Toyota Lean Methodology in Healthcare Course: The Use of Transformational Learning to Attract the Graduate Student

Terri Davis Crutcher, DNP, RN, Assistant Professor and Assistant Dean, Clinical and Community Partnerships, Vanderbilt University School of Nursing, Nashville, TN

Treasa (Susie) K. Leming-Lee, DNP, RN, CPHQ, Assistant Professor of Nursing, Vanderbilt University School of Nursing, Nashville, TN
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Introduction

Today’s graduate students need scientific problem solving skills to be competent and competitive in an ever evolving global work environment. “They will have to transform broken systems and organizations, and create new ones that are more ethical, effective and, hopefully, socially just” (Peet, 2014).

However that need is not always met by traditional disciplinary academic education creating a gap of knowledge for the graduate student.
Background

• Transformational learning provides value-added results that organizations can expect from students completing graduate education in healthcare leadership and management.

• Transformational learning also allows the student to gain a realistic approximation of what will be encountered in the workplace.

• Through this learning approach students gain the knowledge to support the organization’s mission, vision, and strategic plans leading to a more sustainable, successful, high performing organization.

Conference on Higher Education Pedagogy, 2014
Problem

- “Healthcare educators and providers face a rapidly changing health care landscape, shifting student and patient demographics, an explosion of technology, and the globalization of health care, in addition to a myriad of everyday challenges in everyday operations.”

- As we position ourselves to meet today's workforce challenges and tomorrow's, we must understand the drivers affecting how we provide healthcare education and how we deliver healthcare.

- With this in mind it is the duty and responsibility of healthcare educators and healthcare organizations to partner in order to meet those challenges and exceed the expectations of those we serve by sustaining a high performing and high quality healthcare system.

Graduate Education Drivers

- Globalization
- Disruptive Technologies
- Demographic Shifts
- Deregulation

Friga, Bettis, Sullivan
Meeting the Graduate Students’ Need

Vanderbilt University School of Nursing’s Healthcare Leadership Program realized that students would be attracted to transformational, career focused, innovative courses, such as Lean Methodology in Healthcare, that meet the graduate education drivers, provide real life experiences, produces positive results, and that can be applied to their personal and work lives.
LEAN METHODOLOGY

- Leadership
- Eliminate Waste
- Act now
- Never-ending
What is Lean?

A philosophy and rigorous improvement system designed to transform waste into value from the customer’s/patient’s perspective.

- Kim, Spahlinger, Kin, & Billi, 2006
What Lean is NOT

It is not

- Complex or difficult to learn
- An end state
- A set of isolated practices
- Specialized knowledge held by a select few people
- Designed to make people work faster
- Only for making cars
The Toyota Culture/Toyota Way Model

- Continuous Improvement
- Respect for People
- Challenge
- Kaizen
- Genchi genbutsu
- Respect
- Teamwork

Liker & Hoseus, 2008
Why Lean?

- World markets are expanding; to survive and prosper in today’s global economy organizations, including healthcare must be willing to change and improve.

- Fast-paced technological changes challenging the agility of organizations.

- Because of today’s economic times customers or patients are demanding high quality products and services at a lower cost; no longer willing to wait excessive amount of time (waste) to receive these products and services.

- Most important developing the Lean is built on principles of transformational thinking; it is a methodology when applied transforms the way we think about how we do our work.

Leming-Lee, 2013
The Value of Lean

• Lean methodology can provide the tools to improve the workplace environment, reduce turnover, lower costs, and improve health outcomes for patients

• Lean methodology’s team approach may improve communication and collaboration and lead to a willingness to evaluate and reinvent how work is organized and accomplished

Kimball & O’Neill, 2002
What We Know About Organization and Culture Change

Leaders Must Lead
- It starts at the top
- Leaders must change themselves to become transformational leaders
- Progress depends on brutal honesty about the current situation at any time
- Leadership living your values must be developed at all levels
- Long-term change depends on continuity of leadership

People Must be Taught and Supported
- People will resist change because they are human
- Learning by doing is more powerful than learning by listening
- To cope with the high uncertainty of change people need daily support

Change Requires a Reason and a Vision
- People need a reason
- People need a future vision
- You cannot copy an established system, but most evolve your own

Change Needs a Plan and a Process
- Attitude and behavior change must be supported by structural change
- Metrics do not produce change but can be key enablers
- Break up the journey into small steps

Inozu et al., 2012
14 Principles of Toyota Way

Principle 1.
• Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.

Principle 2.
• Create a continuous process flow to bring problems to the surface.

Principle 3.
• Use “pull” systems to avoid overproduction.

Principle 4.
• Level out the workload (heijunka). (Work like the tortoise, not the hare.)

