Introduction
The Laundry/Linen Department at Intermountain Health Care-Utah Valley Regional Medical Center relocated into a newly constructed area in September 2002, which was significantly smaller than their previous area. The smaller storage and workspace forced the staff to store as many as 40 carts and bins full of linen in the hallway outside the clean linen room. The storage solution created a safety concern for patients, visitors and employees because the hallway serves as a service hallway and fire egress.

Project Description
Purpose
The purpose of this project was to determine the optimal method of removing the linen storage from the hallway, while also providing a pleasant and safe work environment for the linen staff and satisfying each hospital department’s laundry/linen needs.

Scope
The scope of this project consisted of all the laundry/linen processes. This included the unloading of the clean linen from the IHC Central Laundry transport trailer, the storage and movement of inventory, the loading and transportation of clean linen carts to each of the departments, the usage tracking process for each department, and the loading and transportation of the soiled linen carts.

Definitions
Throughout the document, the following terms will be used:

- Transport cart = 5 ft. 3 in. tall, 4.5 ft. long, 2 ft. 2 in. wide green bin on wheels used to transport linen to/from the hospital. Owned by IHC Central Laundry.
- Exchange cart, Drop-off cart = 5 ft. tall, 5 ft. long, 2 ft. wide metal cart on wheels used to transfer clean linen from the linen room to the hospital departments.

Method
The method used to approach this project consisted of the following steps:
1. Gain an understanding of the current process
2. Identify and compare possible solutions
3. Determine the optimal solution, establish an implementation plan, and gain support from affected parties and administration.
4. Implement changes
5. Develop departmental ownership for continuous improvement of process

Analysis
Current Process
In order to determine the best solution for the linen storage, the current linen distribution process was analyzed and documented. This was accomplished through:

- Observing the Laundry/Linen staff and work process
- Interviewing the Laundry/Linen staff, coordinator, manager, and director
- Referencing current job descriptions
- Developing flow charts of the current work process and schedules
- Conducting time studies of Laundry/Linen staff tasks, including time to fill, deliver, and drop-off exchange carts and time completing other tasks (unloading linen truck, organizing bins, washing & drying laundry, collecting soiled linen)

The linen distribution process was categorized into three types of distribution:
1. Exchange Carts
2. Drop-off Carts
3. Count & Fill Areas

Twenty-three areas in the hospital used the exchange cart method where a linen cart was located on the department floor for daily use and an identical cart was stored in the clean linen room. Drop-off carts were used for 11 areas in the hospital. The drop-off carts were dropped off on the floor and unloaded throughout the morning by Housekeeping staff. When the carts
were unloaded, the Laundry/Linen staff picked up the empty carts, refilled them, and stored them in the linen room until the next morning’s deliveries. The Laundry/Linen staff used the count and deliver process for 19 small volume areas. In this process, staff would count the items needed, return to the linen room to fill a small cart, and then deliver the needed items to the respective areas. A summary of the three processes is shown in the flow charts below.

Time studies were conducted in two-week intervals, which required the Laundry/Linen staff to document the time they started and stopped certain daily tasks. A statistical analysis using an upper limit of a 95% confidence interval was completed on the time study data. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Task</th>
<th>Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex cart fill</td>
<td>18</td>
</tr>
<tr>
<td>Simple cart fill</td>
<td>14</td>
</tr>
<tr>
<td>Count &amp; Deliver fills*</td>
<td>15 - 37</td>
</tr>
<tr>
<td>Unload linen fills &amp; organize bins</td>
<td>30</td>
</tr>
<tr>
<td>Wash &amp; dry laundry</td>
<td>Start: 30</td>
</tr>
<tr>
<td></td>
<td>Check 10 times: 5 each</td>
</tr>
<tr>
<td>Clean washer &amp; dryer filters &amp; vents</td>
<td>15</td>
</tr>
<tr>
<td>Pick up soiled linen*</td>
<td>40-120</td>
</tr>
</tbody>
</table>

* Independent times were calculated for each area. Range is shown in table.

After the department responsibilities and work processes were understood and documented, possible solutions were explored.

Possible Solutions

The lack of linen cart storage could be solved in three ways:

1. Building expansion
2. Process modification using only a count & fill distribution
3. Hybrid process using a Just-In-Time (JIT) cart filling method

Each of these options was researched and compared to determine the optimal solution.

