Decreasing the Cost of Surgery: A Standardized Process and Decision Tool to Evaluate Surgical Supplies

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Decreasing the Cost of Surgery: A Standardized Process and Decision Tool to Evaluate Surgical Supplies

DNP Project
Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing Practice

St. Catherine University
St. Paul, Minnesota

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May 2021
This is to certify that I have examined this
Doctor of Nursing Practice DNP project manuscript.
written by

Shayna Fleming

and have found that it is complete and satisfactory in all respects
and that any and all revisions required by
the final examining committee have been made.

Graduate Programs Faculty

_________________________
Name of Faculty Project Mentor

_________________________ May 14, 2021 _________________
Date

DEPARTMENT OF NURSING
Abstract

**Purpose:** Management of disposable sterile supplies and implants is an opportunity to ensure quality patient care at an acceptable cost for both the patient and the organization. It is essential to have the right supplies available and reduce the economic and environmental waste for every patient without compromising the quality of care. This project aims to standardize the workflow for evaluating surgical supplies and reduce expired supplies.

**Problem:** In the pediatric operating room (OR) population, would a standardized process and decision support tool to review disposable sterile surgical supplies compared to the current unstandardized process result in fewer expired supplies and increased savings for the organization?

**Approach:** This project sought to develop a standardized process for collecting information on expired surgical supplies and a decision support tool. The Plan-Do-Study-Act (PDSA) cycle was utilized as a framework to guide the project through several cycles and refinements of the process and tool, culminating with building the decision support tool into the value management software (VAMS).

**Results:** The organization loses approximately $100,000+ each year on expired products. This quality improvement project saved roughly $10,000 or 10% of ongoing operational costs for surgical supplies during the project's pilot.

**Conclusion:** This quality improvement project resulted in an objective and consistent decision-making tool and process to evaluate disposable sterile surgical supplies.

**Keywords:** surgical instruments, operating rooms, supply and distribution, and supply chain
Background

The United States spent $3.6 trillion on health care in 2018, with an expected increase of 4.2% a year (Center for Medicare and Medicaid Services [CMS], 2019). Health care spending in hospitals makes up 33% of all health care spending in the United States, and surgical procedures account for almost half of all costs associated with hospital stays (Cleverley, 2018; Plonien & Donovan, 2015). Organizations are obligated to consider quality, price, and value as part of the Quadruple Aim (Institute for Healthcare Improvement [IHI], 2020). The examination of processes and how to manage supplies in the operating room (OR) is vital to any hospital organization's success. Surgical procedures are expensive, and the cost impacts both patients and organizations. Making decisions that consider quality, cost, and value in surgical supply management is a high priority for leaders in the perioperative environment.

For many organizations, surgery is one of the highest cost centers within an organization. Surgical supply inventory is costly to purchase and difficult for clinical nursing staff to monitor. When supplies go unused, it causes economic and environmental loss. Routinely discarding supplies in the OR equates to more than 2 million pounds of recoverable supplies wasted from large nonrural U.S. academic medical centers every year (Wan et al., 2014). ORs need to account for the spending of every dollar spent or wasted due to poor management of supplies.

Hospitals are facing economic challenges, and scrutinizing profit margins is a vital concern. Pediatric hospitals face additional value-based reimbursement constraints because as much as 50% of all pediatric patients receive Medicaid coverage (Children's Hospital Association [CHA], 2018). Hospitals are reimbursed a certain amount for each surgical
Decreasing the Cost of Surgery

procedure regardless of the implants or surgical supplies used in the surgery. Technological advances are not included in value-based reimbursement. Hospitals must carefully consider the cost of new evidence-based practice improvements and frequent requests by physicians for the latest products to stay on the cutting edge of healthcare. Eight to ten percent of the population has an implantable device, and there are approximately 175,000 different medical devices regulated by the U.S. Food and Drug Administration (U.S. Food and Drug Administration [FDA], 2018; Joung, 2013). Technological advances in devices such as heart valves and cochlear implants increase patient longevity and quality of life but are costly and may result in significant financial loss if allowed to expire before use. Management of disposable sterile supplies and implants is an opportunity within perioperative leadership to ensure quality patient care at an acceptable cost for both the patient and the organization.

**Problem Formation and Purpose statement**

Some considerations for supply management are unique to the care of the pediatric population. Pediatric OR inventory needs to be stocked in many sizes, which results in considerably more supplies than adult institutions. The need for various sizes often results in a stockpile of supplies with a high potential for supplies to go unused before expiration. Additionally, increased research and development costs for innovative specialty devices result in significantly higher prices than current surgical supplies. These prices can sometimes overtake the amount reimbursed. The cost of a leading-edge implant may be so high that reimbursement will not cover the actual cost of the hospital stay, anesthesia, or even the standard fees associated with the surgery itself. Ideally, optimizing disposable surgical supplies inventory will ensure essential surgical supplies are available when needed to deliver high quality of care and reduce unnecessary waste. The primary concerns of the project are optimal patient outcomes, safety,
and quality of the products. This project aims to reduce economic and environmental waste, resulting in significant cost savings to the organization. Establishing a standardized workflow process for managing disposable surgical supplies is essential to ensure the right supplies are available for every patient without compromising the quality of care or patient safety.

