

Lean Manufacturing for Health Care Services



Project Report

January 2005

Financial Results and Forecasts for 2004 Lean Projects

Lean projects eliminate waste and rework by creating an immediate feedback system that controls resources. Since August, our 100 percent inspection, lean system has optimized underutilized corporate resources. Photographic, financial, accreditation, quality of care, and objective evidence confirm results. By sustaining Lean, our improvements can have an even greater financial impact in 2005.

LEAN Project "HOME RUNS"			
Project	Description	Outcomes	Estimated Annual Dollar Impact
Marketing Patient Selection and Admission Process (Detail page 3)	Developed FREE admissions database decision system using PACE form as foundation.	<ul style="list-style-type: none"> • On demand pull analysis of admissions including profitability. • Improved patient selection based upon profitability & clinical outcomes. 	\$100,000+
DRG 475 - Case Management Process (Detail page 9)	Case management is the crucial management component to quality patient outcomes and profitability.	<ul style="list-style-type: none"> • Respiratory Failure with Ventilator • <i>Six consecutive months with zero VAP.</i> 	\$100,000+
Clean Supply Rooms (Detail page 13)	Meet regulatory standards, reduce use rates, inventory & establish new par levels. Develop reliable data system to monitor supply use and financial controls.	Established the foundation for a kanban system of inventory reduction and control. Data integrity is improving. Expect significant future savings from new financial controls.	\$65,000
Medication Management Process (Detail page 18)	Management of Controlled substances. Improve safety, regulatory compliance in a complex, high-volume, problem-prone, high-risk process.	Relocated controlled substances within med room. Separated look-alike, sound-alike drugs, alphabetized by generic name, eliminated seldom-used drugs, and educated staff.	Med Errors are #1 cause of patient harm and death
Patient Room Medication Cabinets (Detail page 21)	Reduce supplies in med cabinet and cost of supplies routinely discarded.	Developed PAR levels, revised inventory and stocking methods for med cabinets.	\$11,600
Crash Carts (Detail page 24)	Standardize & establish restocking system. Replace defibrillators	Completed goals. (Reduced liability risk is not included)	\$5,000
<i>Conservative forecast annual bottom line Lean impact for 2005</i>			<i>\$275,600</i>

Lean Executive Summary

Lean principles have led to significant, quantifiable improvements in our organizational culture. Even in photographs, our new customer service emphasis, process standardization, and attention to detail is readily apparent. KHS managers brag enthusiastically about the status of their Lean projects, and rightfully so. Using Lean 5S Housekeeping methods, we cleaned the entire building and organized supplies and equipment. These changes have been sustained and incorporated into a tangible change in organizational culture and pride.

In the past six months, we have had ZERO Ventilator Associated Pneumonias (VAPs). The economic cost of a VAP is estimated at between \$40,000 and \$50,000 per incident. Even more significant is the high risk of serious patient harm, including death. We have been working with Clinical Liaison Managers to improve the quality and quantity of admissions, and used a free Excel add-in to improve our data collection and analysis. The return on our consulting investment exceeded expectations – the full extent to be realized in 2005 and beyond. We will realize over \$11,000 in annual savings from our first completed project in reducing the waste from Medication Cabinets.

Our JCAHO surveyor was favorably impressed with our accomplishments in analyzing and improving significant systems and processes. The discipline and methods of Lean allowed our KHS managers to be better prepared for the JCAHO survey and to have confidence and pride in themselves and their accomplishments. The 5S housekeeping improvements that caught JCAHO's eye, as did the controlled substances FMEA.

Our Future with Lean

We have several important new projects planned, including developing a template for a financial report using key drivers that will automatically update on a daily basis. Development of our external marketing systems offer huge opportunities for process analysis and improvement. We must improve patient selection techniques and generate a more profitable patient mix. This can be accomplished by using our real-time data for making better decisions and targeting the Clinical Liaison Manager's marketing efforts.

We plan to develop a wound care project similar to our successful DRG-475 Respiratory Failure project. This project will be designed to improve profitability and clinical outcomes, and reduce length of stay for wound care patients.

We have only scratched the surface in educating managers and staff on the concepts and methods of Lean. At this point, managers are learning to collect and array data for statistical analysis. We will provide advanced education for managers on techniques of preparing a data matrix and performing detailed, statistically sound, data analysis.

At this point, we have provided only as-needed education for staff members involved in the various projects. All staff must be trained in the concepts and principles of Lean to

sustain process improvements. Using our Lean consultant, we will provide education and training to managers and staff during Spring and Summer 2005.

Managers at KHS are comparatively unsophisticated and inexperienced. They have been resistant to previous attempts at management training, attending the sessions, but behaviors and personal discipline remained unchanged. Lean training provides the unique opportunity for managers to gain new knowledge and leadership skills, and to immediately apply what they have learned, thus cementing the new skills. KHS managers are responding to Lean with unprecedented enthusiasm, proficiency and energy.

We have the ability to make 100 percent quality care routine. We plan to apply the concept of 100 percent inspection at change of shift report by developing and using a structured nursing report format based on lean-data. We have, and continue to demonstrate that quality health care lowers costs.

We are exceedingly pleased with the progress that we have made and the foundation we have built. We expect to see significant financial returns on our investment in 2005 and beyond.

Each Lean project is presented in detail, including project charters and results to date, in the following pages.

MARKETING, PATIENT SELECTION AND ADMISSION

➤ *Marketing has emerged as our most significant profit and expense reduction opportunity.* We broadened the initial scope of this project to profit from serendipitous opportunities.

Our year to date census is below budget and prior year actual. Compared to other Kindred hospitals, we have a high proportion of high-cost outliers and short stay patients, raising questions about the existing patient selection system. To rectify this reality, we needed, and now have, an accessible, accurate, fast, database system for profitable patient evaluation and selection. Patient admission data is now organized using a Lean pull system. This means managers can complete real time, highest standard, and statistical analysis on-demand.

Our Lean innovation completely eliminates the 30 to 90-day lag times between data collection and data analysis that plague traditional management information systems. Marketing, sales, patient profiling, and admission decisions can be made using quantitative evidence rather than intuitive judgment.