Option 1: Building expansion

A local architectural firm determined it would be feasible to expand the clean linen room off of a section of the East wall. The expansion consisted of a 17 ft. 9 in. x 29 ft. 5.5 in. addition, which could be used for the storage of the carts that were currently stored in the hallway. The expansion of the linen room would provide space for the linen, but shelving would also need to be added in order to free up Central Laundry’s transport bins. Central Laundry’s intent for the transport carts is only for transport of the linen, not storage of the linen. By using over 30 of Central Laundry’s transport carts for inventory storage, a shortage of carts is created for the transfer of laundry within the Intermountain Health Care system.

An advantage to expanding the building is that it would allow the current delivery process to be utilized. The delivery times and staff schedules could remain the same.

Disadvantages to this option are that it is very costly, would create work flow and sanitation problems during construction, reduce the much needed parking on the East side of the hospital, and require shelving to be purchased to eliminate linen storage in Central Laundry’s transport carts.

The approximate cost of the building expansion and shelving was $53,200.

Option 2: Process modification using only a count & fill distribution

This option suggests simplifying our current processes of three types of distribution to one type of distribution. This would eliminate the use of exchange and drop-off carts and
require all Laundry/Linen staff to determine the linen needs in each department by counting the remaining linen at each of the departments, fill a large cart full of the needed items, and deliver them to each department. The process flow diagram below represents the process modification.

The advantage to the process modification is that it does not require the use of any exchange carts except for transporting the linen to the departments; therefore, it would eliminate the storage of nearly 30 carts in the clean linen room.

The disadvantages to the process modification are that it would not be as efficient for large volume departments (majority of carts today) because additional transportation and material handling is required and the delivery times would be extended. In the current process, Monday thru Friday 23 carts are exchanged per day, Saturdays 16 carts are exchanged, and Sundays 15 carts are exchanged. These departments receive exchange carts because they require a large volume of linen. Assuming that each department would still require a cart full of linen, it would take 41 minutes* for each count & fill distribution versus 27** minutes for each cart exchange distribution. The 14 minutes of additional time for each large volume delivery equals 5.4 hours/day of additional labor needed Monday thru Friday, 3.7 hours/day of additional labor on Saturdays, and 3.5 hours of additional labor on Sundays. The total additional labor needed to implement the count and deliver method is 34.2 hours/week, or approximately $17,250*** per year.

* (Average walk/to from department without cart = 1 min) + (Average count time = 2 min) + (Average fill time = 17 min) + (Average cart exchange time/time to walk to and from a department with a bin = 10min) + (Average unload time when no counting is involved = 10 min) + (Average walk/to from department without cart = 1 min) = 41 minutes; times obtained from time studies, based on 95% confidence interval

** (Average fill time = 17 min) + (Average cart exchange time/time to walk to and from a department with a bin = 10min) = 27 minutes; times obtained from time studies, based on 95% confidence interval

*** (Average hourly wage $9.70)

The count and fill method is the most efficient when a small volume of linen is needed because it allows multiple departments to receive their linen in one trip (reducing transport time). However, a majority of the departments receiving linen are large volume users.

The approximate cost of modifying the process to only utilize the count and fill distribution was $17,250 per year for staffing.

Option 3: Hybrid process using a Just-In-Time (JIT) cart filling method

The hospital departments receiving linen can be broken down into the following categories:

1. Departments receiving a large volume of items
2. Departments receiving a small volume of items.
   a. Carts that are simple to fill or are similar to other linen carts
   b. Carts that are difficult to fill or are much different than other linen carts.

The high volume departments receiving carts that are simple to fill or are similar to other
linen carts could be distributed most efficiently using a JIT cart-filling concept. In the current process each department stores an exchange cart on their floor and a duplicate exchange cart is stored in the clean linen room. By applying a JIT filling method, a cart that is filled for department 1 is exchanged with the cart stored in department 1, then the cart from department 1 is returned to the linen room and filled for department 2, and so on. This allows carts to be cycled through the system, therefore reducing the number of carts to be stored in the clean linen room. Eleven areas fit into the high volume and simple fill category, allowing the elimination of eight exchange carts because three carts could be cycled through the process throughout the day.

