



Building a Cost, Quality and Outcome Model for a Clinically Aligned Supply Chain

THE REAL-WORLD CASE STUDY OF CQO AT MCLEOD HEALTH

SUPPLYCOPIA: McLeod Health

Table of Contents

Executive Summary	04
Overview	05
Situation	05
The Big Picture: Cost, Quality and Outcomes (CQO)	06
Physician-Led, Supply Chain Supported	06
Addressing Physician Preference	07
The Data Dilemma	08
The SupplyCopia Solution	08
Data Enhancement	08
Bill of Materials (BOM) Creation	09
Data Integration: Cost, utilization, reimbursement and demographics	09
Physician Leader Board Development	09
CQO Insights and Actions	10
Supply and Process Standardization	10
Implants and Outcomes	11
Waste Reduction	12
Contract Optimization	13
Moving Forward	13
Clinical Equivalency	13
Smarter “Shopping”	13



Executive Summary

While McLeod Health's total joint service line was critical to the health and well-being of its patients, it was a strain on the health system as a result of the U.S. Centers for Medicare & Medicaid Services (CMS) reimbursement cuts. Leadership recognized the need to find new ways to reduce spend in this area without negatively impacting care.

To sustain the viability of the service line, McLeod's orthopedic and supply chain teams joined forces to examine how they could reduce costs, maintain patient care quality, and improve financial outcomes for the organization.

To do so, they needed visibility into every aspect of total joint procedures that could impact costs, quality and outcomes by surgeon and by case, including supply usage/costs, amount billed to/ reimbursed by payer, patient outcomes and case revenue/profit.

THE CHALLENGES

The central challenge was creating visibility to the variables that either positively or negatively impact Cost, Quality and Outcomes CQO - in as close to real-time as possible. But the data required for this effort resided in separate systems that lacked integration and spanned different areas of the organization.

THE SOLUTION

The McLeod team turned to SupplyCopia to develop a user-friendly and intuitive dashboard to support its total joint CQO pilot. SupplyCopia's SaaS solution combines disparate datasets and

PHYSICIAN-LED, SUPPLY CHAIN SUPPORTED

The McLeod team realized that if they were to enact real change in the health system's total joint program, the orthopedic team must lead the effort and decide what data was necessary to evaluate supplies and their impact on CQO. Supply chain would support the initiative by obtaining and validating the requested data, as would stakeholders from the finance, value analysis and quality teams.

applies artificial intelligence (AI) and machine learning (ML) to generate actionable insights on CQO.

SupplyCopia then made this data and resulting analytics accessible through a perioperative dashboard, which presents cost, quality and outcomes information by surgeon and by procedure as a consolidated report. Dashboard users can drill down on specific items included in a procedure, identify the costs associated with them and then correlate the items to clinical outcomes.

RESULTS

Using the insights generated by the SupplyCopia dashboard, the McLeod team has uncovered significant opportunities for product and process standardization, waste reduction and contract optimization. Most importantly, they are able to base their decisions on what delivers the greatest value to their patients. Ultimately this work will enable McLeod to have the financial viability to continue to perform life-changing total joint procedures, which are critical to the health and livelihood of its patient population.



Overview

McLeod Health is a not-for-profit healthcare system with seven hospitals and 938 acute licensed beds across South Carolina. More than 55% of the health system's patients are covered by Medicaid and Medicare, with many suffering from chronic health conditions that increase care delivery costs.

Whether patients are insured, under-insured or uninsured, McLeod is committed to providing the healthcare they need and deserve. In many cases, McLeod must absorb the cost of the care it delivers, which places enormous financial pressure on the organization.

Despite these challenges, McLeod has maintained a Stellar A++ credit rating and is recognized as a destination for medical excellence. The health system is constantly striving to improve cost, quality and outcomes (CQO) for the communities and patients that it serves.

Situation

Patients in McLeod's communities rely on the health system for knee and hip replacements, which can have a tremendous impact on quality of life, as Dr. Michael Rose, anesthesiologist and chief strategy and innovation officer for McLeod Health, explains:

"Total joint surgery is one of the most phenomenal care lines available in terms of outcomes for patients. One year later people will describe the surgery as having been 'life altering,' having substantially reduced their pain and improved functionality." But McLeod was losing significant dollars on

these procedures, which threatened this service line so critical to the community.

