



Hospital kanban system implementation: Evaluating satisfaction of nursing personnel



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ABSTRACT

Literature on healthcare supply chain management has shown that the kanban system can provide significant benefits. However, very few benefits have been empirically demonstrated and the extent of each remains unknown. This study aims to measure nurses' satisfaction with kanban systems in logistics of medical consumables and assesses possible advantages and differences among user groups through an anonymous survey at Hospital Universitario Virgen Macarena of Seville, Spain. Treatment of responses included an exploratory factor analysis, and a CAPTCA analysis. The results showed a high level of satisfaction for each aspect of the kanban system. Moreover, it highlighted the differences of opinion between groups of individuals according to workplace, nursing units, job category, seniority, age and kanban training. The exploratory factor analysis revealed that two factors underlie the collected assessments: the inherent advantages of a kanban system, and the logistics system performance as a whole. Thus, hospital managers should promote the implementation of kanban systems, since it increases nurses' satisfaction and provides significant benefits.

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Implantación del sistema Kanban en Hospitales: evaluación de la satisfacción de enfermería

RESUMEN

La literatura sobre cadena de suministro en sanidad ha mostrado que el sistema kanban puede proporcionar importantes ventajas a las organizaciones sanitarias. Sin embargo, muy pocas de ellas se han demostrado y valorado empíricamente. Este trabajo tiene como objetivo medir la satisfacción de la enfermería con el sistema kanban, valorar cada una de sus posibles ventajas e identificar posibles diferencias entre diferentes grupos de usuarios. El trabajo ha consistido en realizar una encuesta anónima en el Hospital Universitario Virgen Macarena de Sevilla, España. El tratamiento de las respuestas incluye un análisis factorial exploratorio y un análisis CAPTCA. Los resultados muestran un alto nivel de satisfacción con cada aspecto del sistema kanban y la existencia de diferencias entre individuos según centro de trabajo, unidad de enfermería, categoría laboral, antigüedad, edad y formación en kanban. El análisis factorial exploratorio señala la existencia de dos factores subyacentes a las valoraciones recogidas: las ventajas inherentes del sistema kanban y el rendimiento del sistema logístico en su conjunto. Como conclusión, los directivos hospitalarios deberían promover la implantación de sistemas kanban ya que ello incrementa la satisfacción de enfermería y proporciona importantes beneficios.

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1. Introduction

The increased demand for health services, together with the economic realities, highlights concerns regarding public health system sustainability, making it necessary to seek maximum

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efficiency in their management. Patient care is supported by a wide array of activities including inventory management, purchasing, and the distribution of supplies to the point of care. These activities, referred to by many as healthcare logistics, or supply chain management, aim to ensure the delivery of the right products where and when needed, at the quality and quantity required to provide services while preventing any stock disruptions. As these logistic services use approximately 30–40% of the hospital's operating budget (Landry & Beaulieu, 2013), these activities are often cited as areas for improvement (Aguilar-Escobar & Garrido-Vega, 2013; Aguilar-Escobar, Garrido-Vega, & Godino-Gallego, 2013; Callender & Grassman, 2010). Logistics therefore become not only a source of savings in terms of support services, but may also render clinical professionals more productive as they can increase dedication to their daily work.

Various management tools have been used to improve logistic and supply chain services. In recent years, the Lean approach has experienced increasing popularity for the improvement of processes. Lean aims to focus on the value desired by the end-customer, to eliminate waste by identifying the value streams of the organization processes, to maintain a continuous flow or pull between process steps, and finally, to continuously improve (Womack & Jones, 2003). Due to Lean's success in the automotive and manufacturing industries, a significant number of other sectors, including services industries such as healthcare, started to adopt Lean principles (Aguilar-Escobar & Garrido-Vega, 2013; Domínguez-Machuca, González-Zamora, & Aguilar-Escobar, 2007a, 2007b; Spear, 2005). Lean principles have been proposed to bring considerable improvements in healthcare (Jarrett, 2006). A recent literature review on Lean applications in healthcare revealed that the most common areas of improvement included timeliness of service, cost reductions, productivity enhancements, and several quality aspects involving reduction in errors, and improved staff and patient satisfaction (Mazzocato, Savage, Brommels, Aronsson, & Thor, 2010).

The Lean approach can be viewed through two perspectives (Hines, Holweg, & Rich, 2004): at a strategic level, focusing on principles and organizational culture for long-lasting outcomes; and, at an operational level, focusing on tools and techniques. Various techniques have been linked to the Lean approach, such as just-in-time, resource reduction, improvement strategies, defect control, standardization, and scientific management practices (Pettersen, 2009). Accordingly, one of the most common and widely spread Lean tools is kanban (Adams & Ruiz-Ulloa, 2003).