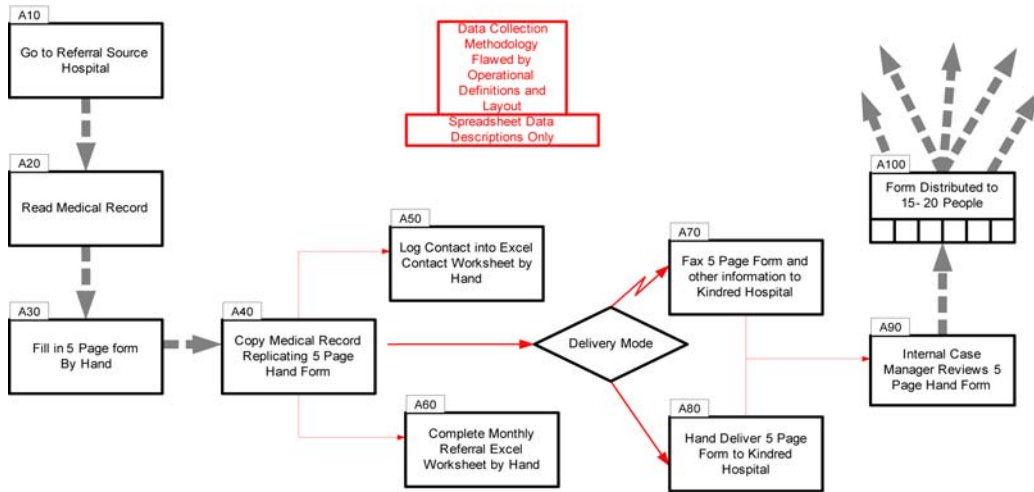
We made paper forms electronic. The Excel form accomplishes more work with fewer resources. Our Lean model also reduced potential HIPPA violations inherent in our previous method of distributing clinical information for patients being considered for admission. (The “old” process involved making multiple copies of the clinical information—up to 10 sets—consisting of up to 80 pages of medical records from the referring hospital and distributing it to clinical and business departments.)

The New, LEAN Electronic PACE Patient Record

We employed an underutilized corporate computing resource, an Excel add-in. Excel’s free data tracking wizard let us build an electronic Pre-Admission Clinical Evaluation (PACE) form. By eliminating redundant paper forms, we directly reduced all paper and paper processing costs. The LEAN electronic form is on the “I” Drive. Only clinical managers and selected staff can view this form under the protected drive. Management control of confidential information is assured.

Our form reduces the time it takes to communicate essential clinical information confidentially and effectively. **Figure 1** contrasts the waste in our “old” current state value stream map with the “future” state value stream map. We have implemented the Lean future state.

Clinical Liaison Manager (CLM) Current State Patient Information Value Stream Map



A hand work information system is, by definition a Non-Value Added Activity.
 Lean calls for automated information *Flow*.
 November 5, 2004
 M. Daniel Sloan

Clinical Liaison Manager (CLM) Future State Patient Information Value Stream Map

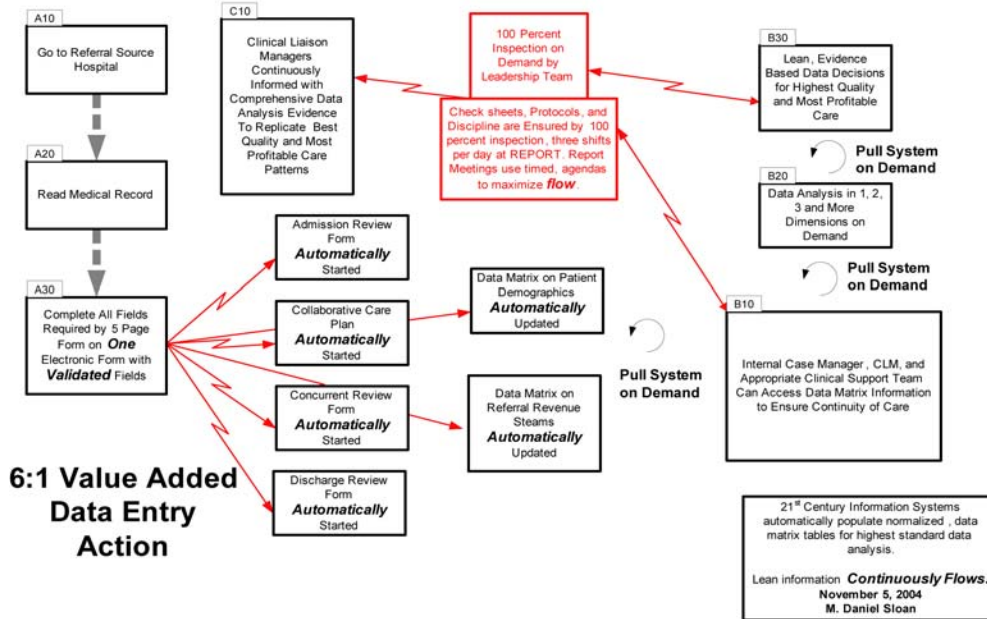


Figure 1 Our old, paper system was inefficient. It placed us at unnecessary risk for HIPPA violations. Our new system adds value by reducing waste. It reduces paper waste as it reduces HIPPA exposure. And it is already producing a more profitable admission patient profile.

Each patient has an Excel workbook. This workbook includes PACE data, InterQual criteria for Severity of Illness criteria for Admission, and Intensity of Service criteria for concurrent review. **Figure 2**