Principle 5.
• Build a culture of stopping to fix problems, to get quality right the first time

Principle 6.
• Standardized tasks and processes are the foundation for continuous improvement and employee empowerment.

Principle 7.
• Use visual control so no problems are hidden.

Principle 8.
• Use only reliable, thoroughly tested technology that serves your people and processes.

Principle 9.
• Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.

Principle 10.
• Develop exceptional people and teams who follow your company’s philosophy.

Principle 11.
• Respect your extended network of partners and suppliers by challenging them and helping them improve.

Principle 12.
• Go and see for yourself to thoroughly understand the situation (genchi genbutsu).

• Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly.

Principle 14.
• Become a learning organization through relentless reflection and continuous improvement (kaizen).
Lean Work Process Design Foundation: Core Tactical Knowledge

**Ideal Concept**
(as it applies to healthcare)

- Exactly what the patient needs, defect free
- One by one, customized to each individual patient
- On Demand, exactly as requested
- Immediate response to problems or changes
- No Waste
- Safe for patients, staff, and clinicians: physically, emotionally, & professionally

**Rules of Use Concept**

- **Rule 1, Activities:** all work shall be highly specified as to content, sequence, timing, and outcome; (standardized work)
- **Rule 2, Connections:** every customer-supplier connection must be direct and there must be a yes-or-no way to send requests and receive responses;
- **Rule 3, Pathways:** for every product and service must be simple and direct; no forks or looping and
- **Rule 4, Improvement:** any improvement must be in accordance with the scientific method, under the guidance of a teacher, closest to the problem, by those doing the work

Spears, 1999
HUMAN FACTORS
What is Human Factors?

- Human Factors is a body of knowledge about human abilities, human limitations, and other human characteristics that are relevant to design.

- It is the application of human factors information to the design or redesign of tools, machines, systems, tasks, jobs, and environments.

- Goals: making human interaction with systems safe, comfortable, and effective (productive).

Chapanis & Shafer, 1991
Lean and Human Factors

- **Lean**: maximize customer (patient) value while minimize waste (efficient use of resources)

- **Human Factors**: design that accounts for human capabilities and limitation to enhance performance, safety, and user satisfaction

Variation creates waste and risk, they are inter-related so then are the solutions to eliminate them!

France, 2013
Human (User)-Centered Design

- A design philosophy, or methodological principle, that centers the design process around the user.

- Three important attributes:
  1. Focus on the roles of humans in complex systems
  2. Design objectives are elaborated in terms of roles of humans
  3. Specific design issues follow from these objectives.
Human Factors Methods

- Observations
- Simulation
- Questionnaires/surveys
- Task analysis
- Time and motion studies
- Checklists
- Expert appraisals/ focus groups
- Interviews
- Event analyses
  - Retrospective
  - Prospective

Lean Methods

- Observation
- Value stream mapping
- Process flow charts
- Affinity diagrams
- 5S Workplace organization
  - Sort, set-in-order, shine, standardize, and sustain
- Visual management
- Waste analysis
TRANSFORMATIONAL LEARNING

Affective Domain
- Values
- Motivation
- Attitudes
- Stereotypes
- Feelings

Cognitive Domain
- Synthesis
- Recollection
- Comprehension
- Evaluation
- Analysis

Original image by Karin Kirk, SERC
What is Transformational Learning?

- Adult exhibit two kinds of learning: instrumental (e.g., cause/effect) and communicative (e.g., feelings).
- Learning involves change to meaning structures (perspectives and schemes).
- Change to meaning structures occurs through reflection about content, process or premises.
- Learning can involve: refining/elaborating meaning schemes, learning new schemes, transforming schemes, or transforming perspectives.

Mezirow, 2015
What is Transformational Learning?

- Transformative Learning includes those “a-ha moments” of insight in which students realize they have learned something beyond disciplinary content that will make a meaningful difference in their lives and the lives of those around them. 
  
  Cowan, Winters, King, 2014

Why Transformational Learning?

To promote student learning and personal growth by creating experiential lessons that transcend the boundaries of the classroom and providing ample opportunities for preflection and reflection.

“At the heart of active learning is the notion that students must read, write, discuss, and engage in problem solving to maximize their potential for intellectual growth (Bonwell and Eison 1991; Meyers and Jones 1993; Svinivki and McKeachie 2011). These activities are important because they engage higher-order cognitive strategies such as analysis, synthesis, and evaluation, and are thought to be most effective when done in pairs or groups, insofar as peer interaction requires students to articulate their logic and to consider different points of view when solving problems (Smith et al. 2009).”
“Analytical ability, problem solving skills and using initiative are among the top ten skills for recruiters of graduates. They want people who will take the personal responsibility to make sure targets are met; who can see that there might be a better way of doing something and who are prepared to research and implement change; people who don’t panic or give up when things go wrong but who will seek a way around the problem.”
The Lean Transformation Model

SITUATIONAL APPROACH
- Value-Driven Purpose -
  "WHAT PROBLEM ARE WE TRYING TO SOLVE?"