The Japanese word kanban, meaning "signboard", is a system that allows for the management of the overall supply chain by strategically and operationally linking production demands and the management of supplies. Kanban traces its roots to the early days of the Toyota Production System when Taiichi Ohno, a Vice President of Toyota, developed kanban cards to implement just in time (pull) production and minimize work in progress (WIP) by means of a simple visual tool. The kanban creates a "pull" material flow requiring employee participation to control and improve processes between workstations. The idea behind the kanban concept is that workstations produce/deliver desired components only when needed, thanks to a visual signal in the form of the reception of a card, box, or empty container (Sugimori, Kusunoki, Cho, & Uchikawa, 1977). Thus, kanban systems normally create cost reduction not only by eliminating waste, but also by being more responsive to change, facilitating quality control, and giving importance, trust and support to the employees running the processes (Chalice, 2007).

In hospitals, material distribution normally follows a periodic inventory system where material is replenished in batches. Some hospitals use exchange carts, or par level, but usually material distribution is a demand-based ordering system where nursing staff conduct regular inventory counts combined with

consumption estimates. Products identified as low in inventory are noted on a requisition form that is then forwarded, either manually or electronically, to the material management department. Based on this requisition, required supplies are picked and shipped to the appropriate wards. Under this system, nursing personnel are often assigned the task of putting away the supplies in the storage units (Landry & Beaulieu, 2010).

Kanban started to appear in healthcare in the late 1980s through the development of a two-bin system (also called no-count), by Danish and Dutch companies (Landry & Philippe, 2004), for medical supplies.¹ Thus, the quota of each item in this double-bin system is evenly distributed into two compartments. When one compartment is empty, the nurses use the second (or backup compartment), and identify that a bin has been emptied. Material handlers normally conduct rounds of the nursing units to be replenished according to a fixed schedule. Rather than drawing on their experience only and "eyeballing" the materials as with par level, the kanban card initiates replenishment for a predetermined quantity (Leone & Rahn, 2010). Thus, material handlers can simply scan the kanban cards and transfer the requests to the material management's information system. For items stored in the central warehouse, a pick list is generated from the material management's information system. For direct purchases (items sourced externally), a requisition is transmitted to suppliers. Finally, material handlers deliver medical supplies directly into the empty bins, thereby ensuring stock rotation in each unit. In a few hospitals, the scanning process (in the form of replenishment-ordering rounds) has been eliminated with the use of RFID-enabled kanban cards, which create an automatic replenishment request once the card is placed on the reader board (Bendavid, Boeck, & Philippe, 2010).

In hospitals, kanban has been used to manage medical supplies, commonly dispensed drugs, office supplies, linen and other commodities (Landry & Philippe, 2004; Persona, Battini, & Rafele, 2008). For many hospitals, kanban replenishment systems have given better inventory management results than traditional requisition-based methods using order on request, exchange carts, par level, or the more expensive automated cabinets (Grabau, 2008; Landry & Beaulieu, 2010; Landry, Blouin, & Beaulieu, 2004; Leone & Rahn, 2010). Landry and Philippe (2004) found multiple benefits of the two-bin (kanban) system in their study of various replenishment systems in hospitals. The ordering process was faster, as there were built-in decision rules, no counting was required, and only empty compartments were scanned (or retrieved) by material handlers, thereby triggering the replenishment process. Furthermore, the use of kanban systems drastically reduced the material management workload of the nursing staff, and even eliminated it when material handlers were employed; thereby permitting nurses to focus on care rather than on material management activities. Moreover, as material handlers would spend less time in the nursing units and reduce product handling, there was less chance of disruption in clinical activities. Additional benefits, linked to the utilization of two-bin systems and point-of-use information, include the built-in stock rotation and lower average inventory levels which, in turn, reduced the number of expired products (Landry & Philippe, 2004). Another study of kanban implementation, in a hospital setting, showed considerable savings in terms of replenishment activities (Landry et al., 2004). In this kanban study, a material handler, in only 35 min, would typically scan products in 18 stocking locations spread across nine wards, which was four to seven times faster than in traditional systems. In summary, several benefits

¹ Although double-bin is not the only possible way to implement kanban in hospital logistics (Heinbuch, 1995; Persona et al., 2008; Patterson, 2012) it is the most widely used application of kanban. Therefore, in this article we use the terms double-bin, two-bin, and kanban system interchangeably.

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