Overview:
The project was initiated at UT Southwestern University Hospitals St. Paul and Zale Lipshy, in July 2011 and is currently ongoing. Our project affects all patients admitted to the hospitals in all units except the neonatal care unit.

Figure 1 shows HAPUs at University Hospitals prior to project initiation. In 2009 there were 13 cases of Stage III/IV HAPUs. In 2010, efforts to reduce HAPUs were made that resulted in a heightened awareness and improved education on wound care and treatment. These initial efforts achieved a 54% reduction in HAPUs. These gains were not sustainable in 2011, and stimulated urgency to improve.

Figure 1. Hospital-acquired pressure ulcers prior to project initiation.

The current project is focused on improving pressure ulcer prevention on a sustained basis by standardizing processes through the design and implementation of an electronic medical record (EMR) based clinical pathway. The design of the interventions
embeds an informed clinical decision support system (iCDSs) in the current EMR. The approach is multi-disciplinary. The project team consists of a physician quality officer, nursing director, quality data analyst, wound-care nursing team, clinical subject matter experts, front-line nurses, and EMR programmers.

**Aim Statement:**
Our aim is to reduce the incidence of HAPU by 50% of the 2011 count through standardizing the processes of assessment, prevention and treatment of the integumentary system by the end of Q4 2012. The specific goals of the project are as follows:

1. To standardize clinical process related to skin and wound care based on current evidence-based best practice guidelines
2. To design and implement an EMR-based iCDSs that would make it easy to adhere to best practice guidelines and EMR documentation standards
3. To evaluate whether the standardized HAPU prevention protocol improves overall screening, prevention and treatment of pressure ulcers

**Measures of Success:**
Our measures of success evaluate HAPU-related outcomes and the extent of adherence to best practice guidelines. Prior to the project implementation, we didn’t have a reliable way to measure process outcomes.

- **Outcome measures:**
  - NDNQI prevalence rates of all HAPUs per quarter
  - Number of stage III & IV HAPUs per quarter
- **Process measures:**
  - Time between admission and first skin assessment
  - Time between admission and first documentation of Braden risk assessment score
  - Percent of Braden score sub-scales < 4 receiving recommended Johnston interventions
  - Percent of patient days receiving recommended skin and Braden risk assessment at least twice daily

**Use of Quality Tools:**
Examples of actual quality tools are included in the attachments. Quality tools included:

- Project charter to keep the focus, scope, and goals of the project clear and galvanize support and agreement among the stakeholders
- Stakeholder analysis to help the project initiators identify departments/individuals who have an interest in the project, where barriers might exist, and what actions need to be taken to obtain the support and participation of those departments and individuals (Figure 2).
- Process mapping to help the project team and the frontline staff understand the complexity of the 2010 processes (Figures 3,4,5,6,)
• Brainstorming sessions to gather staff feedback about what made the process difficult, what the front-line staff thought were main causes for HAPU and what barriers were not addressed earlier
  o Nominal group technique to get all the members to contribute by writing ideas on post-it notes
  o Multi-voting to determine what the staff thought we need to address
• Fishbone diagram as an aid to organize the cause and effect relationships within the free flow of ideas (Figure 7)
• 5-whys and Root Cause Analyses to find out where the problems were and what could have contributed to the problems
• Force-field analysis to focus the project team on issues that are helping or hindering improvements. Elements from the stakeholder analysis were used to populate the “helping and hindering” columns of the force field diagram
• Pareto Analysis to determine where 80% of the issues resided (Figure 8)
• Tracking progress and feedback to staff using (see results section)
  o Run charts
  o Bar charts

**Interventions:**
Our improvement plan followed the DMAIC framework and tollgates (Figure 9). Designing and implementing the clinical pathway in the EMR took approximately 10 months. The finished clinical pathway was put into production June 21, 2012, four months behind schedule. Reasons for the delay were multifactorial, including inadequate dedicated support from an EMR team handling competing priorities and EMR rollouts.

The participation of the Skin Care Committee and the Nursing Quality Council at each step of the plan promoted the project and kept the awareness of HAPU prevention as a high priority. The Skin Care Committee also reported outcomes data to the Nursing Quality Council, and spread information on the project interventions through the Nursing Shared Governance structure. This structure promotes multiple opportunities for communication from the front line nursing staff to the various committees including Unit Based Councils, Nursing Education Council, Nursing Informatics Council, Nursing Executive Leadership Council, and the project team. These venues made it possible to support continuous feedback loops with the project team and the frontline providers.

