

Greet, Treat and Street: Nursing in an Emergency Setting

Jeanie Miskelly, Patricia Oliver, Shannon Bauman, Mamie Aldridge

Human Computer Interaction

Georgia Institute of Technology

Atlanta, GA USA

{miskelly, patricia, baumas}@cc.gatech.edu, gtg176d@mail.gatech.edu

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1. INTRODUCTION

The nursing industry has been brought to the forefront of the public's awareness in recent years by newspapers and television programs reporting on a nursing shortage. The shortage is both a supply and demand issue. The demand is increasing due to an aging baby-boomer population who require more health care services. However, the baby boom was followed by a baby bust, resulting in fewer Generation Xers entering the workforce [7]. According to the American Association of Colleges of Nursing, enrollment into entry-level baccalaureate programs has just started to rise after a six-year drop, but this promising trend may still be insufficient. The average age of a nurse is currently 41.9, and half of the RN workforce will reach retirement age within the next 15 years [7]. Without the continuous flow of nurses entering the profession to replace those who retire, it is projected that the supply of working RNs will be 20 percent below requirements by 2020 [7].

The motivation for this study includes the desire to understand nurses' work with respect to the nursing shortages, to understand how they gain, use, and share knowledge to complete their duties, and to learn the current role technology plays in their job. This insight into their culture will allow us to make suggestions as to how technology could potentially optimize their collaborative work. Because nurses play a critical role in the health of society, information gained via this study can potentially impact all members of society.

1.1. METHODOLOGY

Because of the complexity of our research questions and the potential richness of the data to be collected, we felt this study lent itself to qualitative methods. Therefore, we conducted observations and ethnographic interviews of nurses and personnel working in the emergency departments (ER) at two hospitals (referred to as Hospital A and Hospital B) located in the southeastern part of the United States. The hospitals' Emergency Rooms were not trauma centers and primarily receive patients with cardiac or breathing problems and patients with minor injuries. We divided our four-person team into two sub-teams with each sub-team assigned to research one of the two hospitals. Each researcher spent 2 – 6 hours per week for six weeks at the hospital. Near the end of the study, one researcher from each group went to the other hospital to observe first hand differences in the two hospitals' Emergency Rooms.

Consent forms were signed by and collected from all informants to whom we asked questions. In all, we talked to 14 nurses, 2 nurse technicians, 2 unit secretaries, 1 physician, and 1 paramedic. All interviews were conducted during the informants' shifts. They usually worked 12-hour shifts so there was no desire for them to stay late in order to be interviewed. Most interviews took place at the nurses' station. At times, colleagues were easily within earshot and sometimes would make additional comments or nod in approval to answers. It was common for interviews to be interrupted so informants could attend to a patient or talk with colleagues.

Most of our observations were made from the area around the nurses' station. When a nurse was at the station and did not look extremely busy, we would ask if he or she had time to talk with us. Because the nurses knew we were studying them, sometimes individuals would offer explanations to what was currently going on or what they were currently doing. Multiple interviews with the same informant were rare for two reasons. First, the researcher's visits to the emergency department may have differed from previous informants' work schedules. Second, previous informants may have been too busy to talk with us during later visits. The researchers constantly strived to not get in the way of the nurses' work.

Our interviewing techniques changed during the study. We initially attempted to ask “grand tour” questions and let answers lead to more questions. However, in this fast-paced environment where interviews were often interrupted and not completed, more direct questions, at times even ‘on the fly’, offered better explanations. For example, after observing the movement of a patient’s chart from one person to another or from one person to a slot, we asked an informant to describe this flow or process. And after observing nurses use a particular artifact, we asked what it was and what it was used for.

In addition to interviews, we collected common artifacts used by the emergency department staff. Most of these artifacts were blank forms that are completed in the course of patient care and are included in all, or most, patient charts.

A special effort was made to ensure confidentiality and anonymity, not only of the informants and their hospital, but also of the patients at the hospital during our visits. We did not record any names of the patients or their reasons for visiting the hospital in our field notes. Once a patient was assigned a room in the emergency department, we did not enter the room. One researcher was able to observe Triage of 3 patients and to later interview the Triage nurse. In spite of this, we have limited observations of how a nurse interacts with a patient. Most information pertaining to providing patient treatment was obtained through observing and interviewing the nurses.

1.2. LITERATURE REVIEW

As previously stated, the motivation for this study included the desire to understand information sharing among nurses, their work responsibilities, and their use of technology. We are not the first group of researchers to study elements of shared knowledge amongst nurses and how they share this knowledge to complete their duties. Examples of other research in these areas are studies performed by Sigma Theta Tau International (Honor Society of Nursing) [4] and Alberta Association of Registered Nurses [1]. Previous research has also been conducted in the role technology plays in the ER. Examples are a study by the Maryland Nursing Technology Taskforce [9], the California HealthCare Foundation [3], and RAND Health [5]. In addition to these studies, numerous medical hospitals, such as Vanderbilt University Medical Center, are researching the role of technology in the hospital. Each of the following paragraphs is a synopsis of what some of these aforementioned studies have found out about the use of technology in nursing.

1.2.1. What Others Have Found Out About the Role of Technology

The Maryland Nursing Technology Taskforce is a group of regional healthcare and informatics professionals with the goal of fighting the nursing shortage by exploring the role of technology in nursing in Maryland. They identify technology-driven point of care applications, consult with technology-driven point of care experts, examine present uses of technologies, and explore the potential uses of technology in the future nursing workplace. Their research is currently ongoing and the findings have not been listed.

The California HealthCare Foundation has also explored how technology solutions can support nurses during the growing nursing shortage. Their report cites the experiences of health care organizations that have implemented technology that benefited areas such as nurse scheduling, mobile communication, patient education, computerized patient record, and many others. They have found that technology increases efficiency and frees up more time for nurses to handle direct care.

RAND Health is the nation's largest private health care research organization. In the area of health informatics and technology, RAND is researching electronic prescribing and electronic medical records. Both of these studies are ongoing and the findings have not been released.

1.2.2. Related Problems

In addition to these studies, research projects about information sharing, work responsibilities during a shortage, and the role of technology on the job have also been conducted in several other areas. Examples of such areas are teachers, IT personnel, and librarians. The following paragraphs give information about the teacher shortage, information sharing amongst teachers, and the role of technology in the classroom.

Since the early 1990s, there has been a significant teacher shortage for America's public schools. Various internet websites show a shortage of approximately 2 million teachers over the next decade. Furthermore, half of the population of teachers are expected to retire over the next 10 years and the number of children in the public school system is expected to increase by 3 million by 2006 [12]. When teacher retirement and an increase in the number of students in school are combined with the high number of teachers leaving their job profession for another one, the result is a high turnover rate and a huge shortage [2]. This huge shortage puts tremendous pressure on current teachers to do more. This includes teaching more and assisting more in their students' personal as well as mental growth.

As for research on information sharing, teachers often gain knowledge about their students, knowledge about their teaching methods, and reinforcement for their roles in the classroom through this method. Information sharing exists between the teacher and parent, other teachers, counselors, and the principal. These various groups share information on topics such as student performance, history and needs, administrative information and teaching mechanisms.

There have also been numerous research projects on the vital role that technology has played in the classroom. Adding technology such as digital projectors and PCs to the classroom has enabled teachers to give more visual presentations. Furthermore, with the Internet in the classrooms, there is an endless fountain of information available for the students to research. Computers in the classroom are also efficient tutors for certain types of class material and can simulate real-world projects that the student may encounter when they enter the job market.

2. FINDINGS

2.1. NURSES AS EXPERT

In our study of nurses a number of themes emerged. Several themes revolved around specific roles, while other themes revolved around the Emergency Room system. The nursing role in the United States is a demanding role. Preparation for a career as a Registered Nurse (RN) usually entails earning a BS in Nursing. Other routes to an RN are Associate Degree programs and Diploma Nursing programs. Associated Degree programs are usually 2-year college-based programs, while Diploma programs are 2-3 year Hospital-based programs. The majority of nursing programs are BSN programs, followed by Associated Degree programs. Diploma nursing programs are on the decline. BSN nursing program requirements usually include a significant number of courses in science and mathematics, as well as various clinical and practicum based classes.