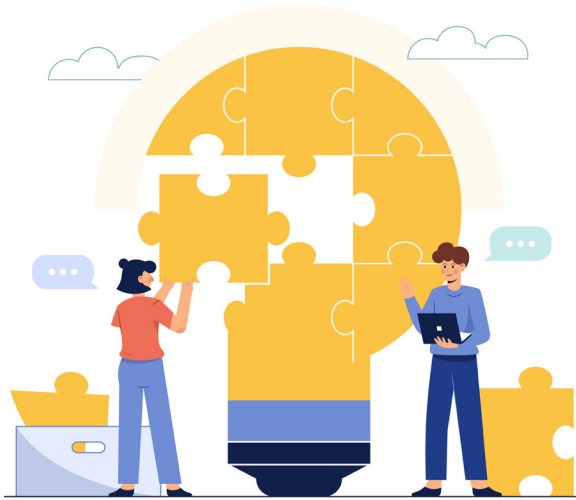
As the already highly efficient health system faced further reimbursement cuts from the U.S. Centers for Medicare & Medicaid Services (CMS), leadership had no choice but to find new ways to reduce spend in this area without negatively impacting care.

"No mission, no margin is real," Dr. Rose added. "The specific challenge was getting the right care to the right people in the most effective way recognizing that our communities trust and depend upon us. That's what really started to push us to look at all aspects of the program, from the supplies used in a total joint case, to what happens after the patient leaves our door because we're still responsible for them."



TOTAL JOINT CQO OBJECTIVES

- Establish the co-relation between cost, quality and outcomes for total knee replacement procedure
- Identify insights, anomalies and patterns from the utilization data
- Integrate CQO with reimbursements and identify insights, gaps and optimization opportunities
- Standardize products and procedures
- Provide recommendations for cost savings
- Develop blueprint for application to other procedures in the organization
- Enable physician-led decisions supported by supply-chain, financial, value & quality data



The Big Picture: Cost, Quality and Outcomes (CQO)

McLeod's orthopedic and supply chain teams joined forces to examine how they could reduce costs, maintain patient care quality, and improve financial outcomes for the organization.

In order to do so, they needed visibility into every aspect of total joint procedures that could impact CQO by surgeon and by case:

- The supplies used in the case and their cost (as well as supplies that were picked for the case but returned to inventory or wasted)
- Total case cost (fixed and variable costs)
- Amount billed to the payer
- Reimbursement received
- Patient outcomes, including infections and readmissions
- Case revenue/profit (reimbursement less costs)
- Variation of the direct and indirect cost per facility

"The ultimate goal was to create a dashboard with all of this information and make it as close to real-time as possible in reference to data so that our decision makers can drive value for our patients and our organization," said BJ McCluskey, director of resource optimization at McLeod Health, who oversees the health system's value analysis program. "Then we could use that same dashboard to measure decisions that we make over time to make sure we achieved our goals."

Physician-Led, Supply Chain Supported

Perhaps one of the most unique aspects of McLeod's CQO initiative was that it was physician-led. Many organizations have been working to establish clinically integrated supply chains where clinical and supply chain teams work together to improve cost, quality and outcomes. But physicians can be resistant to change, particularly when they question the credibility of the data presented by supply chain.

The McLeod team realized that if they were to enact real change in the health system's total joint program, the orthopedic team must lead the effort and decide what data was necessary to evaluate supplies and their impact on CQO.

Supply chain would support the initiative by obtaining and validating the requested data, as would stakeholders from the finance, value analysis and quality teams. In essence, it was not only a healthcare supply chain transformation project but also a clinical and financial transformation project.

"Never before had we presented to our physicians cost, quality and outcomes data together in one place," said Carmen Winfield, vice president of Supply Chain, McLeod Health. "It required close collaboration between various departments. Supply chain would provide the cost of supplies, finance the reimbursement side and quality the patient outcomes. So that was our goal - to put it all together so physicians could see the big picture and make evidence-based, data-driven decisions."



Addressing Physician Preference

Physician preference typically plays a role in hip and knee implant product selection. While one surgeon believes one manufacturer's implant delivers the best patient outcomes, another surgeon believes another manufacturer's product is superior. Because implant components represent a significant portion of the overall procedure cost, the McLeod team was particularly interested in knowing how these items impacted CQO.

