IMPLEMENTING A PERPETUAL INVENTORY MANAGEMENT SYSTEM IN THE OR AT SHANDS HEALTHCARE

By Marisa Farabaugh, William Brewer, and Maggie Downey

Most organizations today are feeling the pinch between increasing costs and decreasing reimbursement. At Shands HealthCare, we found savings opportunity in moving from de-centralized inventory process to a new perpetual management system.

Background

During fiscal year 2008, Shands HealthCare decided to capitalize on a huge cost savings opportunity in the Perioperative/Operating Room (OR) area. Members from Management Engineering, the OR and Supply Chain Services were tasked to look into system options and determine capabilities for managing inventory specifically in the OR.

At the time, Shands HealthCare was already using an inventory point-of-use system in other medical, surgical and ICU areas in the hospital. The team decided to visit and tour other hospitals employing the same technology. They determined that although there were application and logistical differences, the overall product would work in the Shands HealthCare OR areas.

One considerable obstacle was the sheer size of our OR environment; it was significantly larger in the number of ORs and storage locations. At the start of the project, there were 27 OR rooms covering the entire range of surgical services including Transplant, Burn, Cysto, Orthopaedic, Neurological, ENT, Vascular, and robotic. At the end of this project, Shands Healthcare opened an additional 12 OR rooms to extend our service line capacity. With this depth and breadth comes a vast array of supplies and individualized methods of tracking them.

In addition to multiple services, Shands is also a Level 1 Trauma center, which means the stocking and availability of supplies is all the more critical. Shands HealthCare is one of the first Level 1 Trauma institutions to employ this type of inventory tracking system.

Methodology

Since we were implementing such a large scale and complex project, the implementation team had to take a very methodical approach. The following sections outline our implementation plan. In many cases we had to pave our own way using processes developed internally for the project.

Financial Justification

After project feasibility was eminent, the first task Management Engineering underwent was to create a Return on Investment (ROI). To complete this, a quote was obtained from the vendor and savings calculations were generated.

Over the next month, the total capital amount was determined including vendor quote, internal facility costs, internal IT costs as well as any other smaller ancillary costs. Total project costs were estimated at $1.6 Million.

Project savings were calculated based on the following three opportunities:

1) A decrease of 2-3% in annual medical supply expenses
2) An increase of 0.5-1% in annual collections from billable supplies
3) A one-time decrease of 10-12% in overall OR supply inventory

In total, our estimated financial savings at the end of year 1 was expected to be between $1.6 and $2.3 million. This would generate a conservative payback period of one year. Total return on investment at the end of year one would be around $20,000, while year two ROI was estimated at $970,000.

Management Approval

Following the completion of the financial justification, Management Engineering was ready to present to the OR and Supply Chain Services (SCS) managers. After their approval, the ad-hoc team presented the project to hospital administrators.

Establishing upper management buy-in and champions are some of the most important aspects to a successful implementation. This is critical because there were many times throughout the implementation that top level support was needed either in decision making or to engage the staff. This project had the highest support in Supply Chain Services, OR Surgical Services, Information Technology and Operations.

High level management support was easier to come by with a strong and compelling financial case.

Team Development

After the project was approved, we wasted little time in engaging a cross-functional project team. It was important for us to consider all the areas that would be affected with this implementation. The following is a

list of key team members to create our well balanced project team:

- Management Engineering (Project Management Role)
- OR Business Manager
- Purchasing Manager
- OR/Surgical Services Director
- OR Nurse Managers
- OR Information Technology Specialists
- OR Charge Specialist
- OR Materials Management (Director, Manager, Staff)
- Materials Management Information Technology
- Information Technology (IS)
- Facilities Manager
- Extra Temp Labor

We found that it was extremely important to have a dedicated, directional and diverse team.

Dedication was important at a time when Shands was undergoing so many different projects. We needed to make sure that our team members were given the time needed to properly support this type of project. Overall project time differed from person to person. Management Engineering was in the project management role and as such, was dedicated 100% to the project. Other areas started with 10-25% of their time for the first six months then increased to 50% percent of their time for the last six months. As our go-live date approached and for several weeks following go-live, all members were spending about 90-100% of their time on the project.