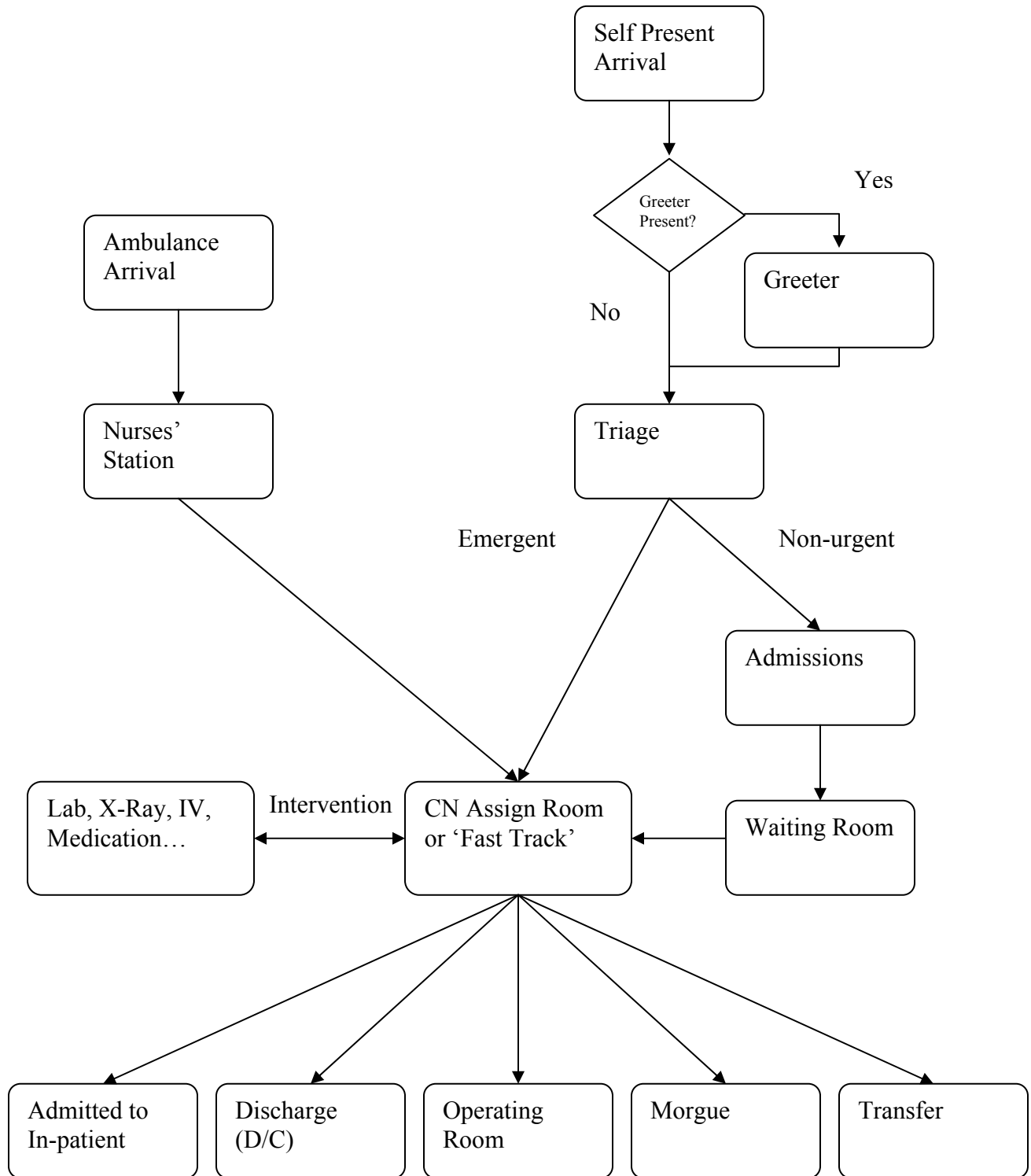
Emergency Room nurses must perform at an expert level of knowledge in their field. The time critical nature of their role requires them to rapidly gather and synthesize information, draw upon a substantial reserve of knowledge and experience, and quickly render judgment. The terms knowledge, skill and experience were mentioned during interviews in both sites. Judgment was mentioned in one interview. Due to the, at times, time-critical, life and death decisions that nurses make within ERs, it is our analysis that a nurse's possession of judgment coupled with experience is vital to successful ER nursing.

2.2. GREET, TREAT AND STREET

The Emergency Room realm is, by nature, a transitory place. Viewing the Emergency Room as a system enables us to study the overarching purpose or goal of the ER, and the manner in which the goal is supported by the various procedures, roles, activities and artifacts. ER roles include Charge Nurse, Staff Nurses, Temporary Nurses, Physicians, Nurse Technicians, Unit Secretary (Nursing Unit Clerk), Admissions staff, Greeters, Housekeeping, as well as other roles. The various roles, procedures and ER artifacts combine as the knowledge source or repository for the ER.

Each nurse has particular knowledge about her assigned patient, such as the patient's vital signs or whether the patient arrived with family members or friends. The Charge Nurse has information about staffing assignments, incoming ambulances, admissions and bed shortages. The Physician has detailed information about the diagnosis, treatment and ultimate disposition of the patient. The different roles, and the supporting artifacts work together to achieve the ER system's goal. This goal is captured in the "greet, treat and street" expression which surfaced several times in interviews. Other interviews described the ER flow as "they come in," we "meet immediate need," stabilize them, perform "patient interventions," followed by "disposition" (admit, discharge, transfer). The ER system evaluates patients and intervenes as needed to stabilize them. Once the patient is stabilized, the ER system ideally transitions them to another place, such as to their home, to a room in the hospital or to another facility via transfer. The ER system is designed to meet emergent and urgent patient needs that call for immediate action. In order to have the necessary resources to meet incoming emergencies, it is necessary for ERs to move patients through the system in an expeditious manner, and to effectively prioritize patient intake and treatment. They cannot allow the facility to be full of patients who are stabilized and ready for disposition. Diagram 1 depicts the flow of a patient through the ER system at Hospital A. The flow through Hospital B is similar. The ER system receives self-arrival patients in the waiting room. If a greeter is present, the greeter will sign the patient in prior to patient movement to the waiting room. If no greeter is present, the patient is directed to perform self sign-in. The Triage Nurse performs rapid assessment of each waiting patient's ABC's (Airway, Breathing and Circulation). Patients with emergent or urgent presenting symptoms receive higher priority for Triage. Based upon priority and arrival queue, the Triage Nurse processes patients through Triage, where initial assessments and re-prioritization occurs. Triage non-urgent patients transition to Admissions where insurance, billing and other patient information is collected. Upon completion of Admissions tasks, the patient transitions either back to the waiting room, or an ER room. If Express Care is open, and the patient complaint is minor, the patient will be transitioned to Express Care. Urgent or emergent patients are quickly transitioned to an ER room, with Admissions staff gathering the necessary information from friends, family or the patient's bedside. Ambulance arrivals are taken directly to the Charge Nurse's station, where they are assigned an ER room. Once admitted to ER, the patient is further evaluated, and stabilized. When stabilized, the ER physician determines patient disposition: admitted to in-patient, discharge, operating room, morgue or transfer to another facility.

Diagram 1: Hospital A ER Patient Flow



Just as the patient flows through the ER system, patient information, in form of the patient chart, flows through the ER system. The patient chart flows from Triage to the Physician, Unit Secretary (Nursing Unit Clerk) and assigned ER Room Nurse. After patient disposition, the chart is removed from the flow of active charts then processed according to Hospital policies.

ERs are not planned to be long term care facilities, but to be facilities in which one's stay is effective and brief. The ER system goal is not always readily apparent to or understood by the patients who come to be treated. As in many hospital ER systems, the ERs in Hospitals A and B receive patients with minor complaints. By law, ERs must treat all incoming patients, and cannot turn any away. Incoming patients are prioritized and categorized based on the severity of their condition. The categories from high to low are emergent, urgent, non-urgent and minor. Emergent patients require intervention within a specific timeframe, and therefore have highest priority. Urgent patients also require intervention within a specific timeframe, and have secondary priority. As ER staff focus on treatment of high priority patients (emergent and urgent), patients with minor complaints may experience a wait, and may not be cared for in order of arrival.

2.2.1. Interferences with Greet, Treat and Street

A number of circumstances can frustrate the ER system goal. The arrival of too many patients with minor complaints can interfere with the system goal of timely patient disposition. At times patients desire a longer stay than is necessary, prompting nurses to remark, this is "not the Hilton." On one occasion, a patient refused to leave unless he/she was first provided with breakfast. Eventually, the nurse had to contact Security to remove the patient from the room. On another occasion, the patient took drastic measures to remain on site, urinating and defecating on himself/herself. Patients who do not wish to leave present dilemmas for nurses. Nurses have been training in patient care, yet in these cases, the nurse must cease care and encourage the patient to leave.

Another circumstance which conspires to frustrate "greet, treat and street" is lack of available hospital beds. Nurses indicated ideal ER stay duration as less than 4 or 5 hours. However, when the hospital has no available beds and the patient has been admitted to hospital in-patient status, the patient may spend significantly more hours in the ER. When there are no beds available in ER, the hospital goes on diversion. EMS is notified that they should not bring patients to this hospital, however, legally the hospital cannot turn any patients away. In one instance at Hospital B, the Emergency Room was on Diversion. Two nurses were discussing bed shortage issues as follows:

BN5: "Bedless all day long and then all of a sudden at 6p – all these beds suddenly become available?"

