-In

"Quick" Registration Occurs by Triage Nurse

Waiting Room

Registration Occurs

Assigned Color Red
Assigned Color Orange

Assigned Color Yellow
Assigned Color Green

Exam Room 1 Patient Waits in Room for Examination

Exam Room 3 Patient Waits in Room for Examination

Nurses Hub

Exam Room 2 Patient Waits in Room for Examination

Exam Room 4 Patient Waits in Room for Examination

Discharge Waiting Room Nurse Explains Discharge Instructions

Admit as Inpatient Patient goes to the Floor

Discharge Home Patient Leaves the Emergency Department

Table created by author: Shaina Trial

Chapter 5
Conclusion

In analyzing the results from direct observation and multiple interviews with the directors of Emergency Departments at several central Texas hospitals, it is clear that several EDs are committed to implementing an ideal patient processing plan within their organization. While many preliminary elements of an ideal process currently exist in the organizations, a cohesive process has yet to be completed. Following are recommendations for fully implementing an ideal patient processing model.

The patient input, -throughput, and -output conceptual model of ED crowding may be useful for organizing a research, policy, and operations management agenda to alleviate the problem. Such a model illustrates the need for a systems approach with integrated rather than piecemeal solutions for ED crowding. I would recommend four general areas of ED crowding that require future research. First, a hospital must develop measures of ED crowding that are valid, reliable, and sensitive to changes throughout time. Second, research is needed to identify the most important causes of ED crowding from each component of the model (input, throughout, output). Third, the effect of ED crowding on the quality of patient care must be assessed. And finally, interventions to reduce ED crowding need to be evaluated. The development of valid and reliable measures of the factors contributing to ED crowding is the first step in developing a coherent research and policy agenda.

Each component of an ideal model contains concepts that should be measured consistently across sites and throughout time. Within the input component, reproducible

measures of the number and complexity of patients seeking emergency care are needed. Where possible, these measures should reflect the local ambulatory care system's ability to deliver unscheduled care. The throughput component identifies the need to measure ED capacity, workload (i.e., urgency- and complexity adjusted occupancy rates), and efficiency across sites. Key output concepts include measurement of the hospital's capacity to admit new patients, the efficiency of the admission process, and the efficiency of the hospital inpatient discharge process.

One marker of inefficient ED care that has been linked to adverse outcomes is patients who leave without completing treatment. This marker includes patients who leave the ED before being treated, those who leave after starting treatment with a physician but before their treatment is completed, and those who leave against medical advice. In studies from Los Angeles and San Francisco, CA, cohorts of patients who left EDs without being treated were followed up to document patient outcomes. A small but troubling proportion of these patients (≤11%) were admitted to a hospital within one week of the initial visit, and several required emergency surgery, indicating that leave-without-completing treatment rates might be a useful marker of adverse outcomes associated with ED crowding (Asplin et al. 2003).

The final recommendation in model-driven research and policy agenda is to develop and test interventions to alleviate ED crowding. The relative importance of operational versus policy solutions is not yet clear; however, both types of interventions likely will be needed. In the search for operational solutions, a fundamental question emerges: Who is responsible for the efficiency of care delivery in the hospital? To find operational solutions for crowding, medical and administrative leaders must accept

greater responsibility for the efficiency of care delivery at their institutions. Hospital leaders should routinely measure key throughput and turn-around times (with accountability for meeting institutional goals), improve the efficiency of ancillary and support services, and use information technology that supports care delivery.

Policy solutions for ED crowding are also needed, yet they are more difficult to define and implement. Again, it is helpful to look at each component of the patient input, throughput, and output to identify how policies contribute to or alleviate ED crowding.

The problem of ED crowding has, to various degrees, captured the attention and energy of emergency providers, hospital administrators, policymakers, and the public across the United States. It is time to use research, policy, and operations-management agendas to remedy the problem. The elements of the patient input, throughput, and output conceptual model provide a practical framework for these agendas. I hope the model helps guide researchers and policymakers through the problem of ED crowding and to an effective solution.

*For similar Applied Research Projects dealing with the practical ideal type category methodology you can consult with Victoriano Casas (2006), Shawn Cox (2006), Heather Gatlin (2006), Agustin Marquez (2008), and Dustin McLemore (2008).

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Appendix

Input

How would you rate the importance of an after hour clinic (additional to the ED) available for minor emergency patients?

At what point should a hospital decide they need to open a clinic to accommodate the number of minor emergency patients?

Should the number of patients seen per physician during peak operating hours in the emergency room be the litmus tests to deciding on the operation of a new clinic?

Should the clinic be in-house or in another location?

Do you think the benefits out way the costs of having a facility in-house rather than having one off campus?

Should patients being admitted to the hospital by their physician be seen by an emergency room physician before they are sent to the floor, or is there no need?

Do you think a physician referred-patient should be at minimum, triaged independently of the emergency room to insure that they do not have an emergency situation?

Under what condition should an emergency medical professional examine the referred patient?

Based upon your experience can you identify three other elements that will help contribute to patient input?

Throughput

Do you think it is a good idea to have an immediate short registration process or do you recommend a complete registration at the time of entry?

Do you think there are time saving benefits associated with having a patient electronically register themselves at a kiosk or tablet PC?

What other solutions do you have get patients registered quickly?

What is your opinion on a color ranking system for incoming patients based upon severity?

Do you feel a color coded ranking system would help expedite patient bed placement?

Based upon your knowledge and experience do you think the triage nurse should have the authority to make a decision whether or not blood should be drawn and urine should be taken?

If yes, should the procedure be done in the triage room by the nurse?

Do you feel this will expedite patient processing?

What is the best/fastest way to collect information from a patient?

When is the best time to complete the registration process?

At bedside?

While they wait for a room?

At what point should you see orange to green patients in an overcrowded emergency department?

At what point would you consider a green patient to wait too long in an overcrowded emergency department?

What is the best timely manner to see a light colored patient?

In your opinion what is the ideal diagnostic process?

Based upon your experience can you identify three other elements that will help contribute to patient throughput?

What are the elements of a "good" physical layout?

Output

Do you think that in order to free up bed space, a patient who is slated for discharge shall be moved from their bed to a secondary waiting room to await their discharge instructions?

Do you think a secondary waiting room would increase the number of bed space at any given time?

Do you have provisions to ensure that emergency room beds are prepared for incoming patients at a timely manner so valuable bed space is not tied up?

In order to expedite turnover of beds should a system be in place where clinical technicians and nurses are on stand-by to prepare the beds for the next patient?

If yes, what should the system entail?

Based upon your expert experience do you have any other suggestions on how to expedite the patient discharge process?