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## A BUSINESS CASE FOR USING REAL TIME LOCATING SYSTEMS FOR MEDICAL EQUIPMENT

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### INTRODUCTION

The high Census experienced by the hospital coupled with the high patient acuity demands that health care provides have the right piece of equipment at the right time at the right place. There have been numerous instances where patient care delays occur because equipment is not located on time. Nursing personnel and other health care personnel waste valuable time as they need to search for the equipment and sometimes causes delays in patient care. The ability of health care providers to “locate” and retrieve equipment in a fast way, offered by the RTLS system, will help in the provision of excellent health care.

This paper will present the development of a business case for the acquisition of an RTLS for the Hospital. It will also present some of the Use Cases that were used when developing a Request for Proposal (RFP) for an RTLS system.

### BUSINESS CASE FOR AN RTLS SYSTEM

As Hospital census continues to be at its maximum, it is imperative that medical equipment be readily available for use. In our institution, there have been safety reports where units have not been able to obtain equipment to provide patient care. In particular, the availability of Infusion Pumps, Feeding Pumps, and beds. Nursing personnel and other health care personnel waste valuable time as they need to search for the equipment and sometimes causes delays in patient care.

Real Time Locating Systems (RTLS) have achieved some maturity in the industry. Health Care facilities are using RTLS to not only track costly supplies and portable equipment, but

also to enhance patient and staff security. In addition, RTLS systems are being used to track staff hand washing compliance and in some instances as the means to identify and enhance patient flows.

At the Hospital for Sick Children, Medical Engineering developed a Business Case for the acquisition of an RTLS system. The RTLS system was to be used for three main purposes: a) Patient wandering (Patient abduction), b) Staff Safety and c) Equipment Location.

#### A) Patient Wandering

The use of RTLS tags for Patient Abduction/Patient Wandering has been highly used in Maternity wards. When the child is born, an RTLS tag is attached to their ID tag. The mother gets an RTLS tag and it is paired to the baby's ID tag. When the baby is brought for feeding the system will check that the ID tags match otherwise it will give an audible alarm alerting the nursing personnel of the possibility of a mistake in bringing the right baby to the mother. Access/exit doors, including elevators, to the maternity ward are equipped with RTLS sensors that would lock the door or not allow the elevator door to close should an unauthorized person attempt to take the baby from the nursery or maternity floor.

#### B) Staff Safety

Staff safety has become another application where RTLS has become very useful. With the increased number of violence against health care workers, it has become necessary to have a way to call for assistance when staff does not feel safe. Staff are provided with an RTLS badge that has the means to activate a “silent” alarm by pressing a button on the RTLS badge.

The alarm is activated and displayed at the Central Nursing station, where the health care provider works, and the hospital's Security desk for dispatching assistance. Depending on the integration with other security systems, when a Staff alarm is initiated, the security personnel could see the exact location where the alarm was generated and if available the video image where the health care provider is located.

### C) Equipment Location

Equipment location has been one of the earlier applications for RTLS systems. Materials Management has used Radio Frequency Identification Systems (RFID) to track supplies and expensive implantable devices. The RFID system would integrate with the order/supply system and place orders when the supplies reached a pre-determined minimum level. As the RTLS systems have evolved and matured, the use of RTLS to track medical equipment has increased. Companies have developed RTLS tags that can be attached to medical equipment and assist users in locating equipment.

### **ARE RTLS SYSTEMS COST BENEFITIAL TO HOSPITALS?**

The cost benefit for implementing an RTLS system for Medical Equipment has been difficult to document. In particular, it has been difficult to truly determine the cost savings when using an RTLS system to locate medical equipment. In particular for equipment location, the business case was for the installation of RTLS tags (RFID or Wi-Fi based), on portable, high use or shared equipment that needs to be readily available. The attached tag on the equipment will allow users to identify the location of the equipment and hence find the device that is close to the unit and not in use which will result in more efficient location of unused equipment. An additional advantage of having the equipment tagged, is that Medical Engineering will be able to locate the device when they are due for annual inspection. This will also help in improving efficiencies in locating portable equipment due for maintenance.

The literature on ROI for RTLS systems indicates that there are numerous advantages on implementing an RTLS system in a hospital.

The more complete use of RTLS a hospital has, the faster the Return on investment. At SickKids, we developed a Business case, where the RTLS was to be used for the three mentioned applications. On the white paper entitled: "The ROI of Real-Time Location Systems and Active RFID in Healthcare" by the company Ekahau produced in 2013<sup>1</sup> they present various areas where savings and efficiencies can be achieved through the use of an RTLS System. Given the proposed application, i.e., use of the RTLS on Portable Medical Equipment the paper assist us in calculating the following ROI:

**Equipment Tracking Savings - Nursing Time-** Studies have demonstrated that on average nursing personnel spend 6% of their daily time looking for equipment<sup>1</sup>. If we assume an annual salary for a nurse to be \$80,000, there is potential savings of \$4,800 per nurse. Assuming that we have 150 nurses per shift, we could save \$720,000 on nursing time searching for equipment. The nurse will only need to look into the Web based application and locate the equipment within their area/floor.

