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Implementation of a Pressure Ulcer Prevention Protocol in a Coronary Care Unit

Samir Eshdooh
Royal College of Surgeons in Ireland

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Implementation of a Pressure Ulcer Prevention Protocol in a Coronary Care Unit

SAMIR ESHDOOH

DECLARATION:
“I hereby certify that this material, which I now submit for assessment for the project / Dissertation module on the Master’s degree of quality and safety management in healthcare is entirely my own work and has not been submitted as an exercise for assessment at this or any other University.”

2014
Implementation of a Pressure Ulcer Prevention Protocol in a Coronary Care Unit

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Lastly, I offer my regards and blessings to all of those who supported me in any respect during the completion of this project.

DEDICATION:

To the soul of my father who has inspired me throughout my life (May Allah grants you mercy), to the sacrifices of my mother, to the patience of my wife and children I dedicate this work.
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ABSTRACT

Healthcare clinicians perceive care standardization as a requirement. Hospital Acquired Pressure Ulcers (HAPU) is a leading cause of preventable harm. It is associated with a significant increase in treatment cost, length of stay, and poor patients' satisfaction. This project applies the principle of care processes standardization via developing and implementing evidence based Pressure Ulcer Prevention Protocol (PUPP). A comprehensive process starts on admission and continues throughout the course of hospitalization in the Coronary Care Unit (CCU). Patients are risk adjusted using the Braden assessment scale to segregate patients who need rigorous Pressure Ulcer (PU) preventive interventions from those who require standard preventive measures. Quality improvement tools and frameworks are integrated into Senior & Swailes organizational development model to implement the project. Measurement and evaluation include patients’ outcomes, performance measurement, and evaluation of barriers to care processes standardization. The PUPP integrates change management and quality improvement tools and frameworks. The results of the first quarter of 2014 revealed one confirmed PU with a significant drop in the reported adverse events relevant to PUs. However, the decline in the number of reported events may be attributed to the introduction of new ‘safety reporting system’ (SRS). The project has several limitations; the evaluation period is too short for the outcomes to materialize. Furthermore, accurate measurement of PUs requires more specific measurement tools such as ‘trigger tool.’ Barriers to care standardization include lack of awareness of the care sets, as well as diverse patients’ preferences.
1.1 Patient safety and adverse events

Since the release of institute of medicine’s (IOM) report ‘To err is human; Building a safer health system’ (IOM,1999), safe care became the focus of healthcare organizations. The report published in 1999 pointed out the magnitude of the safety issues in today’s healthcare systems. It claimed that over one million patients are injured in USA hospitals every year, of which 44,000 to 99,000 lose their lives due to medical errors (Stelfox et al., 2006).

Fifteen months following ‘to err is human,’ the IOM released an equally important report; ‘Crossing the Quality Chasm’ identified six dimensions of healthcare performance that immediate attention. The six dimensions are safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity (Berwick, 2002). The report suggests that the improvement in these domains is integral for healthcare reform.

Safety is defined as ‘do no harm.’ Harm in healthcare systems is common; it is estimated that 10% of the admitted patients experience a form of adverse events (Leape, 2009). Unlike the traditional perception that healthcare induced harm is a result of individual reckless behavior or negligence, the literature demonstrates that the majority of harm is due to defective systems (Institute of Medicine, 1999).

1.2 Hospital Acquired Pressure Ulcer (HAPU)

HAPU is a leading cause of harm in hospitals (Lyder & Ayello, 2005). Pressure Ulcers (PU) result from prolonged pressure on one or more parts of the body that compromises circulation and results in poor tissue perfusion, ischemia, and necrosis (Brindle & Wegelin, 2012). Due to its significant impact on patient outcomes and the cost associated with its treatment, the Agency for Healthcare Research and Quality (AHRQ) has listed stage III and IV HAPU as a ‘never event.’ i.e. events that should not occur at any given time in any healthcare organization (AHRQ, 2011).
1.3 The author’s unit and organization

The Author’s organization is a Joint Commission International accredited, and magnet designated tertiary hospital with around 900 beds capacity. The mission of the hospital is to provide quality healthcare to the people of Saudi Arabia by utilizing the best available evidences. The hospital aims to provide optimal patient service that is comparable to that achieved by the world leading healthcare care organizations.

The Coronary Care Unit (CCU) is an 18 bed intensive care unit. The primary scope of service is treating critically ill patients admitted with acute health problems that are cardiac in origin. Although the unit primary patients populations are those with acute coronary syndrome, the unit is serving patients with chronic health disorders such as heart failure and renal failure.

The author is the direct supervisor of the unit. Given that PU is a nursing specific quality indicator, the team has a total control of the project development and execution process which increases the likelihood of achieving the set goals and objectives.

1.4 Rational of the Pressure Ulcer Prevention Protocol (PUPP) project

Late 2008, the hospital has shifted toward data driven practice. Healthcare services provided by different units and divisions are benchmarked with those delivered by North American organizations. Data analysis of CCU patient outcomes in 2013 relevant to the incidence rate of UAPU revealed a high incidence rate. These results placed the unit at the 90th percentile. i.e. 90% of the similar units were outperforming CCU. Therefore, immediate change in practice is necessary.

The proposed change process in response to the high incidence rate of PU is a unit wide development project that involves management and clinical aspects. The project streamlines the care process and integrates the best available evidences into practice. Furthermore, it highlights the cost associated with the current outcomes and its impact on the unit nurses.
1.5 Aims and objectives of the PUPP project

The aim of this project is to have a PUPP in the CCU. The project objectives described below cover a wide range of desired changes:

- Eliminate variation in PUs prevention process through integrating the PUPP into clinical practice over three months. A clinical audit is employed to evaluate nurse’s compliance with the protocol elements and to link it to the incidence rate of PUs. The audit criteria include all protocol’s elements with explicit inclusive and exclusive criteria. The clinical audit data is analyzed and presented using a bar chart. The expected compliance rate with the PUPP is 90% within three months of introduction.

- Improve reliability of the hospital approved skin assessment scale (Braden Scale) in predicting the risk of developing pressure ulcers through staff education prior initiation of the project. Sample nurses will individually rate two case study scenarios. ‘Fleiss’s Kappa’ statistical analysis test to be used to analyze the ‘inter-rater agreement’ on the Braden scoring. Upon completion of the Braden assessment education, nurses should score a ‘Fleiss’s Kappa’ reliability score of 0.6 (Substantial agreement) or more.

- Decrease PUs incidence rate to 0% by 31 March 2014. PU Incidence rate measures are a combination of Database of Nursing Quality Indicators (NDNQI) PU prevalence survey and Safety Reporting System (SRS). NDNQI is nursing sensitive quality indicators. It measures patient outcomes through benchmarking with the patient outcomes in similar North American organizations (American Nursing Association, 2014).

- Save up to 370,000 Saudi Riyals ($99,000) by 31 December 2014. The estimated cost saving is calculated through multiplying the treatment cost of each PU by the number of PUs incidents. The estimated cost of treatment is drawn from the literature review.

- Identify barriers to care standardization in CCU by 31 March 2014 using interview methodology to collect data from nursing staff.
1.6 Summary of the PUPP project

This thesis provides a comprehensive review of the PUPP project in CCU. ‘Chapter 2’ provides a systematic review of the literature relevant to pressure ulcer prevention protocols and bundles in the critical care facilities. The literature review includes all published articles that represent PU prevention projects. Each project must include two or more preventive interventions combined in a care set. The literature review includes all studies published since January 2005 and meets the inclusive criteria.

‘Chapter 3’ provides the reader with a detailed description of the implementation process. It describes the process of analyzing the current situation, overview of the vision of the change, strategies of building commitment among the internal & external stakeholders, the process of developing and implementing the action plan. Moreover, this chapter provides the reader with a revision of improvement sustaining strategies.

‘Chapter 4’ summarizes the evaluation and measurement process. It provides a detailed description of the evaluation methodologies of the project’s objectives. The evaluation and measurements are a mix of quantitative and qualitative measurement methods. Quantitative measurement includes patient outcomes, performance measurement, and cost analysis. While nurse’s interviews methodology is used to assess nurses perception of care standardization and the barriers associated with the implementation of clinical guidelines.

The last chapter ‘chapter 5’ critically analyses the findings and results of the evaluation and measurement processes. The author analyzes data and discusses the strength and weaknesses of the PUPP project. This chapter involves a brief review of the project’s limitations, recommendation for further improvements, and means of sustaining the achieved improvement.
Despite the growing body of literature that investigates the prevalence of HAPUs, the problem continues to be of high concern (Courtney H Lyder & Ayello, 2005). This literature review is to scrutinize all evidences that represent a PU prevention programs in critical care units. These programs must combine a group of interventions in one care set.

2.1 Search strategy

'Google scholar’ search engine was used to search for the relevant publications. The search terms used were ‘Pressure ulcer prevention program,' ‘pressure ulcer prevention bundles,' and ‘pressure ulcer prevention protocol.' The initial search returned 93 studies from Sage journals, Ovid, ProQuest Medical Library, PubMed, and Science direct databases.

Studies eligible for inclusion must present a set equal to or more than three combined interventions implemented in the form of care set with the aim of preventing HAPU in critical care facilities. All English studies published from January 2005 to December 2014 that met the inclusive criteria are included. Studies conducted in nursing homes were excluded due to the different scope of practice and patients characteristics. The initial 93 studies were narrowed down to nine that met the inclusive criteria.

Thorough study of the included programs revealed six common themes. These themes are scope of the problem, program components, risk assessment, staff education & training, measurement & evaluation, and results.

2.2 Scope of the problem

PUs continue to be a safety concern in today’s healthcare care systems due to the significant impact on patient outcomes and cost of treatment. It is estimated that the cost of treatment of PUs in the USA exceeds 11 billion per annum (Gray-Siracusa & Schrier, 2011). The treatment of each PU event range from $500 to $40,000 (Baldelli & Paciella, 2008). Considering that these adverse events are mostly preventable, the center of Medicare & Medicaid has stopped the reimbursement of all stage II and above PU's (Young et al., 2010).
The increased cost, prolonged hospitalization, poor patient satisfaction, and increased morbidity & mortality are pressing on healthcare facilities to make the necessary changes to manage this alarming patient safety issue.

There is a wide variation in the incidence rate of HAPUs among the different care settings and different countries. For example, the incidence rate in the acute care settings range from 0.4% to 38% (Tayyib et al., 2013). In Jordan, the incidence rate of HAPU is 29% (Tubaishat et al., 2011), 50% in Australia, and 22% in North America (Tayyib et al., 2013). The wide variation in the incidence rates reflects the difference in the measurement accuracy as well as the success of prevention programs.

The Agency for Healthcare Research and Quality (AHRQ) has developed clinical guidelines to prevent PUs. Despite that these guidelines are mostly based on expert opinions rather than solid research evidences, it represents the foundation of PU prevention in healthcare (AHRQ, 2014; Lyder & Ayello, 2005).

Critically ill patients are at higher risk of developing PUs due to impaired mobility, vasoactive medication, poor nutrition, and bed confinement (Estilo et al., 2012). Others consider smoking and alcohol consumption additional risk factors (Çakmak et al., 2008). The broad spectrum risk factors make prevention a difficult task to accomplish.

The risk of developing PUs varies according to the risk factors. This variation makes risk adjustment necessary to target high risk patients and avoid unnecessary interventions on those who need standard preventive care. Several risk assessment scales were developed over the past few decades. Among those, Braden scale continues to be the most commonly used scale (Kring, 2007).

