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Improving Identification of Surgical Site Infections in a Skilled Nursing Facility

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Table of Contents

Pages

Abstract……3

Introduction……..5

Problem description…….….5-6

Literature review…….…..6-8

Rationale……...……..8-10

Aim……..…..10

Methodology…….…10-15

Intervention……..……..15

Measures……..…..16

Ethical Consideration……..…...16

Results ……..……17-19

Discussions…….……..19-21

References……..……..22-24

Appendix……..……25-58

A Evaluation table……..…..25-27

B Clinical Microsystem Assessment Tool……..……28-29

C Bates-Jensen Assessment Tool and Guidelines……...…….30-31

D Pre- and post-test sample……...……...32-33

E Pre- and post-test scores…….....34

F Run chart…….....35

G Return on investment…….....36

H SWOT analysis…….....37

I PDSA…….....38

J Project timeline……..….....39

K John Hopkins Research Evidence Appraisal Tool……...40-43

L Driver diagram…….....44

M Fishbone diagram……..….....45

N Learning theories…….....46

O Project charter…….....47-58

P Evidence-Based Change of Practice Project Checklist……..59

Improving Identification of Surgical Site Infections at a Skilled Nursing Facility

Abstract

Educational deficit in basic wound assessment can lead to failure to recognize early signs of infection or wound deterioration. Despite many challenges towards wound care, there are potential opportunities to reduce patient injury and clinical outcomes through continuing education. The purpose of this paper is to review literature on current wound care knowledge in nurses and assess existing wound care knowledge in nurses at a skilled nursing facility. A 10-question pre-test wound assessment quiz based on the Bates-Jensen Wound Assessment Tool (BWAT) selected by the Wound Care Coordinator (WCC)/Wound Care Specialist (WCS) was given to 22 nurses: 5 Registered Nurses (RN) and 17 Licensed Vocational Nurses (LVN) working at this SNF. Results showed that only 13% (3) scored higher than 75%. Additional clinical education was provided according to knowledge deficits. A post-test was then given with the same questions as the pre-test. Results showed that 77 percent (17) scored equal or higher than 97%, and 22.7 percent (5) scored 77 percent. There was an increase of 32 percent in correctly answered questions. This shows that education has a significant impact on enhancing clinical knowledge.

Introduction

Delivery of wound care in many Skilled Nursing Facility (SNF) remains variable and fragmented (Petrone, Nolan, & Mathis, 2014). Surgical site infections (SSI) are serious complications that can cause adverse outcomes and medical waste, such as prolonged hospital stays, increase risks of antibiotic resistance, and death (Ding, Lin, & Gillespie, 2016). The challenges in complex wound care involves practitioners to develop clinical knowledge and skills that identify populations that are vulnerable to developing wound complications (e.g.

comorbid diabetes, venous insufficiency, protein malnutrition, obesity, limited mobility, etc.). Other approaches include initial and ongoing direct wound assessments which provides baseline information which progress or deterioration can be monitored, set goals, and select appropriate treatments. If assessment is not performed correctly, wounds can suffer from delayed healing or complications related to inappropriate wound care. There is an increasing need of surgical wound assessment and documentation to reduce SSI associated complications.

Problem description

Surgical site infection(s) (SSI) are one of the most preventable hospital acquired infections (HAI), however they still have a significant impact on patient morbidity and mortality as well as additional costs. It is associated with one-third of post-operative deaths (National Collaborating Centre for Women's and Children's Health, 2008). SSI can also be a reflection of substandard care in the eyes of the public. Between 2006 and 2008, SSI was ranked as the second most reported HAI (World Health Organization, 2018). It also has a correlation with prolonged hospitalization, additional diagnostic tests, therapeutic antibiotic use, and additional surgery. To investigate the costs of SSI, a study used the 2005 hospital stay data from the US Nationwide Inpatient Sample found that extra hospital stays per admission that was attributed to SSI was 9.7 days with an additional cost of US $20,842 - on a national scale, that is an additional US $900 million in health care spending (World Health Organization, 2018). Between January and September 2019, this facility had an incidence four SSI, with the approximate cost of $80,000.

Although there are no national benchmarks or aim objectives on nurses' level of wound care knowledge, there is an increasing awareness of wound deficit in nurses (Corbett, 2012). Nonetheless, the success of this study will be compared to a survey undertaken at 2015 Wound

Expo to assess the knowledge of wound infection in frontline healthcare providers. Participants included 33 health professionals from National Health Service (NHS), 26 from NHS hospitals, 8 from nursing or care homes. 7 from private hospitals, and 27 employed in "other" professions (Hughes, 2016). This particular survey was chosen as the control due to the similarity of the questions that is used in the pre- and post-tests given at this SNF, such as recognition of physical changes in wound infection. Results from the survey found that good knowledge (90%) was found in correctly identifying the symptoms of localized wound infection. Comparably, the mean score at this SNF is 60%, demonstrating a gap in wound care. There needs to be a greater focus on reflective practice in wound care, with a focus on wound assessment in day-to-day care and educational opportunities.

Literature Review

Databases including CINHAL, NCBI, SigmaPubs, Medline, and AHRQ were searched using keywords 'nursing wound care knowledge deficit' AND 'wound care education in nursing programs' AND 'nursing wound infection identification' AND 'lack of wound care knowledge in nurses' AND 'lack of wound care education in skilled nursing facilities' AND 'need for wound care education for nurses' AND 'learning theories' AND 'infection prevention nursing'. The goal of this project is to understand if providing wound care education for staff nurses increase SSI identification capabilities. See Appendix A for literature summary.

The majority of general nurses do not have the level of expertise of a Wound Care Specialist (WCS) or a Wound Care Nurse (WCN). Ashton and Price (2013) found that nurses lack knowledge of wound management and feel unprepared to perform wound care, especially when newly licensed. This can be attributed to poor education during nursing education; hence it is not surprising that many nurses scored below 75% on the pretest. Famakinwa et al (2014)

surveyed nurses' knowledge on the surgical unit regarding post-operative wound care and found that 60% of nurses had poor knowledge of infection prevention. In the same article, authors found that nurses who migrate from units without given adequate time to acquire knowledge and skills were only equipped with the basic information on infection control measures (Famakinwa, Bello, Okhiah, & Nwadike, 2014).

Ayello et al (2005) published a survey on nurses' wound care knowledge and sufficiency of chronic wound education in nursing education programs using a questionnaire completed by 692 nurses. Only 30% of nurses believed they received sufficient wound care education, while younger but less experienced nurses felt more confident in their level of wound care education. Labeau et al (2010) conducted a cross-sectional questionnaire survey using a 10-multiple choice survey of 650 Intensive Care Unit (ICU) nurses on Center for Disease Control and Prevention's (CDC) guidelines on SSI prevention, and resulted the mean score of 29%, concluding there are opportunities to improve knowledge about SSI identification and prevention to improve quality of care.

Ongoing professional development demonstrates a nurses' commitment to their patients and profession to provide safe and contemporary care. McCluskey and McCarthy (2012) found that nurses' general knowledge are enhanced with increased number of wounds treated per week and when they had updated their knowledge in the previous two years. When there is an effective system-level intervention that focuses on SSI prevention, such as standard surveillance, assessment protocols, and tracking of infection rates over time, it has shown to successfully reduce SSI (Patient Safety Network, 2019). Sadfar and Abad (2008) performed a study on different educational programs assessing their effects on health care associated infections

(HCAIs)s. The found that the effect of education was apparent and significant decrease in infection rates after the intervention.

Due to the associated mortality risk between HAI and SSI, it is imperative to address the importance of accurate surgical site assessment and documentation. Good assessment allows for early intervention. The National Institute for Health and Care Excellence (NICE) also recommends that continuous accurate assessment of wound guides appropriate medical treatment and identify problems during the healing process (Ding, Lin, & Gillespie, 2016). In Hughes survey of wound care knowledge in 33 frontline healthcare professionals who have completed their pre-registration education, concluded that there is a need for continuing education on aspects of wound infection identification and holistic treatments (Hughes, 2016).

Rationale

In a 2005 hospital data collected from the U. S. National Inpatient Sample, found that SSI contributed to an additional 9.7 days of hospitalization with an additional $20,842 annual expenditure. In 2008, the Centers for Medicare and Medicaid (CMS) halted reimbursements for claims associated with hospital acquired conditions (HAC); which includes pressure sores, hospital acquired infections (e.g. surgical sites, catheter-associated urinary tract infections, clostridium difficile infection, central-lie associated blood stream infection) (CMS.gov, 2010). SSI can no longer be claimed for reimbursement, therefore any additional costs associated with treatment will have to be paid by the facility. The cost to train each staff member is approximately $200 to $280 for four hours of in-service, two hours of completing the pre- and post-test, and one hour for tentative clinical guidance. That totals to approximately $5,789 to $6,360 on training the whole nursing staff for seven hours of in-service. See Appendix G for Return on Investment (ROI) breakdown. Conservatively speaking, if the facility only receives

one patient per year who develops an SSI, the facility would be saving more than $14,000 annually. The return on investment for this project is high.

In-service trainings for nurses are indispensable for improving quality patient care and outcomes. In an article that discussed successful education in nursing staff through empowerment, Chaghari et al (2017) found that empowering education model was composed of self-directed learning and practical learning. The authors also discussed the variable of learning models, such as fostering search skills, clinical performance monitoring, motivational factors, participating in design and implementation, and problem-solving approach (Chaghari, Saffari, Ebadi, & Ameryoun, 2017). In this project, constructivism learning theories from Bruner and Vygotsky informed the design of this project.

Jerome Burner believed students could learn more if they were given the appropriate guidance and resources – he called this framework instructional scaffolding like the ones used to construct buildings which allows for stronger structure be built within it (Lumen, n.d.). Similarly, students can be taught any subject effectively if they were given a strong support structure, helping them learn more. Another comparable learning theory was proposed by Lev Vygotsky, whose focus was on how a novice's thinking is influenced by others who are more capable, knowledgeable, or expert than the learner – he called this zone of proximal development (ZPD) (Lumen, n.d.). Vygotsky believed that when a child or novice is learning a new skill or solving a new problem, he or she can perform better if accompanied by an expert than performing the task alone (Lumen, n.d.). In both of these social constructivist learning, the novice is not really taught a new skill but rather allowed to learn and build knowledge from information that is already present. The in-service training will utilize Burner and Vygotsky's theories on teaching and

learning. Teaching will be led by facility's WCS and ongoing direct clinical mentorship will be provided.

Basic skin integrity and wound management are incorporated in most nursing programs, however, a nurses' competence in managing wounds is dependent on whether they are able to apply what they have learned previously ((McCluskey & McCarthy, 2012). The theory behind the developed interventions is to coach the learner – offering help and ways of practicing, but never doing the actual work themselves. By providing new nurses with continual experienced guidance, it makes it possible for the novice nurse to transfer his or her knowledge into the clinical settings.