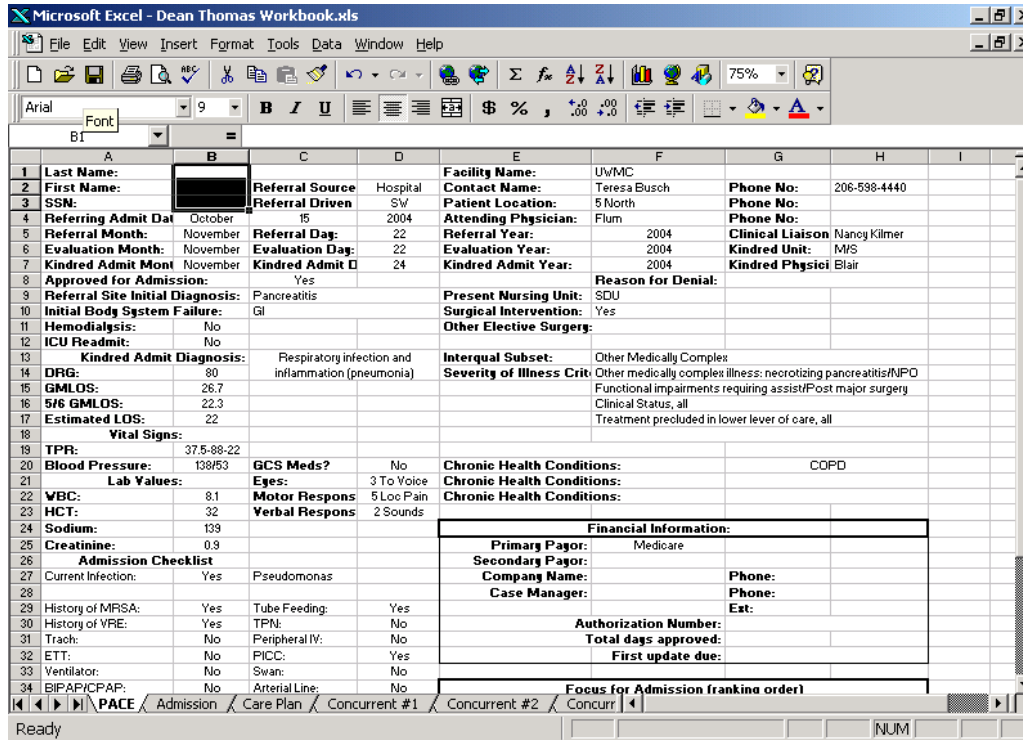


Figure 2. Admission worksheet documenting PACE and severity of illness criteria

The electronic PACE form automates data collection. It lets us use the highest, world standard, statistical analysis system to track cost and utilization patterns. It reveals critical system drivers in real-time. Our FREE, Excel data tracking system transforms referral and admission data into business intelligence we can use to improve patient and financial outcomes.

A More Profitable Patient Selection Process

We changed from MassPro (Washington State's system) to InterQual LTAC to ensure that we select patients that meet LTAC criteria. This adjustment also lets us compare ourselves with other Kindred hospitals. Our new data collection/feedback system helps us aggressively evaluate potential admissions; we can promptly consider 1) profitability and 2) the probability for producing positive clinical outcomes.

For this first Lean project, we selected Margin by Patient Day and Average Length of Stay as benchmark outcome measures. The Lean data matrix arrays created automatically by Excel, promote the use of advanced data analysis tools. These tools identify, quantify, and rank order key system finance drivers. **Figures 3 and 4.**

Microsoft Excel - 2004 DRG Baseline.xls

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Pat Acct #

Pat Acct #	MR #	DRG Type	LOS	Margin	DRG Weight	Apache	Chrg/Day	Reimb/Day	Cost/Day	Margin/Day	
5	EC0000025827	EC000003006 SHORTSTAY	5	3493.00	475	2.1358	59	3941.56	2023.60	1325.00	698.60
6	EC0000025528	EC000002998 NORMALDRG	32	1701.00	465	0.7372	36	2108.36	863.50	810.34	53.16
7	EC0000025312	EC000002982 HIGHCOST	67	5954.00	475	2.1358	71	4179.90	1457.43	1368.57	88.87
8	EC0000025692	EC000003013 SHORTSTAY	2	1283.00	87	1.6513	43	3379.50	1735.00	1093.50	641.50
9	EC0000025684	EC000003012 SHORTSTAY	6	3539.00	475	2.1358	43	6187.91	2790.00	2200.17	589.83
10	EC0000025593	EC000003004 NORMALDRG	27	9193.00	475	2.1358	67	2628.91	1349.74	1009.26	340.48
11	EC0000025536	EC000002999 NORMALDRG	49	-21086.00	271	0.9620	41	2263.21	752.31	1182.63	-430.33
12	EC0000025296	EC000002980 HIGHCOST	98	76.00	475	2.1358	54	3525.43	1231.92	1231.14	0.78
13	EC0000025437	EC000002990 HIGHCOST	77	6151.00	483	3.2131	36	5661.93	2073.09	1993.21	79.88
14	EC0000025742	EC000002940 SHORTSTAY	12	3774.00	203	0.6758	35	2421.05	1243.00	926.50	314.50
15	EC0000025569	EC000002920 NORMALDRG	56	20645.00	475	2.1358	31	3586.70	1484.93	1116.27	368.66
16	EC0000025445	EC000002991 HIGHCOST	82	1561.00	542	2.9337	60	4212.27	1542.55	1523.51	19.04
17	EC0000025767	EC000003016 SHORTSTAY	20	2623.00	271	0.9572	27	2047.96	1051.45	920.30	131.15
18	EC0000025775	EC000003017 NORMALDRG	20	9534.00	127	0.7597	65	2299.45	1455.55	978.85	476.70
19	EC0000025817	EC000003019 SHORTSTAY	10	4152.00	82	0.7591	51	2822.24	1449.00	1033.80	415.20
20	EC0000025700	EC000002794 NORMALDRG	33	41860.00	475	2.1015	49	3752.66	2440.21	1177.18	1263.03
21	EC0000025882	EC000003025 SHORTSTAY	6	-236.00	238	0.9329	8	1741.90	894.33	933.67	-39.33
22	EC0000025908	EC000003027 SHORTSTAY	7	4049.00	475	2.1015		3247.60	1667.43	1089.00	578.43
23	EC0000025916	EC000003028 SHORTSTAY	9	2120.00	34	0.8418	24	2588.54	1329.00	1093.44	235.56
24	EC0000025650	EC000003009 NORMALDRG	55	6840.00	475	2.1015	21	3780.16	1464.13	1339.76	124.36
25	EC0000025783	EC000003018 NORMALDRG	39	35388.00	475	2.1015		2668.43	2064.79	1157.41	907.38
26	EC0000025734	EC000003015 NORMALDRG	42	33443.00	475	2.1015	34	3237.89	1917.31	1121.05	796.26
27	EC0000025791	EC000821578 NORMALDRG	33	32413.00	87	1.6797	22	2015.67	1950.42	968.21	982.21
28	EC0000025973	EC000002913 SHORTSTAY	18	3606.00	34	0.8418	24	2020.94	1044.31	818.94	225.38
30			803	211896				3477.06	1532.55	1268.67	263.88

Baseline /

Figure 3 The FREE data tracking Excel add-in automatically arrays financial and clinical data into a data matrix. The data matrix format is a requirement for Lean, advanced, highest standard data analysis.