PROCESS IMPROVEMENT
Continuous, real, practical changes to improve the way the work is done

CAPABILITY DEVELOPMENT
Sustainable improvement capability in all people at all levels

MANAGEMENT SYSTEM

Basic Thinking, Mindset, Assumptions
That drive this transformation

http://www.lean.org/Workshops/WorkshopDescription.cfm?WorkshopId=109,
Retrieved on February 28, 2015
Transformational Learning: Lean Methodology Instructional Model

Situational Approach
Application of Problem-Solving Lean Tools: 5S, Spaghetti Diagram, Value Stream Map, A3

Process Improvement (PDSA)
Student
Capability Development (Finished Project)

14 Principles
Ideal Concept
Rules of Use
Human Factors

Learning Concepts, Tool Application, Change in Mindset Drives the Transformation

Modification of The Toyota Culture/Toyota Way Model and Lean Enterprise Model
The Lean Methodology in Healthcare Course

The Lean Methodology in Healthcare course provides the next generation of improvement scientists with a set of Lean tools, strategies, and principles that brings value to his/her every day work processes.

It is that scientific, experiential approach to learning that ensures sustainability of those work processes into the future. This type of transformational learning environment creates life-long value for the graduate student.

Pilon et al., 2014
The Lean Methodology Course

- **Course Number and Title:** N469 Lean Methodology in Healthcare

- **Level/Specialty:** DNP

- **Pre-requisites:** Quality Improvement and Patient Safety

- **Description:** This course focuses on the analysis and application of Lean principles to improve a process or system. This course builds on the quality improvement principles learned in N442 (Quality Improvement and Patient Safety).

- Topics include a history of the Toyota production system, how to identify the eight wastes in healthcare, how to implement 5S, A3 concepts, data collection, human factors, and value stream mapping of current state and future state processes.
Lean Methodology Text Books


The Lean Methodology Course

COURSE OBJECTIVES

After completing this course the student will be able to:

A. Describe and demonstrate the application of the Lean

B. Identify the eight wastes in healthcare

C. Describe how human factors impact Lean Healthcare

D. Demonstrate the use of data collection tools

E. Develop current state and future state value stream maps

F. Apply A3 problem solving methodology in a healthcare setting
The Lean Methodology Course

COURSE REQUIREMENTS

Learning Experiences:

• Lectures, readings and web-based activities are made available for each topic on a weekly basis. Students are encouraged to utilize these resources as well as seek other resources to enhance their learning. Sharing of these resources is strongly encouraged by students and faculty.

• Discussions will consist of student led discussions as well as case studies which provide students with the opportunity to further explore the application of Lean Methodology in healthcare. Students are expected to view the lectures, read the required readings, and prepare to participate in meaningful discussions. Students are encouraged to share their scholarly project work and clinical experiences with their class colleagues.
The Lean Methodology Course

- Relationship to School’s Philosophy, Goals, and Organizing Framework: The course is related to the specialist component of the organizing framework. With the four concepts of the nursing paradigm (human, environment, health, and nursing) serving as the framework, the course focuses on assisting the students to develop knowledge and understanding of various roles in nursing and the need to continuously work to improve the environment in which families live in order to enhance health and well-being of those we serve.

- The course focuses on the ability of the student to think analytically, reason logically, and communicate effectively.

- Total Credit Hours: 2 Credit Hours

Class Times/Schedule: Although this course is offered in a distance learning, asynchronous format, the student is expected to participate in the course’s first face-to-face class and learning activities, e.g. chats, discussions, group work, etc.
The Lean Methodology Course

Written Assignments

5S Workplace Organization (quick, visual feedback of learning experience)

The student will identify a space to organize and describe (in writing and via photographs) how (s) he applied 5S methodology to make the space more efficient and effective.

Lean Tools – Spaghetti Diagram ((quick, visual feedback of learning experience)

The student will observe a process, then track the time and distance of the process using a spaghetti diagram.
The Lean Methodology Course

The relationship between Integration of Human Factors and into the Lean Methodology
The student will search the literature to find an article that describes the integration of human factors into Lean Methodology. Students will share their article and a written summary with other students in the class.

Value Stream Mapping – Current State and Future State
After selecting a process for improvement, the student will design a current value stream map and a future value stream map. This work will be incorporated into the final A3 Project.