**Theoretical Framework**

The model that applies to the project is the Plan-Do-Study-Act (PDSA) model of process improvement. This model is frequently used in the organization and is a simple yet powerful way to drive process improvement. This project is aligned with this model and was used to guide the development of a plan to test the change (plan), put the plan into action (do), learn from the changes put into place (study), and make modifications to the project as needed (act) (IHI, 2020).

The planning stage is where the project leader wants to predict what you think will happen based on the data and the development of the intervention. This forecast should include figuring what data needs to be collected. The do stage is where you run the test on a small scale and document the problems or unexpected observations. The data would be collected and analyzed. The study stage is where you would compare your forecasted results against what happened. This stage includes a summary and reflection upon your learnings. Finally, the act stage is based on previous learning to plan your next PDSA cycle. You can adopt the intervention, make modifications, retest, or abandon making any more tests or changes on the idea in this stage. This framework also fits well, as minor adjustments to strategy can be implemented as changes happen rather than waiting until project completion. There is a simplicity in the model that lends itself well to quality improvement in the internal supply chain.

**Literature Review**
A literature search was conducted using PubMed, CINHAL Plus with Full Text, Google Scholar, and Business Source Premier. The search words included: surgical instruments, operating rooms, supply and distribution, and supply chain. A total of 33 articles were located with the identified databases. Of these articles, only one pertains to the pediatric population. Of all the sources found, only six applied to the research question; sources automatically excluded were published over five years ago.

The search was expanded to include the Cochrane Database of Systematic Reviews relating to these specific search words: surgical instruments, operating rooms, supply and distribution, and supply chain. Of the three articles found, only two related to the research question.

**Appraisal of the evidence**

Each article was systematically evaluated and rated to identify the strength of evidence using the Johns Hopkins Nursing Evidence-Based Practice Model (Dang & Dearholt, 2018) appraisal tools for research and non-research evidence. Quality was also assessed with the Johns Hopkins Nursing Evidence-Based Practice Guidelines (Dang & Dearholt, 2018), both for quality and evidence.

All but one of the articles was considered good quality and related to the project purpose. The articles include varying practice settings and a wide variety of interventions applied to the supply chain. Few studies focused on supply chain management in a pediatric organization, but these studies can still guide best practices in a pediatric setting.

Based on the evidence, it is apparent that limited research is available concerning best practices for managing a hospital's internal supply chain. Models such as the value analysis team should be applied whenever possible. The value analysis multidisciplinary team uses the process
Decreasing the Cost of Surgery

actions of examining new products and standardizing the products selected. This means only offering one option rather than several similar products across the organization and as much as possible using value-based purchasing. It emphasizes staying true to the value analysis process by evaluating supplies against the same criteria each time. Integrating the multidisciplinary team and advanced technologies is also essential. The addition of periodic reviews would further reduce expired supplies within the organization, but no information was gathered on the recommended frequency for reviewing purchase decisions.

Synthesis of the Literature

The following is a discussion of significant findings and analysis of the identified eight articles' strengths and weaknesses. The John Hopkins Nursing Evidence-Based Practice Model appraisal tools for research and non-research evidence are used to synthesize the literature (Dang & Dearholt, 2018).

Level III evidence

A total of five articles are considered level III articles in this review. Level III evidence articles include systematic reviews and meta-analysis. Of the five pieces, two of the five are from the Cochrane Database of Systematic Reviews. The Cochrane database articles cover two literature reviews of good and fair quality, including 124 literature citations in these two articles. The first literature review of good quality, Ahmadi et al. (2019), covered approximately 40 articles and found that there is limited research on the internal hospital supply chain available. Decisions in the supply chain are based on experience rather than data of usage information. In many cases, 10% of the highest cost supplies absorb 70% of the operating room supplies budget. Most notably, not having the needed supplies can affect the quality of care delivered. This review also found that using advanced technologies such as barcoding and periodic review is
considered the optimal methodology to decrease the likelihood of not having a supply on hand when needed. Integrating cutting-edge technology into the internal and organizational inventory process is required to reach a more practical supply chain model. Also, outsourcing some logistic activities such as consignment supplies or ordering supplies only when needed would reduce inventory costs without impacting the quality of the service available in the operating room.