2.3 Programs components

The nine reviewed programs share most of the preventive interventions that are proven effective in PUs prevention. The literature demonstrates that the effectiveness of these interventions is optimal when combined in the form of a program, bundle, or protocol (Niederhauser et al., 2012).

The first group of interventions deals with pressure distribution through use of especial mattresses, frequent positioning, and heel elevation. Hospitalized patients have
impaired mobility and mostly confined to bed. Therefore, they need mattresses that are able to distribute pressure especially on bone prominences. Furthermore, nurses are expected to reposition the patient every two hours or more frequent if needed. Repositioning is still considered the most essential preventive intervention (AH RQ, 2014; Moore, 2009)

All reviewed studies have included the use of pressure redistributing mattresses in their prevention program (Baldelli & Paciella, 2008; Carson et al., 2012; Cecile et al., 2012; Cong & Liu, 2012; Estilo et al., 2012; Gray-Siracusa & Schrier, 2011; Kimberly et al., 2007; Racco & Phillips, 2010; Young et al., 2010). All programs but one (Cecile et al., 2012) have included frequent patients turning intervention. Some programs have acknowledged the human factors and nurses tendency to miss the timely turning schedule by integrating a reminder tool into the system design such as stopwatch (Baldelli & Paciella, 2008; Estilo et al., 2012; Gray-Siracusa & Schrier, 2011).

The second intervention is prevention of ‘shear and friction’ when mobilizing patients in bed. ‘Shear and friction’ lead to deep tissue injury. Use of lifting devices as well as maintaining the head of the bed at less than 30 degrees decrease risk of shear and friction (Lyder & Ayello, 2005). All programs have included ‘shear and friction’ in their preventive interventions. However, Cong et al. (2012) and Estilo et al. (2012) did not include the measure of the head of bed elevation in their study.

The third intervention is managing moisture; moisture leads to dermatitis and skin breakdowns. Moisture is managed via applying protective barrier cream on the genitourinary area. The use of diaper is discouraged. Instead, use of a single layer of underpad is preferred (AHRQ, 2011). All programs have included moisture management.

Despite absence of reliable evidences that establish a correlation between the nutritional status and the risk of developing PU, this care aspect is believed to be of significant importance when developing and executing PU prevention initiatives (Little, 2013). Çakmak et al. (2008) have identified anemia as a risk factor of developing PU. Anemia is usually associated with imbalanced nutritional status. All programs but Racco
& Phillips (2010) have included nutritional assessment and support in their preventive interventions.

Table 1 highlights the core elements of the prevention programs. It is apparent that all programs share the main preventive interventions. The agreement on the components among the different programs supports the effectiveness of these components.

<table>
<thead>
<tr>
<th>Author</th>
<th>Pressure redistribution mattress</th>
<th>Minimize shear and friction</th>
<th>Manage moisture</th>
<th>Nutritional assessment</th>
<th>Turning &amp; repositioning</th>
<th>Head of bed &lt; 30 degree</th>
<th>Heels Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Cecile et al., 2012)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>(Cong et al., 2012)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>(Kimberly et al., 2007)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>(Estilo et al., 2012)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>(Gray-Siracusa et al., 2011)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>(Baldelli &amp; Paciella, 2008)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>(Racco &amp; Phillips, 2010)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>(Carson et al., 2012)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>(Young et al., 2010)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

**Table 1: Pressure ulcer prevention programs elements.**

### 2.4 Risk assessment

The extent to which patients are prone to developing PUs varies; patient age, mobility, nutritional status, continence, and comorbidities are all contributing factors that influence the likelihood of developing PU. There are several PU risk assessment tools used to predict the risk of PUs, among those is the Braden assessment scale. Braden Scale incorporates the major risk factors to quantify the risk of developing PU; it categorizes the risk into low, moderate, high, and very high risk (Cox, 2011).

Despite the controversial findings of numerous studies that researched the validity and reliability of the risk assessment scales, the Braden scale is used extensively worldwide (Kottner & Dassen, 2010). Apart from (Cecile et al., 2012), all programs have used risk assessment scales. Among the eight programs that integrated PU risk scales to risk adjust patients, only Cong et al. (2012) used Norton scale. The remaining programs used Braden scale (Baldelli & Paciella, 2008; Carson et al., 2012; Cecile et al., 2012;
2.5 Staff education & training

The approaches to staff education differ from one program to another. All programs but (Estilo et al., 2012) have reported some form of staff education. The intensity of the educational activities varies from rigorous and mandatory to superficial education. Cong et al. (2012) and Young et al. (2010) educational programs were comprehensive and followed by effectiveness tests. Whereas Kimberly et al. (2007) education plan was vague and not clear. Staff education in some programs such as Racco & Phillips (2010) was selective, they targeted key staff only. Gray-Siracusa et al. (2011) and Carson et al. (2012) utilized the NDNQI learning module to educate their nurses.

All educational activities covered essential aspects of the programs such as skin assessment, PU staging, risk assessment scale, and preventive interventions.

2.6 Measurement and evaluation

There is a wide variation in the measurement strategies among the different programs. Some programs established a process and outcome measures (Carson et al., 2012; Kimberly et al., 2007; Racco & Phillips, 2010; Young et al., 2010). While, others were limited to outcome measures (Baldelli & Paciella, 2008; Cecile et al., 2012; Cong et al., 2012; Gray-Siracusa & Schrier, 2011). Estilo et al. (2012) reported neither process nor outcome measures.

Apart from Cong et al. (2012), all programs have used benchmarking to gain insight into their organization performance (Baldelli & Paciella, 2008; Carson et al., 2012; Cecile et al., 2012; Estilo et al., 2012; Gray-Siracusa & Schrier, 2011; Kimberly et al., 2007; Racco & Phillips, 2010; Young et al., 2010). NDNQI is the most commonly used benchmarking database that was employed by four programs (Estilo et al., 2012; Gray-Siracusa & Schrier, 2011; Kimberly et al., 2007; Racco & Phillips, 2010). The rest used national benchmarking databases. Benchmarking is a reliable evaluation tool. However, it is generalized and lacks sensitivity to the individual characteristics and uniqueness of each organization (Wait & Nolte, 2005).
Accurate measurement and evaluation mandates process and outcome measurement. Considering the wide variety of factors that contribute to patients’ tendency to develop PU, it is crucial to segregate the performance from non-performance factors (Mainz, 2003). For example, patient age, comorbidities and obesity are all factors that contribute to patient outcomes. However, they are not measured by any of the programs. Thus, the outcomes are not necessarily results of poor care or staff compliance.

Four programs have performance measurement in addition to the outcome measurement (Carson et al., 2012; Kimberly et al., 2007; Racco & Phillips, 2010; Young et al., 2010). On the other hand, (Baldelli & Paciella, 2008; Cecile et al., 2012; Cong et al., 2012; Gray-Siracusa & Schrier, 2011) have used outcome measures only. Estilo et al. (2012) used neither performance nor outcome measures.

Table 2 illustrates the measurement methods, risk adjustment, and staff education methodologies.
<table>
<thead>
<tr>
<th>Author</th>
<th>Benchmark</th>
<th>Measurement and Evaluation</th>
<th>Outcomes</th>
<th>Staff education</th>
<th>Skin assessment tool</th>
<th>risk Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Cecile et al, 2012)</td>
<td>National</td>
<td>Outcome measure: biweekly PU survey.</td>
<td>Incidence rate decreased from 13% to 0.5%</td>
<td>Educational Sessions</td>
<td>Not reported</td>
<td>NO</td>
</tr>
<tr>
<td>(Cong et al., 2012)</td>
<td>Not reported</td>
<td>Outcome Measure of PU prevalence via one day audit. Outcome measure of staff Knowledge via test.</td>
<td>1.1 % PU rate compared to 1.5% before the program. Outcomes are statically insignificant.</td>
<td>Monthly education followed by assessment test.</td>
<td>Norton Scale</td>
<td>YES</td>
</tr>
<tr>
<td>(Kimberly et al., 2007)</td>
<td>NDNQI</td>
<td>Process measurement relies on the nurse’s documentation of the preventive care provided. Outcome Measure: Quarterly Survey.</td>
<td>Reduction in PU by 50%</td>
<td>Packet of education with post education assessment.</td>
<td>Braden Scale</td>
<td>YES</td>
</tr>
<tr>
<td>(Estilo et al., 2012)</td>
<td>NDNQI</td>
<td>Not reported</td>
<td>Not reported</td>
<td>NO</td>
<td>Braden Scale</td>
<td>YES</td>
</tr>
<tr>
<td>(Gray-Siracusa et al., 2011)</td>
<td>NDNQI</td>
<td>Outcome Measure: Electronic Patient Record.</td>
<td>Statistically insignificant. Improvement in quarterly Survey results.</td>
<td>NDNQI pressure ulcer training module.</td>
<td>Braden Scale</td>
<td>YES</td>
</tr>
<tr>
<td>(Carson et al., 2012)</td>
<td>National</td>
<td>Outcome Measure: Prevalence survey. Process Measure: chart audit.</td>
<td>PU rate from 12.5% to 8.7%.</td>
<td>NDNQI Pressure ulcer training module.</td>
<td>Braden scale</td>
<td>YES</td>
</tr>
<tr>
<td>(Young et al., 2010)</td>
<td>National</td>
<td>Process measure: Nurses documentation audit. Outcome measure: Monthly survey</td>
<td>PU rate Improved.</td>
<td>Mandatory In-services.</td>
<td>Braden Scale</td>
<td>YES</td>
</tr>
</tbody>
</table>

Table 2: measurement, risk adjustment, and staff education methodologies.
2.7 Results:

All studies except Cong et al. (2012) and Estilo et al. (2012) have reported a decrease in PU incidence rate. The extent of improvement varies from one program to another. Kimberly et al. (2007) reported a reduction of PU incidence rate by 50%. Whereas, Racco & Phillips (2010) reported 37% reduction in PU incidence rate. Despite the statistical insignificance reported by Cong et al. (2012), the authors believe that their study contributed to improvements in patient outcomes; they associated the statistical insignificance to the low PU prevalence rate prior the study in comparison with European and North American hospitals. Baldelli & Paciella (2008) reported substantial improvement in PU incidence rate. However, no data was reported.

2.8 Conclusion:

Hospital Acquired Pressure Ulcer continues to be an alarming issue in today’s healthcare systems. The reviewed studies strongly suggest that multifaceted programs contribute to positive outcomes and reduce prevalence and incidence rate of PUs in critical care facilities. Individual program components differ from one study to another. However, majority share the same interventions. As shown in table 1, Pressure distribution, use of risk assessment scale, Nutritional support, Moisture management, minimizing ‘friction & shear, Heels elevations, and head of the bed elevation less than 30 degrees are all shared interventions among all programs.

Most of the programs design is (pretest-posttest design). They lack of randomization and control groups weaken the evidence and mandates careful interpretation of the results (Polit & Beck, 2010). The improved outcomes are linked to the programs implementation as care sets. Thus, it is not possible to validate the effectiveness of the different elements.

Measurement and evaluation focus mainly on outcomes. Even when process measures were considered, the measurement relied mainly on retrospective chart audit of nursing documentation with the assumption that what is documented is done. Moreover, chart audits are subject to hindsight bias (Thomas & Petersen, 2003). Thereby, more rigorous process measurement such as clinical audits could have strengthened the
measurement reliability and assisted researchers in attributing the improvement to the different interventions.

The impressive results of some programs are evidence of the effectiveness of the PUs preventive interventions. However, as stated earlier, outcomes measurement alone is not an accurate reflection of the impact of the programs.