The integration and analysis of this data would facilitate the linkage of specific products, or product combinations, to procedural costs and quality of care delivery. From there the orthopedic team could standardize on those supplies that delivered the greatest value: Best outcomes at the lowest cost.

"Once we established this baseline, we wanted to utilize the data to test hypotheses or changes," said Dr. Patrick Denton, orthopedic surgeon, director of sports medicine, and orthopedic service line leader for McLeod Health. "If we switch to vendor X and use their products because they've come back to the table and given us a better price, does that affect any of our outcomes or results? Or if we implement a new technology (e.g., computer navigations, robotics) how does that affect our cost structure and our outcomes?"

"And the last thing we wanted to do was implement a change in vendor or in product that was detrimental to our patients," Dr. Denton added. "No matter what the cost is, that was off the table."

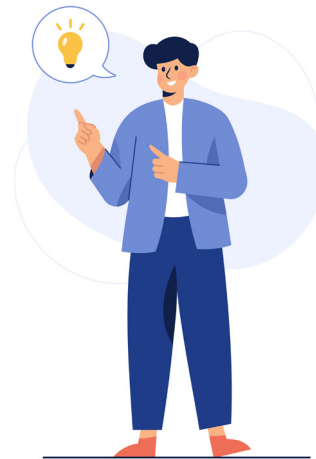


The Data Dilemma

The central challenge was that the data required for this effort resided in separate systems, including healthcare supply chain technology and clinical and financial platforms, that lacked integration:

- Enterprise resource planning (ERP) system for item master and purchase order (PO) data
- Inventory point of use (POU) system for supply consumption data (e.g., supplies used by each surgeon in procedures)
- Cost accounting system for financial data (e.g., what supplies were billed, how much the health system was reimbursed by payers)
- Quality system for patient outcomes data, including infections, readmissions, etc.

“One of the surprising things is how difficult it was to get all the data that we needed,” noted Dr. Denton. “Unfortunately, some data is in one computer system for supply chain, some data is in another system for our CFO and revenue management, another one for what we actually used in the procedure. We needed a way to filter this data and make it as clean as possible.”



The SupplyCopia Solution

The McLeod team turned to SupplyCopia to develop a user-friendly and intuitive dashboard to support its total joint CQO pilot. SupplyCopia’s SaaS solution easily combines disparate datasets and applies artificial intelligence (AI) and machine learning (ML) to generate actionable insights on cost, quality and outcomes.

“We engaged SupplyCopia to create a platform that would bring all of this data into one place and integrate it in a way that’s meaningful for our decision-makers,” said McCluskey.

SUPPLYCOPIA CQO METHODOLOGY STEP BY STEP

- Step 1:** Enhance data and make it analyzable:
Clean, classify, code item master data
- Step 2:** Create a bill of materials (BOM)
- Step 3:** Integrate the purchasing cost with the BOM and establish cost structure for each physician by procedure
- Step 4:** Integrate the reimbursement data with the cost and utilization
- Step 5:** Integrate the demographics data with the cost and reimbursements
- Step 6:** Establish physician leader board
- Step 7:** Slice & dice the data based on payer type
- Step 8:** Identify actions and insights
- Step 9:** Make recommendations for standardization
- Step 10:** Enable physician led decisions supported by clinical, supply chain and financial data

DATA ENHANCEMENT

SupplyCopia leveraged its healthcare technology platform and Virtual Item Master, the largest global product database of its kind, to clean, classify, code and enhance McLeod’s data from each of its systems, making it analyzable.

SupplyCopia then made this data accessible through a perioperative dashboard, which presents CQO information by surgeon and by procedure as a consolidated report. Dashboard users can then drill down on specific items included in a procedure, identify the costs associated with them, then correlate the items to clinical outcomes.

“SupplyCopia is generations ahead of other tools available in the market today,” said Dale Locklair, Senior Vice President Planning & Facilities Management, McLeod Health. “The capabilities of the technology are the kind of things we dreamed about five or 10 years ago. And they’re here today. There just aren’t any other solutions providers who are bringing these CQO insights to the forefront and have integrated everything into one single tool.”