The second level three literature review from the Cochrane database, Lima-Junior & Carpinetti (2017), includes 84 papers over the last twenty years and has a fair quality rating. According to this article, supply chain management's main objective is to minimize the cost of supplies, get the correct quantity on the shelf, and in the right location for use at the right time. The article additionally states that evaluating supply chain management is complicated because the various stakeholders, departments, and processes are unique to every organization. The application of decision-making techniques can help assess the performance of the supply chain and inventory management. Lastly, the article concludes that establishing these models or systems can help organizations develop inventory control parameters (Lima-Junior & Carpinetti, 2017).

Two articles rated at good quality studied physicians' awareness of the actual cost of supplies used in the operating room (Ayoub et al., 2018; Bade & Hoogerbrug, 2014). Most physicians are unaware of the expense of implants and noted that when physicians were aware, they were willing to change to the less expensive version of the comparable item.

The final level III article is of good quality and identifies a different role for physicians. Eiferman et al. (2015) recommend incentivizing surgeons to participate in the value analysis of implants and supplies used in the operating room. Collaboration between organizations and physicians can lead to millions in savings for the organization. Still, many physicians do not
have an incentive to save the organization money because physician participation in value analysis activities is considered non-revenue generating.

**Level IV**

The following level IV article of good quality by Plonien, C., & Donovan, L. (2015) was written in collaboration with the Association of PeriOperative Nursing (AORN) to establish a national guideline for product evaluation and cost containment in the operating room. AORN provides generalizable guidance that there should be mechanisms and documentation for product selection within a multidisciplinary committee. AORN also identifies that there should be a quality assurance or process improvement to measure performance, cost-effectiveness, and user satisfaction. Considerations include cost containment, standardization, group purchasing contracts, product selection, essential stakeholder involvement, value analysis, and evaluation tools.

**Level V**

Davis & Doyle (2012) and Wu & Barnes (2018) are two-level V articles of good quality that recommend using the value analysis approach to design a dynamic and agile supply chain. The value analysis multidisciplinary team utilizes process actions to examine each new product and standardize products as much as possible using a value-based purchasing set up through contracts with hospital supply companies. A dynamic and agile supply chain adapts to the needs of the organization. Combining a value analysis team with an agile supply chain approach mitigates disruption risk, reduces redundancy in inventory, and considers locally negotiated contracts and consignment to lower implant and supply prices. Davis & Doyle (2012) is one of the only pediatric-focused articles. This article emphasizes safety for use in the pediatric population and physicians' involvement in supply decisions as an integral part of the process.
Strengths and Weaknesses of the Research Studies

The strengths of the studies in this review were that many of them were of good quality and only one of fair quality evidence, according to the John Hopkins Guidelines (Dang & Dearholt, 2018). The evidence identified in this literature review is compelling and sound, but results are limited to the amount of literature available for the project PICO question. The use of a multidisciplinary team in the value analysis process, a consistent evaluation tool, and an agile supply chain is achievable in the project organization.

There are several weaknesses or limitations noted in the literature reviewed for this PICO problem. The limitations of the review were the lack of articles addressing supply chain management in a pediatric perioperative environment and the lack of information regarding the frequency of periodic reviews needed of current supply items. Additionally, all articles focus on the initial purchase of the implant or supply item rather than the supply's ongoing relevance. While the evidence quality was determined to be good and fair, there were no high-quality articles in this review. The lack of high-quality articles to review is related to varying ways in which the papers were written and then compared. Lastly, few articles focus on the internal supply chain and more are needed.

Recommendations

Based on the literature, implementing a pilot project that includes recommendations synthesized from the literature can decrease the supplies expiring on the shelf. The proposed project would maximize the current processes in place through the present value analysis team. This team has already established vital stakeholders that include physicians, group purchasing agreements, and the ability to set up consignment contracts. New to this process would be to
identify the high-value supplies expiring routinely over the last three years and reevaluate them. In addition to the supply evaluation process, this process proposes developing and implementing a decision support tool that will consistently evaluate supplies and provide clear communication to various stakeholders about the product's status in the value analysis process. The decision support tool will include the strategic values of the organization in a way that the value analysis process has not in the past. The ideal outcome would include mitigating any supply disruption, decreased loss of supplies or implants related to expiration. The review and evaluation of supplies and implants will need to occur periodically. There is no formal recommendation as to how often this assessment should happen in the literature. A small pilot study of expired items could be evaluated over the next several months to years to obtain the proper periodic review time recommendation unique to the organization. The processes described can be implemented with minimal additional cost to the organization.

**Project Implementation**

The project design answered the importance of what, where, when, how, and why of the expired supply project. Supplies and implants located in the perioperative division that have expired at least once over the last three were under consideration. The plan occurred at a midwestern children's hospital in the perioperative division to include over 20 operating rooms through collaboration with the value analysis committee already established at the organization. Members of the committee included supply chain senior buyers, the surgery business manager, clinical specialty nurses, and clinical staff with first-hand knowledge of supply usage in the operating room. Management of disposable sterile supplies and implants is an opportunity within perioperative leadership to ensure quality patient care at an acceptable cost for both the patient and the organization. Making quality, price, and value decisions in surgical supplies is a constant
companion for leadership in the perioperative environment. Establishing a standardized workflow process for managing disposable surgical supplies was essential to ensuring the right supplies are available for every patient without compromising the quality of care or patient safety.

