Exploring RFID Healthcare Operational Strategies

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INTRODUCTION

Potential Benefits using RFID-Related Technologies

Management at many businesses and, in the present case, hospitals are looking for ways to reduce their costs via effective supply chain management (SCM) principles and techniques. Supply related costs can run as high as 30% of total expenditure and many entities are moving toward vendor-managed inventory systems (VMI) (Bhakoo, Singh, & Sohal, 2012). In very basic terms, several key criteria which must be taken into account when choosing vendors (i.e. quality, price, agreement terms, delivery, and service). Healthcare service strategies and its associated supply chain systems in hospitals are different from for-profit businesses in many respects. For example, one the main drivers of automating prescriptions may be that many healthcare providers, who may have little to no experience in operations management and quality assurance techniques, may be prone to making substantial errors. While such human errors may have little consequences in the retail environment, they may lead to patient harm and litigation in the healthcare environment. To further complicate matters, the prescription industry is highly regulated and such mistakes due to human errors can be costly in both lives and financial resources. It takes great investments in time to bring any drug to market, and with so much money invested; pharmaceutical companies rely heavily on their marketing professionals, their contacts with the doctors and building long-term relationships with in their SCM systems. Supply chain activities can include but are not limited to evaluating inventory needs, placing orders, verifying deliveries, restocking shelves, counting inventory, identification and disposal of expired goods, and dealing with stock-outs. These activities may have no apparent value from a patient-care perspective and only serve to drive up operational costs, but are essential to an effectively management healthcare system.

In general, many hospitals operate on a different scheme than most businesses in that they never really can expect what their patient load will be, what their illness will entail, or what supplies might be needed for which surgeries, especially when it comes to emergency situations. Hospitals carry an extra amount of safety stock, since any problem resulting in a stock-out situation could be life-threatening, leading to catastrophic financial losses. Many innovations in healthcare supply chains and its management have been linked to applications of RFID-related technologies. Such innovations include self-replenishment systems, automated reordering, quality assurance improvements, and enhanced security of prescription medications.

There are significant potential benefits using RFID-related technologies on the healthcare system, costs and infrastructure considerations. Automated technology research and developments in RFID-related systems have improved supply chain efficiency in manufacturing and retail sectors. RFID, radio frequency identification, are utilized in few areas today, including airline luggage tracking, marathon races, and electronic security keys. Organizational success depends on strategies that provide and main-

DOI: 10.4018/978-1-4666-9787-4.ch128

tain a firm's competitive advantage through is operational efficiencies (Scanlon, Swaminathan, Lee, & Chernew, 2008; Scherrer-Rathje, Boyle, & Deflorin, 2009; Smith, 2005a-b). Acquiring strategies that achieve cost reduction, increased quality satisfaction, continual quality improvement, and on-time delivery performance are crucial to the successful operations of a firm (Chen & Dubinsky, 2003; Chiou, 2004; Collier & Bienstock, 2006). Some researchers have suggested that RFID-enabled technologies are considered the next revolution in supply chain management (SCM) (Kumar, Livermont, & Mckewan, 2010; Smith & Offodile, 2007, 2008). SCM activities have traditionally been perceived as an essential strategic decision of operations management (Gaukler, Özer, & Hausman, 2008; Hu, Wang, Fetch, & Bidanda, 2008; Smith & Offodile, 2007, 2008).

In terms of the basic design and cost elements, an RFID tag often resembles a flexible computer chip on a sticker and can be affixed to any moving item. The tag allows the wireless transmission of data about the item into a computer system that may be tracking millions of individual RFID tags and painting a picture of their movement. There are at least two different types of RFID tags, passive and active. Passive tags can only be read when in close proximity to a scanner or reader; whereas active tags are powered by an on-board battery and can transmit signals to the readers from more than three meters away. The cost of RFID technology continues to fall, and individual passive RFID tags can be purchased for as little as US$0.10 to 0.50. Active tags may cost between US$0.50 and 50, but some hold up to two kilobytes of data and can be reprogrammed (Smith, 2008; Smith & Offodile, 2009). There are significant evidence that there is movement by hospital management to move toward full adoption of RFID tags on moving pieces of equipment, instruments, drugs, and patients as passive tags approach a penny each (Smith & Offodile, 2009; Swaminathan, Chernew, & Scanlon, 2008; Ustundag, 2010).

Traditionally, several studies have illustrated that RFID-related technology in hospitals has been shown to speed patient care and improve its quality, reduce inventory costs through loss recovery, and optimize the supply chain process of purchasing and restocking supplies (Seidman, Brockman, & Lewis, 2010). In some instances, RFID technology has helped hospital managers make decisions on staffing levels by seeing exactly how much time nurses were spending at the bedside versus doing administrative tasks at the nurse's station (Condea, Thiessse, & Fleisch, 2012).

RFID-enabled technology can also trigger responses in the environment, such as automatic hospital lockdowns if an infant's RFID anklet exits the birth center or an adult patient wearing an RFID necklace leaves his or her unit. In the instance of time-sensitive processes, such as patient admission and bedding, RFID tags can also increase patient satisfaction by helping staff identify time lags and tighten the process. This is true in life-saving situations as well such as heart attack care and emergency C-sections. Essentially, in addition to improving the quality of care, RFID technology has the potential to help hospitals reduce their operating costs and increased the quality of their services.

In general, RFID-related technologies have great advantages for healthcare applications, especially for drug dose and self-replenishment, patient identification and tracking. Some of the advantages of an RFID enabled replenishment program include an elimination of excess inventory, improve efficiencies, and lower operational costs. These lower costs may take various forms. Labor costs are reduced by eliminated the need for visual or manual inventory checks by sales staff. Efficiency may be increased through inventory accuracy and freeing sales staff to work on value-added projects. Ultimately, inventory is better managed through increased accuracy and capabilities of better data collection in analysis and forecasting. While much research has been done into the possible benefits of RFID implementation, empirical data on benefits of implementation of RFID enable shelf replenishment is relatively lacking. Condea, Thiessse, and Fleisch (2012) established a mathematical model for a single product in a retail store with random demand and lost sales to evaluate the effects on quality of service and costs. The assumptions