Aim statement

The goal of this project is to improve nursing surgical site assessment for infection to a mean score of 90% with the ability to identify odor, localized warmth, induration, tenderness, and erythema by December 1, 2019 (see appendix L).

Methodology

This facility is part a company that has multiple long-term care (LTC) facilities across the nation. This facility is a mixture of post-acute care, offering physical therapy (PT), occupation therapy (OT), speech therapy (ST), intravenous medication administration (e.g. antibiotics), and complex wound care. 90-beds are dedicated to short-term care patients who requires PT, OT, ST, or complex sound care; and 90-beds are for long-term care and hospice patients. Patient population group is 40 percent Caucasian, 20 percent Black-American, 20-percent Asian, and 20-percent Hispanic. 25-percent of our newly admitted patients are chronically homeless with past medical history of substance abuse and mental illness. 75 percent of patients have Medicare, 10% have Kaiser, and 15 percent have either Medical, or Medical and Medicare. This facility

receives 75% of its patients from Saint Francis Memorial Hospital (SFMH); 10% from Kaiser San Francisco, and 10% from Sutter Health, Veterans Association (VA), and University of California San Francisco (UCSF).

Faculty is composed of greater than 75 percent who identifies with Filipino culture or heritage; 10 percent who identifies with Chinese heritage; and 15 percent who identifies with either Russian or Hispanic heritage. There is a total of 22 licensed nurses - five Registered Nurses (RN) and 17 Licensed Vocational Nurses (LVN), and 51 Certified Nursing Assistants (CNA). Individuals who identify with same ethnic background tends to become a cohesive group. This causes the member of the groups to help each other when needed and support each other in the process of learning a new skill. A weakness of this nursing staff group is the average age of nursing staff is 42, with the youngest being 22 and the eldest being 63. Age was noted to play a key factor in some of the resistance observed during the implementation of this project. This can be attributed to lack of technology knowledge to access new information, habits that has been developed over years, and sonority in a professional setting.

According to Institute for Healthcare Improvement (IHI), there are 10 key success characteristics of high -performing microsystems. This includes leadership, organizational support, staff focus, education and training, interdependence, patient focus, community and market focus, performance results, process improvement, and information and information technology. A Clinical Microsystem Assessment Tool (CMAT) (Johnson, 2001) was used to assess the work environment and readiness for change. See Appendix B for complete assessment chart.

After completing the CMAT, it was noted that there was there was strong leadership and tracking of performance results. Mediocre organization support for education, training, staff

focus, process improvement, and information technology. Finally, there was a lack of interdependence, community and patient focus. The administration has shown constancy in purpose, established clear goals and expectations of staff, as well as fostering a culture for learning. Although staff development department organizes weekly staff in-service, it is mainly focused on past faults to required correction, instead of foreseeing potential problems and providing education to prevent them.

This facility is part a company that has multiple long-term care (LTC) facilities across the nation. This facility is a mixture of post-acute care, offering physical therapy (PT), occupation therapy (OT), speech therapy (ST), intravenous medication administration (e.g. antibiotics), and complex wound care. 90-beds are dedicated to short-term care patients who requires PT, OT, ST, or complex sound care; and 90-beds are for long-term care and hospice patients. Patient population group is 40 percent Caucasian, 20 percent Black-American, 20-percent Asian, and 20-percent Hispanic. 25-percent of our newly admitted patients are chronically homeless with past medical history of substance abuse and mental illness. 75 percent of patients have Medicare, 10% have Kaiser, and 15 percent have either Medical or Medical and Medicare.

This facility receives 75% of its patients from Saint Francis Memorial Hospital (SFMH); 10% from Kaiser San Francisco, and 10% from Sutter Health, Veterans Association (VA), and University of California San Francisco (UCSF). Our number one admitting diagnosis is hip fracture with hip replacements, accounting from greater than 60-percent of our newly admitted population. 25-percent with diabetic foot wounds or vascular wounds, and 15% with other needs. Our physician group is associated with SFMH, hence the reason why this facility receives their majority of referrals from SFMH.

The nursing staff is composed of greater than 75 percent who identity with the Filipino heritage, with 10 percent identifying with Chinese heritage and 15 percent who identifies with either Russian or Hispanic heritage. One Director of Nursing (DON) two Assistant Dean of Nursing (ADON), two infectious disease (ID) nurses, 22 licensed nurses – five RNs and 17 LVNs; and 51 Certified Nursing Assistants (CNA). Individuals who identify with same ethnic background tends to become a cohesive group. This causes the member of the groups to help each other when needed and support each other in the process of learning a new skill. A weakness of this nursing staff group is the average age of nursing staff is 42, with the youngest being 22 and the eldest being 63.

Assistant Dean of Nursing (ADON), two infectious disease (ID) nurses, 22 licensed nurses – five RNs and 17 LVNs; and 51 Certified Nursing Assistants (CNA). Individuals who identify with same ethnic background tends to become a cohesive group. This causes the member of the groups to help each other when needed and support each other in the process of learning a new skill. A weakness of this nursing staff group is the average age of nursing staff is 42, with the youngest being 22 and the eldest being 63.

A Strength- Weakness-Opportunities-Threats (SWOT) analysis was performed to assess clinical microsystem (See Appendix H). In past in-services, it was noted that new information is rarely transferred into practice. may be attributed to lack of motivation to change old behavior, failure to appreciate the importance of evidence-based practice, lack of understanding of the new knowledge or skill, or lack of mentorship to apply the new skill clinically. There is also an inadequacy of wound care participation from the nursing staff, and a strong reliance on the wound care team to assess and report possible wound infection or complications. However, in most cases when a nursing staff is approached about a specific problem in-person about why

their actions may lead to adverse patient outcomes; what they can or should do to correct their actions; and how the correct actions can benefit the patient, the staff is more inclined to change their behavior. Nevertheless, this has to do with factors other than readiness to learn, but also personality and cultural backgrounds. Some nursing staff are more resistant to changing current behaviors or feel people who are younger and less experienced should not be teaching them how to perform their job. This can be a threat to successfully fostering an environment for evidence-based practice.

To develop a strategy for delivering this idea to the administration, a Plan-Do-Study-Act (PDSA) was utilized (see Appendix I). The first cycle of PDSA included brainstorming areas of knowledge deficit with nursing staff and WCS, testing existing wound care knowledge, educating staff, and repeated testing for effectiveness of education. After a plan was made, it was discussed with the administrators – Director of Nursing and Director of Business. Our set timetable was five weeks; one week for planning education programs and gathering tools, and four weeks for training (see appendix J). Assessment of knowledge will be evaluated with of pre- and post-tests. In-service will be done in increments of 1-week, with every week being a different topic. The in-service will be delivered in a blended approach using power-point presentations, printed guides that serves as a reference during clinical practice, and one-on-one teaching sessions if post-test score is below 80 percent.

Interventions

After the Director of Nursing Services (DON) reviewed the plan and required hours of overtime, it was further discussed with the Director of Business for approval. After approving of project, a conference was held with the DON, Assistant DON, Director of Business, Director of Staff Development and how the in-service will be delivered. There were discussions of deficit of

knowledge based on previous charting of wound and delayed reporting of infections; and what this improvement project is aimed to achieve. The wound care team presented an outline of what each week's in-service will be presented on – focusing on assessing the wound, documentation, creating care-plans. The Director of Staff Development notified all nurses about the in-service and worked together to develop a lesson plan with the wound care team. Five patients with surgical sites were asked to participate in the learning process for the pre-test and four have agreed. One had total knee replacements, and three with hip replacements. Three patients were within one week of post-operative date, and one was within 2 weeks of post-operative date.

Every staff member was notified of mandatory in-services that will be in place for the next month and a pre-test will be given. After the results were tallied, the wound care team delivered the educational lessons. The in-service was held 3 times a week to cover all shifts and different schedules. Morning shift nurses attended lessons after their shift at three o'clock after giving report. Evening shift nurses arrived an hour early before their shift at two o'clock. Night shift nurses attended the in-service after their shift at eight o'clock after giving report and completing appropriate charting. The lessons were delivered in power point with pictures and were given an outline or guides to highlight the important points. The guides can also serve as a reference during clinical practice. A sample of the guide can be found in Appendix C.

Measures

A pretest consisting of 10-questions taken from the BWAT to establish baseline SSI knowledge. This included location; measuring size of wound; depth; edges; necrotic tissue type; necrotic tissue amount; exudate; skin color surrounding wound; peripheral edema and induration; and epithelialization complete pre-test can be found in Appendix D. Morning and evening shift was to take the exam after and before their shift, prospectively – total of 15 nurses. They were

permitted to stay an hour late or an extra hour early after or before their shift. Four were assigned per patient and were given as much time as they need to complete the assessment tool. 7 night shift nurses were to stay an extra hour late after their shift to complete the task. A post-test was then given after four-weeks of in-service. Same questions were given. Five new patients with surgical incisions agreed to participants; three patients had total knee replacements within one week of post-operative date; one had abdominal surgery within four days -post-operatively, and one with hip replacement within two weeks post-operative date.

Ethical considerations

Upon reviewing potential breach of privacy or ethics, none was found or indicated. The participants for the pre- and post-test was voluntary and understood their objection will not affect their general or wound care in any way. Participants whose language preference was not English, a tele-language line was utilized to explain the process and their right to refuse. 9 of 10 patient agreed to allow three to four nurses to asses and palpate their wound. Some ethical concerns while caring for patients in long-term care facilities are autonomy (informed consent), futility of treatment, and limited resources. Often times, patients are prescribed orders by physicians that does not provide maximum effect or there is a lack of nursing resources in terms of time. Other times, patients are given treatment they did not give informed consent to such as medication they receive.

Results

A total of seven articles on wound care knowledge in nurses were reviewed and concluded there was a deficit in wound care knowledge in nurses in addition to gap between transfer of new or existing knowledge into clinical practice. 22 full time and part-time nurses were tested on their knowledge of surgical site assessment before and after education using a 10-

question test based on the BWAT that this facility currently utilizes (see appendix D for a sample of the test). Collection, assessment and analysis of data was performed by this author. The project was initially focused on “reducing surgical site infections” and was then changed to “improving surgical site infection assessment”. This was partly due to the facility being post-acute and skilled nursing facility, where pre- and intra-operation surgical site infection prevention care does not occur, therefore not relative to this clinical site. The questions for the test was revised twice to incorporate existing evaluation forms for clinical site relevance. The cost of this project was said to be appropriate by the Director of Business, as he said identification of surgical complications are important part of quality care.