Setting

The project took place at a midwestern children's hospital in the perioperative division. This project crossed 20 operating rooms at two different sites that care for surgical patients undergoing outpatient and inpatient procedures. Approximately 20,000 surgical cases occur each calendar year.

Target Population

The target population was the key stakeholders in the supply chain process. The value analysis team comprises clinical staff, perioperative business manager, physicians, and senior buying specialists. The expertise each member brings to the process will guide the development of the process and the decision tool.

Methods of Implementation

The quality improvement project was reviewed and approved by the institutional review board of St Catherine's University and the site perioperative services director as a quality improvement project. The project was developed and implemented using the Plan, Do, Study, Act quality improvement framework. The planning stage began with reviewing the current process to determine how and where the decision tool could be applied. Essential stakeholder feedback was used to inform decisions regarding improvements to the decision tool. Fundamental considerations include using the value analysis process to ensure cost containment,
standardization, group purchasing contracts, product selection, and multidisciplinary decision making.

In the Do stage of PDSA, the implementation of the standardized process and decision tool will be trialed. The decision tool evaluated any supply or implant that has expired more than once over the last three years. The standardized evaluation and rating tool created for this project was unique to the organization to ensure each item is evaluated in the same manner. Supplies identified and placed through the evaluation tool will be forwarded for final review and recommendations by the value analysis committee.

**Cycle One of the PDSA Cycle**

**Plan**

The PDSA Plan stage included the development of the process and the components of the decision support tool. An example of the criteria tool found in Eiferman, Bhakta, and Khan (2015) was used to begin a decision support tool prototype (Appendix A). The decision support tool was formatted into a word document that was shared with key stakeholders. During the initial Plan, this process began with cross-referencing the current process with the proposed decision tool. The current process was found to address some criteria in the new decision tool.

The areas not addressed at all were related to the alignment of decision-making with the strategic plan and specific financial information. Concerns were raised by the organization that the decision tool item criteria related to literature or evidence were weighted too high in the tool. All categories of importance were initially given equal weight in the decision tool.

**Do**
Decreasing the Cost of Surgery

There was a process for collecting information on an Excel spreadsheet to determine expired supplies, but the process was complicated and difficult for some users to navigate. The Excel spreadsheet was updated to include all of the items found in the surgery area and re-examined to ensure only what is necessary was collected in the data. The decision support tool was developed by adjusting the five critical components during the review of the support tool with key stakeholders. The five key areas that were addressed were outcome improvement, quality improvement, safety improvement, supply chain goals, and financial impact.

Study

The decision support tool was created with key involvement from stakeholders and initial historical data was used to identify three items that would be evaluated using the decision support tool. After receiving feedback from the key stakeholders, the tool will need to be tested in the next PDSA cycle.

Act

This cycle resulted in a draft decision support tool ready for the pilot phase of the items identified from the historical data. It is essential to note that in fall 2020, amid PDSA cycle one, the organization underwent a significant restructure. The restructure occurred during the planned implementation of the project intervention and included an organizational review of the hospital supply chain. This redesign had a short- and long-term impact on the outcomes of this project. As a result of the organizational announcement, the perioperative business manager requested a re-review of the project goals and implementation process to ensure the quality improvement project was in alignment with the updated organizational strategic redesign.
Cycle Two of PDSA Cycle

Plan

The second round of the Plan cycle involved taking the newly created decision support tool and three items identified from the historical data through the decision support tool. This pilot will determine if the decision support tool has all the required components and is effective.

Do

During the Do stage of cycle one, three items were identified using the historical data. Three items were identified to use in the decision tool pilot (see Appendix A). These supply items included a Permacol mesh implant, On-Q pain pump, and the cryoblator.

The Permacol mesh implant was found to have expired twice over the last several years. The utilization of this supply during surgery was abnormally low compared to when the item was first purchased. The information regarding its use was shared with the general surgeons who used this item in the past. The surgeons reported the implant was no longer being used because the implant had not met the patient outcome expectations. The decision support tool was used to confirm the information that was gathered. This information was then reviewed at a value analysis meeting. After using the standardized process and decision tool, it was decided the Permacol mesh implant would be removed from the shelf with an ongoing cost savings of $10,000.

The on-Q pain pump was reviewed using the same standardized process used to study the mesh implant. In contrast to the mesh implant, this item is still currently used in surgical procedures at the organization. One physician currently uses it twice a year on average. The pump comes in a package of five, which results in three wasted pumps per year. The data collected using the decision support tool was reviewed and discussed by the value analysis team.
Following this review, the team decided the on-Q pain pump would no longer be stocked. To prevent waste, the item will now only be ordered as needed when a surgery is scheduled. Removal of the item from the supply chain resulted in a savings of $1625.