BILL OF MATERIALS (BOM) CREATION

SupplyCopia analyzed the procedural data and generated a bill of materials (BOM) for McLeod's total joint procedures, with supplies used by each surgeon in each case. This gave the health system a baseline for supply standardization efforts.

"Some really phenomenal insights came from that," said Dr. Rose. "The variation in materials going into a case was unbelievable. SupplyCopia was able to define about 10,000 combinations of products used among nine or 10 surgeons in total joint procedures."

"We found tremendous variation in each physician's surgery pack," said Dr. Denton. "Some had extra items that they didn't use all of the time. Others had minimalist packs where the nurses would have to pull additional supplies off the shelf and add them."



DATA INTEGRATION: COST, UTILIZATION, REIMBURSEMENT AND DEMOGRAPHICS

To present a comprehensive picture of CQO for McLeod's total joint procedures, the SupplyCopia team performed a series of data integrations. First the team integrated supply purchasing costs from the item master with the BOM to establish a cost structure for each physician by procedure. Next, they integrated the cost data with reimbursement data from the finance system and utilization data from the POU system. Lastly, they integrated patient demographics data with the cost and reimbursement data.

"Within this tool on the physician side they get to see everything in one view with respect to cost, quality and outcomes," said McCluskey.

"If they want to understand how their choices of supplies played into the cost, they can dive into that information. If they want to understand how their mix of diabetic patients or smoking patients played into their outcomes, they have the ability to dive into that from a clinical aspect as well."

MCLEOD'S DATA CHALLENGES

- Product data not clean or up-to-date
- Procedures across facilities were not normalized, and were named as per local nomenclature
- Exports from various ERP systems led to lack of common identifiers
- Data had irregularities in terms of uncleaned text and characters embedded in key data points
- Supplier names and OEMs were not standardized
- Unit of measurement was not properly identified

HOW SUPPLYCOPIA ADDRESSED THEM

- Integrated non-standardized headers from item master, case ID, reimbursement, direct/indirect cost and demographics data
- Standardized cases as per ICD-10 coding
- Identified functionally equivalent products for utilization data to identify cost savings
- Took the anomalies and one-offs in the data into consideration

PHYSICIAN LEADER BOARD DEVELOPMENT

The McLeod orthopedic surgical team wanted to use the data within the SupplyCopia dashboard to assign a CQO score to each surgeon performing total joint procedures from 1 to 10, with 10 being the optimal cost, quality and outcomes measure. First, procedure and outcome data was pulled and the surgical team worked together to create a composite score, weighting criteria that included:



- Infection rates
- Length of stay
- Readmission
- Mortality

McLeod Health already had exceptional scores in each of these categories, but by creating a composite score using the same criteria and rating methodology, physicians and procedures could be rated consistently. The SupplyCopia team developed a leader board through which each surgeon can access his or her own page, see their score and delve deep into the factors that influence it.

The leader board considers surgeon-specific data on:

- Number of procedures
- Cost per procedure
- Revenue/margin per procedure
- Average charge
- Average revenue
- Average charge/revenue ratio
- Average operating margin

The McLeod team felt that in order for this scoring to be impactful, it must be transparent. In response, SupplyCopia designed the dashboard so that the surgeons could access each other's scoring information and the contributing factors. That way, they could compare performance to one another and uncover factors that raised or lowered scores.

"Once we had the data we presented it as it was; we didn't play poker," said Dr. Denton.

"We showed everybody the cards, 'here's where we are.' I think it was very enlightening for some of us to see that, wow, we're barely making money on some of these joint procedures, if any, and there's some where we lose money. Then displaying each physician's cost, 'let's look at how come one doctor's total knee procedures cost \$2,000 more than another's.' And then the ability to micro dissect that data to examine the products we are utilizing and their impacts."

According to Locklair, the team found the scoring to be very helpful in stimulating conversation among the physicians themselves. Those surgeons who championed the project have had very helpful conversations with other surgeons and their peers around supply standardization and minimizing waste that occurs from physician preference.

"The high level of engagement and leadership from the physicians themselves brought credibility to the work that none of us in supply chain could have presented," said Locklair. "And it built a camaraderie between them that allowed this project to move forward. All of a sudden we now have physicians who are reaching forward for other information that SupplyCopia can bring to the table."