It was important for the team to remain directional. Keeping everyone on task was primarily the role of the Project Manager, though everyone assumed responsibility. Having a Management Engineer serving in the project management role worked well since typically engineers have a very methodical and directional way to completing a task. It also worked well as Management Engineering is project focused and could focus 100% of their time for a large scale implementation.

Finally a diverse team was critical for success. It was important to have team members ranging from managers to staff on board with the decisions from the beginning. This way there was clarity when it came to current or proposed processes. It also created better buy-in from the staff's perspective when training as they were more receptive to changes knowing that some of their own co-workers helped to develop the new processes.

Milestone Development

The role of developing and maintaining the milestone project plan primarily fell on the Project Manager. We used Microsoft Project for our plan.

Initially, we requested a sample project plan from our vendor for a similar project they completed at another institution. We found that while it gave us insight to different tasks, it was not going to work for us even as a baseline.

Eventually we had to ask each individual area for a list of tasks they felt was important to the successful implementation of the project. Management Engineering then assembled these tasks together and put estimated timelines for each task. Following this rough draft, the entire team met weekly to review the plan. It was always a working document that was constantly being updated.

This process of weekly meetings would continue for the entire duration of the project. We felt that regular team meetings were a 'best practice' for our project. Occasionally there would be limited topics for discussion, but it was still important to meet and continue with the plan. Most of the time we found that there was not enough time allotted to our meeting as we hashed out details.

Process Re-Engineering

The re-engineering process was primarily spear-headed by Management Engineering. Management Engineering initially met with all the different process holders to create a 'Current State' process flow chart. Charts were created in Microsoft Visio.

Following the completion of all current state processes, team meetings were held to discuss them. We found in many cases that processes were not well known to everyone on the team. These process meetings provided an opportunity for everyone to understand the same current state flow and start from the same baseline. We found these meetings to be critical in the success of the project.

After the current state processes were fully determined, the entire team worked to develop 'Proposed State' processes. We found that instead of just working with the process holder, it was more beneficial for the entire group to decide on a best proposed process. In this way, everyone would understand all the different work flows and also get a chance to voice any issues with overlap.

This entire section of process re-engineering took approximately four months to complete. We had over 35 different processes mapped our in flow charts.

First Inventory Audit

For Shands HealthCare the first inventory audit was a groundbreaking experience. Prior to 2008, there was an attempt made at completing an inventory count in the OR. This was a manually completed process and results were generated, though not thought to be very accurate.

In 2008, the OR would undergo its first full inventory audit. The team decided that outsourcing the inventory count work was the best option. We spoke with three vendors and decide on the one with the best combination of price and hospital inventory experience. When vendor managers arrived on-sight for an inventory assessment, they found that many of our items would not scan with their handheld scanners. The problem was that our electronic OR Item Master list was incomplete meaning we did not have all the items within the OR accounted for on a master list.

We decided to move forward with the inventory count even though it would be a more manual process. Counters were onsite for two weeks counting every item in every room. They had to manually write down item description, vendor name, manufacturer catalog number and product quantity on loose-leaf papers. These entries were then keyed into Excel spreadsheets.

One month after the start of the inventory count, we had our first complete inventory list. We ended up with over 25,000 hand-keyed entries. At the time, we could not determine what the overall inventory value was since we were missing information including pricing on many items.

Following the count, we ran multiple queries to identify every item recorded. We found that less than 50% of the items matched our Item Master. These discrepancies were due to:

- Poor/Inaccurate item information collected during the count
- Items not built in the Shands Item Master
- Items built at the wrong unit of measure
- Duplicated products recorded
- Lack of organization in the storage areas
- Obsolete/Discontinued products identified in inventory

A more complete Item Master was necessary to create. In total we added 10,000 new items to the Item Master. All of these items required hours of research and setup from our Supply Chain Services department.

We also needed to standardize descriptions. We send our Item Master to a vendor to complete this task. They cleansed over 20,000 item descriptions. The remaining unmatched (5-10% of the list) required manual look up and research after the standardization. This work would require at least one dedicated resource from the Purchasing Department to continue working on the outstanding items.