Success of the project is determined by whether the average score was 90 percent. The pre-test score was listed according to the greatest number of correctly answered questions to the least number of correctly answered questions, and the post-test score was matched up to each individual’s pre-test score for comparison (see Table E2). In the pre-test, three nurses scored on average 83 percent, nine scored on average 67 percent, and 10 scored on average 48 percent; average of 67% (see Table E1). In the post-tests, it was found that 17 nurses scored on average 97.6 percent and five scored on average 77 percent; average of 92.7 percent. The improvement project increased assessment skills of surgical sites by 25.7 percent (see Appendix E and F). It was observed that 17 nurses have improved their scores from a score range of five to eight to a score range of nine to ten (see table E2). Post-test results were higher than anticipated. The participants who scored below eight received additional one-on-one clinical mentorship from the WCS or this author. It was difficult to coordinate time for clinical teaching due to a few of them worked night shifts and many of them needed time after their shift ends to finish charting.

It was observed that most of the nurse with the higher pre- and post-test scores worked in the morning or evening shifts (7 a.m. to 11 p.m.). The wound care team works between 7 a.m. and 7 p.m., therefore there was a greater overlap of work hours among the wound care team, morning and evening shift nurses, hence increasing time of collaboration when compared to night shift nurses who works between 11 p.m. to 7 a.m. In addition, nurses who work morning and evening shifts have more clinical experience (> one year) as well as more opportunities to perform wound assessment related to patient's complaint, doctor's rounding or return from surgical appointment, when compared to nigh shift nurses (<6 months) who work when patients are asleep. Level of education was not evaluated as part of level of wound care knowledge as there was a variety of education and nursing clinical level. To which wound are knowledge can be accounted for, cannot be clearly identified from a small sample population.

During the initial phase of implementing the project, there was strong resistance related to more time-consumption on an already tight work schedule, as well as the one-hour in-service that was given either before or after the work shift when staff are exhausted or anxious for the workday. After the in-service education was initiated, there was a change in attitude; staff were noted to be more inclined to complete weekly skin alteration reports (WSAR). which were highly neglected prior to this project. This is hypothesized to be due to staff not knowing how to measure and describe a wound which can be a disincentive to not completing evaluation forms. It was also observed that there was more participation in initiating wound care by the nursing staff, while in previous times nurses waited until the next day for the wound care team to implement treatment.

Discussion

The necessity for quality improvement permeates all health care settings. The goal of quality care improvement initiative is to provide services to individuals and population to increase the desired health outcomes which are consistent with contemporary professional knowledge. Some aspects of the CNL role includes design, coordination, and evaluation of care for individuals or populations; synthesize data and evidence to evaluate and achieve optimal outcomes; and team leadership and team collaboration (American Association of Colleges of Nursing [AACN], 2013). The aim of this project was to improve nursing assessment of SSI and prompt early medical intervention due to related mortality risks. The Affordable Care Act of 2010 (ACA) requires health professionals to provide quality, patient-centered care, Therefore, there is an implication for nurses to shift their focus to preventing adverse events such as hospital acquired-infections. To accomplish this, nurses must adopt contemporary evidence-based practice.

No national benchmark was set for wound care knowledge in nurses; and reducing surgical site infection rates was not directly applicable to this facility because as previously discussed, this facility serves as a continuing health services facility where pre- and intra-operative infection prevention does not take place. In addition, majority of SSI prevention tactics provided by CDC were aimed at pre- and intra-operation. Instead, the benchmark was set at an average of 90 percent which were the results of a survey performed at an international wound care expo in 2015 with the participation of 93 frontline healthcare providers from public and private healthcare sectors. This was also chosen as a benchmark because of the questions that was used on the survey: identification of infection in wounds evidenced by localized warmth, induration, color of skin surrounding wound, odor, and drainage characteristics. Results from the

faculty at this facility indicated there was a 25.7 percent increase in average scores (67 percent in pre-test and 92.7 percent in post-test) after education on signs of infection, anatomical location identification, and appropriate adjectives to describe wound was completed.

After the final phases of the project and the administration was presented with the results, the administration, wound care, and nursing team hoped to sustain the change and possibly implement new change projects in the future. However, sustainability of change is difficult with high turnover rates that are typical in SNFs. Up to 70% of organizational change and up to 33% quality improvement projects are not sustained upon 1 year after completion (Silver et al, 2016). One of the major challenges is to continue the work after initial enthusiasm for the project has dissipated as a result of loss of "original" personnel that spearheaded the projects, change in administration with different objectives, and new employees with gaps in clinical experience to realize the importance of previously implemented changes.

To establish permanent change, senior leadership management needs to be involved to facilitate clinical process reform. Unlike staff nurses, the wound care nurses move around the different units like nomads and does not have a permanent unit, hence there were no strong colleague relationship with the staff of each unit. Notably, the Unit Manages (UM) of each unit have worked at this facility for more than two years and have relatively strong relationship with the nurses they lead. They also have expressed their enthusiasm towards quality improvement changes. Their leadership position, their receptiveness to change, and their relationship with staff all were advantages to sustaining change. The successful participation of faculty required the enlistment of their help to audit continuous implementation of frequent surgical site assessment and prompt reporting of complications. Permanent changes will require extended observation for

at least a year and continuation of monthly in-service by the WCS to train newly hired nurses to compensate for the high turnover rates and ensure appropriate clinical process becomes habitual.

In conclusion, the first phase of PDSA was successful and demonstrated possibility for improving quality of nursing care in a SNF. However, the transferability of this project is dependent on the availability of supportive staff as well as a well-established wound care program, and availability and experience of the WCS or Wound Care Nurse (WCN). For example, this facility's sister location unfortunately does not have wound care team and lacks the skeleton of an organized wound care program, hence hypothesized to affect the viability of the project if were to be implemented in that setting that lacks supportive (WCS/ WCN) and main structures (wound care program). Nonetheless, the structure of this project can be used in other improvement projects with necessary resources available.

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Appendix A

Table A1 Evaluation Table

PICO question: In a skilled nursing facility (P), in-service training (I) will increase nurses ability to identify surgical site infections (O).

Citation	Conceptual framework	Design/ method	Sample/ setting	Variable studied and definitions	Measurement	Data analysis	Findings	Appraisal. Worth to practice.
Ayello, Sharon & Salati (2005)	None	Survey	Sample total: 692 ICU nurses Setting: survey published in the *Advances in Wound Care* in the United States and Canada	Independent variable: years of experience as a nurse Dependent: wound care knowledge, level of wound care education	Measurement of knowledge in wound care; sufficient or insufficient wound care education in nursing school	Surveys were reviewed and analyzed by associates	30% felt they received sufficient education in nursing. Younger and less experienced nurses felt more confident in their level of wound care education	Strength: 692 nursing professionals . Author is an accredited expert in wounds and serves as the co-director of International Interdisciplinary Wound Care Course. This study is rated as LV A using the Johns Hopkins Evidence Based Practice appraisal tool (JHEBP)
Chaghari, Saffari, Ebadi, & Ameryoun (2017)	None	Quantitative study Purpose: to design an optimal learning model for training nurses	Sample size: 35 nurses, nursing managers, educational managers, ad hospital administrators Setting: Baghiatallah University of Medical Sciences	Independent variable: level of education previously received Dependent variable: self-directed learning, initiative in learning, practicality	Problems solving approach, design and implementation	Corbin and Strauss method, coded through MAXQDA-10	Empowering education through grounded theory increased participatory of nursing staff in planning and implementation, problem solving approach, and clinical performance.	Strength: members in nursing. Limitations: small number of participants, limited setting. This study is rated LIII using the Johns Hopkins Evidence Based Practice appraisal tool (JHEBP)
Ding, Lin, Gillespie (2016)	None	Integrative review Purpose: evaluate current surgical wound assessment	Sample: 188 articles, with 8 identified searching the reference list Setting: CINHAL, Cochrane,	6 articles were assessed by two of the review authors, a third review author adjugated	Recommendation around wound assessment and documentation	Quality assessment using a tool developed by Kmet et al. Total of 14 items on the tool with	There is limited research on acute wound assessment and documentation in nurses, and further	Limitation: the article is a secondary analysis of quantitative studies; none have used observations or describe

		and documentation practices of nurses	Medline, Proquest Nursing databases	where there were discrepancies in scores.		possible score of 28.	research is needed to provide evidence based practice for nursing wound assessment and documentation practices.	what is happening in clinical practice. Also, research articles were a mixture of different settings (acute vs. long term care facilities) which have different wounds. This study is rated as LIII B using the Johns Hopkins Evidence Based Practice appraisal tool (JHEBP)
Famakinwa, Bello, Oveniran, Kkhiah, & Nwadike (2014)	None	Cross-sectional descriptive survey. Questionnaire was self-developed	Sample size of 100 from a sample population of 133. 41 nursing officer II, 7 nursing officer 1, 13 senior nursing officer, 4 principal nursing officer, 7 chief nursing officer, 28 assistant director nursing service Setting Obafemi Awolowo University Teaching Hospital Complex	Independent variable: years of nursing experience, level of education Dependent variable: infection control knowledge	Post-operative infection, use of sterile dressing of incision sites sterilizing equipment	Collected, coded, organized, analyzed using statistical package for service solution version 16.	Personnel with higher educational degree are still limited in their infection prevention knowledge. Further postoperative wound infection and control is needed through education and training,	Limitations: setting in developing country, within a single hospital. This study is rated as LIII A using the Johns Hopkins Evidence Based Practice appraisal tool (JHEBP)
Hughes (2016)	None	Survey	Sample size of 101 frontline health professional. 33 from National Health Service, 26 from NHS hospital, 8 from nursing homes, 7	Independent variable: areas of expertise (podiatry, nursing, etc) Dependent variable: wound care knowledge on infection. Immune	ability to cognize signs of infection (erythema, localized warmth, induration, tenderness), identify immune responses, and treatment	Synthesis by the author	Trend of ritualistic wound care and that more ongoing education was required on the core aspects of holistic wound management.	Strength: large sample size from various settings; frontline health care professionals. This study is rated as LII B

			from private hospitals and 27 from "other" health professions	mechanisms and treatment options	options for anti-bacterial			
Labeau, et al (2009)	None	Cross-sectional questionnaire survey Purpose: survey the knowledge of nurses on CDC's recommendation on SSI prevention	Sample size of 809 ICU nurse in the United States, with greater than 1 year of clinical experience	Independent: years of experience Dependent: knowledge of SSI infection and control	10 multiple choice questionnaire on sterile dressing, cleansing of wounds, identification of infection	Expert assessment	Nurses mean scores on the knowledge test was 29%. This demonstrates opportunities exist for improving ICU nurses' knowledge about SSI prevention,	Strengths: large sample pool from various hospitals. Nurses with one year or more of clinical experience. This study is rated as LII A
McCluskey & McCarthy (2012)	None	Descriptive quantitative design Purpose: study the correlation between knowledge and competence in wound assessment and management in nurses	Sample size 150 general nurses Setting Cork University Hospital	Independent: years of clinical experience, updated wound care knowledge in the last 2 years Dependent: wound knowledge and wound assessment	Using researcher designed questionnaire	Authors reviewed and analyzed the data	Knowledge of wound assessment were very good. Significant correlation between knowledge and wound assessment competence when updated their wound care knowledge in the past 2 years.	Strength: large sample pool. Limitation: general nurses with other specialized units or settings. This study is rated as LII A

Appendix B

Figure B1 Clinical Microsystem Assessment Tool (CMAT)

CLINICAL MICROSYSTEM ASSESSMENT TOOL

Instructions: Each of the "success" characteristics (e.g., leadership) is followed by a series of three descriptions. For each characteristic, ***please check*** the description that ***best describes*** your current microsystem and the care it delivers *OR* use a microsystem you are *MOST* familiar with.