A3 Project and Presentation
The student will prepare and present to the class an electronic poster of his/her improvement project using the Lean A3 tool.
First Assignment
(Start of Transformational/Mindset Change)
5 S – CREATING A VISUAL HEALTHCARE WORKPLACE

Sort
- Get rid of unneeded items

Straighten
- Organize and label the location for items that are needed in the area

Shine
- Clean the work area
- Equipment cleaned and prepped for use

Standardize
- Develop cleaning methods and cleanliness standards to maintain the first 3 S’s

Sustain
- Review the workplace regularly
- Make it a habit

5 S creates a work environment
- That supports the process
- That supports the caregiver
- That supports the patient

Jimmerson, 2008
Personal Medication Organization

Assignment 1:

5S Workplace Organization

N469 Lean Methodology in Healthcare
MSN, RN-BC
My household medicine cabinets were selected as the space to implement the 5 S process because of the challenges in locating medications and medical supplies when needed.

**Aim** To consolidate, organize and eliminate expired medication and other waste

**Background**- Over the years my household has developed two areas for keeping medications: The master bathroom and cabinet above the kitchen sink.

**Challenges:**

- Family members not aware of which area holds what medicines and supplies. This can make searching for medications and supplies timely
- Duplicate medications and supplies

![Picture 1: Kitchen Medication Cabinet](image1.jpg)
![Picture 1: Master Bedroom Medicine Drawer](image2.jpg)
5S - Sort

Removed all medications/medical supplies from kitchen cabinet and bathroom drawer and placed together in centralized location
5S- Sort
Identified and Separated all the expired medications/supplies

- Identified waste: Categorized and Red tagged medication/Supplies that were expired
5S- Sort
Separated non pertinent items for relocation

- Identified waste: Red tagged all supplies that were not pertinent to the Medication/Supply Cabinet but could be used and relocated elsewhere

Non Pertinent Items for relocation

- Sunscreen
- Toothpaste
- Light fixture Remove
- Pony Tail Holder
- Light Bulbs
- New Razor
- Shampoo (Pert)
- Electric Razor
- Glasses Case
- Hair Clips
## 5S- Sort

Identified and separated all items to be tossed and excess items

- Identified waste: Red tagged all supplies that were not pertinent or excess to the Medication/Supply Cabinet and could be discarded.

<table>
<thead>
<tr>
<th>Non Pertinent Items to be tossed</th>
<th>Excess Supplies to be tossed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Q-Tips</td>
<td>Wax for Braces (no one in the household has braces)</td>
</tr>
<tr>
<td>Stray Cap</td>
<td>Button</td>
</tr>
<tr>
<td>Multiple Liquid Medication Dispenser (Keeping 1)</td>
<td>Loose wrinkled thermometer covers (Non working thermometer)</td>
</tr>
<tr>
<td>Empty Hair Wrap Wrapper</td>
<td>Single Aged Cough Drops</td>
</tr>
</tbody>
</table>

Excess Spirometers (Keeping 1)
5S- Straighten/ Set in Order

• Considered age of children in household and area easiest to access Medications
  • Elected to consolidate all medications and supplies to one area for ease of access and efficiency
  • Considered location for safety purposes, to keep out of reach of visiting children
  • Selected Kitchen Cabinet as the single area for medications and supplies
• Consolidated Supplies (i.e. Alcohol pads and First aid kits)
• Considered Categories for organization
  • Ace wraps and Ice pack
  • Allergy
  • Cold and Flu Medications
  • Pain/Anti Fever medications
  • Gauze, Band-Aids, Tape and Scissors
  • GI
  • First Aid Kit
  • Pain
  • Skin Cleaner and Ointment (alcohol pads, peroxide, triple antibiotic ointment, anti-itch spray)
  • Thermometer and Covers
• Located frequently used items on bottom shelf and less used on top shelf
• Identified Equipment to assist with organization
  • Colored tape
  • Clear Plastic Containers
  • A tiered shelf
5S- Shine

- Cabinet was emptied and cleaned with standard household cleaner
- Tiered Shelf was put in place on lower shelf area of cabinet
- Containers were measured to verify ability to fit in new location
5S- Standardize (visual management/angles/tape/signs)

- Organized medications and supplies by category, label color, container type or shelf location.
- Colored Tape, containers and shelving were used to provide visual queues and quick inventory assessment.