The project interventions were:

1. **EMR-based informed clinical decision support system (iCDSs)**
   - One of our primary interventions was the design and implementation of an EMR-based iCDSs to embed clinical best practices in routine skin and wound care. After a detailed review of the patient care processes and workflow for skin care, we designed the iCDSs to minimize unnecessary nursing documentation and maximize patient care time. The Braden Scale for predicting pressure ulcer risk is a widely used assessment tool designed to help nurses assess a patient’s risk for developing pressure ulcers. We incorporated the Braden scale into the EMR.
Best practice interventions for wound and skin care, consults, and orders are automatically triggered based on the documented Braden sub-scales.

(2) Implementation of an institutional skin and wound care policy
After a comprehensive review of existing skin care procedures, we found that it required modifications to bring it up-to-date with current best practices. The Skin Care Committee modified and implemented an institution-wide skin policy that incorporates timely skin assessments, Braden risk scores, evidence-based best practices for wound and skin care interventions.

(3) Nursing Education
During the course of this project, the Skin Care Committee organized a hospital-wide skin fair to educate all staff on the new institutional policy and its components. They also introduced the new EMR-based iCDSs. Prior to go-live of the EMR-based iCDSs, we conducted extensive hands-on training for representatives of all nursing units on details of the skin clinical pathway.

The key innovation of this project is that we created an EMR-based iCDSs (Figure 10), that embedded evidence-based best practices, standardized risk screening, and appropriate interventions in a seamless manner. We built the EMR to make documentation useful to the staff at the bedside by

- Making skin and wound documentation user-friendly
- Reducing unnecessary documentation (Figure 11)
- Standardizing documentation in discrete data fields to allow electronic data capture for process and outcome measurement
Results:

Outcome Measures:

Figure 12. NDNQI Prevalence Rate for stage I or higher HAPUs per quarter

Figure 13. Number of stage III/IV HAPUs per quarter

Prepared by: Office of Quality Improvement and Safety
Data Source: UT Southwestern Wound Care Nursing Team
Date: 7/30/2012
Process Measures:

Figure 14. Time between Admission and 1st Skin Assessment

Office of Quality Improvement & Safety
Preliminary Post-GoLive Data: Skin Clinical Pathway
Prepared by: Office Of Quality Improvement & Safety as of 08/04/2012

Hours Between Admission and First Skin Assessment Recorded
UTSW University Hospitals - St. Paul and Zale Lipshy
Reporting Period: Jan 2012 to Jul 2012

INCLUSIONS
Inpatient Admissions with a Patient Status 'Admission' or 'Discharged'. Only admissions of patients, ages 12+ years included.

DEFINITIONS
Admission Time: Time of admission to hospital.
1st Skin Assessment Time: Recording time of the first skin assessment

DATA SOURCE
Epic

Figure 55. Time between Admission and 1st Braden Pressure Ulcer Risk Assessment

Office of Quality Improvement & Safety
Preliminary Post-GoLive Data: Skin Clinical Pathway
Prepared by: Office Of Quality Improvement & Safety as of 08/04/2012

Hours Between Admission and First Braden Assessment Recorded
UTSW University Hospitals - St. Paul and Zale Lipshy
Reporting Period: Jan 2012 to Jul 2012

INCLUSIONS
Inpatient Admissions with a Patient Status 'Admission' or 'Discharged'. Only admissions of patients, ages 12+ years included.

DEFINITIONS
Admission Time: Time of admission to hospital.
1st Braden Risk Assessment Time: Recording Time of the first Braden Risk Assessment

DATA SOURCE
Epic
Revenue Enhancement/Cost Avoidance/Generalizability:

The project was comprehensive in that the entire UT Southwestern Health System was involved. Estimated avoidable costs attributable to HAPU based on ranges of stage III & IV pressure ulcers provided by CMS was $302,260 for CY 2011. Estimated avoidable costs for January-June 2012 are $43,180. To date we have demonstrated an 85.7% or $259,080 improvement in avoidable costs.

Figure 16. Estimated avoidable costs attributed to HAPUs

Conclusions and Next Steps:

Through this project, we implemented standardized clinical practice for skin and wound care by the use of clinical information systems, evidence based treatment guidelines, and education.

Our next steps will be to collect process and outcome data for the next four to six months, to study our processes, and make improvements to our system, as needed.