	Characteristic and Definition	Descriptions			
Leadership	**1. Leadership:** The role of leaders is to balance setting and reaching collective goals, and to empower individual autonomy and accountability, through building knowledge, respectful action, reviewing and reflecting.	☑ Leaders often tell me how to do my job and leave little room for innovation and autonomy. Overall, they don't foster a positive culture.	☐ Leaders struggle to find the right balance between reaching performance goals and supporting and empowering the staff.	☑ Leaders maintain constancy of purpose, establish clear goals and expectations, and foster a respectful positive culture. Leaders take time to build knowledge, review and reflect, and take action about microsystems and the larger organization.	☐ Can't Rate
Leadership	**2. Organizational Support:** The larger organization looks for ways to support the work of the microsystem and coordinate the hand-offs between microsystems.	☐ The larger organization isn't supportive in a way that provides recognition, information, and resources to enhance my work.	☑ The larger organization is inconsistent and unpredictable in providing the recognition, information and resources needed to enhance my work.	☐ The larger organization provides recognition, information, and resources that enhance my work and makes it easier for me to meet the needs of patients.	☐ Can't Rate
Staff	**3. Staff Focus:** There is selective hiring of the right kind of people. The orientation process is designed to fully integrate new staff into culture and work roles. Expectations of staff are high regarding performance, continuing education, professional growth, and networking.	☐ I am not made to feel like a valued member of the microsystem. My orientation was incomplete. My continuing education and professional growth needs are not being met.	☑ I feel like I am a valued member of the microsystem, but I don't think the microsystem is doing all that it could to support education and training of staff, workload, and professional growth.	☐ I am a valued member of the microsystem and what I say matters. This is evident through staffing, education and training, workload, and professional growth.	☐ Can't Rate
Staff	**4. Education and Training:** All clinical microsystems have responsibility for the ongoing education and training of staff and for aligning daily work roles with training competencies. Academic clinical microsystems have the additional responsibility of training students.	☐ Training is accomplished in disciplinary silos, e.g., nurses train nurses, physicians train residents, etc. The educational efforts are not aligned with the flow of patient care, so that education becomes an "add-on" to what we do.	☑ We recognize that our training could be different to reflect the needs of our microsystem, but we haven't made many changes yet. Some continuing education is available to everyone.	☐ There is a team approach to training, whether we are are training staff, nurses or students. Education and patient care are integrated into the flow of work in a way that benefits both from the available resources. Continuing education for all staff is recognized as vital to our continued success.	☐ Can't Rate
Staff	**5. Interdependence:** The interaction of staff is characterized by trust, collaboration, willingness to help each other, appreciation of complementary roles, respect and recognition that all contribute individually to a shared purpose.	☐ I work independently and I am responsible for my own part of the work. There is a lack of collaboration and a lack of appreciation for the importance of complementary roles.	☑ The care approach is interdisciplinary, but we are not always able to work together as an effective team.	☐ Care is provided by a interdisciplinary team characterized by trust, collaboration, appreciation of complementary roles, and a recognition that all contribute individually to a shared purpose.	☐ Can't Rate
Patients	**6. Patient Focus:** The primary concern is to meet all patient needs — caring, listening, educating, and responding to special requests, innovating to meet patient needs, and smooth service flow.	☐ Most of us, including our patients, would agree that we do not always provide patient centered care. We are not always clear about what patients want and need.	☐ We are actively working to provide patient centered care and we are making progress toward more effectively and consistently learning about and meeting patient needs.	☑ We are effective in learning about and meeting patient needs — caring, listening, educating, and responding to special requests, and smooth service flow.	☐ Can't Rate

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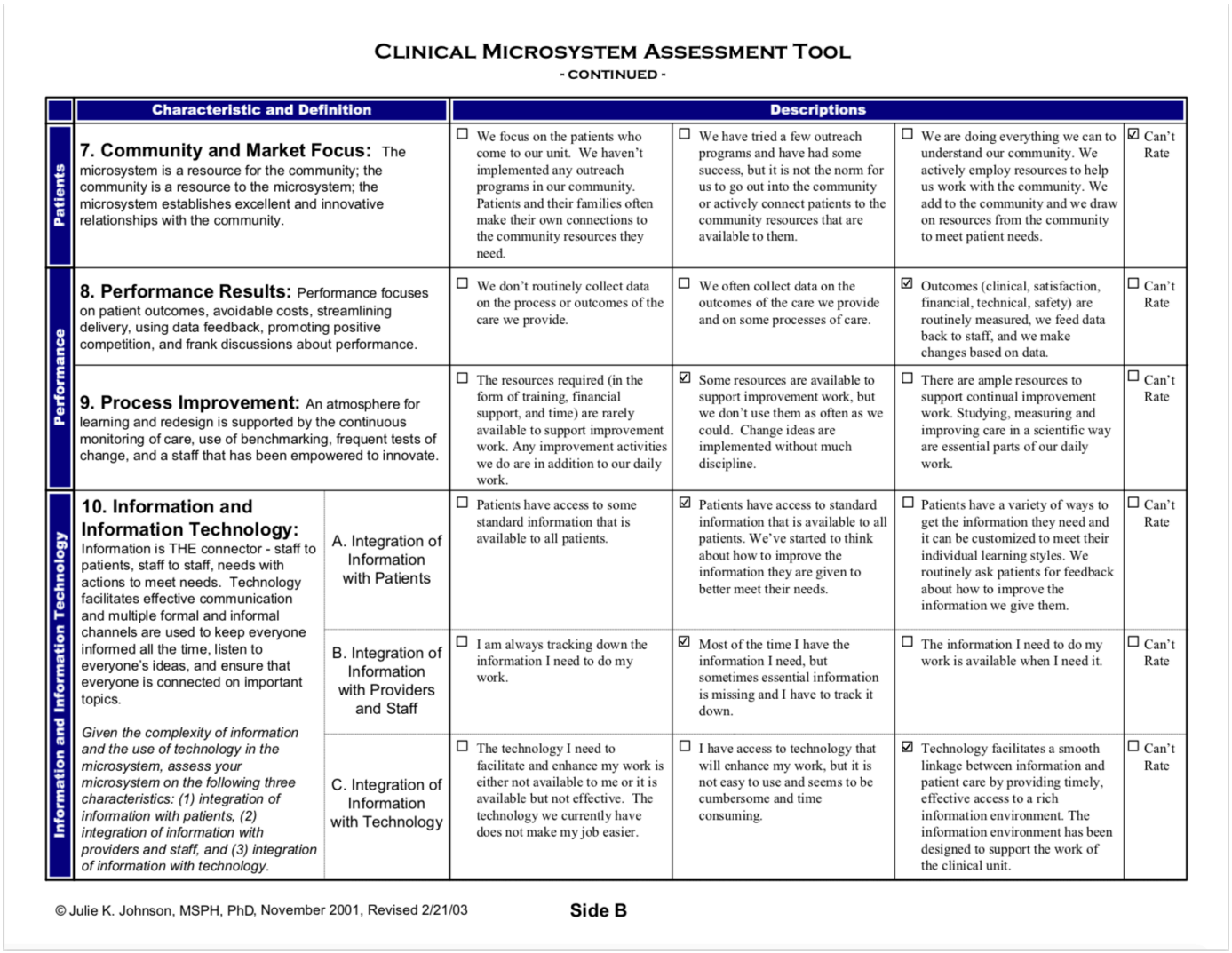
Side A

Please continue on Side B

Figure B2



CLINICAL MICROSYSTEM ASSESSMENT TOOL

- CONTINUED -

	Characteristic and Definition		Descriptions			
Patients	**7. Community and Market Focus:** The microsystem is a resource for the community; the community is a resource to the microsystem; the microsystem establishes excellent and innovative relationships with the community.		☐ We focus on the patients who come to our unit. We haven't implemented any outreach programs in our community. Patients and their families often make their own connections to the community resources they need.	☐ We have tried a few outreach programs and have had some success, but it is not the norm for us to go out into the community or actively connect patients to the community resources that are available to them.	☐ We are doing everything we can to understand our community. We actively employ resources to help us work with the community. We add to the community and we draw on resources from the community to meet patient needs.	☑ Can't Rate
Performance	**8. Performance Results:** Performance focuses on patient outcomes, avoidable costs, streamlining delivery, using data feedback, promoting positive competition, and frank discussions about performance.		☐ We don't routinely collect data on the process or outcomes of the care we provide.	☐ We often collect data on the outcomes of the care we provide and on some processes of care.	☑ Outcomes (clinical, satisfaction, financial, technical, safety) are routinely measured, we feed data back to staff, and we make changes based on data.	☐ Can't Rate
	9. Process Improvement: An atmosphere for learning and redesign is supported by the continuous monitoring of care, use of benchmarking, frequent tests of change, and a staff that has been empowered to innovate.		☐ The resources required (in the form of training, financial support, and time) are rarely available to support improvement work. Any improvement activities we do are in addition to our daily work.	☑ Some resources are available to support improvement work, but we don't use them as often as we could. Change ideas are implemented without much discipline.	☐ There are ample resources to support continual improvement work. Studying, measuring and improving care in a scientific way are essential parts of our daily work.	☐ Can't Rate
Information and Information Technology	**10. Information and Information Technology:** Information is THE connector - staff to patients, staff to staff, needs with actions to meet needs. Technology facilitates effective communication and multiple formal and informal channels are used to keep everyone informed all the time, listen to everyone's ideas, and ensure that everyone is connected on important topics. *Given the complexity of information and the use of technology in the microsystem, assess your microsystem on the following three characteristics: (1) integration of information with patients, (2) integration of information with providers and staff, and (3) integration of information with technology.*	A. Integration of Information with Patients	☐ Patients have access to some standard information that is available to all patients.	☑ Patients have access to standard information that is available to all patients. We've started to think about how to improve the information they are given to better meet their needs.	☐ Patients have a variety of ways to get the information they need and it can be customized to meet their individual learning styles. We routinely ask patients for feedback about how to improve the information we give them.	☐ Can't Rate
		B. Integration of Information with Providers and Staff	☐ I am always tracking down the information I need to do my work.	☑ Most of the time I have the information I need, but sometimes essential information is missing and I have to track it down.	☐ The information I need to do my work is available when I need it.	☐ Can't Rate
		C. Integration of Information with Technology	☐ The technology I need to facilitate and enhance my work is either not available to me or it is available but not effective. The technology we currently have does not make my job easier.	☐ I have access to technology that will enhance my work, but it is not easy to use and seems to be cumbersome and time consuming.	☑ Technology facilitates a smooth linkage between information and patient care by providing timely, effective access to a rich information environment. The information environment has been designed to support the work of the clinical unit.	☐ Can't Rate

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Side B

Appendix C

Guideline C1Bates-Jensen Assessment Tool and Guideline

General Guidelines

1. **Location:** Use correct anatomical location and direction. Medial, lateral, proximal, distal, anterior, posterior, ventral, dorsal, superior, inferior, superficial, deep

2. **Size:** use a disposable paper ruler to measure the longest and widest aspect of the wound surface in centimeters

3. **Depth:** Pick the depth, thickness, most appropriate to the wound

    - 1 = tissues damaged but no break in skin surface.
    - 2 = superficial, abrasion, blister or shallow crater. Even with, &/or elevated above skin surface (e.g., hyperplasia).
    - 3 = deep crater with or without undermining of adjacent tissue.
    - 4 = visualization of tissue layers not possible due to necrosis.
    - 5 = supporting structures include tendon, joint capsule.