The high volume departments receiving carts that are difficult to fill or are much different than other linen carts would not be efficiently unloaded and reloaded and therefore, would not make efficient JIT carts. These carts would need to remain department specific exchange carts. Several departments received two carts at the same time, one exchange cart and one drop-off cart. These carts are filled exactly the same and the addition of the drop-off cart to departments already receiving an exchange cart had developed over the years to meet additional volume needs. However, only one cart of linen was used at a time and then the nursing staff on the floor would reload the empty cart with the linen from the drop-off cart. This process could be replicated and simplified by creating two morning exchanges and eliminating the drop-off carts. Seventeen areas matched this criterion which allowed the elimination of an additional eight exchange carts because six of the areas received two duplicate carts (one exchange cart and one drop-off cart) and one of the areas received three duplicate carts (one exchange cart and two drop-off carts).

The low usage volume departments could be filled most efficiently by the count and fill method. The existing count and fill areas would remain the same, but three other areas could be added to this process. The three areas are currently receiving smaller sized exchange carts because their usage volume wasn’t large enough for a regular sized exchange cart. The smaller sized exchange carts were often unused by staff because they would often count and fill the area even though an exchange cart existed in the clean linen room.

The chart below summarizes the three types of areas and the most efficient distribution process associated with it.

The advantages of these process changes are that the number of carts stored in the clean linen room could be reduced from 31 to 12, while leaving adequate space for two days of inventory and staff work. The exchange carts removed from the system could be used as movable shelving, eliminating the need for Central Laundry’s transport bins or purchasing shelving for the linen room.

The disadvantage to this process is that the changes would affect the staff and linen delivery schedule.

Even with these process changes and the reduction of storing 19 carts in the clean linen room, 21 of the 40 carts would still be unable to fit in the linen room. As part of Intermountain Health Care’s disaster plan, each hospital keeps three to four days of linen on hand at all times. This “safety stock” encompassed the 21 carts still unable to fit in the linen room. Since the safety stock is not needed on a daily basis, it does not need to be kept in the linen room; it could be kept at an alternate location.
Safety stock storage
There was no additional space inside the hospital for storage of the 21 remaining linen carts. Since the linen rooms are located near the loading dock, where extra dock spaces remained, it was feasible to permanently park a semi-trailer there for the storage of the safety stock. The 21 carts of safety stock could be unloaded from Central Laundry’s transport bins and loaded onto the exchange carts removed from the process and some extra carts in the hospital surplus. This would allow the transport bins to be returned to Central Laundry for their intended purpose and create moveable storage for the safety stock.

The approximate cost of modifying the distribution process with JIT filling was a one time expense of $2,000 for a trailer to store the safety stock and about $50/year for plastic wrap to seal the safety stock being stored in the trailer. No additional staff time would be required to adopt these process changes.

Optimal Solution and Implementation Plan
After analyzing the three options to remove the linen carts from the hallway, it was easily determined that the third option (to use a hybrid process with JIT cart filling) was the optimal solution. This option did not require additional staff and was the low cost option compared to a building expansion. A recommendation was made to administration and other affected parties and buy-in was easily received.

An implementation plan was created which required involvement from the Laundry/Linen staff. The affected parties (all departments receiving linen) were also contacted via individual meetings to inform them of the changes that will be occurring and to listen to their concerns. The individual meetings allowed the implementation team to be proactive to concerns that may be found along the way.

Implementation
Implementation consisted of five main changes to the current system, including changes to:
1. Linen delivery schedule
2. Staff schedules
3. Staff job descriptions
4. Charge process
5. Clean storage room layout

Linen Delivery Schedule
Since the new process utilized the JIT filled carts and multiple exchanges for the department specific carts the delivery order and delivery times became a crucial aspect of the success of the new system. The results from the time study and the documentation of the current process were used to develop a linen delivery schedule on a spreadsheet. The spreadsheet was divided into four columns (one for each staff) and each row represented a minute of their day. By displaying the schedule in this form, it was easy to identify which carts had been filled or exchanged and which carts were in a queue to be filled or exchanged. A portion of the linen schedule is shown below.

