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Designing an Efficient Medical Logistic System Using Kanban in Large Hospital Systems

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Abstract

The proposed presentation and research paper will provide very clear and objective application of proven lean tools and how public sector organizations, specifically healthcare can benefit from these methodologies to provide better healthcare with higher quality of care, enhance value of resources and shorten recovery times. It will be shown that enhancing the operational efficiency of public sector dramatically improve quality of life ordinary people of a societies and additional services can be made available at affordable costs.

The research is based on a successfully concluded project for the implementation of 2-Bin *Kanban* inventory management system in a major US public sector hospital system. Hospitals in the system frequently faced stock out situations for Critical-to-Care medical supplies while carrying disproportionate amounts of non-essential inventories. It was discovered in the diagnostic phase that on the average the hospital purchased 30% of all items on premium prices and another 25% of items expired before being used for treating patients. Purchases were made based on contractual obligations with prime vendors, long term agreements and bulk discounts for suppliers' surplus stocks. There had been negligible aggregate planning in procurement of medical consumables at medical facility level; departments and clinics purchased their supplies based on their individual demands resulting in less than economic order quantities with excessive procurement and stocking costs. It was also observed that there was no correlation between demand and consumption to procurement and stock levels in hospital warehouses. Purchases were made considering transactional advantages including bulk quantity discounts, minimum number of purchases, bundled product families etc. These purchase practices led to over stocked warehouses with unwanted products while facing chronic shortages of critical-to-care items. The project started by collecting pertinent data about hospital operations for past five years. It included the number departments and clinics operated by the hospitals; number of patients treated by each department; major presenting conditions using ICD10 coding. The data was used to establish real demand patterns for medical consumables also taking into account seasonal and demographic variations. Real demand and consumption rates were established followed by determining appropriate PAR levels; frequencies of replenishment and ordering. Order quantities were set to match optimal pricing and logistic costs. A corresponding model was created for expensive, low use specialty items like orthopedic and cardiac implants. Finally, aggregate 2-Bin *Kanban* inventory management model was validated through several simulations.

Results showed that the system never resulted in stock out situations in spite of a 55% reduction in inventory levels in dollar amount value; it freed up about 42% of warehouse space eliminating many offsite rented locations; reduced time spent in placing orders by 70% due to the fact that comprehensive inventory taking was no more required. Items with 1st empty bins were ordered. Freed up clinicians' time was used for treating patients which in turn led to higher medical productivity. Another direct benefit of implementing 2-Bin *Kanban* system was complete elimination of expired stock. Since items are not purchased in bulk quantities anymore, every item is used before expiry. A comparison of before and after 2-Bin *Kanban* system showed that buying

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Javed Cheema currently works as Chief Engineer / Senior Vice President, Performance Enhancement practice area of Brilliant Solution Consulting, West Bloomfield, Michigan. Prior to that, Javed worked at Eaton Aerospace; was Director of Quality Assurance at Alcoa Howmet Air Power & Propulsion Division, Vice President Quality Assurance and Lean Six Sigma of Global Transportation Product Division at Molex Interconnect, and Director of Quality and Benteler Operating Systems (BOS) at Benteler Automotive Teknik GmbH. Currently, Javed is concluding his doctoral research with a focus on lean transformation of medical systems. Javed holds MS in Industrial & Systems Engineering from University of Michigan, an MBA from University of Central Oklahoma, and a graduate diploma in manufacturing systems (*Seisan Hoshiki*) from Tokyo Poly-Technique University, Japan. Javed was declared best international trainee (*Kokusai Kenshuin*) by Japan International Cooperation Agency in 1994. Javed is a Fellow of American Society for Quality (ASQ); DFSS & Six Sigma Master Black Belt; serves as Publications Chair of ASQ's Lean Enterprise Division, and is an ASQ Certified Manager of Quality/Organizational Excellence (CMQ/OE), Quality Engineer (CQE), Quality Auditor (CQA), and Certified Professional Engineering Manager (PEM) of Society of Engineering Managers. Javed has been a keynote speaker and presenter in many prominent conferences and events around the world with several research publications to his credit.

Dr. Muhammad A. Bajwa currently works at Henry Ford Health System and as Subject Matter Expert with Brilliant Consulting, LLC supporting validation of lean healthcare models and clinical data analysis. Prior to joining Henry Ford Health System, Dr. Bajwa served as House Physician at Albert Victor (Mayo) Hospital in Lahore Pakistan; specializing in clinical performance enhancement tools; design of leading performance indicators scorecards and process designing for patient treatment; proactive risk management in critical surgical procedures and lean transformation of hospital operational systems. Dr. Bajwa holds M.B.B.S. from Xinjiang Medical University, China and certified Lean Six Sigma Black Belt; is author and presenter of several research publications in the field of Medical Operational Excellence around the world.