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December 13, 2016

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Dear Ms. Singleton:

With this letter, I am enclosing a report outlining the need for real time locating systems in hospitals across the nation. There is an increasing issue with patient overcrowding in emergency departments. It is time for hospitals to implement a solution to the overcrowding to decrease mortality and increase safety for each of their patients. This letter is intended for the hospital administration at various hospitals throughout America. This topic is relevant to healthcare professionals because it increases safety for patients, decreases overcrowding, and increases revenue for hospitals.

I have been researching real time locating systems for close to two months now. I believe that this system is necessary because of the data I found to support the claim that overcrowding is a common issue in many emergency departments across the nation. In this research, I also learned how detrimental a delay in patient care can actually be to the patient's overall wellbeing. Real time locating systems decrease delay in care by allowing hospital staff to know where patients, staff, and equipment are located instantaneously. This in turn helps with overlying issue of overcrowding in emergency departments by cutting down on the issue of time wasted searching for various equipment and people needed in critical situations.

In conclusion of reading this recommendation report I have provided, I hope that you find all the information included helpful in solving the overcrowding issue found in many emergency departments across the nation. If you wish to discuss my research further or have any questions arise, I am available by email at jclark323@sycamores.indstate.edu or by phone (435) 124-4903 Monday, Wednesday, and Friday during regular business hours. Thank you for your time.

Sincerely,

Jacinda Clark

Enclosure: Report

REAL TIME LOCATING SYSTEMS: THE SOLUTION TO OVERCROWDING

By

Jacinda Clark

Nursing, Junior 1, Indiana State University

December 13, 2016

Submitted to

Ms. Singleton, English Instructor

English 305T – Technical Writing

Written for

Hospital Administrators

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ABSTRACT

Real time locating system (RTLS), is a system that can solve the underlying issue of patient overcrowding in emergency departments. This system is the answer hospital health care administrators are searching for to the ongoing problem of overcrowding in emergency departments. RTLS has been used in emergency departments to track equipment, patients, and hospital staff. By doing this, RTLS saves time wasted on searching for these different entities. The system is made up of various components that go into the functionality of the system. Each part has a unique function that is imperative to the success of the system as a whole. Before a hospital implements a system such as this, administration must consider a few different points to judge if the system is necessary for the hospital. After the system is deemed necessary, the benefits of the system are nearly endless. It saves the hospital money, makes money for the hospital, and increases patient satisfaction all while solving the problem of overcrowding in the emergency department. RTLS is the necessary step to be taken in solving the problem of patient overcrowding in emergency departments.

INTRODUCTION

Problem

Generally, when a patient presents to the emergency department they are seeking fast acting emergent care. They want to be seen within minutes of walking through the door because they are suffering from a critical injury or disease. Delayed care due to overcrowding can cause serious issues in delivery of patient care. This then can cause an increase in mortality in patients who arrive during busy times in the emergency department. According to an article by McCarthy, there is a 34% increase in mortality for a patient arriving during a crowded time in the emergency department (2011). Arriving to an overcrowded emergency department significantly increases the odds of a patient's mortality. Delay of care can be detrimental to a patient's outcome.

Overcrowding is a serious issue, and it is only getting worse. In urban areas, emergency departments in hospitals are shrinking, while at the same time the amount of people seeking care from an emergency department is increasing by 44% (Barish, McGauly & Arnold, 2012). This means hospitals are running out of places to put their patients that are in need of care. During each day, hospitals are having to divert ambulances to other emergency departments multiple times a day because there is nowhere to fit them (Horwitz, Green, & Bradley, 2010). This causes delay in patient care which can then worsen the outcome of the patient. Overcrowding does not only endanger the patient and put them at risk; it affects the staff as well.