<table>
<thead>
<tr>
<th>Sample of Linen Delivery Schedule</th>
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</thead>
<tbody>
<tr>
<td>5:00 Weekday Job #1</td>
</tr>
<tr>
<td>5:01</td>
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<td>5:28</td>
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<tr>
<td>5:29</td>
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</tbody>
</table>

Staff Schedules
The staff schedules required adjustment to accommodate the new linen delivery schedule. The total number of working hours remained the same, but the start and stop times were modified. Through the development of the linen delivery schedule, an imbalance of work hours and workload was identified for weekend shifts.
Saturdays and Sundays were staffed the same, even though Saturdays were a heavier workload than Sundays because linen was not delivered from Central Laundry on Sundays. The new staff schedule adjusted this imbalance, adding an hour on Saturdays and reducing an hour on Sundays.

**Staff Job Descriptions**
Along with the changes to the linen delivery and staff schedules, the job descriptions were updated. Each staff received print outs of the job descriptions and small “cheat sheet” versions were also printed so staff could easily carry them in their pockets throughout the day. The job descriptions listed the order carts need to be filled and exchanged, which was crucial to follow in order for the system to work correctly. A portion of a “cheat sheet” job description is displayed below.

<table>
<thead>
<tr>
<th>Time</th>
<th>Weekday Job #1 (Exchanger &amp; Soiled Pick up)</th>
</tr>
</thead>
</table>
| 5:30 - 9:00am | Drop off OR Holding, Count OR Scrubs on walk back  
Deliver OR Male&Female Dr Scrubs, Orderly Scrubs, Ladies Uniforms  
Exchange ICU (1st Exchange) -- prefilled cart  
Exchange Labor -- prefilled cart, Count CAT Scan on walk back |
| 6:30am        | Deliver CAT Scan 
Exchange OR PACU 
Exchange TCU |
|               | Deliver CCU and unload into cupboards, Count Post Cath on walk back 
Deliver Post Cath Recovery Unit (PCRU) & Scrubs |
| 7:30am        | Exchange Mother/Baby-A 
Exchange SDS-2 
Exchange Newborn ICU |
|               | Unload Peds Exchange Cart onto Carts on Rail System (2 areas) 
Unload Green bins for soiled linen pick up 
Pick up Soiled Linen: OR, ER, X-Ray, SDS, MRI |

**Charge Process**
In the existing system, charges were tracked on a form for each department that listed the usage over a two week time period. The staff documented the amount of linen added to the cart and when the form was completed after two weeks, the data was used to charge the departments for their linen usage. In the new system, the JIT carts would be brought from one department and then loaded for another department. The linen could no longer be tracked by what was added to the cart, but instead, the amount of linen remain on the cart would need to be documented. So, in the new process, staff needed to use one sheet of paper for listing all par levels and a separate sheet of paper for documenting the amount of linen remaining on the cart when it was brought back from an exchange. This data would then be entered into a spreadsheet where the charge was calculated by (par level) – (amount remaining on cart) = (amount used/charged).

**Clean Linen Room Layout**
An Auto-CAD drawing of the clean linen room was created of the new layout of the storage, cart, and working space. The drawing was helpful in showing how everything was going to fit into the room and how staff would perform their daily tasks. A small version is shown below.

**Continuous Improvement**
After implementation of the new linen distribution process, bi-weekly meetings were held with the Laundry/Linen staff to discuss what was and wasn’t working well in the new process. Staff brainstormed ideas to fix any of the issues that weren’t working well. This continuous improvement process was an important piece of the success of the project. Staff took additional ownership of the process, worked together as a team to solve issues, and showed pride in what they had accomplished.
Additional Project Findings
As the project developed, a few other process improvement opportunities were identified in the Laundry/Linen department, including:

1. Biohazardous material and soiled linen storage
2. Linen usage charging system
3. Employee training

Biohazardous Material and Soiled Linen Storage
Issue description
When the building was constructed, the soiled linen room was designed with a closet-like structure for the storage of biohazardous material. The “closet” was large enough to store the full cans, but the empty cans overflowed into the soiled linen storage area. The area designed to store the soiled linen was not large enough to store all of the transport carts full of soiled linen so a semi-trailer was rented for storage. When Central Laundry dropped off a semi-trailer of clean linen, the truck would unhook and then re-hook to the semi-trailer full of soiled linen. This was a very costly solution to the lack of soiled linen and biohazardous material storage; costing $750/month for the trailer rental.

