Successfully Using Six Sigma (6σ) to Improve Nursing Quality Indictors

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Objectives

1. Describe how Six Sigma can be used to improve nursing quality indicators.
2. Describe how the DMAIC process identified the critical steps surrounding the incidence or pressure ulcers.
About Heritage Valley Health System

- The Medical Center, Beaver, with 358 beds
- Sewickley Valley Hospital, with 191 beds
- Five affiliated physician groups: Tri-State Medical Group, Sewickley Valley Medical Group, Tri-State Obstetrics and Gynecology, Tri-State Gynecology, Tri-State Pediatric Associates
- Sewickley Valley Hospital and The Medical Center foundations

- **Quality Method: Six Sigma**

  Recommended by the JCAHO

  "Best Practice for Six Sigma Implementation (April 2005)"

  The Medical Center was recently named as one of the nation’s 2005 Performance Improvement Leaders by Solucient® 100 Top Hospitals

What is Six Sigma?

- A method to analyze **Variation**
- Has a strong metric component; it is **Data Driven**
- A process to reduce variation so that acceptable performance is within **Six Standard Deviations** (6 σ)
Reducing variability is the essence of six sigma

Six Sigma Concept

Every Human Activity Has Variability...

Mean

Target

1σ

Errors

Lower Customer Specification

Upper Customer Specification

Reducing variability is the essence of six sigma

Six Sigma Concept

A process to reduce defects per million opportunities (DPMO)

<table>
<thead>
<tr>
<th>σ</th>
<th>DPMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>308,537</td>
</tr>
<tr>
<td>3</td>
<td>66,807</td>
</tr>
<tr>
<td>4</td>
<td>6,210</td>
</tr>
<tr>
<td>5</td>
<td>233</td>
</tr>
<tr>
<td>6</td>
<td>3.4</td>
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</tbody>
</table>

Quantitative methodology, utilizing measurements and scientific process

Defect
pressure ulcer, patient fall, antibiotic delay, central line infection, med omitted
**DMAIC: A Problem Solving Methodology**

- **Define**
  - Project Selection
  - Team Formation
  - Define Opportunities

- **Measure**
  - Measure the Process
  - Analyze Data Collected

- **Analyze**
  - Analyze Data Collected
  - Innovate Solutions
  - Make Improvements

- **Improve**
  - Innovate Solutions
  - Make Improvements

- **Control**
  - "Sustain The Gain"

**We are forced, after improvement, to remeasure, analyze and then control the process.**

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**Six Sigma: A Set of Tools**

- **Process Flow Diagram**
- **Cause and Effect Diagram**
- **Control Charts**
- **Failure Modes and Effects Analysis - FMEA**
- **Measurement System Analysis**

**Risk Priority Number (RPN) = Severity x Occurrence x Escaped Detection**

<table>
<thead>
<tr>
<th>Failure Modes and Effects Analysis (FMEA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escaped Detection (DET)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severity (SEV)</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence (OCC)</td>
<td>Very High</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
<td>Very Low</td>
</tr>
</tbody>
</table>

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**Measurement System Analysis**

<table>
<thead>
<tr>
<th>Environment</th>
<th>Operator 1</th>
<th>Operator 2</th>
<th>Operator 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

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4
Six Sigma Project:
Preventing Hospital Acquired Pressure Ulcers

Why Reduce Hospital Acquired Pressure Ulcers?
1. Nursing Quality Indicator (NDNQI)
   - Magnet Status
   - Regulatory Agencies - DOH
2. Health Care Cost
   - Increase Health Care Cost
   - Increase LOS
   - Increase Use of Resources/Materials
   - Potential For Litigation
3. Increased Mortality
   - Due to complications (Sepsis)
4. Patient Satisfaction
5. Perception that the rate of hospital acquired pressure ulcer was higher than expected.