Staff education is an integral part of quality improvement. Education enhances nurses knowledge and contributes to positive changes in their behavior. Some programs acknowledged the importance of staff education and implemented comprehensive education plans.
3.1 Introduction
This project utilizes Senior & Swailes (2010) action research methodology of organizational development as an implementation framework. The change process involves six phases; diagnose the current situation, develop a vision for change, gain commitment to the vision, develop an action plan, implement change, and assess & reinforce the change (Senior, 2002). This project has two main domains; clinical improvement and change management. Thus, the methodology integrates the quality improvement tools and frameworks into the change model.

The analysis phase involves quantitative and qualitative data collection methods. Quantitative data include ‘NDNQI pressure ulcer’ survey results and adverse events reported in the safety reporting system. The qualitative data involves a wide range of data such as stakeholders analysis, force field analysis, brainstorming sessions, and Ishikawa diagram.

3.2 Diagnose the current situation.
Thorough analysis of the pre change situation is an essential part of the change process. It includes setting a clear and well-defined objectives as well as understanding the strengths and weaknesses. This chapter provides the reader with a detailed description of the current situation analysis and the results of the analysis process.

3.2.1 Patient outcomes:
Data drawn from the NDNQI quarterly PU survey demonstrates fluctuation in the UAPU incidence rate. NDNQI benchmark ranks CCU at the 90th percentile. The ‘safety reporting system’ shows eight confirmed UAPU in 2013. Bearing in mind that the

Figure 1: NDNQI pressure ulcer prevalence rate and number of reported PUs events.
reported events are no more than 5-20% of the actual events (Stockwell et al., 2013), the actual PU events are substantially high.

The above patient outcomes results are poor enough to place the unit on the hospital watch list for units with high incidence rate of UAPU. Figure 1 highlights the PU survey results as well as the number of CCU confirmed UAPUs reported in the ‘safety reporting system, in 2013.

The high incidence rate of UAPUs lead to a cascade of secondary poor outcomes such as prolonged length of stay, poor patients satisfaction, and increased cost of treatment. Despite lack of accurate measurement of the secondary outcomes, it is well established in the literature (Estilo et al., 2012).

3.2.2 Care processes
Upon reviewing patients who developed UAPU in CCU, we noticed that they share common characteristics; all patients are critically ill and at high risk. Furthermore, they are suffering multiple health disorders and chronic illnesses.

Braden scale is utilized to predict the risk of developing PUs. Despite the controversy of its validity and reliability (Hyun et al., 2013; Kottner et al., 2009), it is still widely used worldwide. The author’s organization is utilizing the Braden scale to identify risk of PUs. It is integrated into the clinical information system to facilitate the application process and provide automated scoring. As per the hospital practice guidelines, nurses perform the Braden scale assessment in a daily basis on all patients admitted to critical care units.

Charts review reveals inconsistency in Braden scale assessment scores. Different nurses give the same patient different risk scores. This variability indicates poor reliability and validity of the assessment scale. The poor reliability and validity is not necessarily related to the structural components of the Braden scale; it may result from poor nurses competence in using the scale.

Further to the uncertainty regarding Braden scale validity and reliability, there is no standardized PU preventive care. Nurses rely on their clinical judgment in planning
patient care. This result in significant variation in the nursing care process. Further to the variation, the care plans often gets scattered with no continuity of care.

3.2.3 Cost of treatment
Treatment of PUs associated with additional expenses. These expenses include supplies, nursing workforce, nutritional support, laboratory investigations, and prolonged length of stay (Chicano & Drolshagen, 2009). The estimated cost of PUs treatment in the US healthcare system is up to 11 billion dollars per annum. The cost of treatment of each PU range from $500 to $70,000 (1,875 to 262,500 SAR) depending on the severity of the injury (Makic & Sullivan, 2011).

The author’s organization is a non-profit, government funded healthcare facility. Therefore, the cost of treatment is not a priority for unit managers. However, the hospital management is concerned about the increasing cost of treatment in the organization. Nursing affairs has adopted the LEAN methodology in an attempt to reduce the cost and eliminate waste (Mcgrath et al., 2008). Considering the significant cost associated with the treatment of PUs as demonstrated above, CCU management is under pressure to eliminate UAPUs to reduce the cost associated with its treatment.

HAPUs cost of treatment is not limited to the direct cost. Prolonged patients length of stay is associated with additional indirect expenditures. Moreover, it decreases the bed utilization rate and number of served patients (Chicano & Drolshagen, 2009).

3.2.4 Field forces analysis Change process requires change in behaviors and attitudes. Careful analysis of the driving versus restraining forces is essential success factor (Bozak, 2003). In the case of PUPP project, there are several driving forces. These forces include the desire to improve patient outcomes, the unfavorable representation of the unit, the mandates to meet the targeted
benchmark goals, and the possible impact of the poor results on nurses’ annual performance appraisal.

On the other hand, the major restraining forces are staff resistance to change and lack of commitment. Resistance is tridimensional; the first dimension is ‘behavioral’; how the affected individuals behave in response to the change. The second dimension is ‘cognitive’; do the involved parties understand the vision of the change. The last dimension is the ‘affective,’ how do they feel about the change. Careful analysis of these dimensions is essential success factor (Erwin & Garman, 2010).

For example, the involved parties may feel threaten by the change. Subsequently, their behavior will oppose the change process. Neutralizing such feelings will lead to positive behaviors. Figure 2 illustrates the main driving and restraining forces according to Lewin’s force field analysis model (Bozak, 2003).

3.2.5 SWOT Analysis

Units and organizations are influenced by external and internal factors that affect the change initiatives. CCU is a large unit in a tertiary hospital that is part of the healthcare system in the kingdom of Saudi Arabia. The environmental influence is not limited to the organization’s environment; it rather extends to the environment of the entire country.

For example, the lack of reliable healthcare facilities in the remote areas leads to excessive pressure on the organization and subsequently the unit. Patients with long-term healthcare conditions often refuse discharge due to poor care at the referral hospitals. Therefore, the hospital ends with patients staying longer than what their clinical conditions indicate. Thus, careful and in depth analysis of the internal and external influential factors that affect the probability of success is crucial.

SWOT is an analysis tool used at different organizational levels. SWOT assists in the assessment of the internal strengths & weaknesses and external threats & opportunities (Houben et al., 1999). In the PUPP project, the internal variables refer to those that are directly linked to the unit. Whereas, external variables refer to those originate outside the unit but not necessarily outside the hospital.
## SWOT Analysis

<table>
<thead>
<tr>
<th>EXTERNAL OPPORTUNITIES</th>
<th>EXTERNAL THREATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Achieve the NDNQI benchmark target.</td>
<td>• Unfavorable unit representation within the organization.</td>
</tr>
<tr>
<td>• Inspire and lead other units to achieve the desired improvement.</td>
<td>• Impact on annual performance appraisal and nurse’s incentives.</td>
</tr>
<tr>
<td>• Resources constraints.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>INTERNAL STRENGTHS</th>
<th>STRATEGIC GOAL</th>
<th>STRATEGIC GOAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Availability of educational resources such as electronic health library and clinical instructors.</td>
<td>• Utilize the current structure such as educational resources, electronic health library, and available equipment to achieve the benchmark target of 0% UAPU incidence rate.</td>
<td>• Improve unit representation through improving patient outcomes.</td>
</tr>
<tr>
<td>• Availability of necessary equipment such as Hoists, and pressure</td>
<td></td>
<td>• Utilize the improved patient outcomes to justify staff incentives.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INTERNAL WEAKNESSES:</th>
<th>STRATEGIC GOAL</th>
<th>STRATEGIC GOAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lack of team commitment.</td>
<td>• Improve team commitment and change acceptance through ongoing update of desirable outcomes achievement and progress of the PUPP project.</td>
<td>• Reflect individuals’ contributions to quality improvement in their annual performance appraisals.</td>
</tr>
<tr>
<td>• Resistance to change.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Prolonged length of Stay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Poor patient outcomes.</td>
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**Table 3: SWOT analysis of the pre project situation.**

The objectives drawn from the SWOT analysis are discussed under ‘vision for change’ Part of this chapter.

### 3.2.6 Stakeholders analysis:

Stakeholder analysis is a crucial part of the project planning. Stakeholders’ power and interests determine the extent to which they influence the probability of change succession. The interest of the powerful stakeholders must be optimized by realigning their goals with the project’s goals and objectives.
On the other hands, involvement of high interest and low power stakeholders adds momentum to the change process (Varvasovszky, 2000). CCU manager and clinical instructor are the owners of the project. Thereby, their engagement is granted. Although nurses are powerful, their interest is suboptimal. Strategies to improve nurses' interest must consider realigning their goals with the project’s goals. For example, linking nurses annual performance appraisal to the unit results.

Frontline involvement in the change process is essential. It determines the level of energy and teamwork. Skillful nurses are more engaged and empowered to contribute to the change process. Therefore, adequate training and education is required prior commencement of change initiatives (Parkerton et al., 2009). The more the nurses involved, the higher their interest. The power – interest matrix shown in Figure 3 summarizes the main stakeholders and their power- interest positions.

3.2.7 Cause and effect analysis
The ‘Skin Integrity Team’ has conducted brainstorming sessions to analyze the causes and effects of the high UAPU incidence rate. Donabedian’s domains of Structure, Process, and Outcomes (Gardner et al., 2014) and Ishikawa fishbone diagram were utilized in the brainstorming session (NAHQ, 2005,P58). The goal of the brainstorming was to identify defects in the structure and process that lead to poor results. The four key categories used in the analysis process were resources, staff & skills, policies & procedures, and patients. Figure 4 is a fishbone diagram that highlights the defects in the prior implementation of the project.
As summarized in Table 4, there are many contributing factors to the current state of high PU incidence rate. The structural defects are linked to staff knowledge, skills, availability of essential medical supplies, and patients.

‘Skin Integrity Team’ members identified two key defects that need immediate actions. The key defects are lack of standardized preventive care plan and poor sensitivity of Braden scale.

The poor sensitivity of Braden scale results in risk assessment variation. Subsequently, hinders the effectiveness of the Braden scale in predicting the risk of PUs. Furthermore, the lack of clear guidelines of preventive interventions resulted in inconsistent care process. Each nurse estimates the risk and applies what he/she perceives as the best preventive practice.

Both defects are attributed to the structure. Due to the casual relationship between the structures and processes, the defective structure leads to defective process and consequently poor outcomes. The poor
outcomes include high cost of treatment, prolonged length of stay, poor patients’ satisfaction, and increased morbidity & mortality.

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>PROCESS</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>No PU preventive protocol.</td>
<td>Inconsistency in implementing preventive interventions.</td>
<td>• Increased Incidence Rate of Pressure Ulcers.</td>
</tr>
<tr>
<td>Knowledge deficit related to preventive interventions.</td>
<td></td>
<td>• Prolonged length of Stay.</td>
</tr>
<tr>
<td>Staff knowledge deficit related to Braden Scale assessment.</td>
<td>Poor reliability and validity of Braden Scale Assessment.</td>
<td>• Increased patients morbidity &amp; Mortality.</td>
</tr>
<tr>
<td>Inconsistent supply of essential medical consumables.</td>
<td>Inconsistent use of protective medical items.</td>
<td>• Increased treatment cost.</td>
</tr>
<tr>
<td>Lack of necessary equipment such as pressure distributing mattresses.</td>
<td>Inconsistency in the use of protective equipment.</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Identified defects attributed to the structure, process, and outcome.

3.3 Develop a vision for change

The literature demonstrates that the more the variation in the care processes, the more patient outcomes suffer and the likelihood of adverse events increases (Rozich et al., 2004). The vision of PUPP project is drawn from the concept of care processes standardization. Standardization minimizes variation and leads to improved patient outcomes, cost reduction, improved morbidity & mortality, and satisfied patients (Hasibeder, 2010).