BN3: "That's because all the doctors finally came in to discharge them."

At times, a patient needs to be transported to another facility (Hospital). This might be due to a patient's or their primary care doctor's preference for another facility. Transfers are also ordered due to the nature of the patient's condition. If another hospital specializes in that condition, the patient may be transported there. Such transports occur via ambulance. If currently available ambulances are tied up with emergencies and if the patient to be transported is not urgent, the patient may have to wait a considerable length of time for transport. When this occurs, the goal of patient disposition is delayed.

2.3. INFORMATION CENTERS

Throughout the course of the observations of both hospitals, one of the recurring themes was the massive amount of information that is stored as well as transferred in the ER environment. In some cases, information storage could mean simply knowledge built up over the years in the heads of the various personnel. In other cases information was stored in computers, forms, and books. The transfer of information also took various forms, from traditional verbal communication, to non-verbal forms of communication such as written and digital communication.

The hierarchy of the nurses reflects the importance of information within a hospital setting. There is a range of nursing levels, from Level One to Level Four. Level One nurses are typically right out of school. They are constantly learning more about the profession on a daily basis. Level Two nurses are the category in which the majority of the nurses belong. This is the standard professional nurse. Level Three nurses have the added ability to be a Charge Nurse. More about charge nurses is described below. Level Four nurses have added managerial capabilities. These levels of nurses reflect the hierarchy of the system that recognizes nurses as information rich resources.

2.3.1. Charge nurse

During every shift there is a head nurse known as the Charge Nurse. This position can only be held by nurses with specific qualifications. During one shift, there is often more than one person qualified for this position, yet only one nurse will be the charge nurse during that shift, while the other qualified nurses will be standard staff nurses at that time. During a different shift, the same nurse who was previously a Charge Nurse may now be staff nurse.

“The charge nurse, she is our main resource” – staff nurse

The Charge Nurse is cognizant of the current state of the entire ER. He or she keeps track of which patients are in which rooms, how many patients are being looked at, which nurses are assigned to which ER zones, and what patients are on the slate to arrive (either via walk in or via ambulance). By the time an ambulance arrives at the ER, the charge nurse generally already has been briefed (by radio) regarding the patient’s condition and what has already been done for the patient. In addition, she has knowledge of which room and to which nurse this patient will be assigned.

The charge nurse acts as the definitive resource for the staff nurses during the shift. If there is information that a staff nurse does not know, the question will be brought to the charge nurse. Questions about the protocols for certain situations are also brought to the charge nurse.

The Charge Nurse also takes on additional information gathering tasks. Traditionally, it will be the Charge Nurse that will attend the twice-daily bed meetings. At these meetings, personnel from all over the hospital will meet to discuss how many beds are open in the various departments. This provides the ER Charge Nurse and other meeting attendees with information that enables them to manage their resources, and to know when and where they can move their patients.

2.3.2. Staff Nurse

The nurses at the hospital retain large amounts of information internally, and know the processes to obtain other information to which they need access. Their educational foundation and work

experience enables them to build up, and retain, large amounts of procedural information. They also know to talk to the Charge Nurse to receive various answers, to the Unit Secretary for information on the current state of the system, and even to the doctors and other departments for specialized information.

In one instance, a nurse asked a doctor for information on a “J-pouch” procedure, and the doctor explained the procedure in detail. This nurse seemed to be very interested in learning and obtaining new information. She stated “It is good for a nurse out of school to come to a medical school hospital to get to see all of these new things”.

2.3.3. Unit Secretary

Within the ER the Unit Secretary (also referred to as the Unit Clerk by some) plays a very central role in information transmittal. This person had a more administrative role, staying behind a desk throughout much of the shift. The Unit Secretary could be seen as a central router or hub for certain types of information within the Emergency Room system. Figure 2 reveals the degree to which the Unit Secretary is essential in the flow of information.

This person, in essence, is the gatherer, organizer, and dispenser of information. Information can come in from the Staff Nurses, from the Charge Nurse, from doctors, or from other departments. The Charge Nurse then sorts this information, and then catalogs it into paperwork and computer systems so that the nurses and doctors can then access the information.

The staff seems to understand the importance of the Unit Secretary. Multiple times during interviews praise was given to the Unit Secretary.

“The Unit Clerk, that is one person who knows everything...” – staff nurse

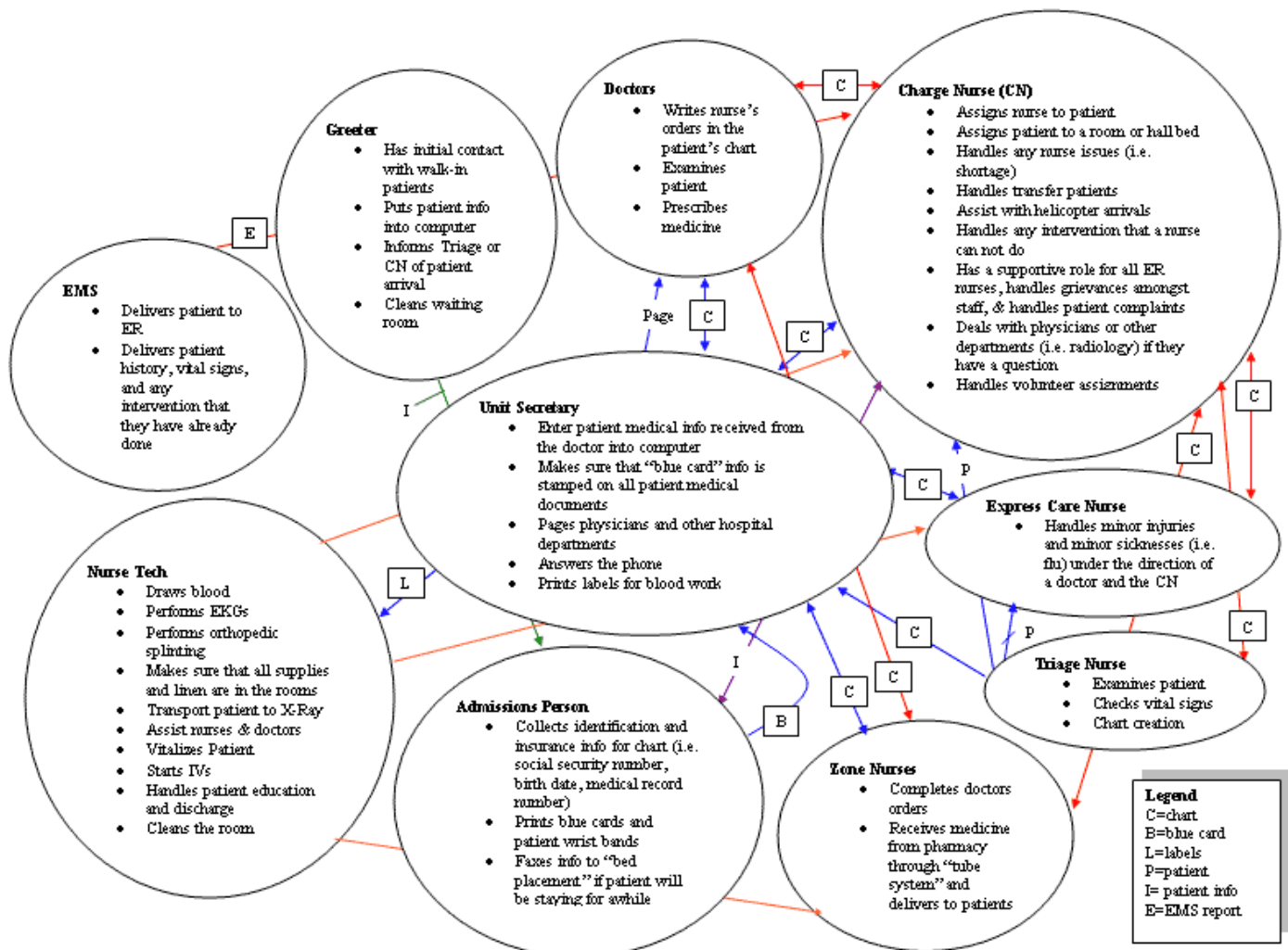


Diagram 2: ER Communication and Responsibilities

2.3.4. Flow of Patient Chart

Diagram 3 displays the flow of the patients' charts through Hospital A's ER and Diagram 4 shows the chart flow of Hospital B's ER. In both hospitals studied, this chart is the primary source of detailed information about a patient. The diagrams describe how the chart initiates with the triage nurse if the patient is a "walk-in" or by the Charge Nurse or other nurse if the patient arrives by ambulance. The diagram then goes on to show the cycle of the chart between the doctor, the nurse, and the Unit Secretary until the point where the patient is discharged.