Issue solution
A storage box was purchased and placed in an unused space on the loading dock. The storage box was used to store all the biohazardous cans, both full and empty. Moving the biohazardous material freed up space in the soiled linen room and the “closet” in the soiled linen room. The doorway and a section of the “closet” wall were removed to enlarge the soiled linen room for the storage of the soiled linen transport carts.

Financial impact
The rented trailer was eliminated, which saved $750/month. One time costs for the storage box ($2,000) and the soiled linen room remodel ($1,000) were incurred to implement the changes. The change paid for itself in four months and will save $9,000/year thereafter.

Linen Usage Charging System
Issue description
The existing linen charging system required the Linen supervisor to calculate the charges by hand and then enter them into Excel. It was a complicated system, requiring one part-time supervisor to manage it. The reports were run monthly and hand-delivered by the supervisor to each of the departments.

Issue solution
The charge system was modified so that Excel would complete the calculations, therefore eliminating hand calculations and human errors. Instead of hand delivering each of the reports, they were stored in a manager’s folder on the network. Since the updated charge system was simpler to use, it required less time (approx. 7 hours/week). This small workload was transferred to the Housekeeping scheduling manager, therefore eliminating the need for the 27 hour/week Linen supervisor. A coordinator position in Housekeeping opened during this time and the Linen supervisor transferred into the position.

Financial impact
The part-time Linen supervisor position was eliminated, saving approximately $20,000/year. By placing the linen reports on the network, an additional $46/year was saved in printing costs.

Employee Training
Issue description
The daily tasks of the Laundry/Linen staff were confusing to communicate and learn. This made it difficult to substitute staff with productive workers and to train new employees.

Issue solution
The solution to this issue involved the application of LEAN concepts. LEAN concepts suggest designing the process so it’s logical for a worker, often using visual aids and forms of organization. A binder was created for each staff, which contained information about what to do, when to do it, how to do it (pictures of filled linen carts), and easy documentation of charges. By organizing the work in a logical manner, workers who had no experience in the area were able to provide productive work almost immediately.
Overall Financial Impact
The overall estimates of the financial impact of all elements of the project included:

- **Total Cost Avoidance** = $53,200
  - Hospital expansion = $53,200
- **Total Cost Savings** = $30,046/yr
  - Biohazardous material and soiled linen storage = $9,000/yr after 4 months
  - Linen usage charging system = $20,046/yr
  - Staff efficiency after adapting new process = $1,000/yr*

*Staff efficiency increased after adopting the new linen distribution system for 3 months. Some staff began leaving early after completing their required tasks.

Conclusion
When Utah Valley Regional Medical Center’s Laundry/Linen Department relocated into a significantly smaller area, they were faced with a challenge concerning the storage of as many as 40 carts and bins full of linen. By gaining a complete understanding of the current work processes through observing, interviewing, and conducting time studies of the Laundry/Linen staff, several solutions were identified. Most of the solutions required additional costs, including additional staff or an addition to the building. By looking at the detailed work processes, a solution was identified with minimal cost, with a cost avoidance of approximately $53,200 for a building expansion and $17,250/year for additional staff.

As the project developed, additional process improvement opportunities were identified involving the storage of the biohazardous material and soiled linen, the charging of linen to the hospital departments, and the training of Laundry/Linen employees. Process improvements were made in each of these areas, resulting in cost savings of approximately $20,046/year.

Biographical Sketch
Christy began working for Intermountain Health Care as a Management Engineer in January of 2003. She received her undergraduate degree in Industrial Engineering and Management from North Dakota State University in Fargo, ND. Christy has been a member of HIMSS and the Institute of Industrial Engineers/Society for Health Systems since 2001, and the Management Engineering Representative on the Board of Directors of the Utah-HIMSS Chapter since July of 2003. She participated as a student volunteer at the 2001 national HIMSS conference and was awarded the HIMSS Foundation’s Richard P. Covert Scholarship in 2002. Her healthcare experience includes internships with MeritCare Health System in Fargo, North Dakota and Premier, Inc. at Asante Health System in Medford, Oregon.
Optimizing Hospital Space with Process Redesign

Christy Finger, Management Engineer
Presentation Outline

- Project Background
- Original Process
- Possible Solutions
- Optimal Solution
- Implementation
- Additional Project Findings
- Lessons Learned
Project Background

- Utah Valley Regional Medical Center
  - Intermountain Health Care System
  - Located in Provo, Utah
  - 330 Bed Hospital
Project Background, Cont.