The delay in identifying the complete item master had a significant impact on the system setup and testing.

Systems Configuration

Throughout the implementation, configuration and system setup was a learning process. Our OR area is different from many other institutions in that we have multiple supply storage locations as well as supplies in every OR room. This presented a very complex issue for us as the system works best when there was only one location for a single supply. Our main challenge was how to make a system with limited flexibility follow our OR and Supply Chain processes.

To address this challenge, we had much on-site support from our Vendor. We spent many hours walking and thinking through the best setup that would yield best processes. Eventually we found that we had to re-work many setups and processes we had initially defined. This re-work ultimately resulted in some mixed messages to the end-user. In hindsight, the implementation would have gone smoother if we walked through setup details at an earlier point in the process.

Inventory Restructuring

With a rough idea of what supplies were in each room, our inventory restructuring process was launched. This process was developed internally to determine the correct products that needed to be in each OR room and storage location. We removed any unnecessary items from the room and reorganized the items that remained.

The organization process followed tight protocol. We had templates designed to indicate where items should go on the shelves. Only one item was allowed per storage bin and each bin had a bin location number assigned. This location number later helped us locate bins with missing labels.

After items were put into bins, a temporary label was affixed to the bin. Temporary labels were printed from the initial inventory audit that was completed. We had a rough idea of what items were in each room and printed off labels with barcodes on them for each item in each room. Any items that we could not find a temporary label for were called ‘unknown’ items. These unknown items would then be looked up on the spot and get a handwritten item number attached. If an item couldn’t be looked up or didn’t exist our Item Master, it went on a list for later research.

After the temporary barcode labels were attached, the team scanned these labels and created a more accurate item list for each room.

This entire process was extremely labor intensive. It required cross-functional teams including an OR equipment coordinator, OR lead nurse, Materials Management Information System expert, person to tag items and person to scan items. Due to the nature of OR schedules, we could only work evenings and weekends. We had over 27 OR rooms, 7 storage locations and 45 specialty carts to complete. To estimate the time it would take, we allotted 4 hours per room, 2 hours per

cart and upwards of 16 hours per storage location depending on the size.

We created a sign-up sheet that the Project Manager maintained, to structure the process. On any given weekend or weeknight we never had more than 3 groups going at once. We felt we could find enough resources to run a maximum of 3 groups. In the end, we completed over 300 hours of work within an 8 week period for the inventory restructuring task. This turned out to be additional labor costs that were not originally budgeted for.

Following the physical setup of the rooms, we still required numerous steps to prepare each location for 'go-live'. We created spreadsheets per location with all the scanned item information. These spreadsheets were reviewed by equipment coordinators and lead nurses. They helped us capture items that either needed to be added or deleted from the room's inventory list. They also had to help determine proper stocking levels for each item (min/max par levels), consigned products and trackable products (LOT/SN).

Ultimately we completed 3 iterations of inventory reviews. The main challenges faced were access to locations, resource limitations and constantly changing inventories.

Training Staff

With over 350 staff employees working all three shifts over weekdays and weekends, training everyone was a true challenge. Initially we relied on a core group of staff to get the updates out to everyone. We held weekly meetings with OR core staff and Supply Chain teams to review process flow, answer questions and complete scenario training. This worked well for the few months prior to go-live because it drew attention to the implementation. However, closer to our go-live date it became apparent that one-on-one system and scenario training was imminent.

The team created custom guides that focused on the system was well as the process. We found that staff understood basics well, but were not always sure what to do in specific scenarios. Project team members were regularly working in the field with small clusters of staff.

During our go-live time, there was an exceptional amount of training completed on-the-fly as the team recognized incorrect practices. This lack of training coupled with system and scenario changes created mixed messages to the employees.

Substantial and proper training is key to a successful implementation of this type of project. In hindsight, the team should have spent more time developing clear training documents and working with each employee prior to go-live. This would have aided in a smoother transition into new practices.

Vendor Compliance

In Shands OR area, vendors play a vital role. They aide surgeons in product knowledge and contribute to the overall success in the OR patient experience. They also played an integrated part in acquiring supplies within the OR.