The final item trialed was a cryoablation disposable device. This item has proven value in supporting positive patient health outcomes. This item, when used, cuts the length of stay for patients by several days and minimizes post-operative pain. Information This item was reviewed using the new standardized process and decision support tool. As a part of the process, the information was reviewed and discussed by the value analysis team, and it was decided the item would remain in stock.

The final item piloted through the decision tool was a cryoablator. This is a new supply item, and the item was looked at in this manner to see if the decision tool could be used at the initial purchase of the supply item. The supply item resulted in known decreased post-operative pain and reduced length of stay for patients. It was essential to pilot a tool with known positive results to ensure the decision tool could see an item both positively and negatively. The cryoablator costs approximately $2000 for each disposable handpiece. This item is known to improve patient outcomes by decreasing pain post-operatively. Patients can also leave the hospital three days earlier than patients who did not have this technology during the surgical procedure. A review of the cryoablater using the new process and decision tool further validated the benefits of this supply item and decided to continue to stock this item.

Following the pilot, a member of the value analysis team suggested the supply decision tool’s use to evaluate new supply items requested by physicians and staff. This proposal offered a new way to expand the use of the decision tool. This team member reasoned that using this tool
Decreasing the Cost of Surgery

would allow the value analysis team to complete a baseline evaluation of a new supply item that could be used to compare when reevaluating the same supply item in the future.

Study

The initial results of the quality improvement project suggest the standardized process and decision support tool were effective in addressing the project problem. The word document format used for the decision tool and the process for storing the data with the tool presented some little challenges to manage and could be addressed in the next PDSA cycle.

Act

In the Study stage of the cycle, all the information was gathered. There was a request to explore options for transitioning the decision support tool from a word document format into the organization's Value Analysis Management System (VAMS) software. Integrating the tool in the A plan intended to make the decision support tool easier to manage and save for future reference was needed.

Cycle Three of the PDSA Cycle

Plan

During the plan for this phase, it was planned to determine if the decision tool could be incorporated into the value analysis software system. The information then would be stored with the item. Additionally, there is the desire for the decision support tool to be added to the VAMS software. During this cycle, the plan was to use a current newly requested supply item to determine if the decision support tool would be helpful to the value analysis team.

Do

A key team member who came back from leave after having been on leave related to personnel reduction from the COVID-19 pandemic was brought into the decision tool's
Decreasing the Cost of Surgery

implementation. This key stakeholder is the VAMS committee leader. His role covered being an expert in the VAMS software. This team member reached out to the Value Analysis Management (VAMS) software platform creator and shared the questions from the decision tool to see if the questions could be incorporated into the software. The tool questions were shared, and then the platform shared a similar tool that is currently part of the platform but never utilized by the organization. This decision tool from the VAMS software is not something any team members were aware existed (Appendix B).

This platform has a tool that is very similar to the tool from the pilot tool. It is trademarked and part of the platform. It is also adjustable, but the numerical rating is simplified even further than my proposed evaluation too. The items that were piloted from the original eval tool and used this newer tool. The project leader and business leader took the previous items discussed and used the newer decision tool. The results are similar. This information was shared with the value analysis team and gained their approval to use this refined decision tool. The project leader then contacted the vendor of the VAMS software to determine how this information could be stored with the supply items throughout the process. Having the tool as part of the VAMS software platform will allow this information to be easily stored and retrievable for reference in the future.

After meeting with the software representative from the VAMS system, there is a capability to personalize the evaluation tool to represent the perioperative division's strategic objectives. During a basic orientation to the software developer's software, it was determined the tool could be saved within the existing software. In the current process, when an individual in the organization requests a new product, they have to enter a request into an established interface.
Decreasing the Cost of Surgery

The request entered by the requestor creates a "project" for every item in the VAMS software. There is a place to add supporting documentation in the project, ensuring its decision tool results remain. The organization is optimizing and expanding the use of existing software. This project has created a method for storing the data so that the organization can monitor long-term patterns and trends in the supply usage data.

The same items evaluated in the cycle one phase were then placed through the newly obtained decision support. The same results were obtained and shared with the value analysis team.

A new item that was newly requested was placed through the decision support tool. The supply item had the initial information gathered and then placed through the decision support tool. What was learned was decision support tool determined that the item should not be approved based on all the five criteria found in the decision support tool.

Study

The results of this cycle were again favorable to the DNP project. Since the results were similar and shared with the value analysis team, it was determined that the decision support tool would remain as a part of the value analysis process. The business manager found it was easier to consistently explain the denial of the new request. It is often difficult to explain why one particular item should be approved and another item denied. The clear communication that the tool helps support that ongoing in the future that requestors will know that their item was determined to be judged fairly every time.