Should the data demonstrate our project was successful, we anticipate replicating the basic approach and guiding principles of the project and applying them to other healthcare-acquired conditions.
### Figure 2: Excerpt of Stakeholder Analysis

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Interest or requirement in the project</th>
<th>What the project needs from the stakeholder</th>
<th>List the barriers/ issues/risks or List the needs of the stakeholder from the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office of Quality Improvement and Safety</td>
<td>Project initiators, Oversight of Clinical Pathway development.</td>
<td>• Form the project team. • Provide structure and framework to initiate, develop, monitor, and evaluate the clinical pathway.</td>
<td>This is one of the first Clinical Pathways in development. The project needs direct access to a dedicated EPIC programmer. Many obstacles are related to availability of resources and time from the stakeholders. • Communication among the stakeholders may be challenging. • Multiple data sources and reporting venues, (external and internal). • Need direct input from the stakeholders for their representative areas.</td>
</tr>
<tr>
<td>Chanhaeng Rhee MD Project Leader</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deepa Bhat ME Quality Analytics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>David Leonard PhD Quality Analytics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eleanor Phelps RN Project Manager</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency Department</td>
<td>The ED staff will not actively initiate the clinical pathway. The pathway will automatically commence in the ED when the “slow-hour” time threshold is crossed or when the “admit to hospital” order is initiated.</td>
<td>Engagement and recommendations regarding skin inspection and automated initiation of the PU Clinical Pathway in the ED. Need testing and validation related to skin inspection in the ED, as well as on-going feedback on the automated initiation of the clinical pathway.</td>
<td>Bariatric patients and the size of our ED beds • Availability of staff to turn bariatric patients in events of high volume • Availability of staff with regards to timing during events of high volume and no staff readily available to assist.</td>
</tr>
<tr>
<td>Vicky Russell RN Manager</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donald Jones RN CC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocky Galvan RN CC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Figure 3: Pre-intervention process map
Figure 4: Improved Pressure screening, prevention & treatment process map

HAPU CP Basic v6.1

Audit

Sites in E5. For each OP

Yes

No

Perform with inspection and Enforcement Assessment per Policy

Sign Protocol

Yes

No

Specialty Bed Protocol

Specialty Bed Protocol

Modified Intensiv Intervention Protocol

TotalBed ICU (utilictraic)

Yes

No

Deficit of CBT to be Enhaanged

No

Per Protocol

Deficit to be replaced

Yes

CIC Protocol

CIC Protocol

CIC Protocol

CIC Protocol

CIC Protocol
Figure 5 Process map of Outpatient entry

Pressure Ulcer Pathway Entry Process (Outpatient)

ADT
- Patient arrives in ED, Day Surgery or other HOD area
- Outpatient questionnaire completed per policy?
- Yes: response on questionnaire?
- No: End

Pre-Pathway Assessment
- Yes: Document Skin WLL, inspection/ BQ Schedule Risk Assessment
- No: Except for surgical wounds, wheelchairs

Pathway Assessment
- Yes: Braden total score of less than 16
- No: Initiate care plan

Epic Event
- Pressure Ulcer Best Practice Alert (BPA) displays in the outpatient's workspace until in CLP

Note: Per policy skin inspections and the Braden Risk Assessment should be performed (5) hours after initial to hospital outpatient department.

D
- Discharge
- Admit
- Go to Inpatient

C
- RN Direct Signature process
- Initiate modified Joint Intervention Protocol Pathway per schedule

B
- Braden total score < 16 and subscales > 4.3

A
- Discharge, Admit
- Go to Inpatient

End

Patient discharged

Yes

No

Yes

No

Yes

No

Yes

No

Yes

No
Figure 6: Process map of inpatient entry

Pressure Ulcer Modified Treatment Protocol/Custom Solution

Nurse

Step 1: Clear Ulcer or document reason not done
Step 2: Measure Ulcer or document reason not done
Step 3: Tissue necrosis > 25% or signs of infection present?
Yes → Place Notify MD, Nutrition and ET RN consult orders
No → Evaluate skin

Step 4: Reference the image that closely resembles the patient’s wound and click hyperlink for recommended solution
Step 5: Choose an appropriate Ulcer dressing or document reason not done