In same article by McCarthy, she poses many questions as to why there is an increase in mortality with overcrowding in an emergency department. Questions such as, does

overcrowding affect the thinking ability of physicians (2011)? Do they base their care decisions on how to solve the issue of overcrowding instead of what is best for the patient (McCarthy, 2011)? It is interesting to take into consideration the added stress that overcrowding can cause the staff members who are working and how it affects the type of care they provide to their patients. Overcrowding is bad for all those involved from the patients to the staff. There must be a solution to this problem that is putting so many at risk physically, mentally, and emotionally.

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Solution

Real time locating systems (RTLS) are the answer to assisting with the overcrowding issues in emergency departments. RTLS locates patients, equipment, and staff in real time by picking up their transmission from the technology within the system (Kamel Boulos & Berry, 2012). Using this system would save the hospital so much time wasted searching for individuals and equipment. The benefits of real time locating systems do not end with the decrease in overcrowding in emergency departments. Its potential for success reaches far beyond that. Real time locating systems are what is needed by hospital administration to assist medical professionals in care of patients to cut down on unnecessary time wasted looking for patients, equipment, and staff, thus assisting in the solution of overcrowding.

DISCUSSION

Components

Real time locating systems are composed of various components. Each system must have the necessary components to work effectively. Without one part of the system the functionality is

nonexistent. It is important for hospital administration and health care workers to understand how each piece of the system works and why each piece of equipment is important. They must fully understand the concept of the system and its components to be able to use it effectively and efficiently. If they are not using the system to its fullest capacity it will not play as major of a roll in decreasing crowding rates in emergency departments. The components include the following:

Tags or Badges

Tags or badges are the physical components of the system that are placed on the patient, equipment, or staff member. The tags or badges are what transmits the location of the above listed entities. Tags are placed on equipment and badges are placed on staff and patients (Ekahau, 2015). This signal that the tags put off is similar to what a GPS signal does. The tag or badge puts off this signal that allows staff to know where it is continuously. They are lightweight and can be affixed quite easily. According to a visual found on Centrak's website, the tags that staff wear are about the size of a credit card, and they hang behind the staff workers ID badge (2016). This feature is nice because it is not going to cause an annoyance for the staff or patient who has to wear them. The signal from the tags or badges is picked up using radio frequency by the access points (Ekahue, 2015). Due to the transmission being in radio frequency, it allows the system to be successful even in areas of low Wi-Fi connection. This means that the system should not run into issues of failure due to lack of Wi-Fi in an area. The tags and badges are the first component of the system. Once they send out their signal it is picked up by the next component of the system.

Access Points

The radio frequency transmitted by tags or badges is picked up and received by access points. Access points are the physical components that pick up the transmission. They are wireless and often adhere to the ceiling. Multiple tags or badges can run off of one access point (Ekahau, 2015). According to Versus, approximately 3,000 tags per minute can be picked up by one sensor (2016). That is a ton of tags or badges that can be picked up by one access point. The access points would be placed in various locations all throughout the hospital so that equipment, patients, and staff are able to be continuously monitored. Having multiple tags and badges be able to run off of one access point saves the hospital money and it is visually appealing. Access points are hardly noticeable by patients because of their location on the ceiling. This keeps the access points out of the way and safe from damage and getting unplugged which could causing issues with the system. Sometimes access points will have issues with transmitting signal even though they are out of way of damage and getting unplugged.

Beacons

Beacons are placed in areas of the hospital where access points are not able to pick up transmitted information. They use infrared technology to pick up transmitted information (Ekahau, 2015). The use of infrared technology is why the beacons are preferred in areas of low Wi-Fi connection. The infrared technology does not require Wi-Fi connection in the same way that access points do (Ekahau, 2015). It is functional with very limited Wi-Fi connection. Beacons are necessary for the success of RTLS because in many hospitals there can be issues with Wi-Fi connections in various locations all throughout the hospitals. With the use of beacons, loss of connection and signal can be avoided which will decrease potential issues with