Act

As the results were again favorable, the next cycle examined how a newly requested item would fit this process. During this cycle, the business manager and project leader have developed
Decreasing the Cost of Surgery

a weekly meeting to evaluate the new products placed into the datasheet. During the first quarter of 2021, there was a review of the expired items. Weekly sessions will help with the datasheet's sustained use, easier retrieval of the costs associated with those items, and potentially quicker decision-making on the expired supplies' disposition. Increasing the frequency of the monitoring and surveillance will increase the success of the project.

The project leader continues to meet with the business manager every week to look at any newly requested supplies or any identified expired supplies. The decision tool is applied to the identified products found during the review process through these work meetings. Following our meeting, the information collected is shared via email with the value analysis committee members. All members will have assigned tasks and will have an opportunity to determine an outcome on the identified products.

The project has moved into the project's sustain phase, and results will be collated over the year to determine the long-term financial impact. As the decision tool is used through the remaining 2021, it will inform the decision-making process of expired supplies further.

Data Collection Procedure

Data collection for this project included the information collected about the expired products reviewed in the project and stakeholder informal formal feedback on the effectiveness of the process and tool via survey monkey. The standardized process begins with collecting data about the supply item under review. Information about the item is entered in a spreadsheet by an individual in the central processing department. This spreadsheet is accessible to all staff involved in the process via the organization’s shared drive. The business manager then takes the entered information and gathers more detailed information about the expired item, such as the initial purchase date, annual usage, and any historical data pertinent to the evaluated supply item.
This information was used to determine whether a supply item should be included for review using the newly developed decision support tool and shared with the value analysis team to determine the product's final disposition.

The data collected to measure the tool's success included informal and formal feedback from stakeholders. The project's overall success will be measured by analyzing cost savings resulting from the implementation of the standardized process and decision tool.

**Data Analysis**

Data gathered about the supply items will be analyzed at the start of the project to identify supplies that expired in the past. The second analysis will occur on the specified items with the tool. The value analysis committee will collaborate and decide the final disposition of the surgical supply.

As part of incorporating the decision tool, the project leader met with the value analysis team's key members. The various roles were able to give me feedback on specific areas of the decision tool. For example, the senior buyer was very interested in the strategy around standardization. The clinical staff was interested in judging each supply item against a uniform tool. Using the feedback from the group helped make the tool more useful in evaluating the supplies. Overall, the initial response to the decision tool by all the stakeholders was very favorable.

The surgery business manager suggested the tool be used on the supply item's initial analysis. Finally, after one of the initial value analysis committee members returned from leave, the suggestion to check with the value analysis management software company. It was determined that a decision tool was quite similar to the developed prototype available as part of the organization's value analysis software. The advantage of using the value analysis management
software is that it's already in PDF form and was entirely customizable. The PDF version in appendix B was developed and trialed with the same products used in the initial prototype version. The final adopted version was the PDF version customized with our unique specifications and based on the literature's recommendations.

Following the stakeholder's feedback on the decision tool, there was a pilot of three items using the decision tool. Initially, my objectives were to analyze the current supplies for specific specialties such as neuro and general surgery that cost more than $300. The project leader found more areas of opportunity from many different services that would impact the project's cost savings. This change from only examining two service lines will allow more supplies to be explored.

As an additional outcome measure, an anonymous survey was sent to determine the satisfaction of team member's use of the decision tool. Due to the team meetings' suspension and the organization's redesign, only four team members were available to complete the evaluation. One of the four members had insufficient exposure to the process and tool to participate in the evaluation survey.

**Social Justice Considerations**

This project addresses several social justice issues in the pediatric surgical population. The Institute of Healthcare Improvement’s (2020) quadruple aim focuses on improving the health care of populations, enhancing the experience of care, and in this case, improving longevity and health outcomes using surgical procedures, and reducing the per capita cost of healthcare.

High healthcare costs due to expired supplies leads to unnecessary waste. Higher prices cause a disproportionate burden on more impoverished families that may not be able to pay for
procedures with high out-of-pocket costs not covered by insurance. Increased costs of health care and surgical care can cause downstream effects. In particular, this project addresses the uneven distribution of surgical services, lack of access to surgical interventions, and inequities in access to surgical treatments. If supplies or implants are not available for every patient undergoing the same surgical procedure, then there is an uneven distribution of surgical services. The lack of access can compromise patient safety and outcomes for pediatric surgical patients. If a supply was available but then discontinued because it was not in stock the day it is needed, the physician would need to modify their technique or delay the surgical procedure itself. This delay can compromise patient outcomes and result in inequities of access to surgical treatments. Healthcare disparities that originate in childhood link to adult chronic illnesses, and by not addressing this disparity during childhood, these issues may follow these children into adulthood (Cheng, Emmanuel, Levy, & Jenkins, 2015).