Initiate modified Johnson Intervention Protocol per subsites

WOCN

Evaluate skin

Take measurements, photos and add to Problem List

MD

Evaluate skin

Epic Event

Patient placed on PU Ostomy Patient List
Figure 7: Fish Bone Diagram

Figure 8: Pareto Analysis

Point Prevalence of HAPU Q2 2011
<table>
<thead>
<tr>
<th>Steps</th>
<th>Phase</th>
<th>Estimated start</th>
<th>Estimated finish</th>
<th>Duration (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form the Team</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Problem Statement</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Aim Statement</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Set Project Goals</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Define Stakeholders</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Baseline Measures</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>High-level Process map: current state</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Summarize time-line</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Identify Risks</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
</tr>
<tr>
<td>Team Charter</td>
<td>Define</td>
<td>13-Jul-2011</td>
<td>3-Aug-2011</td>
<td>20</td>
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<tr>
<td>Detailed process map w/ decision points</td>
<td>Measure</td>
<td>27-Jul-2011</td>
<td>30-Sep-2011</td>
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<tr>
<td>ID input/output/in-process measures</td>
<td>Measure</td>
<td>27-Jul-2011</td>
<td>30-Sep-2011</td>
<td>63</td>
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<tr>
<td>Data collection plan (including sampling plan)</td>
<td>Measure</td>
<td>27-Jul-2011</td>
<td>30-Sep-2011</td>
<td>63</td>
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<tr>
<td>Measurement system can provide reliable/repeatable results?</td>
<td>Measure</td>
<td>1-Oct-2011</td>
<td>1-Dec-2011</td>
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<tr>
<td>Collect data</td>
<td>Measure</td>
<td>1-Oct-2011</td>
<td>1-Dec-2011</td>
<td>60</td>
</tr>
<tr>
<td>Graphs/charts</td>
<td>Measure</td>
<td>1-Oct-2011</td>
<td>1-Dec-2011</td>
<td>60</td>
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<tr>
<td>Adequate resource check-up: EPIC Team members unstable</td>
<td>Measure</td>
<td>1-Oct-2011</td>
<td>1-Dec-2011</td>
<td>60</td>
</tr>
<tr>
<td>Presentation of data analysis</td>
<td>Analyze</td>
<td>17-Oct-2011</td>
<td>16-Dec-2011</td>
<td>59</td>
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<tr>
<td>ID possible solutions/Brain-storming</td>
<td>Analyze</td>
<td>17-Oct-2011</td>
<td>16-Dec-2011</td>
<td>59</td>
</tr>
<tr>
<td>Hypothesis testing/share mock screens with EPIC</td>
<td>Analyze</td>
<td>17-Oct-2011</td>
<td>16-Dec-2011</td>
<td>59</td>
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<tr>
<td>Results of root cause/5 whys</td>
<td>Analyze</td>
<td>17-Oct-2011</td>
<td>16-Dec-2011</td>
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<td>Barrier check-up; need additional resources EPIC team</td>
<td>Analyze</td>
<td>17-Oct-2011</td>
<td>16-Dec-2011</td>
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<td>Test possible solutions (brainstorm, experiment )</td>
<td>Improve</td>
<td>15-Nov-2011</td>
<td>15-Mar-2012</td>
<td>120</td>
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<tr>
<td>Identified solutions, test screens</td>
<td>Improve</td>
<td>15-Nov-2011</td>
<td>15-Mar-2012</td>
<td>120</td>
</tr>
<tr>
<td>5 S Custom solutions; supplies standardized and color coded(Sort, store, shine, standardize, sustain)</td>
<td>Improve</td>
<td>15-Nov-2011</td>
<td>15-Mar-2012</td>
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<tr>
<td>Implementation plan(pilot, staff usability testing)</td>
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<td>30-Mar-2012</td>
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<td>Barrier check-up; Need major demo from EPIC team</td>
<td>Improve</td>
<td>1-Mar-2012</td>
<td>30-Mar-2012</td>
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<tr>
<td>Control Plan (include who will continue to monitor results and monitoring measures)</td>
<td>Control</td>
<td>28-Feb-2012</td>
<td>30-Mar-2012</td>
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<tr>
<td>How do results match with requirements and goals</td>
<td>Control</td>
<td>21-Jun-2012</td>
<td>22-Oct-2012</td>
<td>121</td>
</tr>
<tr>
<td>Status of process updates (mistake proofing, SOP’s, FMEA, etc)</td>
<td>Control</td>
<td>21-Jun-2012</td>
<td>22-Oct-2012</td>
<td>121</td>
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<tr>
<td>Lessons Learned</td>
<td>Control</td>
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<td>22-Oct-2012</td>
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<tr>
<td>Next steps</td>
<td>Control</td>
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<td>22-Oct-2012</td>
<td>121</td>
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<tr>
<td>Plan for sharing</td>
<td>Control</td>
<td>21-Jun-2012</td>
<td>22-Oct-2012</td>
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<td>Storyboard</td>
<td>Control</td>
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<tr>
<td>Final report</td>
<td>Control</td>
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<td>22-Oct-2012</td>
<td>121</td>
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</tbody>
</table>
Figure 10: Screen shots of EMR Documentation

![Image of EMR Documentation](image-url)
Figure 11: Screen shots of EMR Documentation