Diagram 3: Hospital A ER Patient Chart Flow

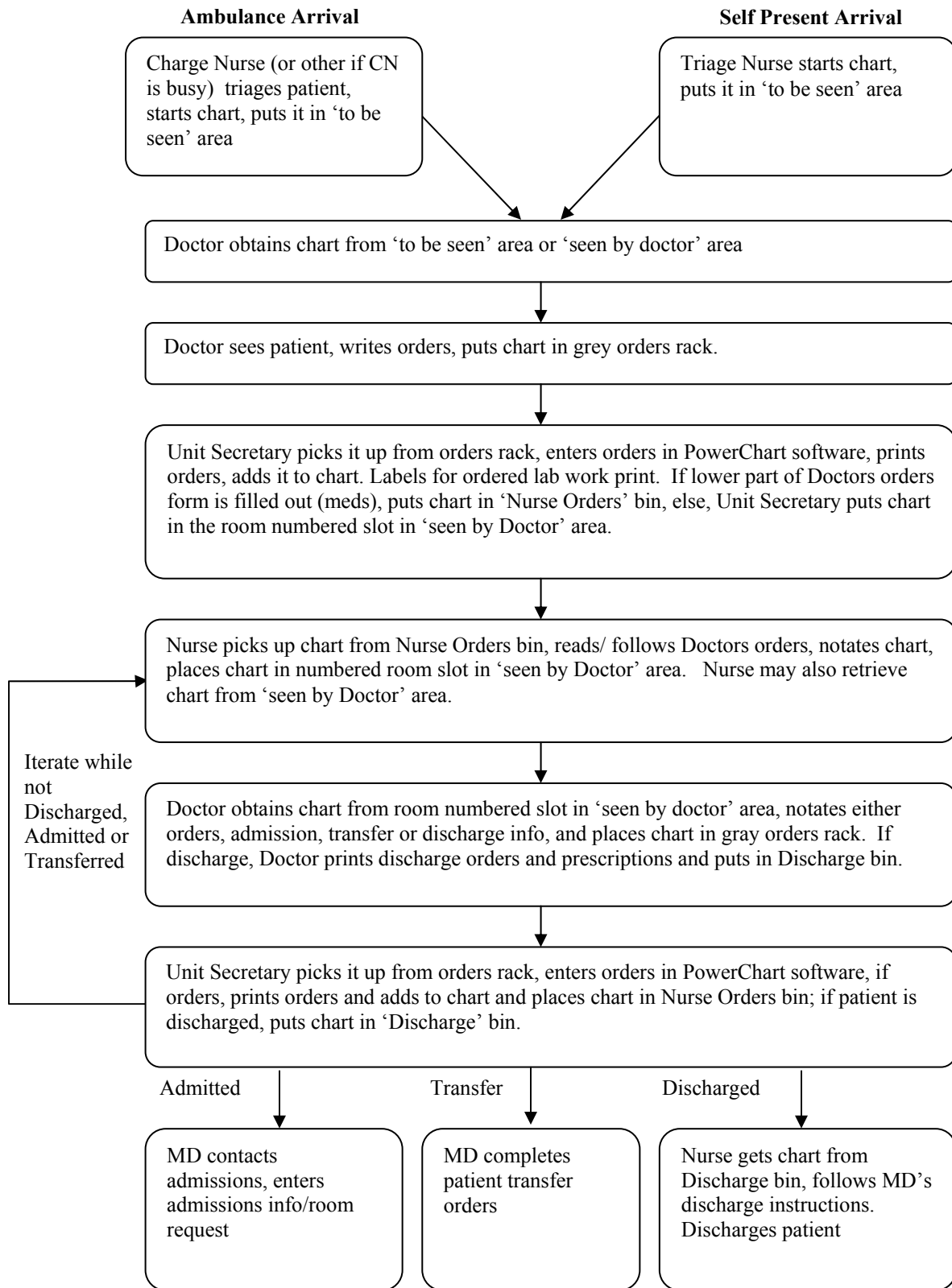
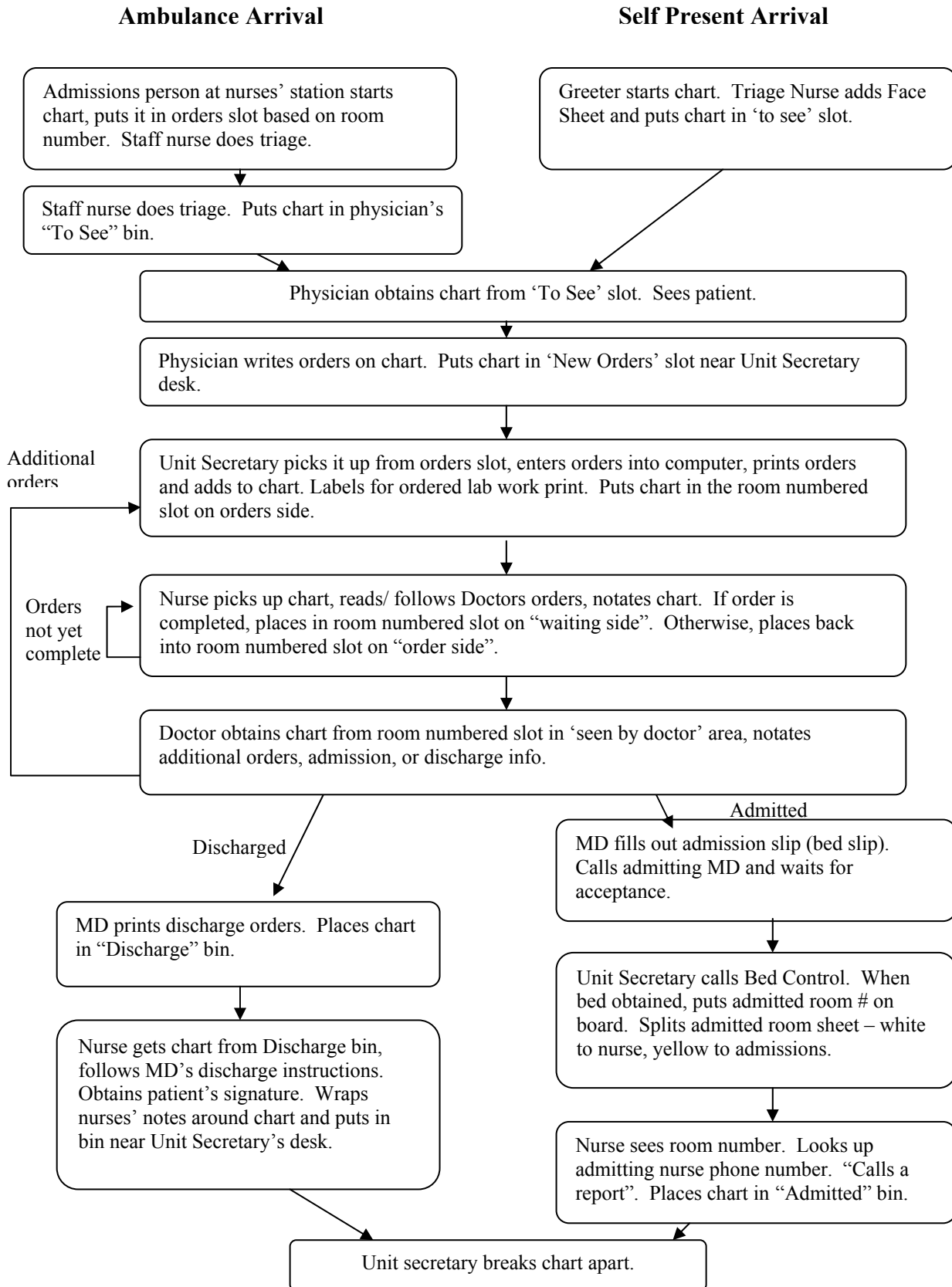


Diagram 4: Hospital B ER Patient Chart Flow



2.3.5. Artifacts and Modes of Communication

With the massive amounts of information that flow throughout the ER and hospital as a whole, various methods and modes of communication have evolved within the department. Diagram 5 attempts to describe some of these ways of communicating.

