Presenter Biography: Dalia Sumaida is currently a Quality Engineer at MD Anderson Cancer Center in Houston TX. Dalia has worked with many centers at MD Anderson, such as the leukemia center, breast, center, sarcoma and pharmacy. She joined MD Anderson Cancer center in 2011 in implementing six sigma, lean and industrial engineering tools throughout the hospital. Prior to joining MD Anderson, Dalia worked at the Boeing Company as an industrial engineer to streamline the assembly line of repairing Boeing military airplanes in addition to being part of the Boeing 787 program. She is a Six Sigma master black belt, and graduated from University of Michigan with a Master’s degree in Industrial Engineering.
MD Anderson cancer center was found in 1941 when the Texas legislature decided to make it part of the University of Texas system. It is one of the three comprehensive cancer centers in the US that was established by the National Cancer Act. It is an academic center in addition to a cancer and research center. MD Anderson has had only 4 full time presidents in its history. The cancer center has been growing in size by 50% in the past 10 years. Around 19,000 are employed which include 1,500 faculty members. Located in Houston Texas with over 50 building w 15M sq ft
MD Anderson currently has 600 inpatient beds to be scheduled to have up to 800 beds in the next few years. It has been ranked No. one cancer care hospital in the best hospitals survey published by the US news and reports for 9 out of the 11 years. It has been the top 2 since 1990
Now, let’s take a look at Pharmacy. The division of pharmacy consists of 16 pharmacies which include satellite pharmacies in the regional care centers. The division of pharmacy is broken down into two groups – Patient Care Services - basically it is the operation side of the business, they work together to reach patients needs. The other group is the clinical pharmacy services who provide comprehensive direct patient care services, collaborates and initiates clinical research. There are specific drugs that the pharmacies order which goes to the inventory control area. The inventory control area is treated as a warehouse where the drugs come in and then are distributed based on the orders made.

Routine Drugs – the drugs that are used on a regular basis based on patient demand
Direct Orders – The drugs that are shipped directly from the manufacturer
Drop ships – The drugs that the wholesaler has no space to store and will order for the institution and it will get shipped automatically to inventory control.
This is the value stream map of the current process and how the ordering is done through purchasing. I will direct each part as we go through the presentation to reflect some of the issues we had and how we were able to address them.

The process starts from purchasing by getting notified of the drugs that will go short nationwide from many sources such as FDA/Sales Reps and so on. Once the order goes through the supplier’s database (MRP – Materials Requirement Planning). The database will generate the order and send it out to the hospital. The dock receives the order and then delivers it to the inventory control warehouse.

The warehouse has no prior knowledge of what it is received. There is no communication between purchasing and inventory control to notify of quantities or types of drugs ordered. Inventory Control receives the order. It takes them up to 24 hours to load the drugs in the carousel, due to capacity issues, and no prior planning of where to store it if they decide to store it outside of the carousel.
As we go through the value stream map, the 1st question is why is there a 24 hr wait for the drugs to be loaded in the carousel? What are the factors that effect that process? How many employees involved? What are the bottlenecks?
The issues we came up with were grouped in 3 categories:
- Space Constraint
- Unaware of drugs received
- Low customer satisfaction
So let’s start with the space constraint
The inventory control warehouse has only one carousel. Due to the drug shortage problem, there are times when they receive drugs and do not have the space to store them inside the carousel. They adopted a process that when a drug is received, if it is a bulk item, it will be stored on the shelf. The drug will still be entered in the carousel database (Pharmagistics) but will be noted as stored in REMOTE LOCATION. The remote location are carts that are located all over the warehouse.

When the drugs that are potentially short arrive, sometimes there is no room on the shelves, so the drugs are planted all around the employees desk giving them no space around their desks.

When a form needs to be filled out for a drug, or a drug is needed right away and it is available, it is very difficult to find it since there is no standard area for each drug. This takes a lot of time from the employees trying to search for a drug.