**Medical Engineering Technologists Searching for Medical Equipment due for maintenance** – Medical Engineering's PM program requires that equipment be checked minimally once a year. The literature indicates that on average Medical Engineering Technologists spend 6% of their time searching for Medical Equipment due for Maintenance<sup>1</sup>. Assuming an annual salary for the technologists of \$58,500 per technologists, we could potentially save \$3,510 per Technologists. As we have 16 technologists, the annual potential savings would be \$56,160.

**Reduction on Capital Expenditures** – It is well known that nursing personnel, keep portable medical equipment hidden in closets to ensure that in times of high census they will have the equipment available for patient care. The literature indicates that there is a potential for 10% savings on Capital expenditures as Hospital can buy less equipment to meet the patient needs<sup>1</sup>. An example quoted in the Ekahau White paper, they indicated that a hospital was able to reduce the number of required ventilators from 80 to 50 ventilators

as the RTLS system allowed them to provide better information on utilization. If we assume that the Hospital spends \$750,000 annually on portable medical equipment, then there is a potential to save \$75,000 per year. The money can then be used to buy other needed equipment.

Adding all the potential savings indicated above, the hospital could save over \$851,160 per year. Obviously, the savings are not real tangible dollars as it is based on time savings from personnel and not spending money on additional portable equipment.

### **USE CASES WHEN DEVELOPING A BUSINESS CASE FOR RTLS**

In developing the business case for the RTLS system, it is important that the hospital develop the Use Cases where the RTLS will be used. Developing the Use Cases, requires the input from an interdisciplinary team to ensure a comprehensive understanding of where the RTLS system will be used and its purpose.

An interdisciplinary team was formed to assist in developing the Use Cases. The team consisted of representatives in the following areas:

- Nursing Informatics
- Front line nursing
- Nursing Management
- Respiratory Therapy (Management and front line)
- Medical Engineering
- Central Sterilization
- Transport team
- Protection Services
- Procurement, and
- Legal representation

The team developed a template that was used for documenting the various Use Cases. The template contained the following questions that needed to be answer:

**Use Case Description:** Describe the main purpose of the use case, e.g., Location of portable Medical equipment.

**Who is the main Stakeholder?** In this section describe who will be using the application. Who is the most affected group in this application? For example, nursing personnel, transport team, medical engineering, clinical users, etc.

**How is stakeholder aware of the available equipment?** Describe the way the user will know where the equipment is located. For example, display of equipment on smart Portable device (smart phone, tablet), etc.

**How do you want the information to be communicated/displayed?** Do you want to display the information as a list of devices available? Do you want to see it on a graphical representation of the floor where the equipment is located?

**Accuracy of location?** Do you want to find the equipment at the room, at the floor, in the area? This information is important as it will determine the location of RTLS sensors.

**How do you want the equipment selection for searching?** Do you want to search by equipment type, e.g., IV pump? Do you want to search by control number, or model number?

**What type of integration do you want to achieve?** Do you want to integrate to your Alarm Management system? Do you want to integrate it to your HIS?

**What type of reports are required from the system?** The number of times a clinician is looking for a specific device? The type of equipment that is searched for the most? Reports of searches by unit?

**Other ancillary information** Other information that might help clarify the Use Case.

At SickKids, we developed seven Used Cases that were used for the development of a Request for Proposal (RFP). The Use Cases were as follows:

- Locating Portable Equipment
- Staff Safety
- Patient Wandering/Elopement
- Patient Flow analysis

- Equipment association to patient, to room and to the clinician
- Handwashing compliance in the Intensive Care Units

The RFP was published in late 2017. The interdisciplinary team has been working to evaluate the responses. We expect to be able to share more information at the time of the CMBEC conference.

## CONCLUSIONS

RTLS systems have become more mature and are being used more widely. Canadian hospitals have started to use RTLS systems for patient abduction, staff safety and tracking medical equipment. However, the high cost of an RTLS system has inhibited some hospitals to use such technology. At SickKids, we have received approval to proceed to acquire an RTLS system. However, it is important that a good Business Case be made representing potential savings from using such RTLS system. A hospital considering acquiring an RTLS system, should establish an interdisciplinary team to develop the Use Cases where the RTLS system will be used. By understanding the Use Cases, the Hospital will be able to better describe where the RTLS system will be used and the expected performance of the system. We have provided some elements that need to be included in the Use Cases, which could be the basis for a good template for use for the various Use Cases of the RTLS system.

## REFERENCES

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