4. **Edges:**
    - Indistinct =.unable to clearly distinguish wound outline
    - Attached = even or flush with wound base, no sides or walls present; flat
    - Not attached = sides or walls are present; floor or base of wound is deeper than edges
    - Rolled under, thickened = soft to firm and flexible to touch
    - Hyperkeratosis = callous-like tissue formation around wound & at edges
    - Fibrotic, scarred = hard, rigid to touch.
5. **Necrotic Tissue Type:** Use the necrotic tissue that is predominant in the wound according to color, consistency and adherence using this guide:
    - White/gray non-viable tissue = may appear prior to wound opening; skin surface is white or gray.
    - Non-adherent, yellow slough = thin, mucinous substance; scattered throughout wound bed; easily separated from wound tissue.
    - Loosely adherent, yellow slough = thick, stringy, clumps of debris; attached to wound tissue.
    - Adherent, soft, black eschar = soggy tissue; strongly attached to tissue in center or base of wound.
    - Firmly adherent, hard/black eschar = firm, crusty tissue; strongly attached to wound base and edges (like a hard scab).
6. **Drainage:** Before assessing for exudate type, gently cleanse the wound with normal saline or water. Pick the exudate type that is predominant in the wound according to consistency and color

- Bloody = thin, bright red
- Serosanguineous = thin, watery pale red to pink
- Serous = thin, watery, clear
- Purulent = thin or thick, opaque tan to yellow
- Foul purulent = thick, opaque yellow to green with offensive odor

7. **Exudate Amount**
    - None = wound tissues dry.
    - Scant = wound tissues moist; no measurable exudate.
    - Small = wound tissues wet; moisture evenly distributed in wound; drainage involves < 25% dressing.
    - Moderate = wound tissues saturated; drainage may or may not be evenly distributed in wound; drainage involves > 25% to < 75% dressing.
    - Large = wound tissues bathed in fluid; drainage freely expressed; may or may not be evenly distributed in wound; drainage involves > 75% of dressing.
8. **Skin Color Surrounding Wound:** Assess tissue within 4cm of wound edge. Dark-skinned persons show the colors “bright red” and “dark red” as a depending or normal ethnic skin color or a purple hue. As healing occurs in dark-skinned persons, the new skin is pink and may never darken.
9. **Peripheral Tissue Induration:** Assess tissue within 4cm of wound edge. Induration is abnormal firmness of tissues with margins. Assess by gently pinching the tissues, Induration rests in an inability to pinch the tissues.

Appendix D

Table D1 Pre- and Post-test

Complete the rating sheet to assess wound status. Evaluate each item and enter the score in the item score column.

1. Location: **anatomical site. Identify using lateral, medial, anterior, posterior, ventral, dorsal**	Correct	Incorrect
2. Shape: **overall wound pattern** **__ Irregular** **__ Linear or elongated** **__ Round/oval** **__ Bowl/Boat** **__ Square/rectangle** **__ Butterfly**		
3. Size		
4. Depth: **circle the appropriate answer** **1 = Non-blanchable erythema on intact skin** **2 = Partial thickness skin loss involving epidermis &/or dermis** **3 = Full thickness skin loss involving damage or necrosis of subcutaneous tissue; may extend down to but not through underlying fascia; &/or mixed partial & full thickness &/or tissue layers obscured by granulation tissue** **4 = Obscured by necrosis** **5 = Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures**		
5. Edges **1 = Indistinct, diffuse, none clearly visible** **2 = Distinct, outline clearly visible, attached, even with wound base** **3 = Well-defined, not attached to wound base** **4 = Well-defined, not attached to base, rolled under, thickened** **5 = Well-defined, fibrotic, scarred or hyperkeratotic**		
6. Necrotic tissue type **1 = None visible** **2 = White/grey non-viable tissue &/or non-adherent yellow slough** **3 = Loosely adherent yellow slough** **4 = Adherent, soft, black eschar** **5 = Firmly adherent, hard, black eschar**		
7. Exudate **1 = None** **2 = Bloody** **3 = Serosanguineous: thin, watery, pale red/pink** **4 = Serous: thin, watery, clear** **5 = Purulent: thin or thick, opaque, tan/yellow, with or without odor**		

8. Exudate amount **1 = None, dry wound** **2 = Scant, wound moist but no observable exudate** **3 = Small** **4 = Moderate** **5 = Large**		
9. Skin color surrounding wound **1 = Pink or normal for ethnic group** **2 = Bright red &/or blanches to touch** **3 = White or grey pallor or hypopigmented** **4 = Dark red or purple &/or non-blanchable** **5 = Black or hyperpigmented**		
10. Peripheral tissue induration **1 = None present** **2 = Induration, < 2 cm around wound** **3 = Induration 2-4 cm extending < 50% around wound** **4 = Induration 2-4 cm extending > 50% around wound** **5 = Induration > 4 cm in any area around wound**		
Total:		

Appendix E

Table E1 Pre- and Post-test Assessment Scores

Pre-test: 22 participants			**Post-test: 22 participants**		
Test questions	Correct	Incorrect	Test questions	Correct	Incorrect
Location	16	6	Location	19	3
Shape	17	5	Shape	22	0
Size	13	9	Size	22	0
Depth	18	4	Depth	22	0
Edges	15	7	Edges	20	2
Necrotic Tissue Type	20	2	Necrotic Tissue Type	22	0
Exudate	10	12	Exudate	20	2
Exudate amount	12	10	Exudate amount	22	0
Skin color surrounding wound	9	13	Skin color surrounding wound	17	5
Peripheral tissue induration	4	18	Peripheral tissue induration	18	4
Total (out of 220 possible points)	**134 (61%)**	**86 (39%)**	**Total**	**204 (92.7%)**	**16 (7.2%)**

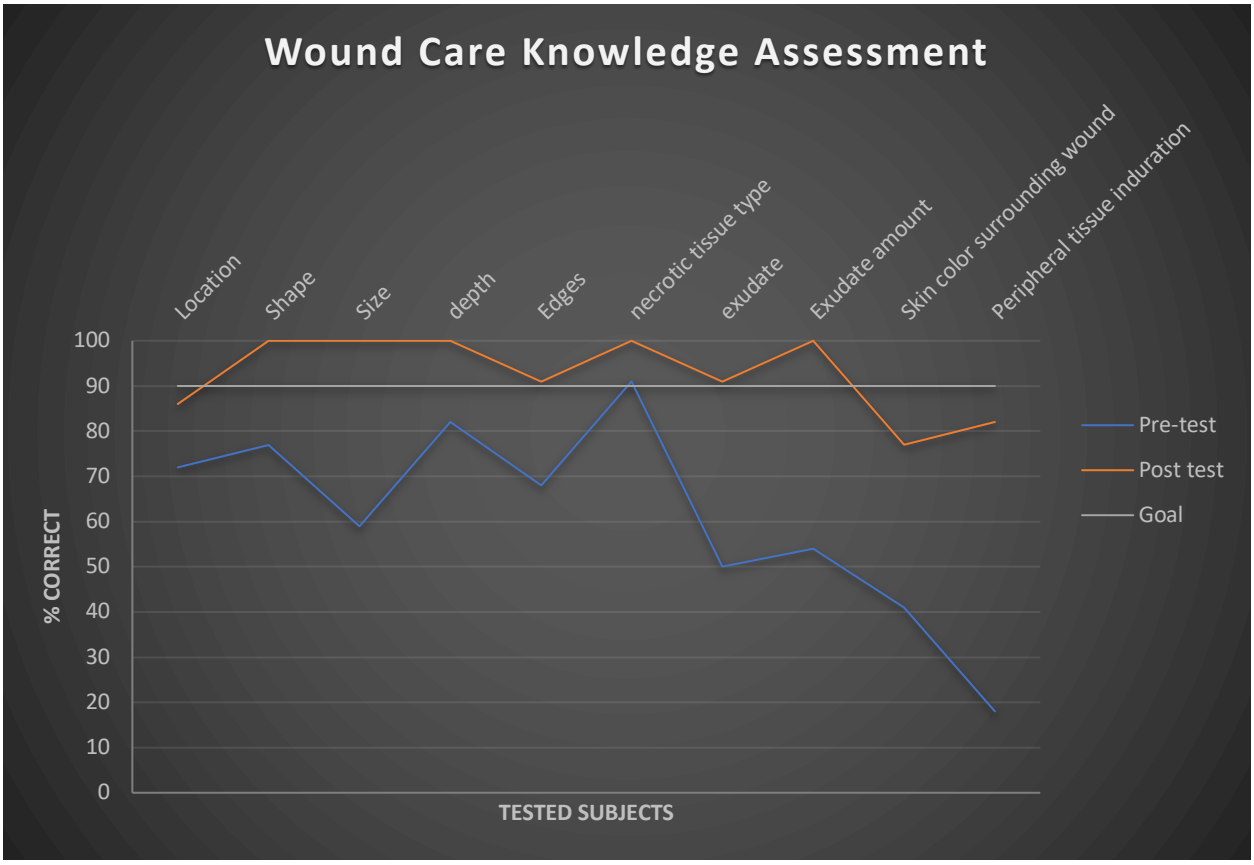
*Number of participants who answered correctly and incorrectly on questions.