This is all happening and the employees are walking across their area looking for/storing/transporting drugs in the area.
This is a spaghetti diagram showing the current flow of the employees and how their paths overlap. At the same time you will notice that the poor layout leads them to walk long distances which puts more stress on their workload. As you see as well there are several carts that house many of the drugs. These drugs are presented in the carousel system as remote location. It is very broad information which makes finding a drug very difficult.
The first approach was to start lean training for the group. The group had to understand what lean meant, so they can improve their area and sustain the improvements. The following were the topics that were covered and effected in this project.

- 5S
- Red Tagging
- 7 Wastes
- Work Cell
- Load Leveling
- Standard Work
- SOP’s
let’s magnify the current spaghetti map
as you notice there are many filing cabinets that are taking a lot of space. The cabinets
contain items that are not value added to the staff, and they never use it.
The next area of interest were the carts that have the remote location drugs.
And last but not least, the shelf that houses the ready to be picked up drugs and how far it is from the carousel.
A red tagging event was placed over a one week period to lean out the area and determine if a new layout can be designed to accommodate the employees needs.
This is the new layout. As you can see the desks are up to the front. The employees are closer to the supply pallet decreasing the walking distance. The refrigerators were moved to the back and having a work station next to it to process any refrigerated items. The drugs ready shelf is close to the carousels. The space allowed the team to install a second carousel to accommodate the remote location drugs. Along with a staging cart so the employee can freely wheel the drugs back and forth near the 2 carousels. The storage room in the back was converted to a printer/copier/fax room.
The same techs in the current spaghetti map are the same here in this future map. This future spaghetti diagram shows the routes of each techs and how it is all spread out.
This diagram shows the employee walking distances before and after. By redesigning the facility, we were able to decrease the employee walking distance by 62% in addition to installing a second carousel to replace the carts and shelves in the area.
Results from Facility Layout & Lean Training

- Results
  - Diagram of the location of medication categories for the after hour shift
  - 1 additional carousel was installed to house the drugs that were in a remote location
  - Employee walking distance reduced by 50%
  - Elimination of waste

This was the result of the lean training and the facility layout. Developing a diagram of Standard work showing the next shift where everything is located based on category of drugs. A 2nd carousel was installed to solve the issue with the carts that took too much space. Employee walking distance was reduced by more than 50% thus eliminating waste.
This is how the desks were surrounded by boxes and deliveries in the before picture. The after pic shows how the desks were moved along the wall, giving it more space and putting it away from the carousel and the packages.
This is the carousel pic with the carts full of remote location items. The after pic shows only the carousel since we were able to store 75% of the items from the carts inside the 2nd carousel.
The area that had all the carts were taken out and the refrigerators were placed there to house the refrigerated drugs. A computer work station was added near the refrigerator sections so one employee will be handling all the refrigerated items.
The 2nd issue we will discuss is employees not aware of drugs being ordered. Lack of communication between parties.
These are the reasons why employees are not aware of the drugs received:

- Quantity errors
- Data entry errors
- Lost packing slips
- Delays in paying the supplier
As you can see here the relationship between purchasing and inventory control is only one way. When the packing slips are received, inventory control will send it to purchasing, and materials management. How would they know what purchasing ordered? If purchasing ordered 24 vials of a drug and they received 2 boxes, how would they know they have to enter 24 vials instead of 2 boxes? This discrepancy had lead to delays in paying the supplier. In addition why does it take them 5 days until they send it to materials management? and the problem was the time. There is not enough time to meet all the deadlines, materials management was always set on the side, and they would send them the packing slip when they had the chance to
To avoid the confusion, there was a need for a communication tool to display transparency of all the parties and automate the process in a way that would help the employees in their workflow.