CQO Insights and Actions

Using the insights generated by the SupplyCopia dashboard, the McLeod team has uncovered significant opportunities for product and process standardization, waste reduction and contract optimization. Most importantly, they are able to base their decisions on what delivers the greatest value to their patients. Ultimately this work will enable McLeod to have the financial viability to continue to perform life-changing total joint procedures, which are critical to the health and livelihood of its patient populations.

Planned healthcare supply chain optimization initiatives in the total joint service line based on the results of this work will drive significant savings to the health system.

SUPPLY AND PROCESS STANDARDIZATION

Through its AI and ML technologies, SupplyCopia identified which supply combinations yielded the highest quality outcomes at the lowest possible

cost. Armed with this information, the McLeod team worked to establish a standardized bill of materials for each total joint procedure, meaning those items essential to a case.

They were able to standardize procedure packs (e.g., total knee case) with supplies that would cover 85-90% of all cases, recognizing there would still be times when a surgeon required a unique item based on patient needs.

“We’ve standardized a lot of processes based on the SupplyCopia insights,” said Dr. Denton. “We’ve questioned whether we should use a specific medication or intervention in certain procedures. Then we looked into the data to find the evidence to say, ‘We think it should be this and everybody should do this.’ And we have about a 95% compliance rate with those processes.”

Winfield adds how they are also using the dashboard for enhanced healthcare supply chain management, such as monitoring compliance with supply standardization for joint procedures.

“We can look at the data to determine if we are maintaining our standardization goals and our formularies that the physicians as a group decided upon,” she explained. “Or did we have some variances, some variables? Did we have

a particular new physician that began to use something different that we were unaware of? It was an important goal for us, being able to see if we have gotten off track in any way when it comes to the product standardization.”

IMPLANTS AND OUTCOMES

With implants having the largest price tags among supplies used in total joint cases, the McLeod team was particularly interested to know if implant choice (manufacturer/ brand) impacted clinical outcomes.

“As we look across all of this patient demographic data and we look at patients one year out, the joint itself does not matter,” said Locklair. “The data shows that in the hands of a skillful surgeon particular implants do not make a difference in the long run. We drew the conclusion that those supplies that we call ‘physician preference items’ in healthcare, really do not contribute significantly to outcomes in total joint procedures at all.”

While the choice of supplier and implant did not have a significant impact on patient outcomes, it did influence the cost of the procedure, explained Dr. Rose. But acquiring lower cost implants isn’t the only solution to improving financial outcomes for the health system. He states:



“In the supply chain area, I think we’ve learned a couple of really important things. One is that the choice of the vendor is an important factor in the cost, no question about it. However, what we learned from this experiment is you can’t take enough expense out of the implant to make this line profitable, and it is unlikely to ever be that way. We also need to impact care outside of the hospital after the procedure, including complications, readmission and length of stay.”

CQO FINDINGS

As a result of McLeod’s work with SupplyCopia, they found:

- There was no correlation between demography and the products consumed
- There was a brand and manufacturer preference associated with every physician that was causing a cost difference
- Medicaid and Medicare related procedures were in net loss
- Third party insured procedures were in profit and leading to overall profit at an aggregate level
- The charge to reimbursement ratio was approximately ~21%
- The physicians had almost equal distribution of inpatient vs outpatient
- Indirect cost across facilities was major reason for overall cost fluctuation across physicians

WASTE REDUCTION

While the supply chain and OR teams relied on physician preference cards for the list of supplies each surgeon required in each total joint case, SupplyCopia’s usage data revealed they were mostly outdated and inaccurate, leading to wasted time, labor and products.

In some cases, a physician’s preference card contained supplies that were never used in the procedure. Materials management staff would pick and deliver them to the OR for the case, nurses would prep them for the surgeon to use but later found they were unneeded.

Some of these unused supplies could be returned to inventory, which adds work for OR and materials management staff members. Others

had to be sent back to sterile processing for cleaning and sterilization, again adding time and labor costs. Perhaps most notable were those unused supplies that had to be discarded for safety reasons and could not be billed to the patient, leaving McLeod to absorb the cost.