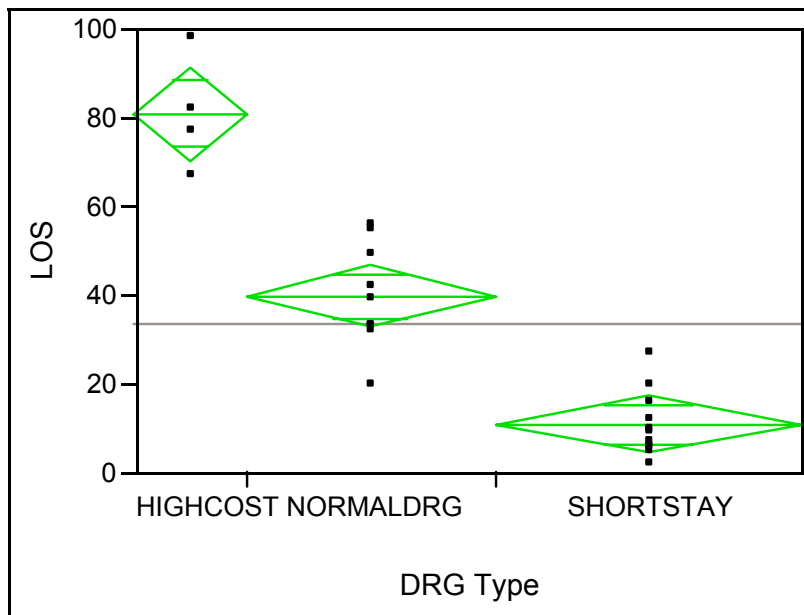


Figure 4 Each 'space ship' in this Lean style graph, displays the average, standard deviation, statistical and economically significant differences between High Cost, Normal, and Shortstay DRG types. With a few mouse clicks we can now profile every patient in extraordinary detail. Profitable patient profiles can be replicated. Unprofitable ones can be avoided.

The following form was used to charter each Lean Project.

PROJECT NAME	MARKETING PATIENT SELECTION & ADMISSIONS
Voice of the Customer Lean Target Service, Department or Area	Refine roles of participants in the Marketing, Patient Selection, and Admissions Process, including Clinical Liaison Mangers (CLM), Internal Case Manager, Administration and Business Office Referral Development, Business Office, Case Management
Senior Leader Sponsor	Rick DeLano CEO
Value Stream Manager(s)	Nancy Kilmer, RN, Clinical Liaison Manager
Expected Annual Savings	To be determined based upon baseline data analysis
Start Date	August 16, 2004
Target Completion Date	November 30, 2004

LEAN ELEMENT	DESCRIPTION	RESULTS			
Lean Project Description	Goal statement (quantified)	Improved patient selection demonstrating an increase in the number and profitability of admissions.			
Objective(s)	Key Process Metrics always include Non-value added time, Value Added time, lead-time, cycle time, and takt times.	Metric	Baseline 24 admits before Nov 1 2004	Goal Nov 2004 forward	Unit of Measure
		Metric 1 Profitability by patient	\$263.88	Statistically / economically significant shift	Margin by Patient Day
		Metric 2 Average LOS	33.67	Statistically / economically significant shift	Days
Value Stream	Identify where waste can be removed	Admission process cycle time is long and labor intensive. Project will focus on reducing paper work, creating an electronic record accessible to the patient care team, and appropriate patient selection criteria.			
Business Case	Clinical and/or financial justification	Data collection and analysis will assist in appropriate patient selection.			
Lean Team Members	Names and roles of team	Nancy Kilmer CLM, Madeleine Lewis Social Worker, Tony Parker Housekeeping Supervisor, Wayne Weeks CLM, Matthew Landers CLM, Judy Derby Case Manager, Rick DeLano CEO, Cheryl Payseno COO			
Value Stream Boundaries	Project focus must be clear to avoid project creep	Phase 1 – Focus on streamlining the internal admissions processes to recover time and wasted material resources. Phase 2 – Develop specific marketing strategies to maximize efforts and increase census.			
Benefit(s) to the customer	How will the customer know improvements have been made?	Appropriate patient selection, reduced LOS, and Increased profitability.			

To Do List for Successful Lean Kaizen Improvement Project	Each To Do must have deadline for completion.	To Do	Deadline
		Future State Map	September 7, 2004
		Data Matrix	September 9, 2004
		Experiment Design	October 13, 2004
		Rework Internal Process and Initiate	October 31, 2004
		Develop Phase 2	November 15, 2004
		Sustain Gains and Standardize	March 30, 2005

DRG 475 – CASE MANAGEMENT PROCESS

➤ *Case management is the crucial management component to quality patient outcomes and profitability.* According to the director of respiratory therapy, with the new nursing and respiratory care protocols developed in January 2004, and the discipline of Lean which began in August, the past six months have been the first time since his arrival in 1998 that our hospital has had six consecutive months of zero Ventilator Associated Pneumonias (VAP).

If the additional cost of a VAP is estimated conservatively at \$20,000 per patient, reducing the VAP rate to zero represents significant savings. If we prevented one VAP per month by using Lean methods, we would save \$240,000 per year.

The Case Management team knows (99.71 percent level of confidence, R squared value =0.40) that the timing of the Family Conference correlates significantly with a patient's length of stay. **Figure 5**

The Case Management Team created the Current State Map in **Figure 6**. The map led to a hypothesis. If the family conference is held earlier within the admission, rather than later in the hospital stay, the patient and family will have more realistic expectations about the patient's condition, potential outcomes, and appropriate discharge goals.

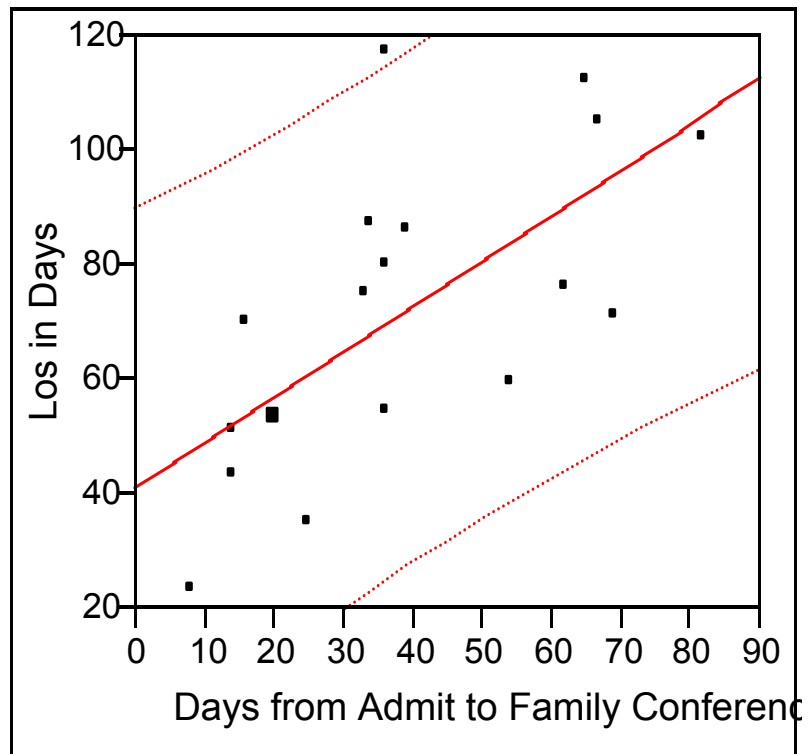


Figure 5 Lean data analysis makes statistical methods an expected standard of excellence.