The web application will be broken down to 4 areas – ordering for purchasing, receiving, scanning, and updating will be inventory control.
This is a screen shot of the web application from the purchasing side. As you see there is an order date, the person who ordered it, what type of order. Purchasing will go ahead and put the drug name from a dropdown menu to avoid typing errors. Once the drug is selected, purchasing will put the qty and the unit ordered.
This screenshot shows inventory control from the receiving side, once they receive a drug, a list will be displayed showing all the drugs ordered. It will be compared to what was receiving, then they will click on the order, and put the order received. The system will show the units ordered to avoid discrepancy.
The webpage was able to solve many issues, the benefits of the webpage was replacing the manual log that inventory control was using. It acts as a communication tool between purchasing, inventory control and materials management. The packing slip is automatically sent once scanned to both materials management and purchasing to avoid payment delays. The system also allows transparency of what was ordered and what was received in an automated manner.
Please review this table, you will see the processing time in days for the packing slip, the red is the baseline and the yellow is after the web app. As you notice there is a huge difference between before and after. The processing time was decreased significantly after implementing the web application.
If you look at the future state value stream map it showed a significant decrease in the processing time to load the drug in the carousel from 24 hr to 3 hrs that is a 85% improvement just by developing the webpage. The lean implementation helped streamline the flow of the process and the work area to be more employee friendly.
Last but not least, low customer satisfaction
The main bullets for customer satisfaction is communication, delays in shipping and after hrs issues.
Every center at MD Anderson sends a request through the pharmacy system for the drug needed. So in this case, we are talking about the internal customers and not the patient.
These were the internal customers. We developed a survey for each department based on their specifications and conducted interviews with the employees to understand their concerns.
The pie chart shows the survey results, as you can see errors and organization were the most 2 that effected customer satisfaction
This graph shows the number of customers (number of Departments) satisfied vs not satisfied.
Out of the interviews conducted we were able to focus on some issues that can be solved with standardization. So when a regional care center requests a drug from inventory control, their main concern is punctuation. If they need to receive the drug in the afternoon, it gets delivered the following morning which delays their operations. When investigated further, the time the drug is picked up was not the correct time, and inventory control was missing the time the driver picks up the drugs because they are scheduled to go 30 mins later. So all the affected parties were contacted and a new schedule was developed to avoid this issue from arising again. The schedule now in on SharePoint and all parties will get notified if any changes occur to the schedule.
This is the schedule that all parties agreed upon

**Delivery Schedule**

- Same day morning deliveries – orders received before 8:30 AM
- Same day afternoon deliveries – orders received before 9:30 AM
- Next day deliveries- orders received before 3:00 PM
The other issue was the after hour shift. As soon as the 1st shift leaves, the 2nd shift starts, they come to a disorganized area, some drugs are on the shelves being labeled as remote location, and some refrigerated items were not labeled, which creates stress and delays in processing the drug and as you all know once there is a delay in medication then we will have an unhappy patient!
Based on lean training and the need for standard work, we needed to develop SOP's to create a framework for each process and any employee will be able to do the job the correct way.
The process of developing the SOP’s is first create a process flow chart, then take the steps and put it in SOP format. Add the SOP to the policies and procedures booklet that is located in a central area. At the same time save the document so there is a digital backup in case it is needed for revision in the future.
The next problem we had was load leveling, some employees were working too hard and some had too much time idle. With developing the SOP’s we were able to load level the workload for the employees which increased productivity and employee satisfaction. Load leveling was based on the job functions each employee had. The job functions were divided and each employee had specific duties everyday. At the same time, all employees were cross trained to cover when their peer was on vacation or sick.
This is a summary of the project and the quality improvements that were used to solve the issues. (Go through the slide)

<table>
<thead>
<tr>
<th>Issues</th>
<th>Solutions</th>
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</thead>
<tbody>
<tr>
<td>Delay in processing the direct order drugs</td>
<td>Standard Work/Developing a webpage</td>
</tr>
<tr>
<td>packing slips</td>
<td></td>
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<tr>
<td>No par levels for drop ships and direct orders.</td>
<td>SOP’s</td>
</tr>
<tr>
<td>Errors in entering the Qty. of the drug received</td>
<td>Developing a webpage</td>
</tr>
<tr>
<td>No space to store incoming drug orders</td>
<td>Facility layout redesign/5S</td>
</tr>
<tr>
<td>Drug shipments to other pharmacies are delayed</td>
<td>SOP’s</td>
</tr>
<tr>
<td>Too much time spent searching for a drug for the after hour shift</td>
<td>SOP’s/facility layout</td>
</tr>
<tr>
<td>Employee Dissatisfaction</td>
<td>Facility layout/load leveling</td>
</tr>
</tbody>
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Any Questions?