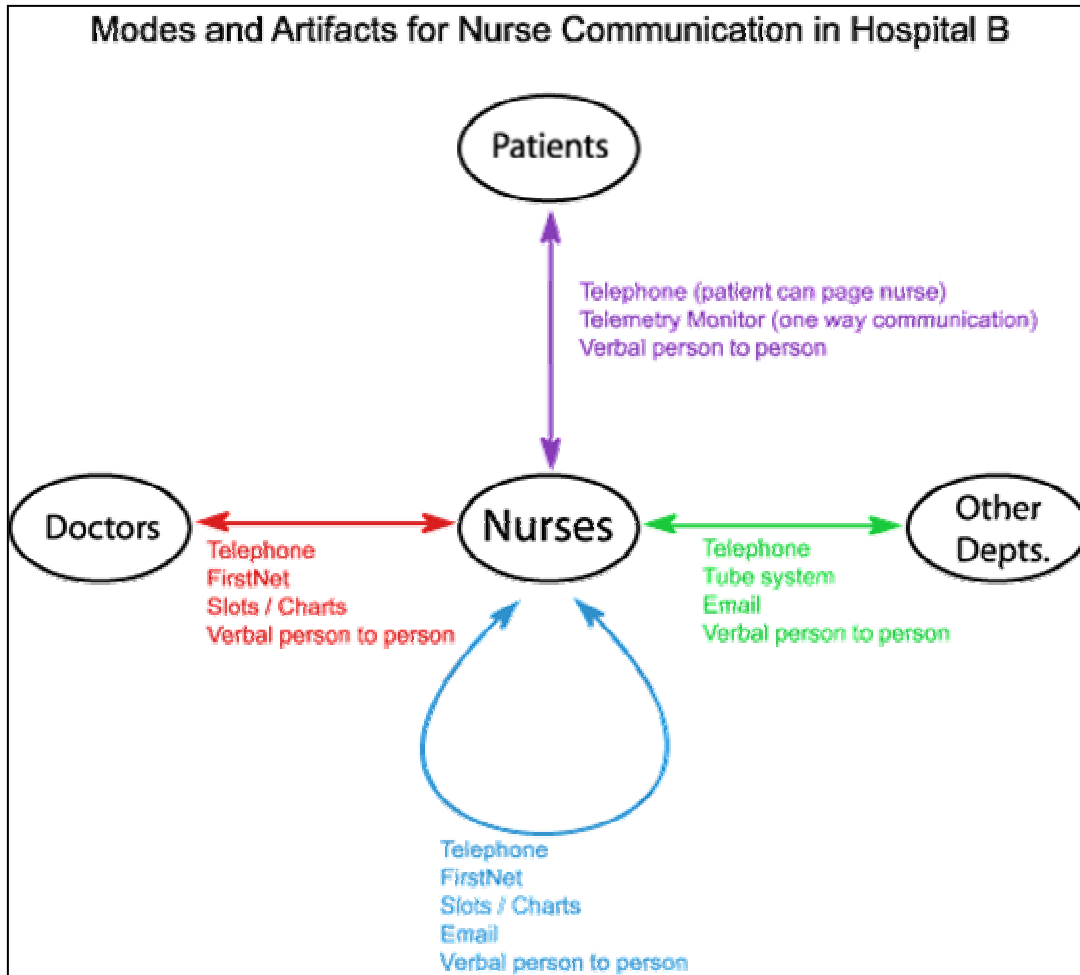


Diagram 5: Hospital B Artifacts for Nurse Communication

One of the most prevalent modes of communication in Hospital B was communicating by traditional phones. Doctors, Nurse Technicians, Nurses, and the Charge Nurse all carried around portable (but not cellular) phones. In addition, the Unit secretary made constant use of the phone on her desk. The charge nurse used the phone to communicate with all of the various parties within the ER, as well as contacted other departments, and on occasion took calls from outside the hospital from concerned past patients or family members. To accommodate all of these calls, the Charge Nurse in Hospital B was often seen with a wireless headset telephone that allowed her to take and make calls from anywhere in the department, and still allow her to have her hands free. These phones also are equipped with multiple phone lines, thereby giving the nurse a greater ability to stay interconnected to the ER and the hospital.

In addition to the patient charts mentioned above, some patient information was held on the computer system. Hospital A was using a text based system called “LogiCare” that allowed nurses to see what patient was in each room, as well as see some basic information on the patient such as if the patient had been seen yet by a doctor. Hospital B had recently installed a more graphical interface for their computer system called “FirstNet”. The use of icons allowed for more information to be displayed and for nurses to be able to quickly glance at the system to determine the current state of patients and the ER as a whole. The layout of the computer systems in the hospital with FirstNet also added to the transfer of information. The nurses’ station contained 4 traditional computer monitors that were all hooked in to the FirstNet software. In addition, there were two large flat screen monitor boards that hung from the ceiling. Any nurse within the nurses’ station was able to look up and see the current state of the ER by looking at these boards. This information was also available in each of the patients’ rooms.

In addition, email was used for group communication, usually of administrative nature. A pneumatic tube system was set up for transferring documents, prescriptions, and lab work between the ER and other departments. Finally, heart monitors were conveniently set up in a central location (the nurses’ station) which provided nurses with ready access to their patients heart monitors.

Perhaps above all other forms of communication in frequency and amount of information transmitted, was the person-to-person communication. This was the method often used for transferring large amounts of information. An example is ‘giving a report’. This is in essence an information dump from one person to another. When an ambulance arrives, the ambulance personnel ‘gives a report’ to the Charge Nurse and perhaps again to the nurse who will receive the patient. Some snippets of such a report given from a paramedic to a nurse follows:

“I have a patient.... radiating.... pale... non-diaphoretic, patient has medical history of ... blood pressure is at... we have an IV established” – Paramedic

When a nurse hands over a patient to another nurse during a shift change, they will give a report. Even when a charge nurse hands over to another charge nurse, they will give a report on the entire state of the ER at the moment. When a patient is admitted to another department in the hospital, the ER nurse will call the patient’s new nurse and “call a report”. Information exchanged about the patient in these reports include medications given, tests taken and test results, patient statistics such as blood pressure, as well as descriptions about the patients such as “alert”, “normal” or “pleasant”. Reports are given to, and received by Charge Nurses, Staff Nurses, Triage Nurses, Physicians, and a number of other staff members. It is interesting to note that the amount of information exchanges varies in each of these situations.

Another form of verbal communication is “Verbal Orders”. These are verbal communications from the doctor that tell the nurse what needs to be done with one of the patients. Often a nurse will take these verbal orders and write them down on the patient’s chart. One nurse stated that they aren’t supposed to take verbal orders from the doctor, but do take them at times as dictated by circumstances. When they do so, they chart it on the patient’s chart so as to legally exonerate themselves in the event that the following the order causes problems.

These and other methods are solutions that have been created to deal with the flood of information that is received at a constant interval. Other possible solutions are discussed in the discussion section later on.

2.5. LOCATIONS

The layout of the nurse station and the items within the nurse station also play a part in information sharing. One example is in the layout of the patient chart slots. These slots are labeled by room number, and hold the charts for the patient that is currently in that room. In both hospitals there are two different sets of slots. The different sets of slots convey their own set of information about the patient's charts. In both cases, the position of a chart conveys information about the current state of the patient within the "Greet, Treat, and Street" flow. For example, if a chart is placed in one set of slots, it means that some step has not yet been taken (in one hospital it means they have not yet been placed in the room, and in the other hospital it means that they have not yet been seen by the doctor). This location information is yet another way in which nurses and the ER environment have dealt with the massive amounts of information that they deal with.

2.6. PATIENT CARE

Customer Care is a buzzword in today's business community, where customer satisfaction and loyalty have been shown to correlate with revenue, profitability and stock prices [8]. More importantly, within the ER, lack of patient (customer) satisfaction can lead to significant consequences ranging from disruption of ER flow to litigation. Within the ER, nurses are responsible for managing patient care. Many of their responsibilities mirror business customer care responsibilities, with an exponential increase in the ramifications of customer dissatisfaction. Research has shown that customer expectations generally fall into five categories: Tangibles, Reliability, Responsiveness, Assurance, and Empathy [10].

The term Tangibles refers to the image the system or organization projects. ER nurses impact this category of customer expectation by presenting a professional image, effective and efficient patient assessment and intervention, ensuring patient rooms are appropriately stocked and cleaned, and verifying that equipment is in working order.

The customer expectation of Reliability involves accuracy and dependability. ER nurses manage patient attitude through expertise and accuracy in activities such as patient interviewing, drawing blood work and initiating IVs. Reliability is also evinced through adherence to standard patient monitoring schedules based on patient categorization. ER nurses manage patient affect via proactive communication, and establishing expectations. Examples of ER nurse proactive communication include providing patients with information concerning unavoidable delays (Physician, lab results, room assignment and transport, etc.).

Responsiveness is another theme customer care management. ER nurses effectively utilize their knowledge and experience, the ER system processes and external ER artifacts to efficiently manage their time. ER nurses must continually prioritize their activities based on patient status. This means that some patients may require, and receive higher levels of care than other patients. ER nurses in Hospitals A and B are generally responsive to patient requests for assistance in the form of blankets, beverages, information and telephone calls. There are occasions, however, when non-urgent patient requests are eclipsed by urgent patient care. When this occurs, ER nurses work to establish realistic expectations among their non-urgent patients. In one such case,

when the non-urgent patient complained, the nurse explained to the patient that he/she had been tied up with caring for an urgent patient.

Assurance is achieved as nurses build patient trust through their knowledge, judgment and demonstrated expertise. Patients develop trust in the ER nurse and in the ER system through timely care, accurate assessments and successful interventions (drawing blood, initiating IVs, administering medications).