The ‘Skin Integrity Team’ met to investigate the high PU rate. The Head Nurse recommended developing a pressure ulcer bundle. The title was later changed to protocol as the care bundle consists of no more than five elements.

The team acknowledged the need to improve reliability and validity of Braden scale assessment. Braden scale assessment is of high importance; the subsequent preventive care is solely dependent on the initial Braden score. To avoid unnecessary interventions on low risk patients, the initial Braden score stratify and risk adjust the
patients on admission. Patients identified to be at moderate or high risk of developing PUs are included in the PUPP.

The team agreed that the ultimate goal is to eliminate UAPU and to achieve the NDNQI 50\textsuperscript{th} percentile benchmark. The proposed protocol has three main domains. The first domain is standardize preventive care via integrating an evidence based PUPP into clinical practice. The second domain is to improve sensitivity of the Braden scale through staff education and training. The last domain is to link the implementation of the PUPP to the initial Braden scale score. Details of the action plan are described in the 'Develop an action plan’ section of this chapter.

3.4 Gain commitment to the vision

Staff commitment to quality improvement is essential success factor. It is essential to achieving the improvement goals as well as maintaining the momentum of the change. Building and maintaining commitment is linked to numerous attributes such as creating a sense of urgency, leadership, Just culture, teamwork, and communication.

3.4.1 Create a sense of urgency:

Creating a sense of urgency is recognized as the first step in the change process (Kotter, 2014). CCU nurses were appraised with the unit’s outcomes and the possible consequences associated with it. These consequences include unit representation, financial incentives, and impact on annual performance appraisals.

Nurses agreed to establish a ‘Skin Integrity Team.’ The team consists of five members who are responsible for developing and implementing the PUPP project in the unit. Team members will serve as project champions. The team agreed on one month timeframe to complete the planning stage and commence the implementation process.

3.4.2 Leadership:

The literature favors the participatory leadership style on the traditional supervisory leadership approach; it increases success potentials and staff innovation. Transformational leadership reshares subordinates values and realigns it with the
mission and vision of the organization. Leaders are required to eliminate barriers with their subordinates by encouraging openness and transparency (Avolio et al., 2004).

Frontline staff involvement is imperative for any improvement initiative to succeed. In preparation for this project and as part of the overall leadership strategy, I have adopted the transformational leadership behaviors in my daily management activities. CCU staff were represented and involved in the planning and implementation of the PUPP project. Moreover, ‘Walk Rounds’ concept has been integrated in a daily basis (Frankel et al., 2006). Throughout the implementation of the PUPP, I have performed daily morning rounds on all patients including those who are on the PUPP. The ‘Walk Rounds’ aim at keeping the channel of communication open with the frontline staff and give the leader the opportunity to observe the practice.

Open communication with the nurses provides venue for the manager to collect data and information regarding the progress of the project and the barriers that may face the change process. The outcome of the ‘Walk Rounds’ discussions facilitate the change process and provides the Head Nurse with innovative ideas for improvement. Nurses are provided with regular feedback concerning their suggestions, concerns, and ideas.

Another approach of promoting staff engagement and openness is the morning safety briefing or “Huddles”. The purpose of these short and concise briefings is to promote the safety culture (Institute for Healthcare Improvement, 2004). CCU nurses have a five minutes daily briefing with the Head Nurse. The Head Nurse provides nurses with feedback regarding the progress of the corrective actions identified in the briefing sessions.

3.4.3 Just Culture:

There is a debate among management schools regarding the punitive versus ‘No Blame’ approach of managing poor outcomes and adverse events. The concept of ‘Just Culture’ is recognized in today’s healthcare management as the most effective in achieving quality care. Yet, it is difficult to achieve (Wachter & Pronovost, 2009). Accountability review is the backbone of ‘Just Culture.’ Nurses are given clear and concise responsibilities with explicit means of evaluation of their performance (Frankel et al., 2006).
Accountability review mechanism is underpinned by Reason’s “Unsafe Acts Analysis” algorithm (Reason, 1997). The ‘unsafe act analysis’ algorithm guides managers in differentiating system defects from intentional violation of the set guidelines, protocols, and policies (Lightizer, 2012). I have customized the algorithm and presented it as a house rule of adverse event management. The modified version is called ‘Fairness Algorithm.’ See appendix 1.

The idea of “Just Culture” is not limited to accountability review in cases of deviation from the set standards and protocols; it includes recognition of excellence and innovation. It is required to provide staff with financial incentives and public recognition when objectives are met (Parkerton et al., 2009).

3.4.4 Teamwork and communication:

Teamwork is increasingly recognized by a growing body of the literature as a key element of safety culture (Meterko et al., 2004). Safety culture is the culture that values and promotes safety. There are many approaches to enhance teamwork and engage frontline staff. For example, quality improvement initiatives promote teamwork among the team members (Thomas, 2011).

Education and training lead to change in behaviors and attitudes. Effective team members must have the necessary skills and knowledge in order for them to contribute to enhancing safety culture and improved outcomes (AHRQ, 2008). Furthermore, conflict management and effective communication are integral to achieving the team’s goals.

CCU management acknowledged the above facts and acted on it. The first action was establishing ‘House Rules.’ The ‘House Rules’ is a written moral agreement that streamlines communication and conflict management procedures. Each nurse signed a copy of the ‘House Rules’ and agreed to have it as a ‘unit constitution’.

In addition to the ‘House rules,’ the unit management continues to adopt the ‘Open Door’ approach of communication. CCU nurses were given the opportunity to communicate with each other’s and with the unit manager via email and personally when needed.
3.5 Develop Action Plan

3.5.1 Formation of the ‘Skin Integrity Team’

The ‘Skin Integrity Team’ was established by the Head Nurse using Belbin’s team role model (Aritzeta et al., 2007). In addition to the Head Nurse who serves as a team leader and facilitator, the team involves five nurses. The nurses act as champions for the project. They provide nurses with clinical support and guidance at the bedside. The members were selected based on their behaviors and clinical competence. These behaviors are diverse and complement each other’s. Table 5 highlights members’ behaviors according to Belbin team role model.

<table>
<thead>
<tr>
<th>Team Role</th>
<th>Behavior</th>
<th>Number of members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant</td>
<td>Creative and solve difficult situations.</td>
<td>2</td>
</tr>
<tr>
<td>Co-coordinator</td>
<td>Chairperson, confident, has the power and authority. Act as a resource and team leader.</td>
<td>1</td>
</tr>
<tr>
<td>Team Worker</td>
<td>Clam, cooperative, and negotiator</td>
<td>1</td>
</tr>
<tr>
<td>Completer-Finisher</td>
<td>Adhere to timeline, search out errors, and omissions.</td>
<td>1</td>
</tr>
<tr>
<td>Resource Investigator</td>
<td>Explore opportunities, develop contacts, and communicative.</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5: ‘Skin Integrity Team’ members’ personality according to Belbin’s team role model.

The team has decided to meet in a weekly basis for the first month then arrange meetings as needed. Email used to facilitate communication among the team members.

3.5.2 Developing the PUPP:

Care standardization is known to be an effective measure in promoting patient safety (Hasibeder, 2010; Rozich et al., 2004). The principle of standardization underpins the strategy to manage the high PU rate. The newly developed protocol is drawn from the best available evidences.

The development process starts with the literature review of the available evidences of PU prevention in critical care facilities. The team facilitator reviewed the literature of the past three years and narrowed down the search results to meet the project needs. The
facilitator equally divided the articles among the team members and sent it via email. Members were given a grace period of one week to review the studies.

One week later, a second meeting was called, each member shared his / her findings; ideas were listed in a flip chart. After in-depth discussion of all the ideas, members started to have insights on the elements of the protocol.

The first element is Risk assessment scale; among the various skin assessment scales used to predict risk of PUs, Braden Scale is the most commonly used assessment scale (Gadd, 2012). Braden scale consists of six subscales; Sensory perception, moisture, activity, mobility, nutrition, and ‘friction & shear’ (Kottner & Dassen, 2008). The final score is the sum of the subscales scores. Braden scale categorizes the risk of PU into mild risk (score >15), moderate risk (score of 13-14), high risk (score of 10-12), and severe risk (score of <10) (Prevention Plus: Home of the Braden Scale, 2014).

The reliability of Braden Scale is controversial; it relies on the nurses competence in using the scale. Nevertheless, it misses important risk factors such as patient’s age and weight (Magnan & Maklebust, 2009; Cox, 2011). Our organization has integrated Braden scale into the clinical information system. Therefore, the team did not have the privilege to choose a different assessment scale.

The hospital internal policies & procedures mandate comprehensive patient assessment including skin assessment within four hours of admission, daily, prior patient transfer, and upon change in clinical condition. Nurses have the privilege to categorize the patients as ‘high risk’ event if the Braden scale score indicates otherwise.

The second element is turning and positioning; immobility of critically ill patients results in circulatory impairment that leads to tissue ischemia and necrosis. The literature elicits the necessity of turning and positioning as the most basic and effective measure of preventing PUs (Still et al., 2013). The frequency of positioning ranges from one to two hours. The additional preventive measures especially new equipment such as pressure distributions mattresses and protective dressing do not replace the routine 30 degree tilt positioning and turning of immobilize patients (Moore, 2009).
The third element is moisture management; incontinence associated dermatitis places the patient at high risk of developing PU and infection. Incontinence management focuses on preventing the urine and fecal parts from getting in contact with the patient’s skin. Using petrolatum-based cream and protective film spray after cleaning the patient protects the skin from the low acidic environment of the urine and the digestive enzymes presents in the fecal parts (Doughty et al., 2012). Further to the skin protection, ideally, the use of adult diaper is discouraged. Instead, nurses may use a single layer underpad to avoid containing moisture (Gray-Siracusa & Schrier, 2011).

The fourth element is the nutritional screening; the impact of poor nutritional status on the likelihood of developing PU is well documented (Little, 2013). Since this aspect of care is relatively out of the scope of nursing practice, the team has agreed to perform the nutritional screening and refer all patients to dietician on admission.

The fifth element is prevention of shear and friction; the routine patient care activities that require patient mobilization induce shear and frictions. The injury results from movement of the inner layer of the skin while the superficial layer is static. This mechanism leads to deep tissue injury which later can develop to PU (Hanson et al., 2010).

Measures of minimizing shear and friction include using sliding sheets, minimizing wrinkles under the patient, and use of lifting machines. Moreover, greater than 30 degrees elevation of the head of the bed is discouraged as it increases the pressure on the buttocks area (Hanson et al., 2010). However, it contradicts with ‘Ventilator Associated Pneumonia’ prevention bundle which recommends more than 30 degrees (Rello et al., 2010). To balance both guidelines, nurses keep the head of the bed at 30 degrees if the patient is on both prevention protocols.

The sixth element of the protocol is pressure relief; bony prominences are the most common body sites of PUs due to compromised circulation and poor tissue perfusion. Pressure distribution equipment enhances the perfusion and lessens the risk of tissue injury. The mattress used in the critical care facilities contributes to the level of perfusion compromise. The literature supports the use of pressure redistributing mattress known as air mattresses (Malbrain et al., 2010).
The last element is heel elevation; heels often develop PU due to prolonged contact with the bed. Heel floating is effective in eliminating the risk of heel ulcers. Nevertheless, the supportive device itself must not cause PU (Baldelli & Paciella, 2008).

As soon as the ‘Wound Care Nurse’ and the team members approved the protocol, a hard copy was placed at each bedside nursing folder. See appendix 2.