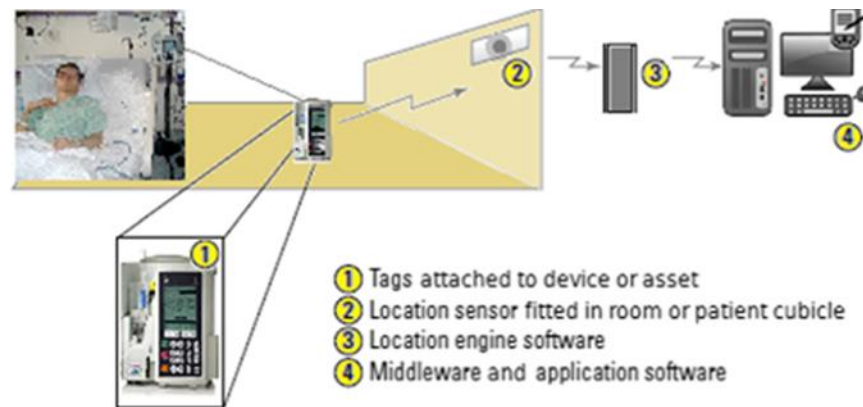
the beacons. They are comparable to an extension of an access point and are necessary for effective and smooth transmission of the signal. Once the beacons have picked up the transmission that the access points could not reach, they send it to the next component of the system.

System Controlling Software

After the information is collected by the access point or beacon, it is then sent to the system controlling software. Once here, it is logged into the software where an algorithm calculates the location of the patient, equipment, or staff member (Ekahau, 2015). Figure 1: RTLS

Transmission shows the progression of the transmission from the tag or badge to the system control software. This software can then take these locations of the patient, equipment, or staff members and can put them into analytical reports (Ekahau, 2015). These reports can be used in a multitude of ways but effectively in research studies of the hospital. These studies could be used in a variety of ways to help the hospital see the effectiveness of their patient workflow. This software has a variety of features to be used, but one that is especially helpful is its ability to compute the battery life of the tags and badges (Ekahau, 2015). This is nice because it allows staff to know when to change the battery, and it prevents the staff from going awhile without a functioning tag due to a dead battery. Each feature of the system controlling software is extremely useful in the success of the system, and they play a huge part in the success of the system as a whole. The system controlling software is what ties together all the components to create a system that increases the functionality of patient work flow, and decreases the problem of overcrowding in emergency departments.

Figure 1: RTLS Transmission



Source: Kamel Boulos, M. N., & Berry, G. *Real-time locating systems (RTLS) in healthcare: a condensed primer*. (p. 2).

Considerations Prior to Implementation

With a system such as RTLS there are many components that go into its success as well as many steps. To successfully implement an RTLS system, there are a few things that must be considered before implementing. Is a patient tracking system even necessary? This is the first question administrators should ask themselves. This is something that can be figured out by going back and identifying if there are issues within the flow of patients throughout the hospital (California HealthCare Foundation, 2011). What entities will be tracked and how often will results be looked over (California HealthCare Foundation, 2011)? What is tracked must be taken into consideration. Administrators should decide what is the most important to be tracked. For this, they should go back and look at data where there could be improvement. Are they slow about finding equipment? Are they having trouble locating staff in critical situations? The final main consideration administrators should think about is, will staff accept RTLS and how will it

affect their work (California HealthCare Foundation, 2011)? This is a very important consideration. If staff cannot accept RTLS, the technology is essentially useless. Administrators must take into consideration how the staff's workflow will be affected especially in the transitionary period from no RTLS to the use of RTLS. Staff may at first be slow to understanding how exactly to use the real time locating system, but overtime, they should be able to implement it into their everyday practice without trouble. Educating staff on each individual component of the system will help as well as holding education courses on the functionality of the system. After administrators have inquired about the implementation considerations, the software can be implemented; and benefits of the system can be felt immediately.