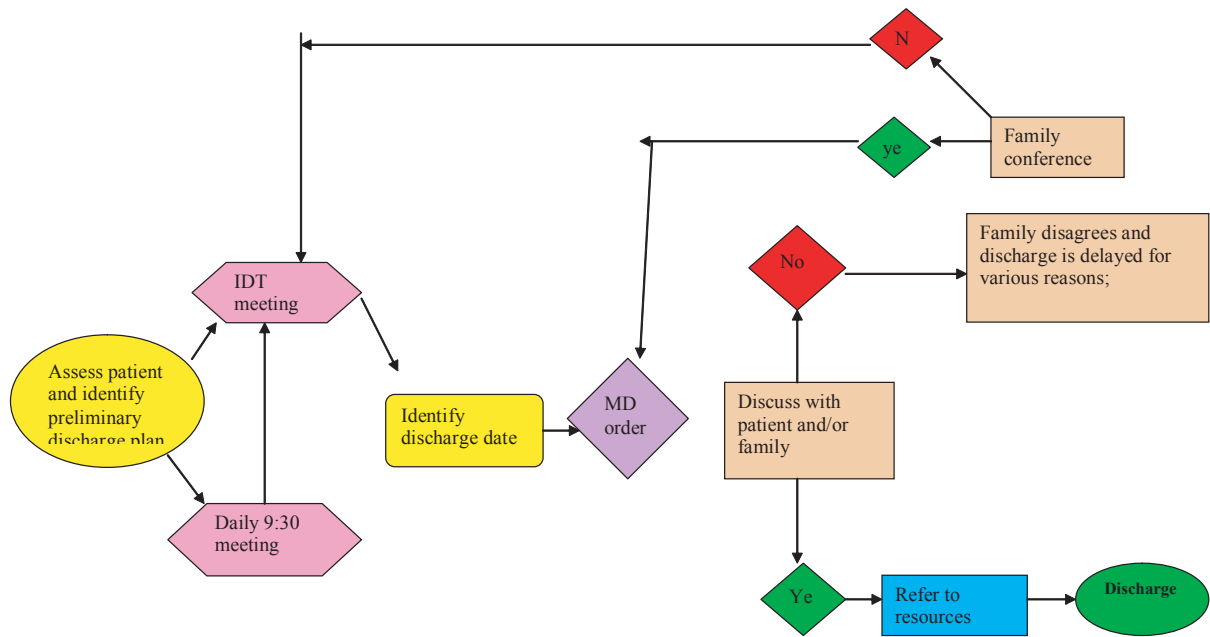


Figure 6 Case Management Process - Current State Map September 2004.

The team developed a future state map (**Figure 7**) and a matrix to collect data. Data either validates or discredits a given hypothesis. The team reviewed 25 charts of discharged patients to determine the current length of stay and significant variables.

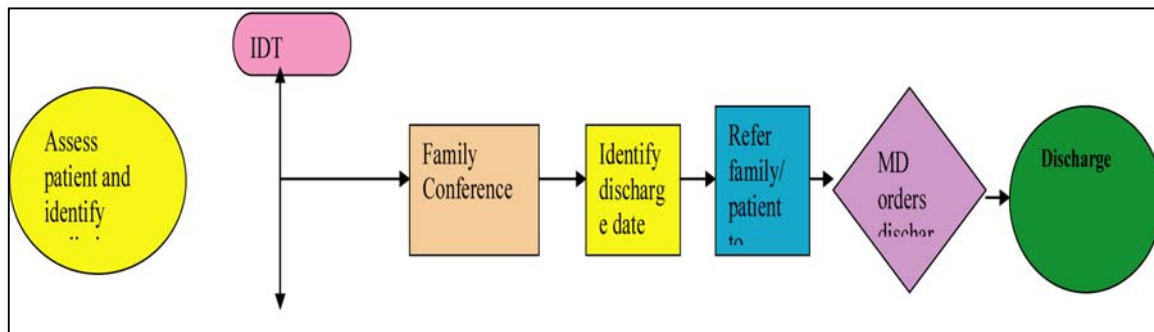


Figure 7 Case Management Process - Future State Map September 2004

Here is the project charter form for DRG 475 – Case Management.

PROJECT NAME	DRG 475 – CASE MANAGEMENT & LENGTH OF STAY (LOS)
Voice of the Customer Lean Target Service, Department or Area	Patients/families want positive clinical outcomes and honest communication regarding the patient’s progress. Respiratory Therapy, Social Services, Case Management
Senior Leader Sponsor	Cheryl Payseno COO
Value Stream Manager(s)	Madeleine Lewis MSW, Ruben Saucedo RCP
Expected Annual Savings	\$100,000 +
Start Date	8/9/04
Target Completion Date	3/30/05

LEAN ELEMENT	DESCRIPTION	RESULTS			
Lean Project Description	Goal statement (quantified)	<ul style="list-style-type: none"> Reduced time to wean or decision to end attempts Length of Stay (LOS) closer to the target length of stay (GMLOS) Reduce length of time between physician stating patient is ready for discharge and patient actually discharging Improved communication with patient/family through realistic expectations and timely family conferences 			
Objective(s)	Key Process Metrics always includes Non-value added time, Value Added time, lead-time, cycle time, and takt times.	Metric	Baseline Jan - Aug 2004	Goal GMLOS Statistically / economically significant shift	Units
		METRIC 1 LOS DRG 475			LOS in days
		METRIC 2 Days Admit to Family Conference			Days
		METRIC 3 VAP Rate	4.89		Rate/1000 Per 1000 Vent Days
		METRIC 4 Margin by Patient Day			Dollars
		METRIC 5 Minutes to Wean	Last 16 patients DRG 475		Minutes
Value Stream	Identify where waste can be removed	<ul style="list-style-type: none"> Case Management: Eliminate backward and repetitive steps through current process by moving certain interventions into an earlier point in the process Weaning: Focus on achieving specific targets. Force decision making when targets not met. 			