The team has agreed that the protocol applies to all patients categorized as Moderate or high risk of developing PU ulcers based on Braden score. Additionally, nurses were given the privilege to start the PUPP on all patients they perceive as moderate or high risk event if the Braden scale indicates otherwise.

Finally, in order to simplify the process of PUPP application, a workflow chart was developed and placed at each bedside. The flowchart guides nurses throughout the process of PUPP application.

The PUPP elements are similar to those adopted by the PU prevention programs discussed in the ‘literature review chapter.’ The consensus among the team members and the literature review is a strong evidence of the validity of these elements.

### 3.5.3 PUPP Implementation process

The process of implementation starts on admission to the unit. The nurse performs the initial Braden assessment scale within four hours of admission. The process flowchart guides nurses through the steps of applying PUPP:

1. Perform Braden Scale Assessment
2. If Braden score is <= 13, start PUPP
3. Daily Braden scale or upon change of clinical condition
4. If Braden score is <= 13, continue PUPP

**Figure 5: PUPP implementation process.**
admission. If the Braden score is less than 14, the nurse initiates the PUPP. Nurses continue to perform Braden scale in a daily basis. Patients switched to standard precaution as soon as the Braden scale score is more than 13. Nurses continue to evaluate patients with low risk in a daily basis. However, if the patient’s clinical condition deteriorates, the PUPP starts as soon as the Braden scale falls below 14. The flowchart shown in figure 5 clarifies the process of PUPP implementation.

### 3.5.4 Develop education plan

The clinical instructor is responsible for planning and implementing staff education. The educational plan had three key domains; the first is Braden scale scoring, the aim of the education was to enhance the reliability and validity of the Braden scale by providing education using real case studies. Reliable scoring is necessary for the prediction power of the PU risk (Magnan & Maklebust, 2009). The clinical instructor demonstrated a live assessment with an in-depth explanation of the proper assessment and scoring process.

The second domain is the PUPP elements; the newly developed PUPP was presented to the staff in the general staff meeting. The clinical instructor and the Head Nurse reviewed the protocol and the rationale behind each element. Nurses’ feedback was incorporated into the PUPP. Many educational sessions were conducted to cover all nurses.

The last domain is Moving & Handling (M&H) workshop; all nurses were booked to attend the M&H workshop. This workshop focuses on the proper procedure of patients mobilization and aims at the minimizing risk of patients and nurses injury.

### 3.6 Implement the change

The PUPP project was implemented over five months. The project started in November 2013 with analysis of the current situation. Nurses were updated with the ‘NDNQI pressure ulcer prevalence’ survey results as well as review of the adverse events relevant to UAPUs.

December 2013, the ‘Skin Integrity Team’ was assembled. The first two weeks meetings focused on identifying a strategy of managing the high PU rate followed by
two weeks of the literature review and PUPP’s elements collection. By the end of December, the ‘Skin Integrity Team’ identified the major components of the PUPP. The PUPP was introduced to the nurses in the last week of December 2013 with a plan to go live on 1 January 2014.

Hard copies of the PUPP and the process flowchart placed at each bedside nursing folder. Nurses started to apply the PUPP with the support and assistance of the ‘Skin Integrity Team’ members. The Head Nurse performed a daily round to encourage nurses to apply the protocol, provide support, and coaching when needed. Nurses scheduled to attend the M&H workshop. However, due to the large number of nurses, the training was delivered over three months’ time.

Implementation of the PUPP commenced on 1 January 2014. PUPP implementation is an ongoing process and to be continued throughout the project timeline. Project evaluation involves outcome measurement, performance measurement, and staff interviews to assess barriers to care processes standardization. Outcome measurement includes the ‘NDNQI pressure ulcer prevalence survey’ scheduled in March 2014 as well as ongoing review of reported skin adverse events. Clinical audits used to measure compliance with the protocol elements. Appendix 3 (Gantt Chart) highlights the timeline of the project.

3.7 Assess and reinforce the change

Change process is inconvenient and opposed with resistance as it drags individuals out of their comfort zone (Karen & Whelan, 2010). The extent to which the improvement is sustainable is linked directly to the ability to integrate the new change into the unit culture i.e. (this is the way we do business here) (Mcgrath et al., 2008). It may sounds easy and straightforward but in reality, it is not.

Several factors are vital for successful execution of the change. The first factor is leadership engagement. Leaders should take the lead in the change process; their constant feedback and engagement deliver the right message to their subordinates and increases their commitment. The second factor is ‘standard work’; the new processes that are implemented as part of the change process must be explicit and documented with clear roles of the individuals involved (Gill, 2002).
Monitoring of the new process is the third important factor; individuals tend to revert to the old processes. Thus, it is crucial to monitor adherence to the new process. This approach should not replace the effort of building commitment, such commitment can be reinforced through ongoing periodic feedback of early improvements i.e. ‘quick wins’ (Kotter, 1995).

The last factor is maintenance; the new processes are drawn from the best evidence, which is very dynamic, and tend to change very frequently. Thus, regular review of these processes is imperative (Mcgrath et al., 2008). Early declaration of victory is a deadly mistake in change management; such declaration most probably will lead to reverting to the old ways of doing business.

The driving forces that sustain improvement are similar to forces that gain staff commitment. Refer to ‘Gain commitment ‘section of this chapter.
4.1 Introduction

The measurement approach of the project's objectives is integrating a mix of qualitative and quantitative measures. Acknowledging the need for process measurement, the author utilized clinical audits to measure the compliance rate with the PUPP elements. ‘NDNQI pressure ulcer survey’ and ‘Safety Reporting System’ results reflect the patient outcomes. The barriers to care standardization are assessed by samples nurses’ interviews. Literature review of the cost associated with PU treatment provides an insight into the estimated cost saving. Nurses education was evaluated using Krikpatrick training model (Krikpatrick, 1979).

The overall measurement and evaluation process is compromised by the short evaluation time. Therefore, the evaluation process will continue to be performed during the improvement sustainability phase of the change process.

4.2 Outcomes measurement

As stated in chapter 2, the outcome measurement integrating two variables. The first variable is the ‘NDNQI quarterly PU prevalence survey’. Each unit in the organization nominates two champions to participate in the organizational wide survey. Nominated nurses receive education on the survey process. The education includes proper skin assessment and staging of the PUs.

On the day of the survey, the survey coordinator assigns two nurses to survey each unit. The assigned nurses do not survey their own units or divisions. Upon completion of patients’ assessment, the surveyors report all possible PUs to the ‘Wound Care Nurse’ who validates the

![Figure 6: NDNQI survey results and number of reported PU events pre & post project implementation.](image-url)
results prior reporting it to the survey coordinator. The unit’s PU prevalence rate is calculated by dividing the number of patients identified with PUs over the total number of patients in the survey day. That is; the number of patients with PUs is the nominator, and the total number of patients is the denominator (Polit & Beck, 2010). Once finalized, the survey coordinator plots the results in the quarterly indicators report and sends it to the units’ managers. All units reported with UAPUs plotted in the watch list.

CCU result of 2014 first quarter survey revealed one confirmed stage II UAPU. The prevalence rate is 5.5%. This result is suboptimal as the targeted Prevalence rate is 0%. The Root Cause Analysis (RCA) performed on the reported UAPU demonstrates issues with nursing assessment, Braden scale reliability, and application of preventive interventions.

The second outcome measure is the safety reporting system. The first quarter report indicates zero reported PU events. Figure 7 illustrates the ‘NDNQI pressure ulcer survey’ results as well as number of reported events in 2013 and the first quarter of 2014.

4.3 Performance measurement

Outcome measures provide a raw data that gives an overall insight into the care processes. The outcomes are the output of the care processes as well as numerous contributing factors that are not all controllable (Mainz, 2003). This fact makes it difficult to segregate the influence of performance from non-performance variables. Thereby, accurate performance measurement and evaluation is essential. The ‘Skin Integrity Team’ has acknowledged the necessity of rigorous performance measurement. Team members agreed to measure performance using two measurement tools, clinical audits and Braden scale validity and reliability tests.

4.3.1 Clinical audit

Patient outcomes are the output of the structures and processes (Donabedian, 2005). Nevertheless, several attributes affect the outcomes, yet, not related to the structures or processes. Clinical audits are common performance measure; it compares the practice against explicit standard of care (Rawlins, 2002). However, it is difficult to conduct due to manpower time and lack of expert auditors (Benjamin, 2008).
The ‘Skin Integrity Team’ acknowledged the need for performance measurement in order to segregate practice related from non-practice related attributes. The team agreed on clinical audits as a tool to measure nurses’ compliance with the PUPP elements.

The team planned the clinical audits utilizing Benjamin's framework of clinical audit (Benjamin, 2008). The initial stage is preparing for the audit; the ‘Skin Integrity Team’ has already identified the PUPP elements as the standards of care. The structure including nurses’ knowledge & skills, supplies, and equipment were all set.

The second stage is the selection of the criteria; team members have designed the audit criteria based on the PUPP elements. The third stage measures the performance; the Head Nurse and the Assistant Head Nurse will choose random dates to perform the audits on all patients on PUPP. In the day of the audit, the auditors review the Braden score of all patients. Those with Braden scale less than 14 i.e. moderate to high risk of developing PU are included in the audit. The same patient may be audited in two different days.

Electronic medical record (EMR) review, direct observation, and staff interview were used to collect data. The data were analyzed using Bar chart to identify areas of poor compliance. The audit process includes an actionable feedback with improvement plan; the improvement plan involves revision of the PUPP elements and management of structural defects.

The target was 20 audits. Data analysis includes overall and individual elements compliance rate. In line with the continuous quality improvement principle, the audit will be performed in a monthly basis with actionable audit feedback following each audit.
episode (Kahan & Goodstadt, 1999). Figure 8 represents the audit cycle according to Benjamin's (2008) audit framework. Appendix 4 is the clinical audit criteria.

The final audit yielded 21 audit episodes. Element number nine and 13 were not applicable on all audited patients. Thus, they were excluded from the analysis process. As shown in figure 8, individual elements compliance rate ranged from 25% to 100%. The overall compliance rate was 88%, which is close to the targeted compliance rate (90%). Wound care consultation on admission has the lowest compliance rate (25%). Compliance with the guideline of patient positioning every 1-2 hour is low 57%; this is of high importance as this element is the most basic and crucial preventive intervention (Moore, 2009).

Low compliance with the use of Chlorhexidine hygiene pads (element number 7) is related to structural defect where the supply is inconsistent and the item is often out of stock. Comprehensive skin assessment on admission is suboptimal; compliance rate of
76% is not satisfactory. The initial assessment is the first and most critical step in the prevention process.

In general, the literature demonstrates that the compliance rates with clinical guidelines are poor. Burstin et al. (1999) estimate of the compliance rate is no more than 50%. Therefore, achieving compliance rate of 90% is statistically significant.

4.3.2 Braden scale assessment reliability

‘Inter-rater reliability’ refers to the extent of agreement in the measurement among the different raters (Polit & Beck, 2010). Braden scale ‘Inter-rater’ reliability was measured utilizing the ‘Fleiss’s Kappa’ test performed on the two case scenarios rated by a sample of nurses. See appendix 5 and 6.

Fleiss’s Kappa is a variant of Kappa agreement reliability statistical test that measures the degree of agreement among raters who assign a numerical rating to number of items. Unlike Kappa, ‘Fleiss’s Kappa’ works for more than two raters. The ‘Fleiss’s Kappa’ score range from zero to one where zero is no agreement and one is perfect agreement (Shoukri, 1999).