- Laundry/Linen Department
  - Relocated into new addition
  - Inadequate space
    - Up to 40 carts and bins stored in fire egress hallway

Safety Concern!
Original Process

Gain an understanding of process by:
- Observing staff
- Interviewing staff
- Referencing job descriptions
- Developing flow charts of work processes
- Conducting time studies
Department Responsibilities

- Clean Linen Room
- Biohazardous Storage Room
- Central Laundry’s Trailer
- Hospital Departments
- Biohazardous Storage Room
Original Distribution Processes

1. **Exchange Carts**
   - 23 Locations

2. **Drop-off Carts**
   - 11 Locations

3. **Count & Fill Areas**
   - 19 Locations

- Exchange each exchange cart for each department
- Fill each exchange cart for next day
Original Distribution Processes

1. **Exchange Carts**
   - 23 Locations

2. **Drop-off Carts**
   - 11 Locations

3. **Count & Fill Areas**
   - 19 Locations

- **Drop off exchange cart at department (department unloads)**
- **Pick up exchange cart from department when empty**
- **Fill department’s cart for next day**
Original Distribution Processes

1. Exchange Carts
   - 23 Locations

2. Drop-off Carts
   - 11 Locations

3. Count & Fill Areas
   - 19 Locations

- Count needed items at the department
- Fill delivery bin with needed items
- Deliver & unload items at department
Possible Solutions

- Option 1: Building Expansion
- Option 2: Process Modification using only a Count & Fill Method
- Option 3: Process Modification using a Just-In-Time (JIT) Cart Filling Method
Possible Solutions, Cont.

- **Option 1: Building Expansion**
  - Addition to store carts stored in hallway
  - **Advantage:**
    - Utilize current delivery processes (no changes)
  - **Disadvantages:**
    - Costly
    - Work flow and sanitation problems during construction
    - Expansion would eliminate needed parking spaces
    - Shelving would need to be purchased to eliminate storage in Central Laundry’s transport bins

**Approximate Cost = $53,200**
Possible Solutions, Cont.

- Option 2: Process Modification using only a Count & Fill Method
  - Reduce to one type of distribution
  - Advantage:
    - No carts needed, except for transporting to depts
  - Disadvantages:
    - Less efficient use of staff for large volume depts
    - Require additional 1,778 hrs of staff

Approx. Cost = $17,250 per year for staffing
Possible Solutions, Cont.

- Option 3: Hybrid Process using a Just-In-Time (JIT) Cart Filling Method
  - Hybrid Process with Modifications

  Hospital Depts Receiving Linen

  High Volume Usage Depts
  - Simple Carts or Similar to Others: 3 Carts, 11 Areas
  - Difficult Carts or Much Different than Others: 9 Carts, 17 Areas

  Low Volume Usage Depts
  - Add 3 Areas

  Dept Specific Carts

  Count & Fill
Possible Solutions, Cont.

- **JIT Carts**
  - 3 Carts, 11 Areas
  - **How?**
    - Cart filled just before delivery, allows same cart to be reused

- **Dept Specific Carts**
  - 9 Carts, 17 Areas
  - **How?**
    - Some carts are filled exactly the same; use the same cart for both deliveries

- **Count & Fill**
  - Add 3 Areas
  - **How?**
    - 3 low volume areas use smaller exchange carts, make them count & fill

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- Eliminates storage of 8 Exchange Carts in Clean Linen Room
- Eliminates storage of 8 Exchange Carts in Clean Linen Room
- Eliminates storage of 3 Exchange Carts in Clean Linen Room
Possible Solutions, Cont.

