



Improving Efficiency and Patient Satisfaction in a Peripherally Inserted Central Catheter Center Using Lean-Based Methodology

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Abstract

Background: The peripherally inserted central catheter implantation and maintenance process was optimized at Shanghai Fu Dan University Cancer Center using lean-based methodology. Problems addressed were coping with capacity limitations and streamlining the process of patient care to reduce potential complications associated with delays in catheter administration. These clinical processes were evaluated with regard to pretreatment areas—such as booking, waiting, and patient education—and solutions were recommended to the problems that were identified.

Methods: Lean methodology was used under actual clinical settings to improve the clinical process, using observations, patient surveys, interviews, data analysis, and a kaizen workshop. Three tools were applied from lean methodology: value stream mapping, bottleneck calculation, and fishbone root cause analysis. The philosophy of kaizen was used to enhance teamwork, boost morale, and encourage all members of the frontline nursing team and administration leaders to contribute ideas and suggestions for improvement.

Results: A value stream map and a redesigned future value stream map were plotted at the workshop to identify problems related to inefficiency and waste and to aid in proposing solutions. Implementation of these solutions resulted in smooth and steady patient distributions on days with the largest patient volume during a typical week and an increase of 30% in the number of patients that could be seen in a week.

Conclusions: The economic methodology of lean manufacturing, especially value stream mapping, can be a powerful tool for visualizing and better understanding processes to reduce waste and reengineer a standardized workstream in settings where peripheral intravenous central catheters are placed.

Keywords: efficiency, kaizen, lean health care, process reengineering, value stream map

Introduction

Lean, a term used to describe the principles and philosophy of the Toyota Production System, is widely recognized as a powerful method to improve performance in a broad array of industries, from automobile manufacturing and aluminum refining to financial services and aerospace

administration. The concept of lean thinking has rapidly gained followers in the health care arena, especially in a number of hospitals and medical groups in the United States, to minimize waste and unnecessary steps, as well as to create standardized, efficient, and stable processes.¹ However, the application of lean methodology to the Chinese health care system has been very limited.

With a projected increase in use of peripherally inserted central catheters (PICCs) in China, many hospitals and cancer centers have established PICC centers to address the increasingly specialized requirements of catheter placement and maintenance. Fu Dan University Cancer Center (FUCC) is the largest Chinese cancer hospital that treats both inpatients and

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outpatients from across the country (>1,200 beds) and it ranks first in China for PICC placements (~30 per day) and maintenance (~200 per day). FUCC has established a standardized PICC placement procedure and developed a skilled PICC nursing team (4 nurses for placement and 7 nurses for maintenance). As a result of an unrestricted reimbursement policy for Shanghai citizens with a medical insurance card, demand at FUCC has increased by 300% in recent years, and the hospital cannot expand the center space to accommodate the increase in volume over this short time period. To address this increased demand, organizational quality and process improvement practices such as lean, total quality management, 0 defects, continuous process improvement, continuous quality improvement, and many others were proposed by a University of California, Los Angeles-National University of Singapore executive master's of business administration consulting team that reviewed the FUCC PICC center. With expertise in different aspects, as well as with strong support from the hospital leadership team and center staff, we took advantage of lean methodology to address the pressing challenges of efficiency, safety, quality, and appropriateness in the PICC center.

Methods

Project Scope

The project scope was confined to PICC placement and maintenance process optimization in the areas of booking and registration, patient wait time and education, as well as informed consent conversations. Layout redesign within the treatment room of the PICC center was not considered. Goals were to more effectively meet the high demand for PICC treatments, reduce risk of complications due to delays in therapy, and create a patient-centric workflow to improve patient satisfaction.

Project Methodology

To reduce nonvalue-added activities, known as waste,² and optimize the clinical process, the lean method was implemented. The method focuses on the components of the process. Elimination of waste is important because waste uses resources without adding value.³ The lean method focuses on unnecessary intermediate steps, so that only those that add value are retained.⁴ We also examined customer needs and feedback to add value to the process.

Kaizen tools and techniques, such as value stream mapping (VSM) and bottleneck calculation, are available to enhance the lean concept. These are clear and objective communication tools that capture nurses' knowledge of work processes in the value stream. VSM needs to be complemented by other tools, such as fishbone root cause analysis. Whereas VSM is a method for visualizing and understanding work from a high-level viewpoint,⁵ fishbone analysis uses the same logic but focuses on specific problems in microscopic detail. However, fishbone methodology is not applicable to very complex situations because it focuses on finding the root cause of a problem. In a complex situation, the link between cause and effect is often unclear, making fishbone analysis unsuitable for chaotic situations. When value stream maps are drawn, capacity use rates are calculated, and fishbone analysis charts are

written, all specialists and staff can review them. This allows for cross-functional sharing of process changes and generates additional problem-solving ideas.

The consulting team structured the project to get input from a patient satisfaction questionnaire, to observe the process flow of the current value stream map, to interview center personnel/patients, and to organize an onsite workshop with PICC center staff. Input was obtained using fishbone tools for root cause analysis, calculating relevant performance metrics for comprehensive process analysis, and determining capacity bottlenecks at various stages. The team presented the recommendations and the staff described a future state value stream map of consensus views.

Data Collection

Data were collected using interviews, observations, surveys, and the document analysis methods. The consulting team observations were obtained across 5 working days during April 2012. Catheter placement and maintenance procedures, the waiting area, the booking system, and other relevant outpatient department activities were observed for approximately 6 hours each day, for a total of 30 hours of observation time. The PICC nursing team used a questionnaire (Table 1) designed and modified by the consulting team to collect feedback from 127 placement and 521 maintenance patients regarding informed consent conversations, placement booking, procedure and publicity, maintenance booking, procedure and education, center environment, and reasons for yes/no recommendations. Fifteen semistructured, face-to-face, individual interviews (Table 2) were also conducted with employees in 20- to 50-minute sessions. Bottlenecks in the overall operation stages were investigated by evaluating the use rates of treatment rooms for placement and maintenance in terms of current working capability and potential performance capacity, as well as for informed consent conversations.

Study Location and Team Composition

The project was performed in the PICC center at FUCC. Prior approval was obtained from the hospital vice president and management of the Nursing Department. The onsite workshop was conducted at the hospital conference hall on April 28, 2012, and involved all PICC center staff, the head nurse of the Outpatient Department, the leadership team of the Nursing Department, and an international consultant group composed of University of California Los Angeles-National University of Singapore executive master's of business administration students with expertise in different areas. Participants included radiologists, experts in medical access systems both in the United States and China, the head of a manufacturing industry who specializes in lean process, an information technology solution provider of a large multinational company, and 2 professional interpreters.

Workshop Subject and Fishbone Framework

During the kaizen workshop, all the steps necessary to complete placement and maintenance processes from the beginning

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