Probability sampling design used to recruit participants (Polit & Beck, 2010, P309). Each nurse completed unit orientation had a chance to be chosen. Each test yielded 19 participants. All nurses involved in the study have the same level of education and training.

In addition to the quantitative measurement of the reliability of the Braden scale assessment, Kirkpatrick model of training was utilized to assess the effectiveness of the training (Kirkpatrick, 1979). See table 6.
<table>
<thead>
<tr>
<th>Evaluation Level</th>
<th>Findings</th>
<th>Evaluation tool</th>
</tr>
</thead>
</table>
| **Reaction**     | • The nurses acknowledged the inconsistency in the Braden scale scoring, subsequently the need of the training.  
• The participation level was satisfactory. The training was designed to enhance participation via scoring real cases from the admitted patients and compare the results with the ideal scores. Nurses debated each other’s scoring and reached a consensus on the ideal score of each case.  
• The verbal feedback indicated that the training was beneficial in the clinical practice. However, the venue was uncomfortable as the operational demands interrupting the flow of the education. | • Verbal feedback of the staff and monitoring of the participation level. |
| **Learning**     | • The training was specific and targeted the intended objective of enhancing the ‘Inter-rater agreement’. The results of the statistical analysis of the case studies were suboptimal. The objective of enhancing the ‘Inter-rater agreement’ was not achieved. | Post training assessment using two case scenarios. |
| **Behavior**     | • The new training had minimal impact on the nurses behavior. The RCA performed on a UAPU reported three months after the training revealed consistency in Braden scoring. However, poor sensitivity. The scoring was consistent but not reliable as it was higher than the correct Braden score. This is attributed to lack of proper assessment rather than lack of knowledge. | • Root Cause Analysis of confirmed PUs.  
• Chart reviews. |
| **Results**      | • There was an improvement in the patient outcomes represented by decreased rate of PUs incidence rate. But not the Braden scale reliability.  
• Compliance with the hospital standard of daily Braden scale assessment has increased to 100%. | NDNQI Pressure Ulcer Survey. |

Table 6. The education evaluation according to Kirkpatrick’s model.
Data analysis of the case studies:

Microsoft Excel sheet was used to calculate “Fleiss’s Kappa” reliability score on each case study. The ‘Fleiss’s Kappa’ results were 0.31 and 0.33 respectively. As illustrated in table 7, these results reflects ‘fair agreement’ which is suboptimal and clearly demonstrates inconsistent scoring between the nurses.

Despite the intense training and education of the nurses on the proper use of the Braden Scale, the goal of achieving ‘Fleiss’s Kappa’ score greater than 0.6 was not met.

<table>
<thead>
<tr>
<th>Score</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 — 0.19</td>
<td>Poor agreement</td>
</tr>
<tr>
<td>0.20 — 0.39</td>
<td>Fair agreement</td>
</tr>
<tr>
<td>0.40 — 0.59</td>
<td>Moderate agreement</td>
</tr>
<tr>
<td>0.60 — 0.79</td>
<td>Substantial agreement</td>
</tr>
<tr>
<td>0.80 — 1.00</td>
<td>Almost perfect agreement</td>
</tr>
</tbody>
</table>

Table 7. Fleiss’s Kappa scores interpretation guide.

Root Cause Analysis of the reported UAPU.

During implementation and in response to the first quarter ‘NDNQI PU prevalence survey’, an RCA was performed on the reported stage II PU. The finding of the RCA revealed issues with the Braden scale sensitivity. The Braden score was more than 14 throughout the admission course. i.e. low risk of PU. Nurses constantly rated the patient as ‘slight to no’ mobility impairment while he is known to have bilateral above knee amputation.

Cost effectiveness

Alongside the negative consequences of PUs such as patients quality of life and prognosis, PUs are associated with significant cost of treatment on already constrained budgets of healthcare organizations. PUs costs the US healthcare care system up to 11 billion dollars per annum (Cox, 2011). The cost of

<table>
<thead>
<tr>
<th>Reported PUs adverse events</th>
<th>Stage 1</th>
<th>Stage II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Actual PUs adverse events</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Estimated cost of treatment per case</td>
<td>£1,214</td>
<td>£4,399</td>
</tr>
<tr>
<td>Total Cost</td>
<td>£18,210</td>
<td>£43,990</td>
</tr>
<tr>
<td>Total in Saudi Riyals</td>
<td>SAR 373,200</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: Estimated number of PUs events and cost of treatment.
treatment of each PU event varies according to the stage of the PU. Treatment cost is as low as $400 dollar for grade I PUs (redness only) and up to $40,000 for stage IV PUs (Baldelli & Paciella, 2008). In the United Kingdom, the cost of PUs treatment range from £1,214 (Stage I) to £14,108 (Stage IV) per case (Dealey et al., 2012). There is no consensus in the literature regarding the exact cost of PUs treatment. However, there is a consensus on the high cost as well as the preventability of PUs. Considering the preventability of the majority of these adverse events, ‘PUs prevention’ quality improvement initiatives are given priority in most healthcare facilities.

Data review of 2013 shows five reported PUs, three were stage II and two stage I. considering that no more than 20% of the actual adverse events are reported in the Safety Reporting Systems (Griffin & Resar, 2009), the actual number of the PUs events in CCU were approximately 15 stage I PUs and 10 stage II PUs. There was no reported stage III or IV. It is most likely that there were no Stage III or IV as these PUs treatments require special equipment and experts consultation. As a manager of the unit who is responsible for acquiring the resources needed to deal with such severe events, I am not aware of any stage III or IV PUs that have occurred IN 2013.

As shown in table 8, the cost associated to the treatment of PUs is substantial. Thus partial or full achievement of the PUPP goal of eliminating UAPUs will contribute to significant cost saving. It worth mentioning that the quality improvement initiatives are associated with additional cost. However, at the long term, the return value is significant and justifies the investment (Makai et al., 2010).

Despite the agreement on the additional length of stay associated with PUs, there are no studies the measure the exact number of additional days of stay (Chicano & Drolshagen, 2009).

4.5 Nurses perception of care standardization and barriers of implementation
A growing body of literature supports the effectiveness of care standardization in providing a safer care (Rozich & Justeson, 2004). Several obstacles encounter this approach. Healthcare clinicians often deviate from the set protocols and guidelines. The deviation is attributed to many factors such as clinician's resistance, organizational
culture, and impracticality of the clinical guidelines (Cabana et al., 1999). These factors vary from one organization to another.

In addition to the PUPP, there are care bundles at the author’s organization such Ventilator Associated Pneumonia (VAP) and Central Lines Associated Blood Stream Infection (CLABSI) Bundles. In this section, the author attempts to assess the potential barriers of implementing care bundles, protocols, and clinical guidelines in his unit. A semi-structured interview methodology is used to collect qualitative data of nurses understanding of care processes standardization and the possible implementation barriers (Polit & Beck, 2010).

Interview sampling technique is based on ‘stratified random sampling’ (Polit & Beck, 2010). Nurses were divided into two groups; the first group represents nurses with more than one year of employment. While, the second group represents those with less than one year of employment. Only the first group members were considered. The rationale of this measure is to assure that the interviewees have adequate experience with the standardized care sets. Any nurse who has worked in the unit for more than one year had a chance to be chosen. Interviews were conducted between 23rd to 28 March 2014. Therefore, only those who worked in this time were included. Due to time constraints, the number of participants was limited to eight nurses. The sample was subject to change if new themes emerged from the interviews.

The interview questions are predetermined open-ended questions. The questions are structured to facilitate in-depth discussion. At the same time, maintain focus on the interview topics. All interviews were recorded after obtaining interviewees permission. All interviews were conducted in the Head Nurse office in order to provide quiet and comfortable venue for interviews.

The interview questions are:

1. What does care standardization mean to you?
2. Can you provide examples of care sets created based on the standardization principle?
3. In your daily practice, what makes it difficult to apply the clinical guidelines, protocols, and bundles?
4. Do you think care standardization ease or complicate your daily routine work?
5. What makes the clinical guidelines, protocols, or bundle the appropriate ones for our patients?

4.5.1 Date analysis:
The analysis process started with audio recording transcription followed by thorough reading of the transcriptions to identify category schemes. The next step was data coding; as shown below, each category was given a letter code. The categories were identified via scrutinizing the interviews data. The coded data was plotted in a table format. See table 9. The following are the category schemes:

A. Understanding of the standardization principle.
B. Barriers to implementation of care standardization.
C. Advantages of care standardization.
D. Disadvantages of care standardization.
E. Examples of care standardization.
<table>
<thead>
<tr>
<th>Understanding of the standardization Concept</th>
<th>Barriers to care standardization</th>
<th>Advantages of Standardization</th>
<th>Disadvantages of standardization</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Care standardization is the care we give, but standardized by policies and protocols.</td>
<td>Patients and families sometimes mandate their way of care rather than what the protocols indicate.</td>
<td>It makes nurses work easier.</td>
<td>Care protocols and bundles are time consuming.</td>
<td></td>
</tr>
<tr>
<td>Standardization is having everyone doing the same thing across the board.</td>
<td>Nurses sometimes are not familiar with the protocols or bundles.</td>
<td>Standardization makes us all do the same thing.</td>
<td>It does not always fulfil patient's needs.</td>
<td></td>
</tr>
<tr>
<td>It is something that we follow for better patient's care.</td>
<td>Lack of nurses’ commitment.</td>
<td>Without standardization, the work will be chaos.</td>
<td>Not flexible.</td>
<td></td>
</tr>
<tr>
<td>Care standardization anything that would affect patients care.</td>
<td>The needed supplies is not always available</td>
<td>Improve patient outcomes.</td>
<td>Can't cover all care aspects.</td>
<td></td>
</tr>
<tr>
<td>All protocols, bundles, and guidelines must be based on the best evidence.</td>
<td>Physicians chose not follow the protocol due to individual clinical condition of the patient and lack of familiarity with the protocols.</td>
<td>Protocols make the procedures and medical items internalized in nurse’s minds.</td>
<td>Excessive standardization makes work too rigid.</td>
<td></td>
</tr>
<tr>
<td>We can make protocols more effective if we breach them every day, share information among nurses, and help each other's.</td>
<td>Standardize care is not implemented across the board.</td>
<td>Streamline care processes.</td>
<td>Take away nurses autonomy.</td>
<td></td>
</tr>
<tr>
<td>Best protocols are the ones considering nurses opinion.</td>
<td>Must be based on research findings.</td>
<td>Protocols make the procedures and medical items internalized in nurse’s minds.</td>
<td>Apply more loads on nurses.</td>
<td></td>
</tr>
<tr>
<td>It doesn't cope with the fast pace</td>
<td>Foley catheter management protocol.</td>
<td>Standardize care is not practical in chaotic conditions.</td>
<td>Standardize care is not practical in chaotic conditions.</td>
<td></td>
</tr>
</tbody>
</table>

Table 9: Nurses interviews category schemes.
4.5.2 Data interpretation

4.5.2.1 Understanding of care standardization principle

The exact definition of standardized care is not clear to most of the nurses. Three nurses were unable to distinguish the standardized care sets from the routine nursing tasks. For example, one nurse referred to skin assessment as a protocol. While, two nurses were unable to give examples of standardized care sets. Five nurses linked effective protocols and bundles to research evidences. One nurse stressed the importance of periodic revision of the protocols and bundles.

4.5.2.2 Barriers to implementation of care standardization

The nurses reported a wide range of implementation barriers. Five nurses believed that patients and families interference with the care is the most common obstacle. Two nurses considered poor nurses familiarity with the contents of the protocols and bundles as a major barrier of application. One nurse cited lack of necessary supplies.