Empathy is the final aspect of customer care. Research has shown that in many cases, customers would not have taken legal action if the company had demonstrated empathy. ER nurses often establish an effective empathic relationship with the patient during Triage or ER room care. Most ER nurses demonstrate an understanding of the patient's social needs, and will engage in small talk with their patients. This has the effect of putting the patient at ease and promoting a feeling that they are valued. ER nurses often engage in proactive communication with patients when it appears that patient expectations will not be met. Examples observed were letting family or friends know if there is a delay in room assignment or patient transport. Nurses communicated with patients if the ER physician was held up or if lab results were delayed.

ER nurse patient care aligns well with the above dimensions of customer care, but incorporates many other dimensions that are not present in the customer care model. One such dimension is patient monitoring. Patient care requires ER nurses to periodically monitor patient vital signs and take action as appropriate. The time periods between monitoring are driven by patient health issues. ER nurses must prioritize this monitoring with other tasks that also might be of a high priority nature. ER nurses must continually manage their time, prioritize patient needs and re-prioritize patient status as indicated by physicians, lab results or results from other assessments.

Another dimension of ER nurse patient care that is not present in the customer care model is the nature of the situations that ER nurses can face. Although, as noted earlier in this paper, the ERs in Hospitals A and B are not trauma centers, the staff, at times, does deal with time critical, life and death patient care issues. Decisions made and actions taken or not taken can have tremendous impact on a patient's health and well-being. Understandably, this increases the cognitive and stress load of ER nurses.

Additionally, ER nurses are in an interesting cultural position within the medical world. They are part of the overall ER team. They have a nursing chain of command and do not directly report to ER physicians. However, the physician wields considerable authority. They work with the physician, but not as a truly equal team member. Just as many people in the business world speak of having to manage their manager, ensuring patient care means that ER nurses must sometimes manage the ER physicians. Obviously, this must be done very tactfully. In one instance, the ER nurse knew that the patient was adamant about leaving, but that doing so would place him or her at great health risk. The nurse knew he/she did not have the authority to call Security to keep the patient on site. Therefore, the nurse dropped several hints to the ER physician regarding the patient's desires. The ER physician failed to understand the hint and proceeded to lecture the nurse on why the patient should not, could not be allowed to leave. The nurse listened patiently, then carefully led the physician to take the necessary action (directing a call to Security and the patient's caregiver) so that the patient would not bolt. Another instance that highlighted the constrained role of the nurse surfaced during an interview. The interviewee described a situation that would call for the ER nurse to "go over" a physician's "head." An example of when this would occur is as follows. If the patient has a critically low heart rate, and the nurse notifies the physician, and the physician directs the nurse to "don't do anything," but the family wants the ER to do everything possible to save the patient, the nurse needs to "go over his head." Although the

ER system does work together as a team, these instances highlight a breakdown in the system's teamwork. It appears that ER nurses are not free to make suggestions to or requests of ER physicians regarding patient care. This aspect of the culture appears to be an impediment to expeditious and optimal patient care.

2.6.1. Confidentiality

Another aspect of customer/patient care is patient confidentiality. In 1996 the United States Congress passed the Health Insurance Portability and Accountability Act (HIPAA), with Final Rules release August 14, 2002. HIPAA Privacy Regulations provide national standards regarding the confidentiality of individual's protected health information. Protected health information is any individually identifiable health information, e.g. health information that can be linked or traced to an individual.

“Generally, health information is considered "identifiable" if it contains any of the following elements: (1) names; (2) geographic subdivision (e.g., street address, city, county and zip code); (3) names of relatives; (4) name of employer; (5) birthdate; (6) date of treatments; (7) telephone numbers; (8) fax numbers; (9) e-mail address; (10) SSN; (11) medical record number; (12) health plan beneficiary number; (13) account number; (14) license number; (15) vehicle identifiers, serial numbers, license plate numbers; (16) device identifiers and serial numbers; (17) URLs; (18) Internet Protocol address numbers; (19) biometric identifiers, including finger or voice prints; (20) full face photographic images and other comparable images; and (21) any other unique identifying number, characteristic, or code.” [6]

Consequences for failure to comply with HIPAA are severe, with both civil and criminal penalties, ranging from monetary penalties (fines) up to \$250,000 and imprisonment from 1 to 10 years. The ER nurses at Hospitals A and B consistently demonstrated HIPAA compliance, by maintaining their patient's confidentiality and by ensuring that the researchers did not violate patient confidentiality. The nurses assumed responsibility for their own professional HIPAA compliance, and for managing other's HIPAA compliance for patients within their realm of responsibility. HIPAA compliance, though maintained at both hospitals, could be enhanced by redesigning Hospital A's patient sign-in process. The current process relies upon the patient physically turning their sign-in sheet over after sign-in. The current process could be re-designed to make it more difficult for a patient to leave their information in a public place.

2.7. CULTURAL CENTER

In both hospitals studied, there was a definite culture that was unique to the ER environment. There is usually a 4 to 1 ratio of nurses to physicians working at one time in the ER. Nurses at both hospitals mentioned that the physician-nurse relationship in the ER is different than a “regular floor nurse”. One nurse at Hospital A said, “the physicians treat ER nurses with more respect as far as competence than floor nurses”. Another at Hospital B said they have very different interactions. “We are much more partners with physicians in ER than other departments.” However, other comments indicate the physicians still do not treat nurses with enough respect. One nurse said that many doctors still feel that “a good nurse is one with a weak mind and a strong back.” This is frustrating and disheartening for many nurses because they have training in science, but are treated as a common laborer. A nurse commenting on this mentality said, “a lot of the newer ones [doctors] are better”.

The ER is a fast-paced, high-stress environment where nurses have to make decisions quickly. When talking about the environment, a charge nurse mentioned that some people enjoy the

“adrenaline rush” of working in the ER. If a patient has certain symptoms, the nurse is required to perform standing orders prior to notifying a physician. They are constantly treating patients, some in critical states. The ER staff works closely with and depends upon one another. We regularly observed the staff hugging, patting, and laughing with each other. These interactions help create a comfortable and supportive environment which is important when aspects of a job can be unpleasant. A nurse mentioned they have a “pack mentality”. The current staff welcomes new employees, but it may take 3 – 6 months to integrate into the group. Acceptance is based on skill level, ability to do the job and cooperation with others in the pack.

Food is very important to the ER staff. There is usually food available at the nurses’ station allowing people to “graze”. The nurses can only eat a meal when they are away from their patients, and multiple people leaving at the same time is impossible. Because they do not get a chance to share meals with each other, grazing allows for social interaction with food.

As mentioned earlier, the study focus was nurses within two hospital Emergency Rooms. These two ERs are each part of a hospital and the hospital exercises considerable influence on the respective ERs. Both hospitals are teaching hospitals that are associated with a local university. There exists a push-pull relationship between the local university and the ERs. The two hospitals are part of a greater healthcare organization that exerts considerable influence and control upon both hospitals, and consequently, their ERs. The 2 hospital’s ERs are further influenced by the hospital/healthcare community at large and by the CDC and WHO. Diagram 6 depicts this cultural model.

Cultural Model for the ER

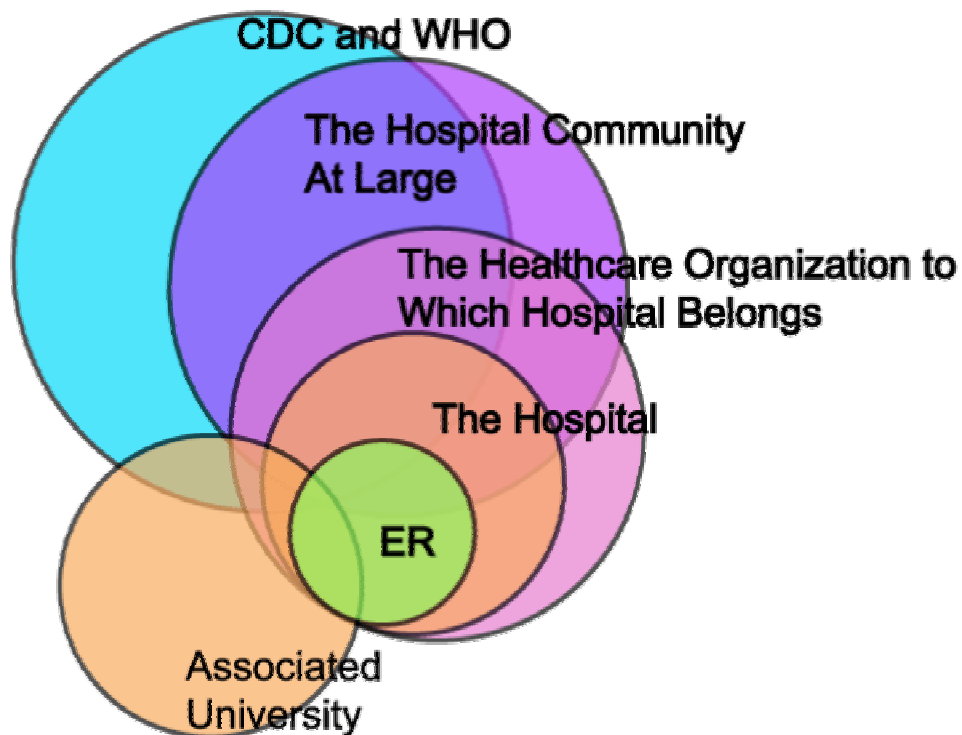


Diagram 6: Cultural Model of the ER

3. DISCUSSION

A number of themes emerged from our observations and interview data. From these themes, one that bears further exploration and explication deals with situations when a nurse must work around a common procedure. What happens when there is a situation in which the nurses must work around? According to a nurse at Hospital A, "most workarounds are alerted by word of mouth." In the case of a contagion, in addition to informing the staff by word of mouth, isolation signs are placed on the room door and appropriate gear is outside of the door for people to use. This also applies to rooms that have patients in them who have had radiation treatments. The staff makes every effort to protect themselves and others.