Business Case	Clinical and/or financial justification	<ul style="list-style-type: none"> Case Management: Creating realistic expectations with patient/family early in hospitalization will improve satisfaction. Patient, Family and Physician will be able to make better decisions. Weaning success rate will be improved. LOS will approximate GMLOS Reimbursement will increase due to reduction in unnecessary procedures or medical interventions that can be done in a lower level setting Reduce unnecessary, repetitive procedures and interventions i.e. # vent weaning trials) 		
Lean Team Members	Names and roles of team	Madeleine Lewis & Ruben Saucedo Value Stream Managers Team members: Lee Berger, Judy Derby, Cheryl Payseno, Rick DeLano, Lois Stevens, Wayne Weeks, Matthew Landers		
Value Stream Boundaries	Project focus must be clear to avoid project creep	DRG 475 Case Management: Focus on family conferences as part of the case management process. Will attempt to determine whether a family/team conference scheduled earlier in the patient's stay leads to decreased length of stay. Weaning: Use specific protocol and weekly targets to determine patient's progress		
Benefit(s) to the customer	How will the customer know improvements have been made?	<ul style="list-style-type: none"> Expectations and goals identified sooner Barriers to achieving goals identified sooner Clearer communication Improved weaning outcomes Placement in appropriate clinical setting throughout the patient's illness 		
To Do List for Successful Lean Kaizen Improvement Project	Each To Do must have deadline for completion. Note date completed	To Do	Deadline/ Completion	
		5S Improvements	9/15/04	9/15/04
		Current State Map	8/31/04	8/27/04
		Future State Map	8/31/04	8/27/04
		Data Matrix	11/5/04	10/13/04
		Experiment Design	10/15/04	10/13/04
		Sustain Gains and Standardize	3/30/05	

CLEAN SUPPLY ROOMS

➤ *Photographs of this project area make the benefits obvious.*

The clean supply room on the second floor nursing area was unorganized, housed incompatible furnishings and functions, such as office furniture, computer, and table where Respiratory Therapy staff took breaks and ate their lunch. This activity violated Department of Health regulations.

Previous attempts to clean and organize the space and change the function failed. The project team identified 22 storage areas for nursing and respiratory supplies! **Figure 8** The goal was to organize supplies and to reduce the number of storage areas.

Given the Lean 5S—Sift, Sort, Sweep, Standardize, Sustain—methods, our team felt that Kindred’s Purchasing and Inventory Control Policy 14 from the Financial Policy and Procedure manual provided inadequate controls.

We established the foundation for a kanban system of inventory reduction and control. The integrity of our data is improving and we expect to see significant saving resulting from more discipline financial controls.

With our recent Lean training and commitment to 5S Housekeeping methods the rooms have been re-organized to house only clean supplies and equipment.



Figure 8 Clean supply room before lean 5 S activities.

Inventory par levels were lowered across the board in August. 100 percent inspection processes are in place to sustain the new levels of financial control. Supplies and equipment have been grouped by task to reduce time spent by staff on "treasure hunts", thereby reducing return trips to the supply room to retrieve forgotten items.

We limited the number and kinds of supplies and equipment stored in the clean supply rooms. We determined the definitive location for each piece of equipment and supply item. We labeled each item. We then marked the specific location where it is to be stored using colored tape on the floor for equipment and labeled bins for supply items.

We successfully reduced the medical equipment routinely stored in the hallways. **Figures 9 and 10.** We have a few more pieces to relocate and will complete the project when the construction project is complete.



Figure 9 Before Lean - Blood Pressure Monitors used to be stored in the corridor to access an electrical outlet

When this project is finished, each piece of equipment will have a "home" within a supply room that is clearly labeled.

We are adding electrical outlets to accommodate certain pieces of equipment. Following the completion of the project, only equipment currently in use will be in the corridor.



Figure 10 Before Lean - Equipment was routinely and inappropriately stored in the corridor.

Financial results related to a more disciplined financial controls are a subject of ongoing discussion. We discovered variations between actual inventory activity and reported activity. The absence of reliable baseline inventory data makes dollar saving projection savings problematic. We will continue to calculate and nail down the cost of certain nursing and RT supplies to allow before and after comparison.

We have achieved new discipline in establishing and maintaining inventory PAR levels and are confident the \$65,000 target for annual savings will be achieved.

Plan for Future of Project

To further promote the principles of Lean, the enthusiastic and committed members of the team plan a hospital-wide education plan to address medical-surgical supply waste, professional appearance, and the efficient utilization of our strategic resources to provide optimal patient care which will effect positive patient outcomes.



The Lean concept has taken over Kindred Hospital Seattle with force.

As a result of the supply room project, the overall appearance of our facility has drastically improved.

Figure 11 After Lean - Clean supplies organized in bins and labeled with PAR levels

Carryover of the project can be observed at all levels. Public and office spaces are professional and organized; staff members from all clinical departments are maintaining the organization and cleanliness of supply rooms.



Figure 12 After Lean - Ventilators, ready to use, located in their designated “parking space”

PROJECT NAME	CLEAN SUPPLY ROOMS
Voice of the Customer Lean Target Service, Department or Area	Respiratory and Nursing Departments
Senior Leader Sponsor	Cheryl Payseno COO
Value Stream Manager(s)	Lee Berger
Expected Annual Savings	\$65,000 +
Start Date	08/25/04
Target Completion Date	11/30/04

LEAN ELEMENT	DESCRIPTION	RESULTS			
		Metric	Baseline	Goal	Units
Lean Project Description	Goal statement (quantified)	Maintain the organization and daily maintenance of supplies to enhance employee efficiency.			
Objective(s)	Key Process Metrics always includes Non-value added time, Value Added time, lead-time, cycle time, and takt times.		Jun - Aug 2004	Oct 2004 forward	
		Metric 1 Med-surg supply cost PPD – Nursing & RT	<i>Due to inventory methods changing, we have not determined this number.</i>	Statistically/economically significant shift.	Supply cost per patient day (PPD)
Value Stream	Identify where waste can be removed	Square footage facility space, transportation time, inventory dollars.			