- **Option 3: Hybrid process using a JIT Cart Filling Method**
  
  **Advantages:**
  
  - Reduce cart storage in linen room; adequate space for 2 days inventory and staff work
  - Reduce # of exchange carts from 31 to 12
  - Exchange carts removed from the system could be used as movable shelving, eliminating the need for Central Laundry’s transport bins

  **Disadvantages:**
  
  - Changes would affect staff & linen delivery schedule
  - Storage space still needed for Safety Stock Inventory
Possible Solutions, Cont.

- **Option 3: Hybrid process using a JIT Cart Filling Method**
  - **Safety Stock Inventory Storage:**
    - Reduction of cart storage allowed enough space for 2 days inventory
    - IHC Disaster plan requires 3-4 days’ inventory on-hand
    - Extra Safety Stock Inventory could be stored in another location
    - A semi-trailer could be parked in an open spot on loading dock and used for storage

**Approx. Cost = $2,000 for used semi-trailer**

$50 per year for plastic wrap for storage
Optimal Solution

**Option #3:** Hybrid process using a JIT cart filling method with semi-trailer storage for safety stock
Implementation

- No phase implementation— all or none
- Laundry/Linen staff involvement
- Notification to all departments receiving linen that change will be occurring
Implementation

Changes to:
- Linen delivery schedule
- Staff schedules
- Staff job descriptions
- Charge process
- Clean linen room layout
Implementation

Changes to Linen Delivery Schedule:

<table>
<thead>
<tr>
<th>Time</th>
<th>Weekday Job #1</th>
<th>Weekday Job #4</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00</td>
<td>Weekday Job #1</td>
<td>Weekday Job #4</td>
</tr>
<tr>
<td>5:01</td>
<td>Drop off OR Holding</td>
<td>Cart #2: Exchange SDS1</td>
</tr>
<tr>
<td>5:02</td>
<td>Count OR Men's &amp; Women's Scrubs on walk back</td>
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</tr>
<tr>
<td>5:03</td>
<td>Count OR Men's &amp; Women's Scrubs on walk back</td>
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<td>5:04</td>
<td>Count OR Men's &amp; Women's Scrubs on walk back</td>
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<td>5:05</td>
<td>Count OR Men's &amp; Women's Scrubs on walk back</td>
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<td>5:06</td>
<td>Count OR Men's &amp; Women's Scrubs on walk back</td>
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<td>5:07</td>
<td>Count OR Men's &amp; Women's Scrubs on walk back</td>
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<td>5:08</td>
<td>Count OR Men's &amp; Women's Scrubs on walk back</td>
<td></td>
</tr>
<tr>
<td>5:09</td>
<td>Deliver OR Men's &amp; Women's Scrubs</td>
<td>Cart #1: Exchange Labor</td>
</tr>
<tr>
<td>5:10</td>
<td>Deliver OR Men's &amp; Women's Scrubs</td>
<td>Cart #3: Exchange OB Delivery</td>
</tr>
<tr>
<td>5:11</td>
<td>Deliver OR Men's &amp; Women's Scrubs</td>
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<tr>
<td>5:12</td>
<td>Deliver OR Men's &amp; Women's Scrubs</td>
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<td>Deliver OR Men's &amp; Women's Scrubs</td>
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<td>5:14</td>
<td>Deliver OR Men's &amp; Women's Scrubs</td>
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</tr>
<tr>
<td>5:15</td>
<td>Deliver OR Men's &amp; Women's Scrubs</td>
<td></td>
</tr>
</tbody>
</table>
Implementation

Changes to Staff Schedules:

- Modified to accommodate linen delivery schedule
- Earlier Start Times
- Imbalance of workload and hours
  - Transferred 1 hour on Sunday to Saturday
### Implementation

#### Changes to Staff Job Descriptions:

<table>
<thead>
<tr>
<th>Time</th>
<th>Weekday Job #1 (Exchanger &amp; Soiled Pick up)</th>
</tr>
</thead>
</table>
| 5:30 - 9:00am | Drop off OR Holding, Count OR Scrubs on walk back  
                Deliver OR Male & Female Dr Scrubs, Orderly Scrubs, Ladies Uniforms  
                Exchange ICU (1st Exchange) -- prefilled cart  
                Exchange Labor -- prefilled cart, Count CAT Scan on walk back |
| 6:30am     | Deliver CAT Scan  
                Exchange OR PACU  
                Exchange TCU  
                Deliver CCU and unload into cupboards, Count Post Cath on walk back |
| 7:30am     | Deliver Post Cath Recovery Unit (PCRU) & Scrubs  
                Exchange Mother/Baby-A  
                Exchange SDS-2  
                Exchange Newborn ICU  
                Unload Peds Exchange Cart onto Carts on Rail System (2 areas)  
                Unload Green bins for soiled linen pick up  
                Pick up Soiled Linen: OR, ER, X-Ray, SDS, MRI |
Implementation