Prior to the implementation of our project, vendors were bringing in supplies as needed on consignment, trunk stock or trauma services. In many cases these supplies were not already accounted for in our inventory or our Item Master. To properly implement the system, we had to create a process that would address items arriving through vendors.

The Supply Chain Services and the OR Department developed a tighter program for all supply vendors. In addition to proper check-in and ID, vendors are also required to disclose products being used in cases prior to their use. This disclosure allows for time to research and add the item into our Item Master Materials Management Information System. If supplies are not disclosed using Shands New Item process, then Shands will not be held responsible for paying the vendor for it.

It is through these tighter rules and disclosures that vendor compliance has increased.

Testing and Integration

Systems testing and integration is a key component to a successful implementation. After receiving the code from the vendor we installed it into our Test Environment. In the Test Environment we completed all of the scenario tests to make sure it was accounting for inventory correctly. We completing out scenario testing within two days.

Once everything was validated and working correctly, we moved the code into Production Environment. We then re-tested in Production to make sure inventory was incrementing and decrementing correctly. After the code was live in Production for a minimum of two days we accepted the modified code and completed our final inventory count in preparation for our true go-live.

We needed to coordinate the data flow between the OR scheduling system, the inventory system, the item master/purchasing system and the billing system. Several of the interfaces were already in place. Testing was critical to ensuring that updates and changes were populated consistently throughout the systems.

Go-Live

Our go-live process was completed in stages. In the first stage we moved the code into the Test Environment. In this stage we had everyone start practicing scanning from storage locations. This created an opportunity for users to interface with the system without compromising inventory counts.

Two weeks later after the code was tested and approved in the Test Environment, we started the

second stage. In this stage we outsourced the final inventory count. This count took a fraction of time compared to the first inventory count at a total of 3 days. The count was completed fully via handheld scanners.

Following the inventory count we started our third stage of go live in Production Environment. This started the Monday after the inventory count was completed. We created signs, posters, pamphlets, etc. to gain awareness within the OR area. We also prepared a 'War Room' to function as a main hub for all implementation activities. To boost morale and add excitement, we decorated our war room with a 'Lights, Camera, Action!' theme.

For the first two days of production go-live, the team provided 24 hour on-site support. On the third day and finishing out the week, the team provided 16 hour on-site support with 24 hour hotline support. We dedicated a cellular phone to our implementation and posted the phone number as our questions/issues hotline help number. The phone would change hands throughout the implementation as to not burden just one member.

After the first week of support, the team remained on-site working on the floor and out of the war room for 4-6 more weeks. The team was available for troubleshooting any issues and worked to minimize OR staff downtime. Staff would either page a member on the overhead pager or call the hotline number with any issues.

Results Achieved

The entire system implementation took less than one year to implement. Typical implementations of our size take over 24 months to complete. Through hard work, focus and dedication we were able to meet our timeline.

Currently in the OR area at Shands the following results have been achieved:

- Inventory is perpetually managed
- Invetory re-ordering process is automated
- Orders are being restocked at optimal times of the day

In addition to a tight timeline, the team also tasked themselves to come in under budget. While there were items that were not budgeted for and others that were budgeted but not implemented, the project came in roughly $200,000 under budget.

Sustaining Success

The key to sustaining success is putting the right feedback and tracking methods in place. For new employees entering the Shands HealthCare system, we have developed a comprehensive training packet.

Scanning compliance has improved because the entire OR staff has taken ownership in the process. People are actively reminding others to scan, which leads to more complete charging records. Daily feedback reports are also generated to track compliance.

Charging records are currently being 100% audited to make sure all items are properly accounted for. This task will eventually cease once automated charging is completely live.

There is now a process for adding new items to the Item Master. With this new process, both the OR administration and Supply Chain Services are aligned with all products entering the system.

There still an ongoing weekly meeting to discuss any problems. An Issues/Resolutions list is maintained to track progress and outstanding issues.