Future Benefits

Once implemented, the pros to this technology are endless. For starters, RTLS will allow the hospital to make more money. According to an article from the California HealthCare Foundation, the facility they were doing a study on saved \$1.7 million in savings (2011). They specifically saw revenue increases in the amount of money acquired through increased inpatient admission, and the amount of patients that were entering the emergency department. The increase in emergency departments was by 18 percent in the hospital that had implemented the RTLS. All these increases happened within the first year alone (California HealthCare Foundation, 2011). Due to an increased patient work flow, the hospital is able to turn patients over more quickly. This creates space to be filled in the hospital. The increased patient turnover increases the hospitals revenue because they are able to see more patients. RTLS is a great way to make the hospital more money.

Not only will the hospital make more money, it will save money. One of the many facets of RTLS, is that it is able to track equipment. A feature of RTLS is when a piece of tagged equipment roles beyond the premises of the system an alarm will sound (Žigman, Krajina, & Krznarić, 2009). This is useful when it comes to theft prevention. RTLS makes it so the hospital knows if a patient is trying to take home hospital equipment because as soon as they step off the premises an alarm will sound alerting the hospital officials. This is a major help in saving money because it prevents the hospital from spending money redundantly on equipment that has been taken either by accident or intentionally.

Tracking equipment can also save money in the sense of not buying repetitive equipment merely because the hospital cannot find the equipment in a fast enough time. Tagging hospital equipment would allow officials to know where equipment is instantaneously. There would be no time wasted for searching, and hospitals would not constantly be buying new equipment because it got misplaced. According to Long (2016), “some hospitals purchase up to 3x the amount of equipment needed based on loss or difficulty in locating devices already available.” Tagging equipment ensures that hospitals do not buy excess of unnecessary equipment.

Money aside, this system allows for fewer ambulance diversions because staff are able to work more efficiently (California HealthCare Foundation, 2011). One hospital was able to reduce the time in hours of ambulance diversions by 8.5% (California HealthCare Foundation, 2011). This was a major decrease in time wasted within the first year alone of the implementation of this system. Decreasing ambulance diversions allows for quicker access to care for patients in emergent situations. Ambulance diversions are decreased because RTLS allows hospitals to

provide more efficient and effective care to their patients. This is a major advantage for hospitals because by getting patients to hospitals faster, it decreases the rate of mortality for patients.

RTLS benefits the general population in another way as well. RTLS has been proven to increase patient satisfaction. One of the many benefits of real time locating systems is that it decreases time spent in the hospital (California HealthCare Foundation, 2011). It increases patient satisfaction by allowing hospital staff to spend more time with their patients. According to Žigman, Krajina, and Krznarić (2009), “tagged instruments are quicker and easier to track, which leaves hospital staff more time to take care of patients” (p. 506). This system allows staff to revert back to more contact with patients by salvaging lost time wasted on searching for equipment or personnel. When patients are seen faster and more frequently, it allows for an increased patient work flow which increases patient’s satisfaction and safety

CONCLUSION

A hospital with real time locating systems is a hospital that is a step ahead. Overcrowding has been shown to be a huge issue over and over again for emergency departments all across the nation. It is time that hospitals take a step in the right direction with trying to solve this issue. Real time locating systems are an all in one solution. They should reduce overcrowding issues, increase revenue for hospitals, and increase patient satisfaction. Real time locating systems are the answer hospitals administrators are looking for the problem of emergency department overcrowding.

RECOMMENDATIONS

Hospitals can decrease overcrowding in emergency departments while simultaneously saving money, making money, and increasing patient satisfaction by implementing real time locating systems. Hospital administrators should take the following steps in order to implement a real time locating system in their facilities successfully:

1. Approve the implementation of a real time locating system.
2. Provide the funds to implement RTLS in the hospital.
3. Hire a work crew to come in and install the real time locating system components such as tags and badges; access points; beacons; and system controlling software.
4. Hold mandatory educational courses for staff to learn the new technology, and pay the staff members to attend the course.

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