Our Profile of a Patient with “Decubitus Ulcer”

A review of 226 cases from July 2005 to Jan 2006 with ICD-9 Principle or Secondary diagnosis of 707 (decubitus ulcer) showed:

- Mean age 71 with a range of 17-92
- 56% female and 44% male
- Top 5 diagnosis codes:
  - heart failure, hypertension, urinary track infection, atrial fibrillation and COPD.
- Top 2 DRGs: heart failure and septicemia
- Discharging nursing unit:
  - A1 (46%), B3 (32%) and A3 (9%)
- 49% Medicare and 25% Security Blue
- LOS average 7.6 days +/- 6.3 days
- Discharge Status: SNF 40%, Home 23%, HH 18%
  - Expired n = 16 (7%)
Skin Care Committee Team Members

- **Nursing Administration**
  - Joann Hatton RN Director of Nursing
  - Kathy Hoffman RN CWOCN Nurse
  - Gail Inman RN CWOCN Nurse
- **Critical Care**
  - Cheryl Decker RN
- **CardioPulmonary Step Down**
  - Kathy Starkey RN Level 3
- **Medical Surgical Units**
  - Kristen Majetic RN A3 Med Surg
  - Lisa McLean RN Level 2 Med Surg
  - Kristen Coster RN Level 1 Med Surg
  - Ting Andrews LPN Level 1 Med Surg
- **Psychiatric Unit**
  - Pat Martyak RN

**IPO**

**Inputs**

- **People**
  - Patients
  - Families
  - Nurses
  - Clinical Techs
  - CWOCN Nurse
  - Physicians

- **Policies / Procedures**
  - Risk Assessment
  - Nutrition Screen
  - Documentation Tool
  - Event Reporting

- **Training / Education**
  - Skill/knowledge
  - Competency

- **Equipment / Supplies**
  - Bed Surfaces
  - Pressure Relief Devices
  - Dressings
  - Wound care products

**Outputs**

- **Quality**
  - Reduced Incidence pressure ulcers
  - Practicing evidenced based nursing (ie risk assessment)
  - Competent and knowledgeable staff

- **Customer Satisfaction**
  - Improved patient/family satisfaction
  - Improved physician satisfaction
  - Improved relationships

- **HR**
  - Improved nursing satisfaction
  - Positive impact on nursing retention

- **Financial**
  - Reduced patient costs
  - Reduced LOS

**Preventing Hospital Acquired Pressure Ulcers**
**Skin Risk Assessment Process Flow**

- **Patient Admitted to Hospital**
- **Skin Assessment Completed by RN (Admission Assessment)**
- **Skin Breakdown Present?**
  - Yes
  - No
- **Risk Assessment Completed by RN (Braden Scale)**
- **At Risk?**
- **Not Currently at Risk >18**
- **Low to Moderate Risk 12-18**
- **High Risk <12**
- **Stage 1**
- **Stage 2**
- **Stage 3**
- **Stage 4**
- **Unstageable**

**Event Report**

- **Follow Skin Care Protocol according to Risk and Stage**
  - Yes
  - No
- **Implement Prevention Strategies and consult CWOCN**
- **TMC: All Units**

**Measure**

**Percent of Surveyed Patients with Hospital Acquired Pressure Ulcers**

- Critical Care
- Cardiopulmonary
- Level 1
- Level 2
- A3
- Psych
- TMC

Data Source: NDNQI
Hillrom Study March 2005

TMC Data

2005 Facility Prevalence Rate Benchmarks

Analysis: TMC rates below Benchmarks

= TMC

What Have We Learned?

Analysis: Failure Modes

Improvement Steps

MANPOWER

- Staff Education
  - Lack of knowledge on protocol/policy
  - Lack of knowledge on products
  - Competency (has not been one for past 4 years)
  - Policy / Protocol not up to date

1. Revised Skin Care Protocol Aug 2005 to reflect evidence based practice. Included easy to follow tables on equipment and products. Completed

2. Provided Staff Education In Progress
   - On line learning module for RNs on Risk Assessment
   - Incorporated Assessment / Staging into Annual Nursing Seminar.
   - Skills lab for CTs (turning, positioning, reducing shearing and friction)
What Have We Learned?

Analysis: Failure Modes

MANPOWER

- Role of CWOCN nurse not clear
  - Hospital culture (expect ET to do it)
  - Inappropriate consults
  - CWOCN workload

Imagination Steps

Further study and define role of CWOCN

Completed

1. July 2005 Kathy Hoffman CWOCN reassigned full time at TMC with Gail Inman providing support coverage.
2. In addition to seeing patients, focus on customer service and coaching / mentoring of RNs, CTs and students
3. Monthly tracking of caseloads – looking at workload and types of consults.
4. Focus on improved event reporting / FU
5. Job Description revised
6. Participation in Western PA WOCN Assoc.

Role of CWOCN

Visits by Reason for Consult

Volume of Visits
What Have We Learned?