### Upper Cabinet Shelf Area

<table>
<thead>
<tr>
<th>Category</th>
<th>Color Label</th>
<th>Container Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>first aid kit</td>
<td>first aid kit label on case</td>
<td>plastic case</td>
</tr>
<tr>
<td>skin cleaner and ointments</td>
<td>white label</td>
<td>plastic container</td>
</tr>
<tr>
<td>gauze, band-aids, tape and scissors</td>
<td>white label</td>
<td>plastic container</td>
</tr>
</tbody>
</table>

### Lower Cabinet Shelf Area

<table>
<thead>
<tr>
<th>Category</th>
<th>Color Label</th>
<th>Container Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>cold and flu medications</td>
<td>blue label</td>
<td>tiered shelf</td>
</tr>
<tr>
<td>pain medications</td>
<td>red label</td>
<td>tiered shelf</td>
</tr>
<tr>
<td>allergy</td>
<td>green label</td>
<td>tiered shelf</td>
</tr>
<tr>
<td>GI medications</td>
<td>yellow label</td>
<td>tiered shelf</td>
</tr>
<tr>
<td>thermometers and covers</td>
<td>white label</td>
<td>plastic container</td>
</tr>
<tr>
<td>ace wraps and ice pack</td>
<td>white label</td>
<td>plastic container</td>
</tr>
<tr>
<td>Wart Remover</td>
<td>Label on Box</td>
<td>Plastic case</td>
</tr>
<tr>
<td>Cough Drops</td>
<td>Label on Bag</td>
<td>Sealed Bag</td>
</tr>
</tbody>
</table>

Picture 2: Organized and Labeled Medication Cabinet
5S- Sustain (Standard work/ Plan to sustain)

**Standard Work:**
The organization of the house hold medicine cabinets not only consolidated and eliminated waste of medications and supplies, it also standardized and streamlined access in the following ways:

- Having a single location for all medications and supplies eliminates searching in multiple areas
- Color labeling allows for quick visualization of inventory or medication and supplies
- Reduction of waste and cost by preventing duplicate supplies due to quick visualization

**Plan to Sustain:**
Incorporate into monthly tasks

- Establish first Sunday of the month for the review of cabinet supplies
- Monthly review of medicine cabinet for low supplies and outdates medications.
Before

2 extremely Cluttered Medication Areas

After

1 Central Medication Area
<table>
<thead>
<tr>
<th>Pre Medication Total</th>
<th># Expired/ Defective</th>
<th>Post Medication Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cold and Flu</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Medications</td>
<td>9 Medications</td>
<td>4 Medications</td>
</tr>
<tr>
<td>2 bags of cough drops and multiple aged loose cough drops</td>
<td>Multiple aged loose cough drops</td>
<td>2 bags of cough drops</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Medications</td>
<td>6 Medications</td>
<td>3 Medication</td>
</tr>
<tr>
<td><strong>Allergies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Medications</td>
<td>16 Medications</td>
<td>4 Medications</td>
</tr>
<tr>
<td><strong>GI Medications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Medications</td>
<td>5 Medications</td>
<td>8 Medications</td>
</tr>
<tr>
<td><strong>Thermometers and Covers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 thermometers, covers in a pack and multiple loose covers</td>
<td>1 thermometer and multiple loose covers</td>
<td>2 thermometers and a package of covers</td>
</tr>
<tr>
<td><strong>Ace Wraps and Ice Pack</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Ace Wraps and 1 ice pack in large box</td>
<td>1 large box- Threw out large box for ice back and consolidated in container</td>
<td>3 Ace wraps and 1 ice pack</td>
</tr>
<tr>
<td><strong>Wart Remover, Fungal Cream</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Medications</td>
<td>5 Medications</td>
<td>1 Medication for Wart Remover</td>
</tr>
<tr>
<td><strong>Gauze, Band-Aids, Tape and Scissors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 packets of Gauze,</td>
<td>1 Box that contained Gauze- Consolidated to one box</td>
<td>1 Box of Gauze</td>
</tr>
<tr>
<td>5 boxes of Band- Aids</td>
<td>4 Boxes of Band- Aids – Consolidated to one Box</td>
<td>1 Box of Band-Aids</td>
</tr>
<tr>
<td>3 Rolls of Tape</td>
<td>0</td>
<td>3 Rolls of Tape</td>
</tr>
<tr>
<td>1 pair of scissors</td>
<td>0</td>
<td>1 pair of scissors</td>
</tr>
<tr>
<td><strong>Skin Cleaner and Ointment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 boxes of Alcohol Wipes and hydrogen peroxide</td>
<td>1 box- Consolidated to</td>
<td>1 Box of Alcohol wipes and hydrogen peroxide</td>
</tr>
<tr>
<td>6 Medications</td>
<td>4 nearly full tubes of medication- Three triple antibiotic and 1 hydrocortisone</td>
<td>2 Medications</td>
</tr>
<tr>
<td><strong>First Aid Kits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 First Aid Kits</td>
<td>1 Kit- Consolidated to 1 First Aid Kit</td>
<td>1 First Aid Kit</td>
</tr>
</tbody>
</table>
Spaghetti Diagram
(Application of Lean and Human Factors)
Vanderbilt Student
Spaghetti Diagram:
Medication Administration on Patient Care Unit
Medication Administration
Process Improvement
Last Assignment