Changes to Charge Process:

- **Current**
  - Each dept had a sheet of paper for 2 week period
  - Staff documented amount of linen added to cart, this was the charged amount

- **New**
  - One sheet of paper showing all par levels
  - One sheet of paper per day for documenting amount of linen left on cart, charged amount was calculated by
    \[(\text{Par Level}) - (\text{Amount left on cart}) = (\text{Amount Used})\]
Implementation

Changes to Clean Storage Room Layout:
Implementation

Continuous Improvement

- Held meetings with staff bi-weekly to discuss how new process was working
- What worked well
- What didn’t work well
  - Staff brainstormed ideas to fix it
Additional Project Findings

- Biohazardous material and soiled linen storage
- Linen usage charging system
- Employee training
Additional Project Findings

- Biohazardous Material and Soiled Linen Storage

- Rented Trailer for Soiled Linen

- Central Laundry’s Trailer

- Purchased Storage Box For Biohazardous Storage

- Biohazardous Storage Room

- Soiled Linen Storage Room
Additional Project Findings

- Biohazardous Material and Soiled Linen Storage
  - Financial Impact
    - Eliminate: Rented Trailer = $750/month
    - Add: $2,000 one time cost for storage box
    - Add: $1,000 one time cost for storage room adjustments
  - Summary
    - $3,000 one time cost to eliminate $750 monthly charge
    - Pays for itself in 4 months; $750 monthly ($9,000 yearly) savings after 4 months
Additional Project Findings

**Linen Usage Charging System**

- **Current Process**
  - In Excel, but didn’t use Excel capabilities (doing calculations by hand)
  - Required one part-time supervisor to manage
  - Personally delivered monthly reports to all depts

- **New Process**
  - Used Excel to calculate all calculations and produce reports
  - Posted reports in Manager’s Folder on network, eliminating the need for printing and personal delivery
  - Required less time, transferred workload to Housekeeping Scheduling Manager, therefore eliminating Linen Supervisor position
  - Linen Supervisor replaced Housekeeping Training Staff that had moved on
Additional Project Findings

**Linen Usage Charging System**

- **Financial Impact**
  - Reduce staff time managing charges from 24 hrs/week to 7 hrs/week; transferred workload to existing staff; Elimination of part-time Linen Supervisor position = approx $20,000/year
  - Eliminate printing of reports (78 copies/month, 936 copies/year); Elimination of $46/year

- **Summary**
  - Cost Savings = $20,046 per year
Additional Project Findings

**Employee Training**

- **Current Process**
  - Difficult to substitute staff with productive workers
    - Confusing process, substitutes didn’t know what to do
  - Difficult to train staff

- **New Process**
  - Application of LEAN concepts—design the process so it is logical (visual aids, organization)
  - Use manual which indicates
    - What to do
    - When to do it
    - How to do it (picture of filled linen carts)
    - Easy documentation of charges (corresponding tabs)
Overall Financial Impact

- **Financial Impact**
  - **Cost Avoidance = $53,200**
    - Hospital Addition = $53,200
  - **Cost Savings = $30,046/yr**
    - Biohazardous Material Storage = $9,000/yr after 4 months
    - Linen Usage Charging System = $20,046/yr
    - Staff Efficiency = $1,000/yr
Lessons Learned:
What you should take home. . .

- Apply the most efficient distribution method to hospital processes. There are several different ways to distribute linen (or other materials).
- Use important hospital space for important hospital operations. If something is not needed often, you may be able to store it elsewhere.
- Keep an eye open for process improvements, even if it doesn’t fit in the exact scope of your current project.
- Communicate with the staff doing the work—they know the process the best and have great ideas.
Questions?