Table E2 Pre-and Post-test Assessment Score Breakdown

Pre-test				**Post-test**			
Participants	Scores	Participants	Scores	Participants	Scores	Participants	Scores
#1	8	**#12**	6	**#1**	10	**#12**	10
#2	8	**#13**	5	**#2**	10	**#13**	9
#3	9	**#14**	5	**#3**	10	**#14**	9
#4	7	**#15**	5	**#4**	10	**#15**	9
#5	7	**#16**	5	**#5**	10	**#16**	9
#6	7	**#17**	5	**#6**	10	**#17**	9
#7	7	**#18**	5	**#7**	10	**#18**	8
#8	7	**#19**	5	**#8**	10	**#19**	8
#9	7	**#20**	5	**#9**	10	**#20**	8
#10	7	**#22**	4	**#10**	10	**#22**	8
#11	6	**#22**	4	**#11**	10	**#22**	7

Appendix F

Figure F1 Run chart of wound care assessment pre- and post-test results



Percentage of staff members that answered correctly of each questions in pre- (blue) and post-test (red), compared to goal of 90 percent (grey).

Appendix G

Table G1 Return on Invest (ROI)

# Personnel	Minimum Cost per hour	Maximum Cost per hour	Estimated time for training (hours)	Estimated cost per person	Total cost (# Personnel x cost/hour x hour for training)	Cost per patient for SSI
(1) Wound Care Specialist	42	48	24	$1008 - $1152	$1,008 - $1,152	
(5) Registered Nurse	38	40	7	$266 - $280	$1,330 - $1,400	
(17) Licensed Vocational Nurse	29	32	7	$203 - $224	$3,451 - $3,808	
				Total	$5,789 – $6,360	$20,000
				Minimum total return on investment (cost per patient – min. total cost of training personnel)	$20,000 – $6,360	$13,640
				Maximum total return on investment (cost per patient – min. cost of training personnel)	$20,000 – $5,789	$14,211

*Employees hourly salary are not disclosed, therefore the estimated range of hourly salary – provided by the Director of Nursing, are used for calculation.

Appendix H

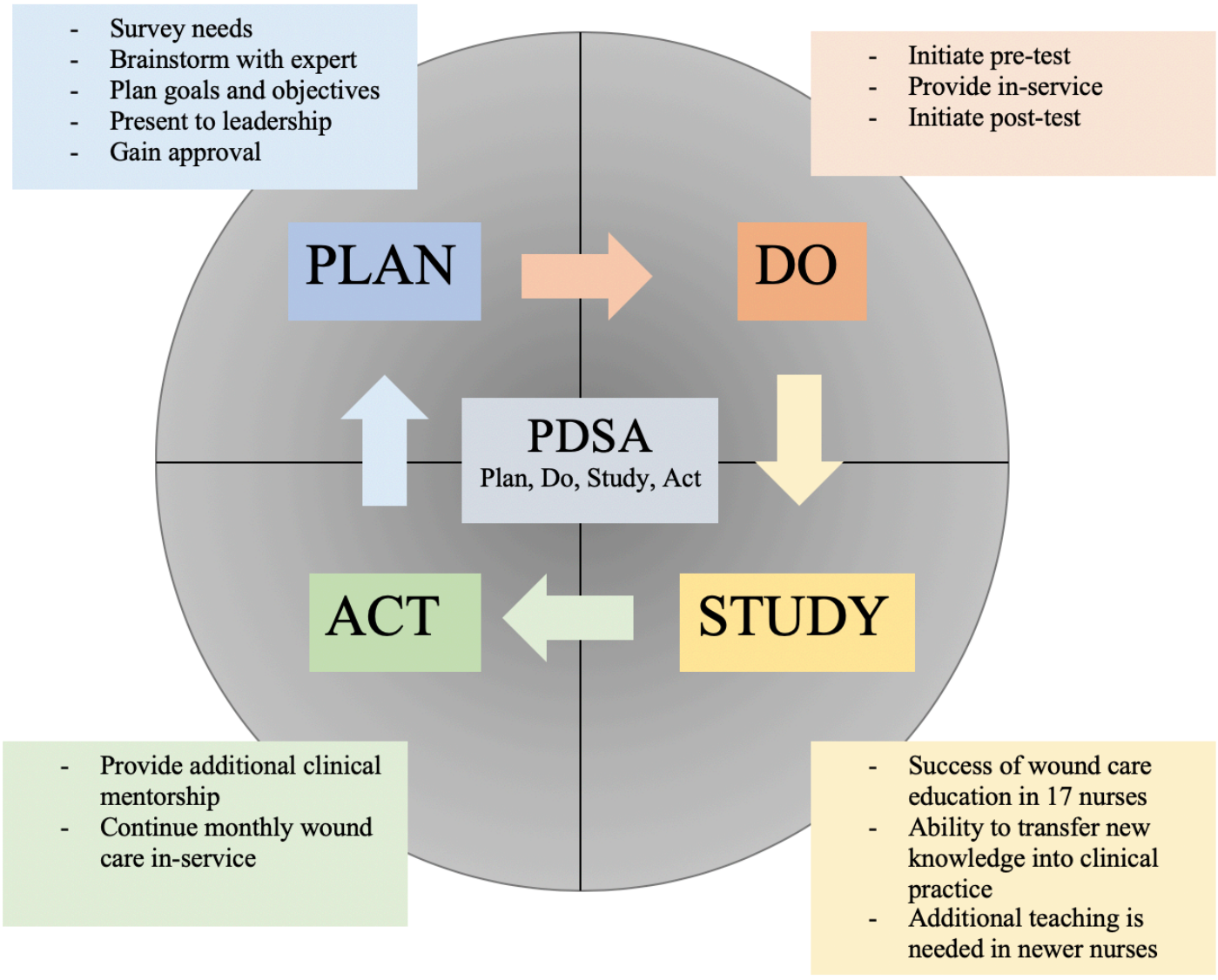
Matrix H1: SWOT Analysis

Strengths	Weaknesses
• Administration is receptive to changes in improvements • Administration fosters an environment for learning	• Lack of patient focus • Fixing problems instead of preventing them • Inability to transfer new information into clinical practice
Opportunities	**Threats**
• Staff are open to continuing educational courses • Staff have strong sense of cohesiveness and help others when needed	• Resistance to change • Work culture of sonority

SWOT Analysis

Appendix I

Matrix I1 Plan, Do, Study, Act (PDSA)



Appendix J

Table J1 Project Timeline

Description	October Week 1	October Week 2	October Week 3	October Week 4	November Week 1	November Week 2	November Week 3
Project Selection							
Aim Statement							
Business case development							
Background							
Measurement strategy							
Charter-team							
Unit presentation							
Project implementation							
Start Charter							
Collect data							
Finalize charter							

Appendix K

Figure K1 Johns Hopkins Research Evidence Appraisal Tool (JHREAT)

Johns Hopkins Nursing Evidence-Based Practice

Appendix E
Research Evidence Appraisal Tool

Section I: QuaNtitative		
Level of Evidence (Study Design)		
A Is this a report of a single research study?	☐ Yes	☐ No **Go to B**
1. Was there manipulation of an independent variable?	☐ Yes	☐ No
2. Was there a control group?	☐ Yes	☐ No
3. Were study participants randomly assigned to the intervention and control groups?	☐ Yes	☐ No
If **Yes to questions 1, 2, and 3,** this is a randomized controlled trial (RCT) or experimental study.		**LEVEL I**
If **Yes to questions 1 and 2 and No to question 3** or **Yes to question 1 and No to questions 2 and 3,** this is quasi-experimental. *(Some degree of investigator control, some manipulation of an independent variable, lacks random assignment to groups, and may have a control group).*		**LEVEL II**
If **No to questions 1, 2, and 3,** this is nonexperimental. *(No manipulation of independent variable; can be descriptive, comparative, or correlational; often uses secondary data).*		**LEVEL III**
Study Findings That Help Answer the EBP Question: Enter Text Here		
Skip to the **Appraisal of QuaNtitative Research Studies** section		

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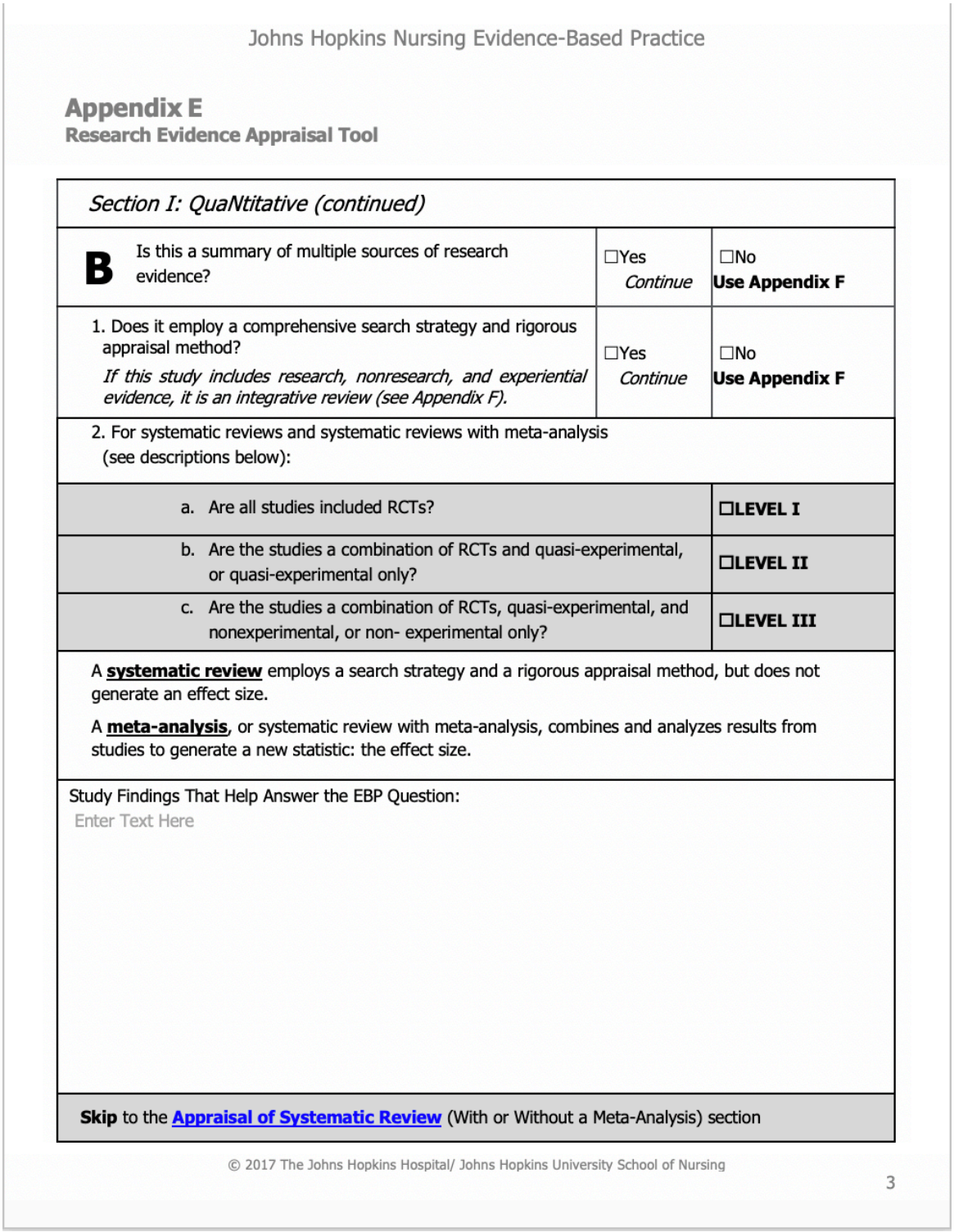
Figure K2 JHREAT