In other instances, the preference cards were missing supplies for a particular procedure. When the surgeon was performing the case, he or she would realize they weren’t there, requiring OR nurses to work with materials management in an attempt to track them down. This not only added time and labor, but also took nursing time away from the patient.

“We learned that the items maintained in physician preference cards were not kept up-to-date. That in itself was no surprise to us,” said Locklair. “What was significant though was the amount of waste in rehandling the items by having to take them, place them back in inventory, or clean and reprocess them again.”

“What we did find was that we are throwing away significant items,” Locklair added. “Beyond this project, we hope to routinely update physician

FUTURE SCOPE

Moving forward, McLeod plans to leverage the SupplyCopia dashboard and data in the following ways:

- Factor in the rebates, volume commitments and various terms and conditions from suppliers
- Incorporate hip disability and osteoarthritis outcome scores (HOOS) and knee injury and osteoarthritis outcome scores (KOOS)
- Separate out inpatient versus outpatient CQO results
- Separate analysis by each facility
- Identify components of indirect costs across facilities
- Investigate correlation of loss-making physicians/payers with indirect cost
- Investigate reimbursement related contracts with various payers
- Extend CQO analysis beyond total joint replacement

preference cards based on what supplies are used in a case using artificial intelligence that is available with SupplyCopia, and which SupplyCopia is very adept at using.”

“We have been discussing how we can leverage the data we have today on what the preference cards say versus what is actually used and done in the room,” said Winfield. “How can we create a more accurate preference card to say: ‘This is what our data says you should use versus what you did use’ and ‘Here are the products you used that you did not plan to use.’ That’s going to be one of our biggest opportunities for savings.”



CONTRACT OPTIMIZATION

As Dr. Rose explains, the dashboard also provided visibility into implants and other supplies that were used but not part of McLeod’s negotiated contracts with suppliers. While the implants themselves are the most expensive items used in a case, Dr. Rose notes how use of lower-priced items can add up when their prices are not pre-negotiated. He states:

“That gave us visualization to items that were used but were not part of our joint request for proposal (RFP) process. For example, the decision to use collagen for acceleration of wound healing may offset a year and a half RFP process on an implant cost. Having visibility into usage of these items gives us a huge leg up on managing vendors and contracts.”

Moving Forward

The McLeod team has only touched the tip of the iceberg when it comes to CQO. Future expansion of supply optimization into other service lines, and initiatives aimed at reducing costly complications and readmissions based on the dashboard’s data, are likely to yield even more substantial results in the future.

CLINICAL EQUIVALENCY

According to Locklair, the team plans to use the SupplyCopia virtual item master to identify clinically equivalent items that are less expensive than those clinicians are already using. He stated:

“I’ll use the implant analogy. Within the virtual item master is the ability to match like for like products that are made out of the same materials. Not only is the composition the same, but also dimensionally it is exactly an identical implant for less cost. That opens the door for comparisons, not only for supply chain, but also for the surgeons themselves to consider alternatives that could potentially save the system significant dollars.”

SMARTER “SHOPPING”

When a surgeon completes a case, SupplyCopia generates a list of the supplies that were used, whether they deviated from the standardized bill of materials and their cost. Essentially the surgeon receives a receipt for the supplies he/she used and can see the financial impact of their choices. Dr. Rose believes this will ultimately drive more cost effective product selection decisions among McLeod’s physicians. He likens it to the retail experience, where consumers shop around for products that deliver the best value (quality balanced with cost).

“That kind of visibility to the bill of materials is incredibly important now that we are able to put that in the hands of the surgeon,” he explained. “We now have a system that can show us in a very granular way what was spent on supplies in a procedure in near-real time. With this knowledge we believe surgeons will be able to make the same kind of shopping decisions in the operating room that they do in Target.”

“So that’s one of the places we would like to go in the next phase of this project. With timely access to this type of pricing information, we want to continue to drive the quality composite up while driving costs down and create a more sustainable revenue formula for individual service lines.”

SUPPLYCOPIA:

SupplyCopia was created to address the critical lack of supply chain intelligence faced by healthcare organizations. This is especially problematic because it can adversely affect quality, costs, and patient outcomes, and the development of more effective relationships among providers and suppliers. SupplyCopia applies the latest data science and software technology to bring maximum transparency to both major constituent groups of the supply chain - to the benefit of both and expense of neither.