**Analysis: Failure Modes**

**MANPOWER**

- Skin Care Committee
  - Only meets quarterly
  - Ill-defined - unclear focus other than audits
  - Focus not on PI
  - No management involvement / accountability
  - Not all units represented
  - Managers not really aware of what they did

**Improvement Steps**

Resurrect Skin Care Committee with newly defined charter. *Completed*

1. Decided quarterly was sufficient in 2006
2. All units now represented
3. NDNQI results shared with members
4. Each meeting focus on a PI topic and education
5. Competency completed on all members Aug 2005
6. DON Professional Practice attends mtgs
7. Summary of meeting and findings communicated via email to nursing leadership within 24 hours of mtg.

**Analysis: Failure Modes**

**MEASUREMENT**

- Question validity of data
  - Audit process not clearly defined
  - Not using current NDNQI forms and data definitions
- Only completed quarterly
  - No real time feedback to Mgrs
- “feel” rates are higher than reported in prevalence studies

**Improvement Steps**

Revised Measurement / Auditing Process Aug 2005 *Completed*

1. Using current NDNQI forms
2. DON PP and CWOCN completed NDNQI online tutorial
3. Review data collection methodology with skin care committee prior to each quarterly audit.
4. Attended conference call by NDNQI on improving reliability and validity of data.
5. Review audits at mid day and at end of day to ensure accuracy and completeness
6. Nursing assumed responsibility for data entry into NDNQI web based system.
7. Manager’s review and initial audit tool at the end of the day.
8. CWOCN weekly tracks incidence of pressure ulcers.
### What Have We Learned?

**Analysis: Failure Modes**

<table>
<thead>
<tr>
<th>MACHINES</th>
<th>Improvement Steps</th>
</tr>
</thead>
</table>
| - Bed Utilization - high rental fees  
  - over and under utilization  
  - monitoring bed usage (what reports are out there?)  
  - mattresses and beds are old | Plan for replacing all beds in 5 year capital plan **In Progress**  
1. All Critical Care beds replaced Nov 05  
2. Preventive surface included in all beds  
3. Stopped using mattress overlays |

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>Included one page tables on equipment and products as an attachment in the Skin Care Protocol. <strong>In Progress</strong></th>
</tr>
</thead>
</table>
| - Lack of knowledge on  
  - which products available at TMC  
  - when to use which product  
  - where products are kept | 1. CWOCN focus on 1:1 coaching / mentoring at the bedside.  
2. CWOCN participates in value analysis process / committee. |

### METHODS

| Documentation | Policy on Admission Assessment revised  
  - Moved Braden Scale with Integumentary section of the form  
  - defined areas of responsibilities |
|---------------|--------------------------------------------------------------------------------------|
| Risk Assessment | 2. Skin Care Protocol revised to specifically define the process for documentation, risk assessment and event reporting.  
  - Changed from on admission to daily  
  - Added risk tools to daily graphics  
  - Focus on event reporting of pressure ulcers noted on admission by Mgrs, supervisors and CWOCN.  
  - Educational sessions for nursing to focus on Risk Assessment and documentation. **Completed** |
| - New admission assessment form:  
  - Small print, limited education on use  
  - Unclear who completes what section of form  
  - Patient not “captured” on admission  
  - Event Report not always completed  
  - Patients not “captured” ICDM coding on discharge | 3. |
Documentation

- Document the patient’s initial Braden Scale on the Admission Assessment as usual.
- Record the daily reassessment on the Clinical Record.

Document pressure ulcer prevention measures on the Clinical Record and update plan of care.

Can I delegate the documentation of the frequent observations to my ClinTech?

YES, you are encouraged to do this!
Results

The project results so far have been impressive:

1. Reduction in hospital acquired pressure ulcers from 6.9 to 3.5 (Sigma level from 2.9 to 3.5)
2. Incorporation of risk assessment from “on admission” to daily with an improvement in documentation of risk assessment from 50% to 96%.

Results

Hospital comparison to NDNQI
Results: Critical Care

Summary

• Skin care remains an important measure of quality for nursing
• Incidence of pressure ulcers remains a significant problem in most hospitals. Using a six sigma problem solving approach within nursing can identify and eliminate barriers nurses face in caring for their patients.
• The FMEA assisted us in developing processes to prevent and mitigate those instances that escaped the initial process.