**Evaluation**

**Presentation of Results**

The effectiveness of the new standardized process and decision support tool were evaluated using the results of the PDSA cycles, supply chain cost savings, and informal and survey feedback from the interdisciplinary value analysis team. The monetary savings identified through the utilization of the decision tool amounted to significant cost savings for the organization and validated the success of the project intervention.

<table>
<thead>
<tr>
<th>Initial Pilot through decision tool:</th>
<th>Cost Savings</th>
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</thead>
<tbody>
<tr>
<td>Permacol Mesh Implant</td>
<td>$10,000</td>
</tr>
<tr>
<td>On Q Pain pump</td>
<td>$1875</td>
</tr>
<tr>
<td>Cryoblator</td>
<td>Decreased post-operative pain &amp; Decreased</td>
</tr>
</tbody>
</table>
Additionally, the project's success can be assessed using informal and formal feedback from value analysis team members and organizational stakeholders. The initial plan was to conduct a written survey of team members with the following questions. The changes to the supply chain personnel impacted the number of available survey respondents. These are included for review.

Analysis
During the initial PDSA cycle, the decision tool was utilized to evaluate expired products. This cycle proved that the proposed project intervention could work as a part of the process. Stakeholder feedback was collected to further inform the development and prioritization of the criteria included in the decision-making tool. The first cycle was impacted by the organizational staffing reductions, which affected the implementation and timeline for the project intervention due to changes in stakeholder and value management team member availability.

In the third PDSA cycle, the tool's implementation, it was determined that there was a source document as a PDF that is provided with the purchase of the VAMS software. Information was gathered and trialed similarly to the original tool. We were able to implement this tool through the findings and get the same results as the original, less technology-enabled tool.

The fourth and final PDSA cycle demonstrated that the process would work, and it could be sustainable. Demonstrated in this cycle is the tool's ability to be put into a sustainable process used throughout the re-examination of expired products.

Overall, using the PDSA cycle is remarkable for beginning the process and the follow-up used throughout.

**Interpretation of Results**

The initial analysis of the results obtained from implementing the decision tool from eliminating two supplies and decreased length of stay is approximately 10% savings of the approximate $100,000+ lost annually with expired surgical supplies.

There have been multiple limitations throughout the project. First, and perhaps most impactful, has been the impact of the COVID-19 pandemic. The pandemic resulted in personnel layoffs throughout the supply chain team and organization. The organization hired an outside
consultant to evaluate the supply chain. This restructuring process led to the loss of several key value analysis team members and the suspension of regular meetings. This made evaluating stakeholder satisfaction with the decision tool using the anonymous survey challenging. The small number of stakeholder participants in the survey made it challenging to analyze the results and make conclusions.

**Discussion**

The results of the quality improvement project were remarkable for demonstrating the ongoing cost savings that can occur for the organization with the use of the new standardized process and decision support tool. Before implementing this project, data was only collected on expired items, and there was no standardized process or decision support tool to review and analyze previously approved items. The development and implementation of a standardized process and decision tool make it easier to address the issue of expired supply. Discussion and decisions by the value analysis team, including key stakeholders, allow a thorough conversation with the value analysis team's expertise to pursue standardization or group purchasing contracts. The decision tool also provides an effective means to facilitate communication amongst key stakeholders. The standardized process enhanced the value analysis team’s ability to utilize the group's expertise to make the best decision to ensure the right product is available at the right time and in the right quantity. The application of the PDSA model was an effective framework to guide the implementation of the project intervention to evaluate expired supplies using a standardized process and tool.

This project will progress and move into the quality assurance phase of the newly implemented VAMS decision tool. It has surpassed its original intent for expired products and
Decreasing the Cost of Surgery

has grown to include all submitted items through the value analysis process. Every product that is requested will now be evaluated in the same consistent manner.

**Conclusion**

As of August 2020, Children's hospitals across the country suffered over five billion dollars in economic losses related to the COVID-19 pandemic (CHA, 2020). Reducing financial burdens to consumers and healthcare systems will be at the forefront of redesigning healthcare delivery to all patients and children. Quality improvement projects performed with nursing input and leadership should be fiscally responsible and affect patients' quality of care will become necessary in the future sustainability of pediatric-only facilities.

Developing a standardized process and decision tool to consider sterile surgical supplies before they expire compared to the current unstandardized process could result in fewer expired supplies and increased savings in the pediatric OR. As hospitals and organizations continue to face challenging economics, managing disposable sterile supplies and implants is an opportunity within perioperative leadership to ensure quality patient care at an acceptable cost for both the patient and the organization. Organizations are obligated to consider quality, price, and value as part of the Quadruple Aim. Examining current processes regarding disposable surgical supplies and managing supplies in the operating room (OR) is vital to any hospital organization's success (IHI, 2020). Implementing a standardized process to achieve cost containment further supports the goal of providing high-quality, safe patient care for every patient.
References


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Appendix A

Initial tool Pilot

**Quality of the Evidence**

Strong: Evidence includes consistent results from well-designed, well-conducted studies in the pediatric population that directly affect health outcomes.