Business Case	Clinical and/or financial justification	Items will be located and managed in an efficient manner, reducing usage and inventory. Increased available space.	
Lean Team Members	Names and roles of team	Ruben Saucedo, Sue Bull, Joyce Sorenson, Greg Hardy, Rob Cook, Cheryl Payseno, Christina Asimakopoulos	
Value Stream Boundaries	Project focus must be clear to avoid project creep	Focus is room organization and maintenance, facility space efficiency, fewer “treasure hunts” for staff and reducing wasted supplies.	
Benefit(s) to the customer	How will the customer know improvements have been made?	Storage rooms will appear clean and organized with products easily accessible. Hallways will be clear. Space will be identified for additional use.	
To Do List for Successful Lean Kaizen Improvement Project	Each To Do must have deadline for completion.	To Do	Deadline
		5S Improvements	10/15/04
		Current State Map	9/30/04 (photo)
		Future State Map	10/26/04 (photo)
		Data Matrix	10/13/04
		Experiment Design	10/13/04
		Sustain Gains and Standardize	11/30/04

MEDICATION MANAGEMENT PROCESS

➤ *The medication management and administration process, beginning with the initial practitioner order, through the administration of the medication to the patient, is complex, high-volume, problem-prone and high-risk. Errors have the potential to cause serious harm patients. Medication errors are, by far, the most common health care error, and the #1 cause of patient death. Medication errors place professional licenses at risk and lead to costly litigation.*

Based on an evaluation of medication errors from June 1 to August 18, we selected the Management of Controlled Substances for in-depth analysis and process improvement.

There were 141 medication variances related to controlled substances during the study period involving 14 different drugs. See **Figure 13**. Controlled Substance Variances.

Signing out drugs and failing to document was the most frequently occurring variance. One nurse had 5 incidents, and five nurses had 4 incidents each. These six nurses were re-educated. There were no patterns noted by any one nurse that would indicate diversion.

Variance Description	Occurrences	Percent
Signed Out Drug, No Documentation	80	56.74%
Wrong Or Missed Dose	20	14.18%
Wastage Policy Not Followed	18	12.77%
Wrong Drug Given	14	9.93%
No Active Order	8	5.67%
Wrong Patient	1	0.71%
Total Variances	141	100.00%

Figure 13 Controlled Substance Variances

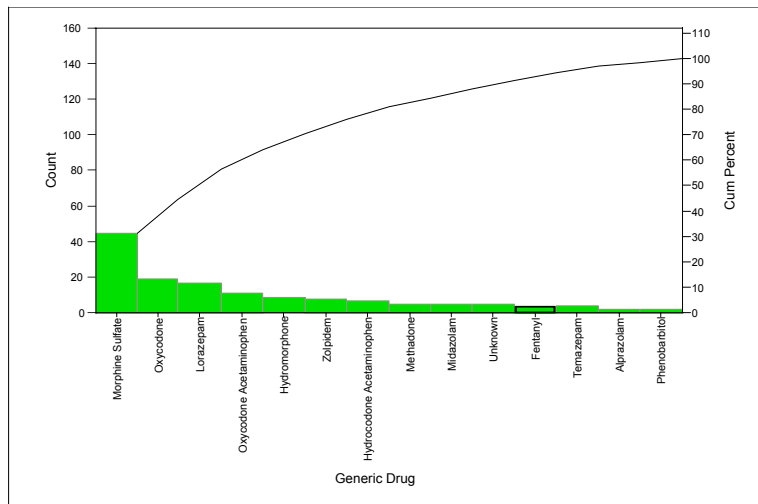


Figure 14 Incidence of Variances by Generic Drug

Figure 14 shows the drugs we found were the source of medication variance in descending order. Morphine sulfate, in its various forms, was the most problem-prone drug during this study.

The process of ordering, administering and documenting morphine sulfate was selected to be the subject of a Failure Mode Effects Analysis (FMEA) by the Quality Council, based upon this analysis of medication variances.

The FMEA was completed on September 1st and 2nd, 2004 and actions implemented by November 15, 2004.

Issue: <u>Controlled Substance Administration</u>		Process Responsibility		Key Date: <u>1-Sep-04</u>		FMEA				
Department: <u>Cross Functional Nursing/ Pharmacy</u>						FMEA				
Core Team: <u>Sue Bull, RN, Midori Kondo, PharmD, Judy Smith, RN, Cheryl Payseno, RN, Nancy Kilmer, RN</u>						FMEA				
Process Function	Potential Failure Mode	Potential Effect(s) of Failure	SEV	Occur	Detect	CN	RPN	Recommended Action(s)	Responsibility & Target Completion Date	
Accurate administration and documentation of controlled substances.	Morphine Sulfate (42%)	Death, longer lengths of stay, longer recovery time, pain, and vent weaning impact.	10		9	10	90	900	1. 5S Clean Up. 2. Fix labeling in med cart with appropriate font. 3. 5S organization for storage container and room. 4. Lighting improved. 5. CBR	Carolyn, Midori, Judy, Sue and Greg by 9/13/04
	oxycontin/oxycodone errors	Allergic reaction, over sedation	10		10	10	100	1000	1. 5S Clean Up. 2. Fix labeling in med cart with appropriate font. 3. 5S organization for storage container and room. 4. Lighting improved.	Carolyn, Midori, Judy, Sue and Greg by 9/13/04
	Wrong medication	allergic reaction, drug interaction, oversedation	10		8	10	80	800	1. 5S Clean Up. 2. Fix labeling in med cart with appropriate font. 3. 5S organization for storage container and room. 4. Lighting improved. 5. CBR	Carolyn, Midori, Judy, Sue and Greg by 9/13/04

Figure 15 FEMA – Management of Controlled Substances

Figure 15 is a snapshot of one portion of the FEMA completed analysis¹. Analysis of our process for administering controlled substances revealed significant and fundamental, high-risk problem areas, as well as rapid and significant improvement opportunities.

The poorly lit medication room housed drugs stored in a medication cart in drawers near the floor. The drugs were delivered to the nursing unit in baggies labeled by pharmacy using both generic and brand names. There was no consistent use of font, font size or location of the identification label on the baggie.

¹ See FEMA report for detail.

Long and short-acting drugs were stored in close proximity, as were look-alike, sound-alike drugs. All controlled substances were stored in the medication cart drawers in a bottomless paper “envelope” system, allowing individual pills to drop out of the envelope. All this contributed to a lengthy and difficult narcotic count at the change of shift.