Johns Hopkins Nursing Evidence-Based Practice

Appendix E
Research Evidence Appraisal Tool

Section I: QuaNtitative (continued)		
B Is this a summary of multiple sources of research evidence?	☐Yes *Continue*	☐No **Use Appendix F**
1. Does it employ a comprehensive search strategy and rigorous appraisal method? *If this study includes research, nonresearch, and experiential evidence, it is an integrative review (see Appendix F).*	☐Yes *Continue*	☐No **Use Appendix F**
2. For systematic reviews and systematic reviews with meta-analysis (see descriptions below):		
a. Are all studies included RCTs?		**☐LEVEL I**
b. Are the studies a combination of RCTs and quasi-experimental, or quasi-experimental only?		**☐LEVEL II**
c. Are the studies a combination of RCTs, quasi-experimental, and nonexperimental, or non- experimental only?		**☐LEVEL III**
A **systematic review** employs a search strategy and a rigorous appraisal method, but does not generate an effect size. A **meta-analysis**, or systematic review with meta-analysis, combines and analyzes results from studies to generate a new statistic: the effect size.		
Study Findings That Help Answer the EBP Question: Enter Text Here		
Skip to the **Appraisal of Systematic Review** (With or Without a Meta-Analysis) section		

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Figure K3 JHREAT

Johns Hopkins Nursing Evidence-Based Practice

Appendix D

Evidence Level and Quality Guide

Evidence Levels	Quality Ratings
Level I Experimental study, randomized controlled trial (RCT) Explanatory mixed method design that includes only a level I quaNtitative study Systematic review of RCTs, with or without meta-analysis	**QuaNtitative Studies** **A High quality**: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence. **B Good quality**: Reasonably consistent results; sufficient sample size for the study design; some control, fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence. **C Low quality or major flaws**: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn.
Level II Quasi-experimental study Explanatory mixed method design that includes only a level II quaNtitative study Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis	**QuaLitative Studies** No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria. *For meta-synthesis, there is preliminary agreement that quality assessments of individual studies should be made before synthesis to screen out poor-quality studies*[1]. **A/B High/Good quality** is used for single studies and meta-syntheses[2]. The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry. Evidence of some or all of the following is found in the report: • Transparency: Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated. • Diligence: Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence. • Verification: The process of checking, confirming, and ensuring methodologic coherence. • Self-reflection and scrutiny: Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations. • Participant-driven inquiry: Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated. • Insightful interpretation: Data and knowledge are linked in meaningful ways to relevant literature.
Level III Nonexperimental study Systematic review of a combination of RCTs, quasi-experimental and nonexperimental studies, or nonexperimental studies only, with or without meta-analysis Exploratory, convergent, or multiphasic mixed methods studies Explanatory mixed method design that includes only a level III quaNtitative study QuaLitative study Meta-synthesis	**C Low quality** studies contribute little to the overall review of findings and have few, if any, of the features listed for high/good quality.

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Figure K4 JHREAT

Johns Hopkins Nursing Evidence-Based Practice

Appendix D

Evidence Level and Quality Guide

Evidence Levels	Quality Ratings
Level IV Opinion of respected authorities and/or nationally recognized expert committees or consensus panels based on scientific evidence Includes: • Clinical practice guidelines • Consensus panels/position statements	**A** **High quality:** Material officially sponsored by a professional, public, or private organization or a government agency; documentation of a systematic literature search strategy; consistent results with sufficient numbers of well-designed studies; criteria-based evaluation of overall scientific strength and quality of included studies and definitive conclusions; national expertise clearly evident; developed or revised within the past five years **B** **Good quality:** Material officially sponsored by a professional, public, or private organization or a government agency; reasonably thorough and appropriate systematic literature search strategy; reasonably consistent results, sufficient numbers of well-designed studies; evaluation of strengths and limitations of included studies with fairly definitive conclusions; national expertise clearly evident; developed or revised within the past five years **C** **Low quality or major flaws:** Material not sponsored by an official organization or agency; undefined, poorly defined, or limited literature search strategy; no evaluation of strengths and limitations of included studies, insufficient evidence with inconsistent results, conclusions cannot be drawn; not revised within the past five years
Level V Based on experiential and nonresearch evidence Includes: • Integrative reviews • Literature reviews • Quality improvement, program, or financial evaluation • Case reports • Opinion of nationally recognized expert(s) based on experiential evidence	**Organizational Experience (quality improvement, program or financial evaluation)** **A** **High quality**: Clear aims and objectives; consistent results across multiple settings; formal quality improvement, financial, or program evaluation methods used; definitive conclusions; consistent recommendations with thorough reference to scientific evidence **B** **Good quality**: Clear aims and objectives; consistent results in a single setting; formal quality improvement, financial, or program evaluation methods used; reasonably consistent recommendations with some reference to scientific evidence **C** **Low quality or major flaws**: Unclear or missing aims and objectives; inconsistent results; poorly defined quality improvement, financial, or program evaluation methods; recommendations cannot be made **Integrative Review, Literature Review, Expert Opinion, Case Report, Community Standard, Clinician Experience, Consumer Preference** **A** **High quality**: Expertise is clearly evident; draws definitive conclusions; provides scientific rationale; thought leader(s) in the field **B** **Good quality**: Expertise appears to be credible; draws fairly definitive conclusions; provides logical argument for opinions **C** **Low quality or major flaws**: Expertise is not discernable or is dubious; conclusions cannot be drawn

1 https://www.york.ac.uk/crd/SysRev/!SSL!/WebHelp/6_4_ASSESSMENT_OF_QUALITATIVE_RESEARCH.htm
2 Adapted from Polit & Beck (2017).

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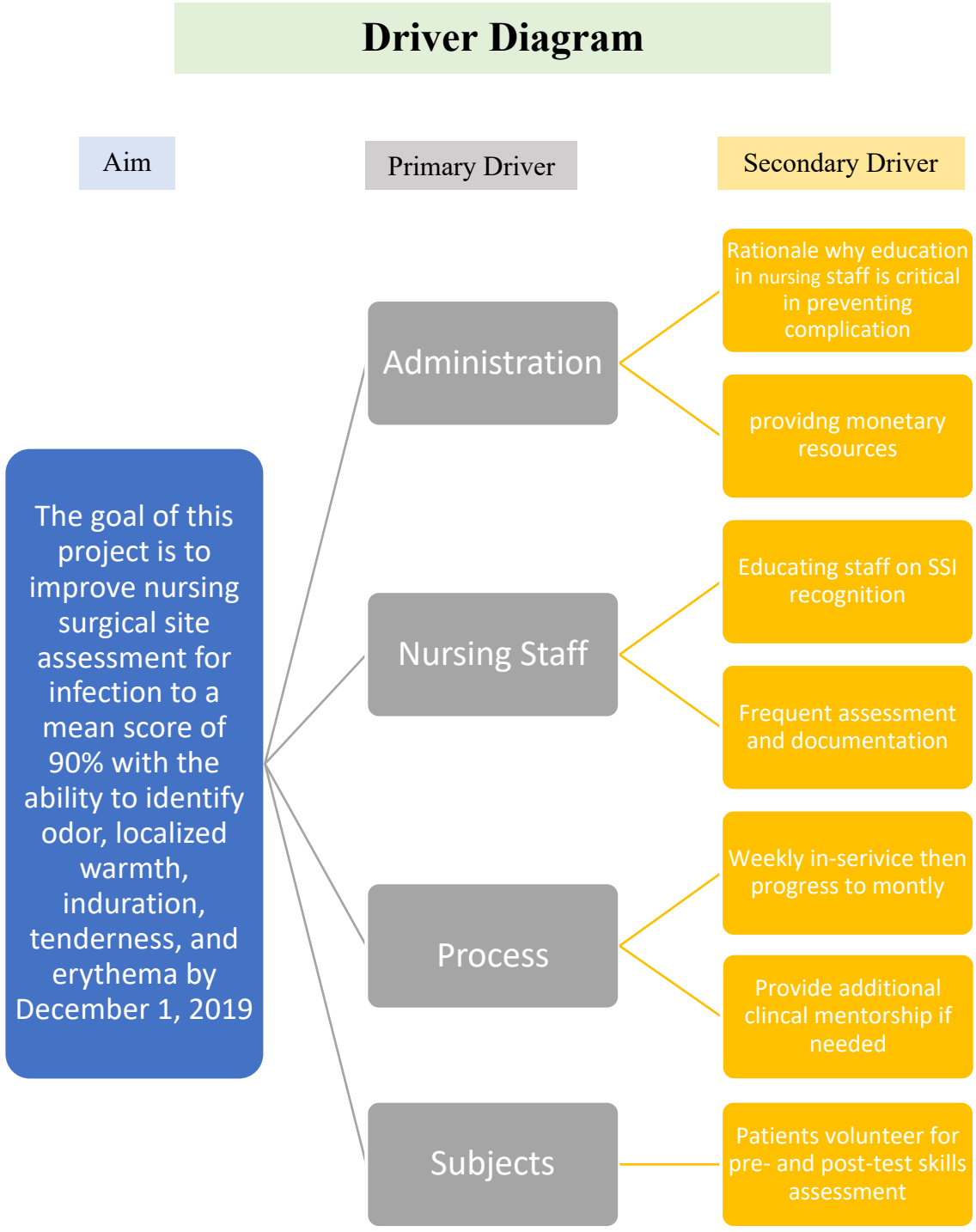
Appendix L

