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Surgical tray optimization as a simple means to decrease perioperative costs

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ABSTRACT

Background: Health care spending in the US remains excessively high. Aside from complicated, large-scale efforts at health care cost reduction, there are still relatively simple ways in which individual hospitals can cut unnecessary costs from everyday operations. Inspired by recent publications, our group sought to decrease the costs associated with surgical instrument processing at a large, multihospital academic center.

Methods: This was a single-site observational study conducted at a large academic medical center. At the study start, all attending surgeons within the section of pediatric surgery agreed to standardize the pediatric surgery trays and to eliminate instruments that were deemed unnecessary from each tray. A multidisciplinary start-up meeting was held, and this meeting included stakeholders from central sterile processing, operating room nursing, scrub technicians, and materials management along with all five pediatric surgeons. Each tray was addressed individually. Instruments were eliminated from trays only if there was unanimous agreement among all the surgeons in the group. If no instruments in a given surgical tray were deemed necessary, the entire tray was eliminated from sterile processing rotation. Feedback questionnaires were drafted by the multidisciplinary team that participated in the start-up meeting. Surgeons were allowed to request for certain instruments to be placed back into the trays at any time, and the questionnaires also allowed for free-hand comments. Surgical kit preparation time was obtained from the institutional barcode scanning system. The cost per second of sterile processing labor was calculated using regional median salary for sterile processing technicians in the state of Connecticut. Using the pediatric surgery section as the model unit, this method was then applied to pediatric urology, neurosurgery, spine surgery, and orthopedics.

Results: The pediatric surgery section eliminated an average of 59.5% of instruments per tray, resulting in an overall reduction of 1826 (39.5%) instruments from rotation, 45,856

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fewer instruments processed per year, and nine trays eliminated completely from regular rotation. Processing time for six commonly used trays was reduced by an average of 28.7%. The urology section eliminated 18 trays from regular rotation and 179 (10.1%) instruments in total. Pediatric orthopedics, neurosurgery, and spine sections eliminated 708 (17.1%), 560 (92.7%), and 31 (32.2%) instruments, respectively, resulting in approximately 18,804 fewer instruments processed per year. Among all five surgical sections, annual instrument cost avoidance after tray optimization was estimated at $53,193 to $531,929 using average instrument life spans ranging from 1-10 y. Negative feedback and requests for instrument replacement were both minimal on feedback questionnaires.

Conclusions: Surgical tray optimization represents a relatively simple microsystem improvement that could result in significant hospital cost reduction. Although difficult to quantify, other gains from surgical kit optimization include decreased weight per tray, decreased materials cost, and decreased labor required to count, decontaminate, and pack surgical trays.

Introduction

Health care spending in the United States (US) has risen dramatically in the past several decades. The World Bank estimates that US health care spending rose from 13.1% of gross domestic product in 2000 to 17.1% or $2.8 trillion in 2013.[1] Furthermore, the Institute of Medicine estimates that as much as $750 billion was wasted on unnecessary services, excessive administrative costs, fraud, and other problems of inefficiency.[2] Inspired by the successful "Lean" and "Six Sigma" performance improvement methodologies of manufacturing industries, many health care providers and administrators now share a renewed urgency to eliminate waste within the US health care system.[3]

Given the logistical complexity and high material costs associated with modern operating rooms, surgical specialty care is beleaguered by waste and inefficiency. The successful completion of a single operation depends on the coordination of many team members with variable incentives for efficiency. There is now a large body of literature examining operating room efficiency, and investigators from various backgrounds have analyzed virtually every aspect of operating room management, from materials' supply lines to physical movement of operating room staff. The management of operating rooms involves the coordination of many of these microsystems. In contrast to slow and expensive macrosystem changes such as health care policy reform, surgical team members can implement and analyze microsystem improvements relatively quickly and with far less effort. Following a successful pilot test, large-scale implementation of a simple microsystem improvement might easily result in significant cost savings after being applied to an entire hospital system or region.[4]

Multiple studies have suggested that the elimination of unnecessary or seldom-used instruments from standard procedure trays can result in savings in time, effort, and cost without harmful effects on patient care.[5-13] In a recent comprehensive analysis of surgical instrument tray optimization at a large academic medical center,[9] the authors observed 49 cases across four surgical services and noted that only 13% to 21.9% of the instruments in the sterile surgical trays were used during any given operation. Removal of the majority of unused instruments had no significant negative impact on patient safety. In fact, they estimated a labor cost savings as high as $20,400 per year for just one tray after eliminating unnecessary instruments from regular processing rotation. Although decreased labor costs require several assumptions, there is little doubt that removing thousands or even millions of instruments from sterile processing circulation will improve overall operating efficiency.

Given the success of previous studies in surgical instrument tray optimization, we hypothesized that we could achieve similar cost savings within our own large academic medical center. Anticipated benefits of tray optimization included lower operations costs for central sterile processing (CSP), reduced instrument count times, and increased staff satisfaction. With the section of pediatric surgery as the primary model cell, we attempted to develop a simple, reproducible process for surgical tray optimization that could be applied across all surgical services within the institution and possibly the extended health network.

Methods

Surgical tray optimization process

This was a single-site observational study conducted at Yale New Haven Hospital (YNHH) in New Haven, Connecticut. At the start of the study, all attending surgeons within the section of pediatric surgery agreed to standardize the section's surgical trays and to eliminate unnecessary instruments from each tray. A multidisciplinary start-up meeting was held, including stakeholders from CSP, operating room nursing, surgical technicians, and materials management in addition to the five pediatric surgeons. Each surgical tray was addressed individually, and labeled photos of each instrument were available during the review. To determine which instruments to retain, a list of procedures associated with each individual tray was also provided to the surgeons at the time of review. Some trays, such as "PSU Minor," were used for 11 or more distinct procedures. A total of 20 pediatric general surgery trays were analyzed. Instruments were eliminated from trays only if there was unanimous agreement among all the surgeons in the group. If no instruments in a given surgical