We have now reached the point in the paper where we will discuss our framework, make suggestions on why things are the way they are, reflect on our findings, and suggest possible solutions to the problems that we observed.

3.1. FRAMEWORK

One way of analyzing the ER system is to interpret it through the framework of distributed cognition. According to the textbook Human-Computer Interaction, distributed cognition is "a theoretical framework that explains cognitive activities as embodied and situated within the context in which they occur. It accounts for the socially and cognitively distributed work activities of a group of people and their interactional use of artifacts. This includes distributed problem solving, decision-making, and shared memory." [11].

Distributed cognition is evidenced by the entire ER system. Each person's (nurse, unit secretary, doctor, and nurse tech) knowledge about their duties is affected by the other persons working in the ER and the supporting artifacts. For example, the movement/placement of the patients chart aids in distributed cognition. The location of the artifact contains knowledge about what is the patient's status in the ER and what functions the nurse, nurse tech, or unit secretary must complete. If a chart is in the 'Nurses Orders' bin all nurses will look at the number on the chart to see if the chart pertains to them. If the room number on the chart matches the one that a nurse is in charge of, he/she will collect the chart and view it to see what are his/her duties. The doctors also check their bin to see if the unit secretary has placed something in it. Furthermore, the unit secretary checks all of the bins for charts to see if a doctor has placed something there for him/her to type.

Also, the patients themselves aid in distributed cognition in the ER. The nurses, doctors, or nurse techs usually have to probe the patients to find out what intervention needs to take place. They have to use their senses (i.e. touching, listening, and visual) as well as expertise to get information out of the patient.

The computers are also all networked to promote distributed learning of a patient's status and duties that the nurse/nurse tech must complete. The charge nurse, nurses, and nurse tech can use the system, LogiCare in Hospital A and FirstNet in hospital B, to see/update what has been completed with a patient.

3.2. REASONS WHY THERE ARE HUBS OF INFORMATION & ACTIVITY

The two main hubs of activity in the ER are the Unit Secretary (Nursing Unit Clerk) and the Charge Nurse. As previously stated, the Charge Nurse has information about staffing assignments, incoming ambulances, admissions and bed shortages. The Unit Secretary, on the other hand, gathers, organizes, and dispenses all information. Both of these persons have a very vital and supportive role in the ER. The Charge Nurse has more of a managerial role and the Unit Secretary has more of a communicative role.

3.3. RECOMMENDATIONS FOR PATIENTS WITH SAME NAME

One situation that arose at Hospital A's ER was that two patients with the same last name were in the ER at the same time. The ER system at this particular ER refers to patients by their last name. When this situation occurs, there is a potential for patient mix-up. This represents a breakdown in the system. To overcome the system breakdown at this the nurses have developed and implemented a 'name alert' system. However, even with the name alert system, there is still the potential for patient mix-ups. One solution to this problem is for Hospital A's ER to adopt the patient referent system used in Hospital B's ER. In that ER, staff refer to patients by room number. In addition to this, when there are two or more persons with the same last name, the FirstNet system automatically writes the names in italics on the FirstNet Board. In addition, the patients' names could be either written in red or highlighted in red on the large display monitors in the nurses' station. The color red is often used to highlight important information or to draw attention and the more that the ER does to distinguish the patients, the less likely an ER patient mix-up would occur. It is our understanding that Hospital A will soon be transitioning to FirstNet. We recommend that Hospital A adopt the patient referent practices used in Hospital B in conjunction with their transition to the FirstNet system. In addition, the Charge Nurse may also wish to continue their current practice of vocalizing 'name alert' warnings.

3.4. IMPLICATIONS FOR SYSTEM DESIGN

Perhaps within the next five years all nurses, admissions persons, and doctors will be walking around with lightweight wireless tablet PCs. This would eliminate some of the paper forms that are in the ER and give instant access to patient information. If a patient's medical information is entered digitally it can be uploaded to a server very efficiently so that many can simultaneously access the information. This could potentially improve the instance that Hospital A has with duplicate manual chart sheets where they notate medication. This could also potentially solve the 'hoarding' problem in Hospital B where some nurses hoard patient information by carrying all their nurses notes on a clipboard instead of placing them in the slots. There would no longer be a need for physical charts; a nurse could simply just press a button on the UI of the tablet PC to view a patient's electronic chart. Doctors' orders could be transmitted from their tablet PCs to the nurses' in order for the nurse to find out his/her orders. Also, the UI could provide instant access to protocols or standing orders based on the patient's presenting symptoms. Every chart can have a tracking mechanism that allows a staff member to look up the location of a chart at any time. Additionally, an image of the 'blue card' could appear on the UI and each window/document related to a particular patient would automatically contain this 'blue card' information. (Note: The ER may still need to keep the 'blue cards' if other departments require that the information on the card be placed on all of their paper forms.)

An alternate display device could be a head-mounted display. These devices attach to a headband or eyeglass frames and project an image which is viewable by the user. The image is similar to a display on a computer monitor. In essence, the device is a wearable computer, allowing a person to maximize use of their hands, bodily position and physical location within one's work

environment. We are not recommending the head-mounted display device for several reasons. Such devices require an input device which is often carried on the waist in a small pack. Interaction with these devices is uncommon and the technique has a steep learning curve. The nurses also mentioned a preference for being able to view the entire [current] chart at a glance. We believe that the input tablet has higher potential for displaying the large amount of data in a patient chart, and minimize the need for scrolling. Sharing information between staff members is common and the tablet would facilitate such collaborative work in ways that the head mounted display could not. A large part of the nurse's job is interacting with patients on a personal level. Eyes are very important for personal communication and establishing rapport. Nurse to patient non-verbal eye contact communication should not be blocked or impeded by technical hardware.

The UI on the tablet PC would have a screen that lists all items that are available for viewing on the large monitor in the nursing station. In addition to this, it would be great if this UI could include a layout of the ER with rooms marked based on workarounds (i.e. contagion). Also because the UI would be installed on the new tablet PCs, the nurses and doctors could still write their notes by hand but with a stylus instead of a pen. The system could then either store the information as it was written or convert it to typed text. The UI would also have to have a reminder system which would remind the nurses to complete interrupted or unfinished tasks such as writing their notes. Writing these notes is crucial for nurses because if they do not document per procedures, they may end up being legally liable for something that may not be their fault. The UI should not only remind them to enter in their notes but also require them to enter appropriate items in the patient's chart depending upon patient category or diagnosis. Potential items are listed below.

- patient reactions to medications
- procedures: e.g. patient to & from X-ray
- conscious sedation needs
- vital signs every 5-10 minutes
- oxygen saturation
- narcotics reversal medications (in the event that they need to bring the patient out from medication)
- patient activities that might impact their license CYA, e.g. patient non-cooperative (or family)
- how patient was transported home
- all medications, labs, IVs, all procedures done in ER

These items are examples of information that a nurse is legally responsible for noting in the patient's chart.

An alternate method for entering information is a voice recognition system (VRS). As the type of information is relatively limited, and is categorized, VRS is a viable alternative to written or typed input. The system could be flexibly designed to accept written, typed and voice input. Furthermore, because ER nursing work requires use of one's hands, VRS would enable the nurses to attend to patient needs while updating their charts.

Because ER nursing work requires use of one's hands, a light-weight backpack or carrying strap would also have to be designed for the tablet PC. The device would have to be very durable because it may be dropped on occasions. Moreover, for security reasons, these machines would have to be password protected and would need to have a security tag on them. The security tag would be needed to prevent someone from leaving the hospital with one of these devices. Nurses

indicated that login could potentially be a bottleneck. Logging into the system every few minutes would slow them down. The tablet PC could enable quick login via a thumb-print identification. This would provide almost instant access to the chart. Additionally, the VRS system could provide voice recognition identification login. These login methods would provide secure and rapid system access.