Vanderbilt Student Project
“The current medication administration process takes too long and is very inefficient.”
- Nursing 6th and 7th Floor
Acute care nurses at the medical center have identified opportunities for improvement with the medication administration process. While critical care units are often staffed with smaller patient to nurse ratios and have additional technologies available within patient rooms, the acute areas have space limitations that are often not suitable for mobile cart technologies which support medication administration. In addition the layout of the units with the nursing workspace and proximity to pharmacy dispensing technology has led to inefficiencies and quality issues in regards to medication administration within acute care units.

- Average patient to nurse ratio is 4:1
- Average acute care unit size is 12 beds
- Average patient has 11 scheduled medications and an average of 15 total including PRNs.
- Mobile carts difficult to fit into rooms to appropriately utilize for medication administration
- Work a rounds to pocket medications for increased efficiency, increase potential for medication errors
- Delay in medication co-signature to technology availability does not support best practice for medication verification
CURRENT STATE/CONDITION

1. Medication Orders placed in Electronic Health Record
   - Place order
   - Review med order
   - Sign orders
   - Place order: Lo= 2 sec, Hi= 25 min, Avg= 8.1 sec
   - Review med order: Lo= 1 min, Hi= 4 hours, Avg= 1 Hr.
   - Sign orders: Lo= 3 min, Hi= 26 min, Avg= 9.1 min

2. Pharmacy Verifies Orders
   - Verify med order
   - Review med order
   - Verify med order: Lo= 12 sec, Hi= 42 sec, Avg= 28.6 sec

3. Review Orders in Electronic Health Record
   - Review order
   - Review order:
   - Review order: Lo= 2 sec, Hi= 10 sec, Avg= 6 sec

4. Access and remove medications from Pyxis
   - Log onto pyxis
   - Remove from drawer
   - Access and remove medications:
   - Lo= 2 sec, Hi= 10 sec, Avg= 4 sec

5. Verification within EMAR Medication dose and route from computer adjacent to Pyxis
   - Verif
   - Lo= 1 sec, Hi= 5 sec, Avg= 4 sec

6. Supplies and preparation of Medications
   - Draw up injections
   - Cups for meds
   - Supplies and preparation:
   - Lo= 14 sec, Hi= 51 sec, Avg= 32 sec

7. Administration of Medication
   - Perform assessment
   - 5 rights
   - Administer med
   - Administration:
   - Lo= 5 sec, Hi= 47 sec, Avg= 25.3 sec

8. Document Medications and assessment in EHR
   - Log onto EMR
   - Document med
   - Log onto EMR:
   - Lo= 60 sec, Hi= 12 Hr, Avg= 4 hours

9. Co-Sign Medications as per policy for drip and medications
   - Lo= 30 sec, Hi= 101 sec, Avg= 66 sec

D/C orders that were specific to ED and PACU
**Potential safety issue
Should be cleaned up in the areas before transfer

- Value added time: 1260.6 s
- Non-Value added time: 14,564 s
- Total process time: 15,824.6 s
- Value added % = 8%
- Non-Value added % = 92%
1. Patient complaining of pain but unclear as to what medications can be administered
   - Why? PACU and ED orders still active in system
     - Why? Staff did not “clean up orders before transfer”
     - Why? Staff did not have physician orders to discontinue medications
     - Why? Follow up not performed and discussed with physician
     - Why? Staff forgot or Physician Unavailable

2. Inefficiency noted when Staff walks to Nurses computer area after each medication administration
   - Why? Staff do not like to use computers available in room
     - Why? Staff do not feel that there is enough privacy to document while with patient
     - Why? Staff are concerned that patient and/or families may view parts of the record unintended for viewing
     - Why? Rooms are small and computers are directly at the patient bedside
     - Why? Rooms were designed so documentation could occur close to the patient

3. Nurse forgets to cosign medications
   - Why? After reviewing medications with nurse colleague, nurse does not come back to task
     - Why? Nurse gets distracted with other patient care responsibility and does not remember need for co-signature
     - Why? Co-signatures pending alerts are not readily available in EMR
     - Why? Functionality for co-signatures is within a separate area of EMR
     - Why? Vendor design developed co-signature functionality within signature manager with limited alert reminders
COUNTERMEASURES