Next Steps

There are only a few items that remain outstanding from the OR implementation. The most significant one is bringing the automated charging process fully live. This has not been able to happen yet due to the importance of proper charging. The OR administration needs to be completely certain that all charges being generated by the system are properly accounted for. Until there is 100% certainty that items are correctly scanned to patients, all charges are manually reviewed. Another reason for the delay has to do with *Total Touch*, a program in the system that allows a user to drill down to a specific item or implant on the screen. This is important since all items in the OR do not have a scannable barcode but still need to be accounted for within the charges. Currently the three largest Orthopaedic vendors have been created in *Total Touch*. This accounts for over 7,000 items that can be added to charges by drilling down on the user's screen. However, since there are still other items to be added to the program, charging has not been fully automated.

Since the go-live in summer 2009, Shands HealthCare has implemented this system in Interventional Radiology. Due to the smaller size and minimal staff, this implementation was very successful. Within three months the system was functioning completely. Shands HealthCare sees opportunities for this system in other areas of the hospital including all of Radiology, Cath Lab and Gastro Intestinal (GI) areas.

Lessons Learned

Though there were countless lessons learned through the year-long implementation of this project, there were four that rose to the top.

1. Re-organizing Inventory – In hindsight, the team should have reorganized inventory before the first inventory count. It is never too early to get started on this.

2. Creating the Item Master – It was difficult for some people to recognize that every item in the OR area had to be in the Item Master this includes bandages and Foleys as well as implants and suture. And the Item master needs to be compete prior to integrated testing.
3. Training Staff – As mentioned earlier in this paper, training staff is critical to a successful implementation. Train the staff extensively and early to educated and enforce all the changes.
4. Test the System – Test, test, test! Even when a vendor provides a finished product, test it against the internal processes to make sure it works. Make sure to leave plenty of testing time within the project timeline.

Conclusions

In conclusion, there are a lot of critical components that are needed for a successful implementation of a perpetual inventory management system in the OR area. Some of these include supportive upper management as well as an engaged and dedicated project team. In addition, the team needs to have an analytical and practical approach to solving all the unknown problems that will arise. If these basic components are present, successful implementation *can* be achieved.

If you have any questions or comments for the writers and presenters of this project, please feel free to contact them.

Presenter Biographies

Marisa Arvesu Farabaugh is currently a Senior Management Engineer for Management Engineering Consulting Services and Shands HealthCare in Gainesville. In this role she is responsible for completing a variety of management engineering projects throughout the hospital system ranging from large scale implementations to department specific process improvement. Farabaugh has been in this role since August 2008. Prior to healthcare, she worked for The Hershey Company in Hershey, PA, for five years as an Industrial Engineer with an emphasis in engineering economy and production supervision. Farabaugh has been a member of IIE for the last 9 years and has served on various boards throughout this time, but most notably as Harrisburg/Lancaster Chapter 71 president in 2005. Farabaugh received her Industrial Engineering degree from the University of Florida and is currently finishing up her M.B.A. from Pennsylvania State University.

William Brewer currently serves as Purchasing Manager for Shands HealthCare in Gainesville, FL. In this role, Brewer is responsible for purchasing activities for the Shands IDN composed of 9 hospital, 2100 staffed beds and an annual supply spend of $340 million. Prior to his appointment at Shands, Brewer served as a Senior Consultant at University HealthSystem Consortium where he worked with UHC's membership of over 100 academic medical centers to apply supply chain analytics to help hospitals to reduce supply chain costs. Brewer also has worked at University of Missouri HealthCare where he served in various capacities. Though his experiences, Brewer has developed an in-depth knowledge of applying supply chain informatics to reduce costs and improve operational efficiencies. Brewer received a Master's of Health Administration and a Master's of Science in Health Informatics from University of Missouri - Columbia and a Bachelor's of Health Administration from Central Michigan University.

Maggie Downey is a Manager of Perioperative Business Services for Shands HealthCare. She is responsible for the business and IT management for 50 operating rooms and related services. She manages an annual expense budget of $100 million and a revenue budget of $500 million. Prior to joining the Operating Room team, she provided strategic data analysis and project management services as part of Decision Support Services. In addition, Downey has fifteen years of health care information technology experience. She was the project leader for many Shands HealthCare IT projects including the development and implementation of an enterprise online medical record. She has BA in Computer Science and Mathematics from Boston College and received her MBA from the University of Florida.