Finally, the ER would need to have sufficient technical support in the event that technical problems occur. This may require a full time technician at the hospital at all times to assist when doctors and nurses have technical problems with their tablet PCs. Alternately, designated staff members could be provided with additional training that would enable them to troubleshoot technical difficulties for their shift. On several occasions, the nurses at Hospital A complained about LogiCare being down repeatedly. Currently, the IT support person is not physically in the hospital during evening hour and on the weekends. A system of this magnitude would require adequate technical support coverage for the ER 24/7.

3.5. FUTURE RESEARCH

One theme that warrants future research is the Bed Control system. Currently it takes awhile to get a bed for admitted patients. Further research is required to figure out why this occurs and what can be done to optimize the situation. Another area of future research to explore would be how the redesign of Hospital B's ER (Diagram 7: Hospital B nurses station) has helped/hindered the performance of the nurses. One nurse at Hospital B indicated that while the remodel of the ER area is successful and really nice, it has a few areas which were less than optimal. Perhaps, at the same time, Hospital A's ER (Diagram 8: Hospital A nurses station, Diagram 9: Hospital A ER) can be studied to see if the space is sufficient in meeting the needs of the nurses. Both of these are area in which we did not have enough time to examine during our study.

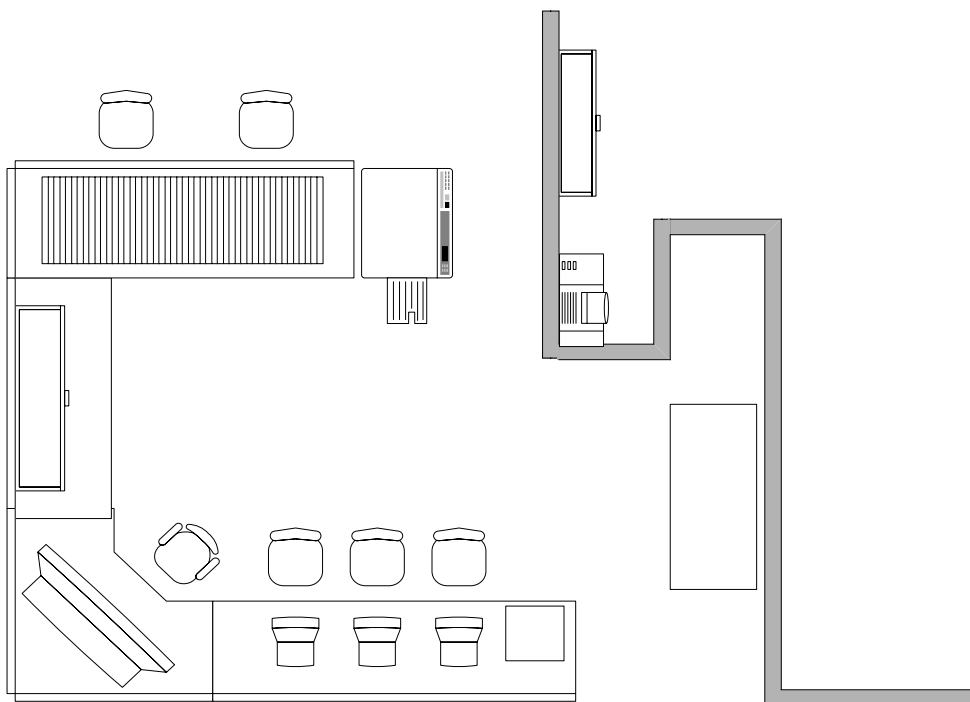


Diagram 7: Hospital B nursing station

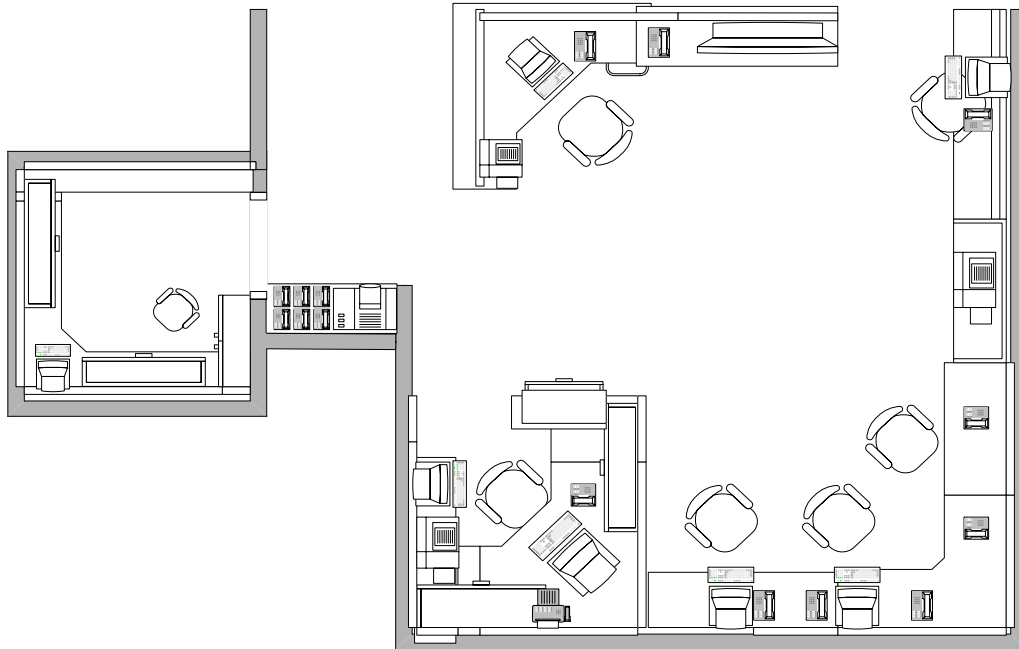


Diagram 8: Hospital A nursing station

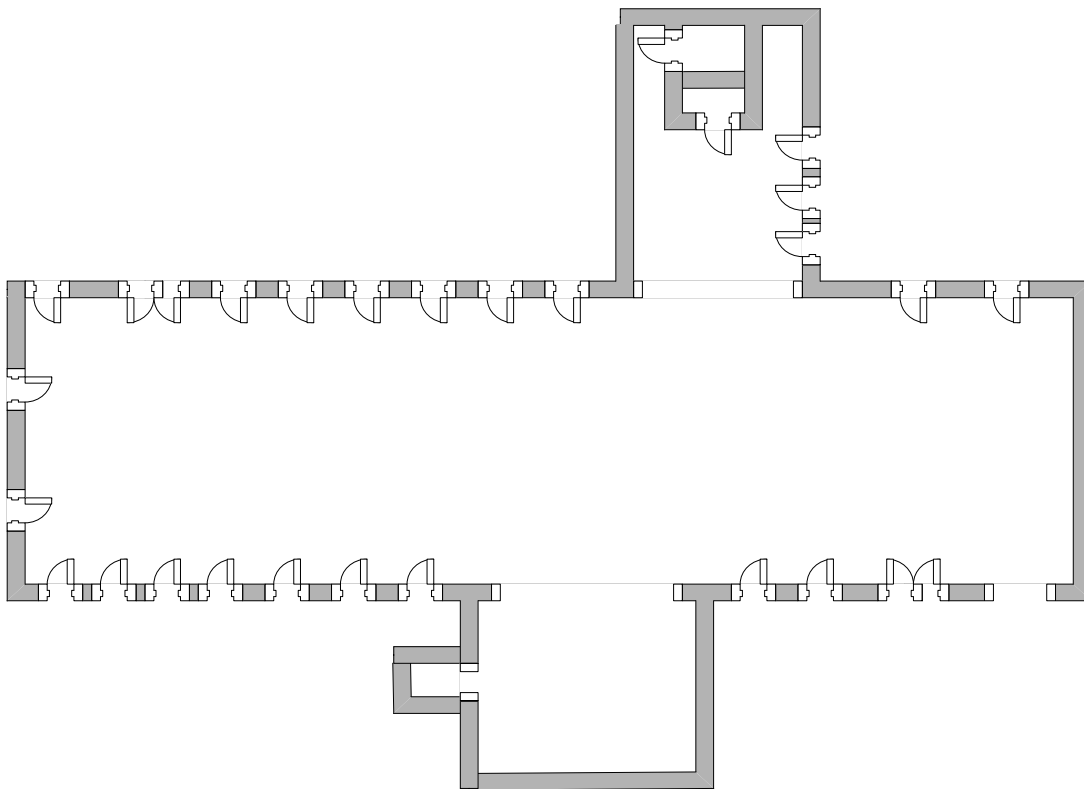


Diagram 9: Hospital A ER

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