We began by installing additional lighting in the med room and relocating the narcotics to two drawers at waist height in an existing cabinet. We installed hard dividers to the drawers and separated long and short-acting and look-alike/sound-alike drugs between the drawers. We reduced the number of drugs routinely stored and counted. We established a font standard and affixed the labels to the baggies in a consistent location.

All drugs are now labeled using only generic name and listed in alphabetical order. The narcotic sign-out sheet has been re-designed by pharmacy and lists drugs also using only generic names in alpha order.

While these changes may appear simple and obvious, without the discipline and methods of Lean, including the FMEA tool, we would not have accomplished so much in such a short period of time. We plan to re-audit compliance in February to determine if these improvements have reduced the number and type medication variances related to controlled substances.

We did not assign a specific dollar savings to this project. It is difficult to estimate the considerable value of Patient Safety improvements resulting from the reduction in medication errors. Literature on this subject cites the cost of additional tests and lab work, increased patient monitoring, change in treatment regime, extended hospital stay, and costly litigation among the considerable costs of medication errors.

PATIENT ROOM MEDICATION CABINETS

➤ *Eliminating waste is key to Lean projects.* We identified this project as a quick and visible way to reduce wasted supplies related to medication administration.

Each patient has a medication cabinet within the patient room. The current state, shown in Figures 16 & 17, picture medication cabinets packed full with supplies related to administering medications, including several types and sizes of syringes, including pre-filled saline flush syringes, needles, multi-dose access devices, medicine cups, alcohol wipes, and other supplies needed to administer medications.



Figure 16 Medication Cabinets Before Lean

The medication cabinet, located within the immediate patient care area, is contaminated. *Unused supplies cannot be returned to stock and are routinely discarded.*

The objective of this project is to decrease the number and type of medication administration supplies stored in each medication cabinet, thus reducing the amount of supplies routinely discarded whenever a patient is discharged or transferred to another room. Based on current census and patient mix, we have 550 patient transfers per year.

By changing the process, we estimate annual savings of \$11,600, exceeding our initial target of \$5,000 to \$10,000.

Figure 17 Supplies to be wasted From One Cabinet





Figure 18 Medication Cabinets after Lean

Figure 18 is a picture of a medication cabinet the way they all look now. We established PAR levels and changed the restocking method. Nursing staff now find it faster to locate needed medication supplies. Waste when the patient is discharged or transferred to another room is significantly reduced. Cabinets are easy to clean and maintain. Nursing staff restock at the end of each shift.

PROJECT NAME	MEDICATION CABINETS	
Voice of the Customer Lean Target Service, Department or Area	Nurses require readily available supplies to administer medication. Extra supplies are discarded when patients are discharged, leading to significant waste and increased medical/surgical supply expense. Nursing and Material Management	
Senior Leader Sponsor	Cheryl Payseno COO	
Value Stream Manager(s)	Greg Hardy, LPN, Materials Management	
Expected Annual Savings	\$5,000 to 10,000	
Start Date	September 1, 2004	
Target Completion Date	November 30, 2004	

LEAN ELEMENT	DESCRIPTION	RESULTS
Lean Project Description	Goal statement (quantified)	Establishing realistic par levels, and improving inventory management will result in ongoing savings in medication supplies.

Objective(s)	Key Process Metrics always includes Non-value-added time value added time, value-added time, lead-time, cycle time, and takt times.	Metric	Baseline	Goal	Units
		Metric 1 Cost of supplies per cabinet	\$38.92	Established par levels @ \$17.89	Dollars
		Metric 2 Annual supply cost X Room changes	\$21,481	\$9,875	Annual savings of \$11,606
Value Stream	Identify where waste can be removed	<ul style="list-style-type: none"> • Med-surg supplies discarded at discharge • Time spent by licensed nurses restocking cabinets and searching for medication supplies • Individual boxes will be clearly labeled and maintained in a neat and orderly manner it easier to locate and restock supplies quickly. 			
Business Case	Clinical and/or financial justification	<ul style="list-style-type: none"> • Excess supplies are discarded when the patient is discharged due to contamination • Cabinets are “packed” with extra supplies including syringes, needles, pre-filled saline syringes, and other items, making it difficult for nurses to quickly locate necessary supplies. 			
Lean Team Members	Names and roles of team	Gregg Hardy Manager, Materials Management Team members: Sue Bull CCO, Cheryl Payseno COO, Judy Smith LPN			
Value Stream Boundaries	Project focus must be clear to avoid project creep	Redesign medication cabinet storage system using clearly labeled boxes, established par levels, easy and accurate restocking system.			
Benefit(s) to the customer	How will the customer know improvements have been made?	All medication cabinets will contain individual, clearly labeled boxes for supplies. Restocking system established and nursing using the new system and expressing satisfaction.			

To Do List for Successful Lean Kaizen Improvement Project	Each To Do must have deadline for completion. Note date completed	To Do	Deadline	Completion
		5S Improvements	10/31/04	10/31/04
		Current State Map	9/10/04	9/10/04
		Future State Map	9/10/04	9/10/04
		Data Matrix	10/20/04	11/04/04
		Experiment Design	10/31/04	10/29/04
		Sustain Gains and Standardize	11/30/04	11/30/04

CRASH CARTS

➤ *The condition of the crash carts was identified as a potential high-risk condition.* The three carts were not standardized, including three completely different defibrillator models, two over 10 years old. There were too many supplies and medications stocked on the carts, making it difficult for Code Team members to locate needed supplies and emergency medications in a typically a high-stress situation. See **Figure 19**.



Figure 19 Crash Cart before Lean

We established a Lean process improvement team, led by the Respiratory and Nursing Departments. Staff from Materiel Management and nursing participated in the project. They quickly identified unneeded supplies (*i.e.*, gloves that are available in each patient room) and established par levels. All carts are now standardized.

We located a fourth cart and set it up as a backup, allowing us to implement an exchange cart system. The cart is immediately replaced after use and the used cart returned to the pharmacy for prompt restocking by pharmacy and Central Supply.

We identified the defibrillators as a potential high-risk situation, due to their age, performance capability, and significant variation in operating mechanism. We replaced the three defibrillators.

Revised crash cart records and checklists have been developed and implemented. The ICU Committee reviews code outcomes and are developing new criteria for review and analysis of code outcomes.

Figure 20 Crash Cart after Lean