- Update Medication Reconciliation Transfer Policy to include practice to notify and discontinue orders prior to a patient transfer to another unit
- Education Providers and Nurses on updated Medication Reconciliation Policy
- Nurse will use handheld mobile device to scan and document medications in EMR.
- Nursing Education on handheld mobile devices for medication administration and documentation.
- Update Nursing Medication Administration Policy to reflect co-signature process within 30 minutes of administration.
- Nursing Education regarding co-signatures and policy update
<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
<th>When</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer Policy reflects practice to notify and discontinue orders</td>
<td>Nursing Administration/Hospital Administration</td>
<td>11/18/14</td>
<td>• Policy verified and reflects practice to discontinue orders prior to patient transfer by sending RN.</td>
</tr>
<tr>
<td>prior to a patient transfer to another unit (i.e. OR, Procedure</td>
<td></td>
<td></td>
<td>• Providers will discontinue medications and communicate medication changes with sending Nurse caring for patient at the time transfer order is submitted</td>
</tr>
<tr>
<td>areas, L&amp;D, ICU, ED)</td>
<td>Administration</td>
<td></td>
<td>• Sending Nurses will ensure communication with documentation to receiving nurse prior to transfer patient to another unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 100% of patients being transferred will have medication communication and medication updates prior to transfer to new units</td>
</tr>
<tr>
<td>Education Providers and Nurses on Transfer Policy</td>
<td>Nurse Educators and Provider Champions</td>
<td>11/18/14</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Providers will discontinue medications and communicate medication changes with sending Nurse caring for patient at the time transfer order is submitted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sending Nurses will ensure communication with documentation to receiving nurse prior to transfer patient to another unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 100% of patients being transferred will have medication communication and medication updates prior to transfer to new units</td>
</tr>
<tr>
<td>Nurse will use handheld mobile device to scan and document</td>
<td>Informatics and Nursing</td>
<td>11/18/14</td>
<td>• Nursing will update and document on handheld within patients room once medications administered</td>
</tr>
<tr>
<td>medications in EMR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Education on handheld mobile devices for medication</td>
<td>Nursing Staff Development</td>
<td>11/18/14</td>
<td>• 100% of Nursing will complete competency regarding device functionality and usage within medication administration practice</td>
</tr>
<tr>
<td>administration and documentation.</td>
<td></td>
<td></td>
<td>• Nurses will take a satisfaction survey regarding medication administration prior and post implementation to evaluate satisfaction and usability.</td>
</tr>
<tr>
<td>Update medication administration policy to include expected</td>
<td>Nursing Managers/Nursing</td>
<td>11/18/14</td>
<td>• 100% Co-signatures for medications will be signed within 30 minutes of Medication Administration.</td>
</tr>
<tr>
<td>timeframe of co-signature completion.</td>
<td>Administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Education regarding Co-signatures and policy update</td>
<td>Nursing Staff Development</td>
<td>11/18/14</td>
<td>• 100% Nurses will attend an in-service regarding co-signature policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Decrease in delinquent co-signatures.</td>
</tr>
<tr>
<td>Create a weekly report for management identifying pending co-</td>
<td>Nursing Administration</td>
<td>12/7/14</td>
<td>• 100% Co-signature rate will be within 30 minutes of medication administration.</td>
</tr>
<tr>
<td>signatures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>$$$</td>
<td></td>
<td></td>
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<td>------------------------------</td>
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</tbody>
</table>
| Hand held mobile units for Medication administration and documentation.  
  • 3 Apple 5S disabled Phones with Scanning Sleds  
  (For 12 bed units with staffing 4:1 ratio)  
  • Sunrise Clinical Manager (SCM EHR) application licenses | $12,000.00 per Unit |

<table>
<thead>
<tr>
<th>Cost Benefit</th>
<th>$$$</th>
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</thead>
<tbody>
<tr>
<td>Improve Medication Administration Safety- supporting 5 medication administration rights (right medication, right dose, right time, right route, right patient)</td>
<td>Improved Quality reduction of errors save costs and improved reimbursement</td>
</tr>
</tbody>
</table>

Nurses time saved and improved efficiency:  
170 hours a year saved for an average daily assignment of 4 patients on a 12 bed unit. (average nursing salary is 23.00/ hour )  
$11,730.00 saved yearly on a unit

Reference
Deploy 3 Apple Mobile Devices with Sunrise Clinical Manager mobile application available on the 6th floor acute care unit for a 72 hour period between November 19th thru the 21st.