Four nurses agreed that the lack of physician compliance with the set protocols is common; two nurses attributed this to unique patients’ clinical conditions, while the remaining two believe that poor physicians' compliance is due to poor knowledge with the protocols and bundles.

One nurse addressed the inconsistent supply of medical items. Two nurses understand that the failure of other units to initiate the standardized care set prior transfer to CCU compromises effectiveness of the protocols and bundles. One nurse gave an example of the Catheter Associated Urinary Tract Infection (CAUTI); patients admitted to CCU with urinary catheters inserted elsewhere. Therefore, the CAUTI bundle is partially implemented as they have no control on the insertion part.

Seven out of the eight nurses agreed that nurses’ commitment to protocol implementation poses as a barrier. However, they disagree on the extent the issue prevails. One nurse believes that nurses are often choosing not to abide with the care sets due to behavioral and attitude reasons, while, the remaining six nurses believe that
the lack of commitment is due to factors related to the environment and the fast pace nature of the workflow.

4.5.2.3 Advantages and disadvantages of care standardization

All nurses (7) except one have confidence in the positive impact of standardization on patient outcomes. Five nurses believe that the care bundles, protocols, and pathways unify the clinical practice and make nurses practice the same way. One nurse pointed out the advantage of repeating the same sequence of steps, which make the process internalize in nurses mind. All nurses but one said that the standardized care sets make their daily routine easier. The seven nurses agreed that their daily work would be chaos without the protocols, bundles, and pathways.

On the other hand, one nurse believes that standardization does not contribute to positive patient outcomes; she further stated that it often contributes to poor outcomes. Additionally, she is concerned about the undesirable effect of standardization on nurses’ autonomy and critical thinking. She still believes that we cannot totally remove standardization. Four nurses agreed that more nursing care standardization lead to better patient outcomes. On the other hand, four nurses believe that too standardized care makes the work dynamic solider and less flexible.

Interviewed nurses mentioned additional disadvantages such as increased workload on nurses, impracticality in chaotic situations, and inability to cover all care aspects.
5.1 Outcomes measurement

Effective measurement of the patient outcomes mandates sensitive, valid, and reliable indicators. Indicator sensitivity refers to the ability of the indicator to capture the positive events. Whereas, validity is the ability to measure what is intended to measure (Mainz, 2003). The outcomes are not necessarily the output of structures and processes only, there are many contributing factors that the healthcare providers have no control on such as age, comorbidities, and lifestyle (Cecile et al., 2012).

This project has combined two patient outcome measures in an effort to yield an accurate measurement. The first measure is the number of UAPU events reported in the Safety Reporting System. This system was adopted by healthcare from the aviation industry (Shekelle, 2002). Several studies have examined the contribution of the safety reporting systems to patient safety. Researchers debate almost all aspects of safety reporting system except one major rule; ‘Safety Reporting System’ stand alone should not be used as a quantitative measure of adverse events in healthcare; rather it provides insights and hints of the current safety status of the organization (Wachter, 2012a). This is due to diverse approach of interpreting reporting rates (Stockwell et al., 2013).

In one hand, one organization may recognize low reporting rate as a positive reflection of safety culture. On the other hand, a second organization may recognize the low reporting rate as a sign of safety culture (Wachter, 2012b). The different interpretation makes safety reporting systems unreliable safety measurement tool.

Safety events’ reporting was hindered by the introduction of a new SRS. The new system is entirely different from the old one. Therefore, it needed intense training of the health team members. This ‘Special Cause’ had contributed to a significant decline in the reporting rate.

The second outcome measure is the ‘NDNQI quarterly PU prevalence survey’. The survey provides accurate and precise measurement of the PUs prevalence in the day of the survey. However, the survey is a snapshot of one day only, and the rest of the
quarter is not measured. Combining both measures provides more reliable measurement of the outcomes. Yet, it is not sensitive enough to capture all positive events.

It is crucial to consider new outcome measurement approaches. In 2003, the Institute of Healthcare Improvement (IHI) has introduced the ‘Trigger Tool’ as a new adverse events measurement methodology (Griffin & Resar, 2009). The ‘trigger Tool’ identifies adverse events through administrative and clinical triggers.

For example, if the patient received blood transfusion, it may indicate that he/she has received an overdose of the anticoagulant drug. A qualified clinician review the patient’s chart and confirm the existence of an adverse event. The ‘trigger tool’ design was enhanced later via integrating the trigger tools into the clinical information systems. Classen et al. (2011) found that the IHI ‘Trigger tool’ is 10 times more powerful than AHRQ safety indicators in capturing adverse events in healthcare. In his study of the power of ‘Trigger tool’, in revealing medication errors, Rozich (2003) found out that only 1.8% of the medication errors were filed as incidents in the safety reporting system. These evidences clearly prove the effectiveness of ‘Trigger tool’ in measuring the actual adverse events that are rarely reported in the traditional reporting systems.

The ‘trigger tool’ can be utilized in quality improvement initiatives similar to PUPP through incorporating the triggers into not only the clinical information system, but also the administrative electronic systems used to manage and control medical supplies and consumables.

For example, the use of medical consumables that are specific to wound care may indicate the occurrence of PU especially in medical units where wounds are rare. Another possible trigger is the consultation of wound care clinicians in medical units. Such consultation is made when there is a wound to be assessed. Wounds in medical units are most probably associated with PUs. A qualified clinician reviews the patient with a positive trigger and determines the presence of adverse event.

In conclusion, the current safety measures used in this project are not adequately sensitive. Considering ‘Trigger Tool’ methodology would strengthen outcome
measurement and produce data that are more reliable. However, such initiative has to be organizational wide rather than unit specific.

5.2 Performance measurement

5.2.1 Braden scale reliability
The ability of the Braden scale to predict the likelihood of PUs is limited due to either sensitivity or application of the scale. The first factor was not examined in this project. However, the literature demonstrates the controversy in this regard (Kottner & Dassen, 2008b).

Statistical analysis shows significant variation and lack of consistency in Braden scoring. Nurses were requested to complete the scoring by the 'Head Nurse' who is their direct supervisor. This makes them suspect to Hawthorne effect. Hawthorne effect defined as a change in behavior or performance as a result of being observed or participant in the study (AHRQ, 2008). In this case, the Hawthorne effect has a positive impact. Nurses attempted to score the cases correctly in order to prove their competence. Therefore, the inconsistency in the scoring is a reflection of the real situation.

This argument is supported by the RCA conducted on the reported PU. The patient was given a high Braden score throughout the admission course. The high Braden score indicate low risk of PU. Yet, the patient developed pressure ulcer and the accurate score given by the ‘Wound Care Nurse’ was much lower that the nurses scores.

In his study conducted in intensive care units similar to CCU, Hyun et al. (2013) questions the ability of the Braden scale to discriminate patients at high risk of pressure ulcers.

Considering the necessity of reliable risk assessment of PU on admission as it is the most integral assessment step that determines the patient’s legibility for the PUPP, it is imperative to consider alternative or complementary means of risk assessment. Such means may include, patient assessment by expert wound care nurse on admission. Thereby, the decision of whether the patient is at high or low risk of PU is centralized and not controlled by the primary nurse. Furthermore, the Braden scale only is not a
strong risk indicator. Adding other risk indicators such as weight, comorbidities, and age is essential.

Kelechi et al. (2013) recommend the use of assessment scales. However, he argues that, in addition to the scale validity and reliability, the organization must consider the usability of the scale. I.e., whether the assessment should be made by the bedside nurses or a specialist such as wound care nurse.

5.2.2 Clinical audit

The clinical audit goal is to measure nurses compliance with the PUPP. The overall compliance rate (88%) is close to the targeted compliance rate (90%). Nevertheless, the poor compliance is associated with the essential elements of the PUPP such as ‘turning and positioning’. The audit findings assist manager in the accountability review process as well as sustaining improvement. Nurses must be held accountable for their unjustified poor compliance according to Reason’s unsafe act algorithm (Leape, 2009). Accountability review underpins the implementation of safety culture (Wachter & Pronovost, 2009).

Effective audits are those generate actionable feedback. PUPP elements with poor compliance require intense focus in order to optimize the outcome of the PUPP. Ongoing audits on a regular basis contribute to improvement sustainability. However, clinical audits are associated with additional cost. In addition to the auditor’s time, clinical audit contribution to the quality improvement relies on the organizational commitment to introduce change based on the audit feedback. It is less likely that the clinical audit will lead to the desired change unless it is implemented at the organizational level. Organizational wide audit program enables the auditors to have protected time to conduct the audits as well as the required training (Benjamin, 2008).

5.3 Nurses perception about care standardization and barriers of plementation

The IOM cited care processes variation as one of the major safety issues in today’s healthcare systems (Leape, 2009). This variation is traditionally attributed to the clinicians unwillingness to sacrifice their control of practice (Berwick, 2002). Others argue that the intangibility nature of healthcare service and the uniqueness of individual patient’s needs justify variation in care processes (Bandyopadhyay & Coppens, 2005;
Spalding et al., 2013). In general, there is an agreement on the value of care standardization in order to narrow down the common variation in the processes and achieve the desired outcomes with the least possible cost and minimal harm to the patients (Resar et al., 2012).

The PUPP project is a simple and straightforward model of care standardization. The goal of the PUPP project is to mitigate harm resulted from PUs via minimizing variation in the care processes. To some degree, it deprives nurses from practice control. At the same time, gives them the privilege to act outside the protocol boundaries if the clinical condition of the patient mandates so. For example, nurses are required to abide by the PUPP elements. However, they have the privilege to apply the PUPP when the Braden scale score indicates otherwise.

The author believes that standardization of care is an essential component of healthcare reform efforts. Standardization is a mean of integration of the new research evidences into practice (Evans-Lacko et al., 2010). CCU nurses agree on the positive influence of care standardization on patient outcomes. They addressed various obstacles and barriers to implementation. Amazingly, these barriers are identical to those reported in the literature. However, families interference with nursing care is considered by CCU nurses as a major and unique obstacle. Nurses believe that this obstacle is a result of mistrust of healthcare team members.

Cabana et al., (1999) categorized barriers into knowledge, attitudes, and behavior related barriers. Knowledge related barriers are due to lack of familiarity and awareness of clinicians with the standardized care sets. While, the attitude barriers are related to disagreement with guidelines, lack of applicability, and conflicting guidelines.

Designers and developers of pathways, bundles, and clinical guidelines must consider the above barriers when developing care sets. Moreover, Clinicians involvement is a vital success factor (Evans et al., 2010).
5.4 Cost of treatment

PUs are associated with direct and indirect cost. The direct cost includes workforce, medical supplies, and prolonged length of stay (Makic & Sullivan, 2011). Whereas, the indirect cost includes compromised patients flow, and poor customer satisfaction.

The methodology used to estimate the cost saving in this project is not rigorous. It relies on the literature findings to estimates the actual number of UAPUs and the estimated cost of treatment. I calculated the estimated cost based on the finding of a research study conducted in the United Kingdom (UK) (Dealey et al., 2012). The cost of treatment in the UK is different from Saudi Arabia. This measurement approach is the only possible method of cost measurement at this point. Accurate measurement of cost can be achieved by conducting a research project utilizing the Information technology available in the hospital. However, such initiative requires a precise measurement of the PU incidence rate as well as accurate staging of each PU as the cost varies from one stage to another.

In conclusion, the purpose of this project is to demonstrate the potential of care standardization in achieving the desired patient outcomes. Best evidence practice is the only way that determines what the right process is. Lack of standardization opens the door for variation in clinical practice.