_____ 2 points

Limited: Evidence is sufficient to determine health outcomes, but the number, quality, or consistency of the individual studies, generalizability to routine practice, or indirect nature of the evidence on health outcomes limits the evidence's strength.

_____1 point

Insufficient: Evidence is insufficient to access the effects on health outcomes because of a limited number of studies, significant flaws in their design or conduct, gaps in the chain of evidence, or lack of information on important health outcomes.

_____ 0 points

**Clinical Benefits**

Decreased Length of Stay

_____ 1 point

Decreased Infections / Complications

_____ 2 points

Decreased invasiveness

_____ 1 point
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Increased Quality of Life
_____ 2 points

Decreased Follow up Procedures
_____ 1 point

**Subjective Benefits**

Decreased OR time
_____ 1 point

Increased Competitive Advantage
_____ 1 point

Increase Surgical Population
_____ 1 point

Available at the area (competing hospitals)
_____ 1 point

**Staff Safety/Satisfaction**

Decreased Exposure
_____ 2 points

Decreased Needle Sticks
_____ 2 points

Decreased Workers Comp (lifting/manual pressure)
_____ 2 points

Increased Convenience (Practice Compliance / Handling)
_____ 1 point
Supply Chain Goals & Strategic Plan

Product Standardization

Positive

_____ 2 points

Neutral

_____ 0 Point

Negative

_____ -2 points

Compliance with State bid requirements

_____ 1 point

Contract Compliance

_____ 1 point

Complete portfolio of treatment options

_____ 1 point

Supports mission

_____ 1 point

Financial Impact

_____ 6 points > $50,000

_____ 5 points +$40,001-$50,000

_____ 4 points +$30,001 - $40,000

_____ 3 points +$20,001 - $30,000
Decreasing the Cost of Surgery

<table>
<thead>
<tr>
<th>Points</th>
<th>Cost Range</th>
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<tbody>
<tr>
<td>2</td>
<td>$10,001 - $20,000</td>
</tr>
<tr>
<td>1</td>
<td>+ $1 - $10,000</td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td>- $1 - $10,000</td>
</tr>
<tr>
<td>-2</td>
<td>-$10,001 - $20,000</td>
</tr>
<tr>
<td>-3</td>
<td>-$20,001 - $30,000</td>
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<tr>
<td>-4</td>
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<td>-5</td>
<td>-$40,001 - $50,000</td>
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<tr>
<td>-6</td>
<td>&gt; -$50,000</td>
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Score

0-5 – Deny

6-7 – Limited approval w/6-month review

>7  - Approve
Appendix B
Decreasing the Cost of Surgery

### Data Leverage Group - Decision Matrix

<table>
<thead>
<tr>
<th>Category Summary</th>
<th>Weight (%)</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
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<tbody>
<tr>
<td><strong>Outcome Improvement</strong></td>
<td>25</td>
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<td>0</td>
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<tr>
<td><strong>Quality Improvement</strong></td>
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<td>1</td>
<td>1</td>
<td>0</td>
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<td><strong>Safety Improvement</strong></td>
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<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Supply Chain Goals &amp; Strategic Plan</strong></td>
<td>15</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Financial Impact</strong></td>
<td>20</td>
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<td>-1</td>
<td>0</td>
</tr>
</tbody>
</table>

*For each Decision Factor, assign either a 1 (for positive results), a 0 (for Neutral Results or Not Applicable), -1 (for negative results)*

<table>
<thead>
<tr>
<th>Outcome Improvement</th>
<th>Length of Stay Reduced</th>
<th>Clinical Efficacy</th>
<th>Restart / Redes / Follow up</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Quality Improvement</th>
<th>Reduction in Infections / Complications</th>
<th>Involved</th>
<th>Compliance with Patient Safety Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
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<table>
<thead>
<tr>
<th>Safety Improvement</th>
<th>Reduced Exposures</th>
<th>Reduced Needle Sticks</th>
<th>Reduced Workers Comp [Lifting, Positioning]</th>
<th>Staff Accountability / Ease of Practice</th>
<th>Physician Acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
<td>1</td>
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</table>

<table>
<thead>
<tr>
<th>Supply Chain Goals and Strategic Plan</th>
<th>Promotes Product / Practice Standardization</th>
<th>Contract Compliance</th>
<th>Replaces Current Lisa Product(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

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**Acceptable Passing Score**: 1.70

**Final Score**:

- #1: 1.80
- #2: 0.75
- #3: 0.35
- #4: 0.00

**Result**:

- #1: Approved
- #2: Not Approved
- #3: Not Approved
- #4: Not Approved