• Time from review of medication to administrative time to evaluate for improvement

• General feedback on nursing satisfaction and improvement and on medication safety
FOLLOW-UP

- Co signatures occurring within 15 minutes on average of medication administration
- Nursing medication administration time reduced:
  - Nursing expressed increased satisfaction with incorporating mobile technology with the improvement process
    - “I like it because it is easy to clean and carry. This is great for our isolation patients”
  - Workload shared between sending and receiving nurse with transfers. Reducing Medication clarifications and “clean-up” time
  - Same medication hardware process will be implemented on 8th floor in December
  - Measurement period will be over 1 month and then plan to implement house wide through July 2015

<table>
<thead>
<tr>
<th>Pre Implementation</th>
<th>Post Implementation</th>
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</thead>
<tbody>
<tr>
<td>Average of 10 minutes and 36 seconds per medication</td>
<td>Average of 6 minutes per medication administration</td>
</tr>
<tr>
<td>administration</td>
<td>Savings $85,629 per unit per year</td>
</tr>
</tbody>
</table>
Student Course Evaluation

Course Offered in:
• Fall of 2013 and Fall 2014

Total Number of Students: 14
• 10 DNP Students
• 4 Interprofessional Students

Grades:
• A to A+

Course Evaluation Results:
• 10 Respondents over Two Semesters
Student Course Evaluation

EVALUATION COMMENTS 2013 (6) 2014 (4)

• It is a current hot topic to become more Lean, it was great to get to use the tools and knowledge of the course in my actual work.

• Where do I begin. I already have a DNP but felt this course STRONGLY augmented and began the basics of a foundation in LEAN. VERY BENEFICIAL to practice and applicable to today's health care environment.

• The course material is great, and so easy to learn from. I also felt like the instructors were available when you needed them.

• This course has tremendous practical application. This is an essential skill set for leaders across the continuum. The projects were fun.

• The projects provided valuable tools for future quality improvement work.

• CONTINUATION! within and outside of the VUSN.

• Instructors:
  • Very friendly, which helped facilitate learning. Loved learning about their experience in the field.
  • Very supportive, knowledgeable / practical about how to apply these skills to every aspect of our every day practice
## Project Results

### N 469 Lean Methodology in Healthcare Fall 2013-2014

<table>
<thead>
<tr>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2013</strong></td>
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<tr>
<td>• Delay in Pediatric Asthma Patient Discharges</td>
</tr>
<tr>
<td>• Pharmacy Waste</td>
</tr>
<tr>
<td>• House Supervisor Management of Patient Placement</td>
</tr>
<tr>
<td>• Urologic Supply Acquisition for Intravesicular Medication Instillation</td>
</tr>
<tr>
<td>• Reducing Waste in the Outpatient Supplement Staffing Process</td>
</tr>
<tr>
<td>• In Consist Nursing Handover</td>
</tr>
<tr>
<td>• Clinical Placement Process in an Academic Setting</td>
</tr>
<tr>
<td>• Waste in the Policy Revision Process</td>
</tr>
<tr>
<td><strong>2014</strong></td>
</tr>
<tr>
<td>• Medication Administration</td>
</tr>
<tr>
<td>• RN Recruitment</td>
</tr>
<tr>
<td>• Expediting Compensation &amp; Pension Processing</td>
</tr>
<tr>
<td>• MICU Non-Mirrored Medications</td>
</tr>
<tr>
<td>• Long Triage Wait Times in the Emergency Department</td>
</tr>
<tr>
<td>• Surgery First Case On-Time Starts</td>
</tr>
</tbody>
</table>
Lessons Learned

- First assignment must be simple and fun to fire up the mindset change; Seeing is Believing
- Simple is Better-text book, use of pencil and paper
- Assignment choices empower the student
- Tool Application in the student’s personal and professional life
- Sharing work among students = student engagement
- Lean empowers the student
- Coaching instead of instructing, we want a win!
- Project sponsor, engages the organization
- Reflection
- Coaches with real life Lean experience
Conclusion

“Life-changing experiences ignite leadership potential that increases the students' desire for wisdom, understanding of calling, and preparation for service in a diverse and interconnected global society”

Prepare yourself to change the world.
Remember!

“Tell me, I’ll forget. Show me, I may remember. But involve me, and I’ll understand”

Chinese Proverb
References


France, D. The Role of Human Factors in the Lean QI Methodology. Retrieved on March 1, 2015 from https://blackboard.vanderbilt.edu/webapps/portal/frameset.jsp?tab_tab_group_id=_2_1&url=%2Fwebapps%2Fblackboard%2Fexecute%2Flauncher%3Ftype%3DCourse%26id%3D22065_1%26url%3D

References


http://www.kent.ac.uk/careers/sk/problem-solving-skills.htm


http://digitalcommons.georgiasouthern.edu/cgi/viewcontent.cgi?article=1471&context=ij-sotl