The PUPP project implemented in CCU at the author’s organization is currently under revision by the quality department. There are plans to customize the PUPP structure according to different unit’s requirements and adopt it as a hospital wide performance improvement project. At this point, three units other than CCU have started implementing the PUPP in their areas.

5.5 Recommendation

As stated earlier, the project is still at the early stage of evaluation. Therefore, it is important to continue the evaluation process preferably for four quarters before we can get clarity of the actual impact of the project in the patient outcomes.

The CCU is internationally benchmarked with similar units in North America. However, the scope of practice has changed over the past two years due to changing patients’
needs and clinical conditions. The current scope of practice is more toward medical intensive care rather than classical coronary care patients. Having that said, the newly emerged scope of practice mandates considering a different approach of measurement. The acceptable PU incidence rate of medical intensive care units is indeed higher than coronary care units due to several comorbidities and risk factors. The benchmark strategy and standards must consider this fact.

Performance measurement is essential to the management of the high incidence rate of PUs. Clinical audits were integrated into the structure of the project. However, this approach of measurement requires resources that are not available at the unit level. It will be of great benefit if the hospital adopts an organizational wide audit program of key performance issues such as PU prevention. Furthermore, performance improvement must not rely on documentation audit. Lyder et al. (2001) found that 22.6% of the nurses in the intensive care units have documented that their patients are at high risk of pressure ulceration. However, only 7.5% applied preventive measures.

Clinical outcomes measurement can be optimize via integrating the ‘Trigger tool’ safety measurement methodology. As stated earlier, this approach of measurement was found to be effective in revealing adverse events that are not captured by the traditional reporting methods.

Individuals always find it difficult to give up old habits. Therefore, significant number of change projects reverts to the status quo. The new practice and behaviors that were introduced with the implementation of the PUPP must be sustained for a prolonged time before it is enculturated into the unit routine and culture. Assigning a PU champions and regular staff updates with the unit outcomes contribute to maintaining the momentum of change.

Finally, regular revision and update of the PUPP elements is crucial to keep the PUPP updated with the best evidence. Such revision may be done every one to two years.

5.6 Limitations
The entire implementation process was in CCU. Thus, the unit nurses had a total control of the process. While in surgical intensive care units, the process of prevention starts in the operating room and the characteristics of preventive measures are
different. Hereby, the PUPP protocol cannot be generalized unless the individual units modify its components to fit their patients' clinical conditions.

PUs are not always a result of pressure on bony prominences. In the intensive care units, medical devices may apply pressure on different body parts. For example, PU may result from endotracheal tubes. Such events require different preventive measures that are not included in the PUPP.

The evaluation time of the PUPP is too short for the outcomes to materialize. Therefore, it is premature to judge the effectiveness of the project. Full four quarters are the minimum period required to make a sound inference of the data.
REFERENCES


Little, M. O. (2013). Nutrition and skin ulcers. *Current Opinion in Clinical Nutrition and Metabolic Care, 16*(1), 39–49. doi:10.1097/MCO.0b013e32832bc0a1


Appendices

Appendix-1: Fairness Algorithm, adapted from Reason’s “Unsafe Act Analysis” Algorithm.
# APPENDIX-2: PRESSURE ULCER PREVENTION PROTOCOL

## PROTOCOL ELEMENTS

<table>
<thead>
<tr>
<th></th>
<th>Protocol Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comprehensive skin assessment within <strong>four hours</strong> of admission.</td>
</tr>
<tr>
<td>2</td>
<td>Pressure ulcer risk assessment is every <strong>24 hours</strong>.</td>
</tr>
<tr>
<td>3</td>
<td>Wound care consultation within the <strong>first day shift</strong> after admission.</td>
</tr>
<tr>
<td>4</td>
<td>Check incontinence pad <strong>every 2-3 hours</strong>. Apply protective Spray and oil based cream to the perineal area after <strong>EVERY change of the wet pads</strong>.</td>
</tr>
<tr>
<td>5</td>
<td>Consider rectal tube for fecal incontinence and loose bowel motion.</td>
</tr>
<tr>
<td>6</td>
<td>Document any skin breakdown in daily nursing record and ‘safety reporting system’.</td>
</tr>
<tr>
<td>7</td>
<td>Refer to dietician on admission.</td>
</tr>
<tr>
<td>8</td>
<td>Place the patient on air mattress or use bed with air mattress.</td>
</tr>
<tr>
<td>9</td>
<td>Change patient position <strong>Every 1-2 Hour</strong>. The patient must be turned at <strong>30-45 degrees</strong>.</td>
</tr>
<tr>
<td>10</td>
<td>Elevate Heels using soft pillows.</td>
</tr>
<tr>
<td>11</td>
<td>Use minimum of two nurses to slide the patient in the bed.</td>
</tr>
<tr>
<td>12</td>
<td>Use sliding sheets to minimize friction and shear.</td>
</tr>
<tr>
<td>13</td>
<td>Keep bed linens clean, dry, and wrinkle free. Don't use excessive linens.</td>
</tr>
<tr>
<td>15</td>
<td>Use pillows between knees and bony prominence to avoid friction and direct contact.</td>
</tr>
<tr>
<td>17</td>
<td>Apply moisturizing cream <strong>TWICE</strong> per day and <strong>AFTER</strong> bath.</td>
</tr>
<tr>
<td>18</td>
<td>Use packed cleaner wipes (Chlorhexidine based) for general hygiene.</td>
</tr>
<tr>
<td>19</td>
<td>Elevate the head of the bed no more than 30 degrees unless the patient is ventilated, maintain 30 degrees.</td>
</tr>
<tr>
<td>20</td>
<td>Use soft pillow to position the patient.</td>
</tr>
<tr>
<td>21</td>
<td><strong>Ambulate the patient when possible” Provide justification if not possible.”</strong></td>
</tr>
</tbody>
</table>
## APPENDIX-3: PROJECT IMPLEMENTATION TIMELINE

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Wk 1,2</td>
<td>Wk 3,4</td>
<td>Wk 1,2</td>
<td>Wk 3,4</td>
<td>Wk 1,2</td>
<td>Wk 3,4</td>
</tr>
<tr>
<td>Analysis of the current situation</td>
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<tr>
<td>Brainstorming session</td>
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</tr>
<tr>
<td>Literature review</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>PUPP elements development</td>
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<td></td>
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<td></td>
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<tr>
<td>PUPP finalization and approval</td>
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</tr>
<tr>
<td>Braden Scale education</td>
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<tr>
<td>Protocol education</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Manual &amp; Handling training</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Protocol implementation</td>
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</tr>
<tr>
<td>Practice Measurement</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Outcome measurement</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse’s interview</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
# CLINICAL AUDIT CRITERIA

## PUPP AUDIT CRITERIA CCU

<table>
<thead>
<tr>
<th>#</th>
<th>TASK</th>
<th>DATA SOURCE</th>
<th>COMPLIANCE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comprehensive skin assessment is done within 4 hours of admission to the unit.</td>
<td>(EMR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Braden Scale assessment is done every 24 hours of admission to the unit.</td>
<td>(EMR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>All skin breakdowns are documented on admission.</td>
<td>(EMR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Wound care nurse is consulted on the first day duty after admission.</td>
<td>Patient’s file</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Dietician is consulted on admission.</td>
<td>(EMR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Intact skin is moisturized.</td>
<td>(EMR), supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Chlorhexidine hygiene pads are used for cleaning.</td>
<td>Bedside supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Head of the bed is elevated no more than 30 degrees.</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Patient is ambulated.</td>
<td>Nurse interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bed linens are dry, intact, and wrinkle free.</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Protective spray and barrier cream are used after cleaning personal area.</td>
<td>Assessment/ Supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Patient position is being changed every 1-2 hours.</td>
<td>EMR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Rectal tube is used for patients with loose bowel motion.</td>
<td>Nurse interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Patient is on air mattress.</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Nurses are using sliding sheets (red sheets).</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Nurses are checking incontinent patient every 2-3 hours</td>
<td>Staff interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Patients are placed 30-45 degree when turned to either side.</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Soft pillows are used to position the patients and between popy prominence.</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Heels are elevated.</td>
<td>Observation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX-5: CASE STUDY SCENARIO NUMBER 1.

**Braden Scale assessment case study 1**

A 74 years old female patient admitted to CCU with congestive heart failure, generalized edema, shortness of breath. Patient weight is 90 kg, and height is 155 cm. The initial laboratory tests show HB = 80 mg/dl and low albumin and have been NPO for the past 24 hours. The patient is dyspneic on sitting position to facilitate breathing. She is incontinent, alert and responsive. The patient tolerates ambulation on chair with assistance.

**SENSORY PERCEPTION**

| ☐ Completely Limited | ☐ Constantly Moist |
| ☐ Very Limited        | ☐ Very Moist       |
| ☐ Slightly Limited    | ☐ Occasionally Moist |
| ☐ No Impairment       | ☐ Rarely Moist     |

**ACTIVITY**

| ☐ Bedfast           |
| ☐ Chairfast         |
| ☐ Walks Occasionally |
| ☐ Walks Frequently  |

**MOISTURE**

| ☐ Constantly Moist |
| ☐ Very Moist       |
| ☐ Occasionally Moist |
| ☐ Rarely Moist     |

**MOBILITY**

| ☐ Completely Immobile |
| ☐ Very Limited        |
| ☐ Slightly Limited    |
| ☐ No Limitations      |

**NUTRITION**

| ☐ Very Poor         |
| ☐ Probably Inadequate: |
| ☐ Adequate          |
| ☐ Excellent         |

| ☐ Problem           |
| ☐ Potential Problem |
| ☐ No Apparent Problem |
**APPENDIX-6: CASE STUDY SCENARIO NUMBER 2.**

Braden Scale assessment case study 2

75-year-old male with heart failure, Alert and oriented, Height 180 cm, Weight 73 kg, Spends most of the day in bed. Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently. Occasionally slides down to foot of bed, requiring some assistance to move back to the top. Able to walk a short distance to the chair with assistance, Incontinent of stool, Continent of urine – uses urinal as needed, Skin occasionally moist from incontinence, Hgb = 8.5, Serum Albumin 3.1

<table>
<thead>
<tr>
<th><strong>SENSORY PERCEPTION</strong></th>
<th><strong>MOISTURE MANAGEMENT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Completely Limited)</td>
<td>1 (Constantly Moist)</td>
</tr>
<tr>
<td>2 (Very Limited)</td>
<td>2 (Very Moist)</td>
</tr>
<tr>
<td>3 (Slightly Limited)</td>
<td>3 (Occasionally Moist)</td>
</tr>
<tr>
<td>4 (No Impairment)</td>
<td>4 (Rarely Moist)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ACTIVITY</strong></th>
<th><strong>MOBILITY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Bedfast)</td>
<td>1 (Completely Immobile)</td>
</tr>
<tr>
<td>2 (Chairfast)</td>
<td>2 (Very Limited)</td>
</tr>
<tr>
<td>3 (Walks Occasionally)</td>
<td>3 (Slightly Limited)</td>
</tr>
<tr>
<td>4 (Walks Frequently)</td>
<td>4 (No Limitations)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>NUTRITION</strong></th>
<th><strong>FRICTION AND SHEAR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Very Poor)</td>
<td>1 (Problem)</td>
</tr>
<tr>
<td>2 (Probably Inadequate)</td>
<td>2 (Potential Problem)</td>
</tr>
<tr>
<td>3 (Adequate)</td>
<td>3 (No Apparent Problem)</td>
</tr>
<tr>
<td>4 (Excellent)</td>
<td></td>
</tr>
</tbody>
</table>