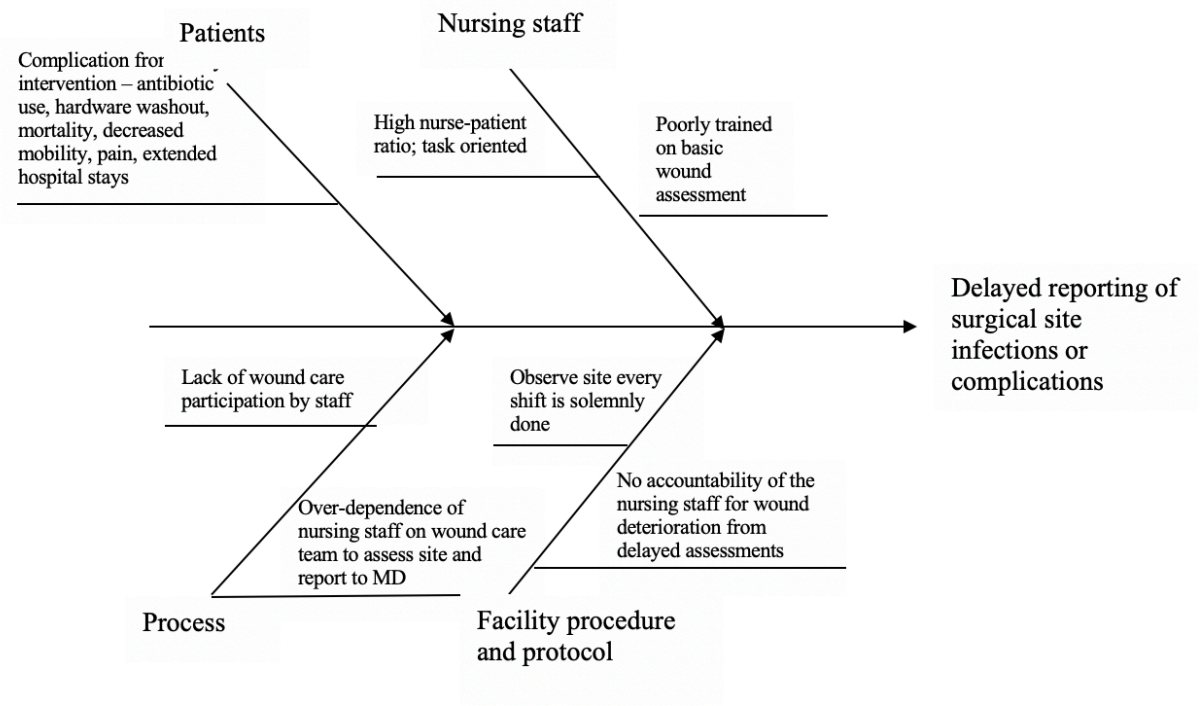
Figure L1 Driver diagram



Appendix M

Figure M1 Cause and Effect

Fishbone Diagram: Cause and Effect



Appendix N

Table N1 Bruner and Vygotsky's Social Construction Learning Theories

	Bruner	Vygotsky
Constructivism	Social	Social
Key processes in development and learning	Zone of proximal development (ZPD); language/dialogue	Scaffolding on existing knowledge
Role of language	Strong in shaping thoughts	Strong in facilitating thinking and problem-solving skills
Teaching Implications	Provide opportunities for novices to learn with teachers and more expert peers	Facilitate students to construct their own knowledge
Clinical Relevance	Nursing faculty given in-services by the WCS	Clinical mentoring with the WCS to improve clinical assessment skills

Appendix O

Project Charter

Introduction

Gaps in wound assessment knowledge and experience can lead to adverse patient outcomes due to delay in timely report of signs of infection. Wound care in skilled nursing facility (SNF) remains highly variable. This can be attributed to inexperienced nurses with less than one year of licensed clinical experience, lack of awareness of crucialness of wound assessment, and over-dependence on members of the wound care team to facilitate assessment and communication with the doctors. Being ranked as the second most reported hospital acquired infections (HAI), surgical site infections (SSI) are one of the most preventable HAI, yet they remain to have significant impact of patient morbidity and mortality. SSI is related to an additional 9.7 days of hospitalization and cost of $20,842 per patient. This facility was found to have an incidence of four SSI between January to September 2019.

This facility receives 75% of its patients from Saint Francis Memorial Hospital (SFMH); 10% from Kaiser San Francisco, and 10% from Sutter Health, Veterans Association (VA), and University of California San Francisco (UCSF). Our number one admitting diagnosis is hip fracture with hip replacements, accounting from greater than 60-percent of our newly admitted population. 25-percent with diabetic foot wounds or vascular wounds, and 15% with other needs. Our physician group is associated with SFMH, hence the reason why this facility receives their majority of referrals from SFMH.

The nursing staff is composed of greater than 75 percent who identity with the Filipino heritage, with 10 percent identifying with Chinese heritage and 15 percent who identifies with either Russian or Hispanic heritage. One Director of Nursing (DON) two Assistant Dean of

Nursing (ADON), two infectious disease (ID) nurses, 22 licensed nurses – five RNs and 17 LVNs; and 51 Certified Nursing Assistants (CNA).

Improvement Theme

The improvement theme is based on Institute of Health Improvement (IHI) Triple Aim: improve patient experience of care; improve health; and reducing per capita of health care. This project will improve patient experience through early identification of SSI of complication; improve health through early interventions and shorten length of stay (LOS); and reduce cost by reducing LOS and potential need for invasive procedures (e.g. hardware washout, hardware remove/replacement).

Global Aim

This skilled nursing facility (SNF) aim to improve the nursing surgical site assessment for infection. The process begins by testing existing knowledge to establish baseline. In-services of wound care management was provided by the WCS. Through these learning modules, we expect: (1) nurses improve on their visual and tactile assessment skills; (2) improve documentation through using appropriate adjectives to describe observations; and (3) prompt timely report of potential SSI to MDs or surgeons. There is a nursing implication to work on this project as evidenced by: (1) high incidences of delayed reporting of surgical site complications; (2) high cost; (3) lack of participation of wound care in nursing staff; and (4) poor documentation skills by nurses.

Specific aim

We aim to improve nursing surgical assessment skills with a benchmark score of 90 percent; with the ability to identify odor, localized warmth, induration, tenderness, and erythema by December 1, 2019.

Background

SSI are associated with one-third of post-operative deaths (National Collaborating Centre for Women's and Children's Health, 2008). In the public eye, SSI can also be a reflection of substandard care. It has a correlation with prolonged hospitalization, additional diagnostic tests, antibiotic use, and additional surgery. This has an implication on increased length of stay (LOS), increased cost, decreased mobility, unmeasurable psychological burden, and future complications (infections). In the 2005 hospital stay data from the U.S. Nationwide Inpatient Sample found that SSI contributed to 9.7 days of additional hospitalization with cost of $20,842 – that is $900 million in healthcare spending on a national scale, (WHO, 2018).

Clinical Problem

The review of literature found that the majority of generalist nurses do not have the level of expertise of a WCS or WCN, and there was a lack of knowledge of wound management where many novice nurses feel unprepared to perform wound care. This was found to be attributed to poor education during nursing education. In addition, 60% of nurses working on a surgical unit were found to have poor knowledge on surgical site infection prevention strategies. However, in a study that aimed to reduce on SSI, it was concluded that with an effective system-level intervention such as standard surveillance, assessment protocols, and tracking of infection rates over time, it effectively reduced HCAI and SSI.

During planning for this change project, some questions were considered: (1) Does the innovation fit (is it compatible); (2) Should we do it here (can we build a business case); (3) Can we do it here (are we ready for change and do we have the resources); and (4) How will we do it here (how will we measure success and how will it be implemented)? It was found that this change project was appropriate for this setting due to high SSI incidences and observed low nursing knowledge; high return on investment; and existing organized wound care program and available experienced WCS.

Using Social Construction Learning Theories from Bruner and Vygotsky, we mimicked their learning process of zone of proximity (ZPD) and scaffolding. Nurses were given the opportunity to mentor or learn from an expert and built on existing knowledge learned in nursing education. The goal of this project is to improve nursing surgical site assessment skills to a benchmark of 90 percent on the post-test. The first cycle of PDSA is successful with the mean score of 92.7 percent. However, the true determinant of success of this project is the sustained changes after one year or more.

Family of Measures

Measures	Data Source	Target
Outcomes measures - Incidences of SSI - Lapse in reporting SSI	Direct observation	<4
Process Measures - 22 licensed staff assessed on their levels of surgical site assessment knowledge	Test scores of 22 licensed nursing staff	>90%
Balancing measures - Accuracy between Wound care team assessing surgical site and nursing assessing surgical site	Direct observation	0%

Team composition & Sponsors

Director of Nursing, Director of Business, Assistant Dean of Nursing, Director of Staff Development, Wound Care Specialist, Registered Nurses, and Licensed Vocation Nurses.

Population criteria

Licensed staff working at this Skilled Nursing Facility.

Measurement Strategy

Data will be collected from the scores of 22 licensed staff and calculated for average by this author.

Data definition

Data element	Definition
Size	Multiplying the longest and widest part of the wound surface.
Edges	Well defined and even with wound bed or rolled (not even with wound bed)
Depth	Deepest part of the wound
Necrotic tissue	Dead or devitalized tissue; often presents as yellow and soft but can be black or grey.
Exudate	Drainage
Skin color surround wound	Color of skin surrounding skin within 4 cm parameter
Peripheral induration	Firmness of tissue around wound within 4cm parameter

Data description

Measure	Measure definition	Data collection source	Goal
Surgical site infection (SSI)	Number of patients who developed infection of surgical sites during their stay at this facility	Monthly wound care audits from wound care team	<4
Nursing surgical site assessment	Number of nurses to accurately assess and describe surgical sites	Point Click Care (PCC) documentation and weekly skin alteration reports (WSAR); post-test	>90%

Recommendation for changes

The current goal of this facility is to improve surgical site assessment of infection by nursing staff to 90% by December 1, 2019. Preliminary implementation demonstrated promising results in improving patient care and reducing adverse outcomes. After 4 weeks of education was provided, there was an increase of 25.7 percent in assessment skills. To establish permanent change, continuous continuing education opportunities will be necessary to train new nursing staff, review existing knowledge, and strengthen newly acquired skills. Future steps include continuous monitoring of progress in all leadership levels: Unit Managers (UM) will need to monitor surgical site assessments by nurses and the completion of documentation of surgical sites and treatments; wound care team will need to frequently communicate with UMs to understand knowledge deficits, educational support or re-assessment of surgical sites; administration to provide continuous support for monthly wound care in-services and provide monetary incentives (paid overtime) as well as verbalize support for improving nursing assessment skills.

Lessons Learned

- Clinical process changes require the collaboration and support of peers and administration.
- Microsystem assessment is needed to understand stakeholder mix (patients and faculty) prior to planning and implementing change, as well as establish measurable and achievable aim.
- Frequent communication with peers and leaders is critical in articulating problem, plan, and processes.
- Changes in projects sometimes will be necessary to adopt to the setting and situation.
- One must be assertive and confident when presenting plan to administrative leaders and peers.

CNL Competencies

The CNL is a leader in all levels and settings of the healthcare delivery system. The CNL is not a management or administration role; instead it is a provider and manager care at the point of care across various care settings. The CNL assumes the responsibility and accountability for patient-centered outcomes through evidence-based information to design, implement, and evaluate patient-care processes and models. Some of the CNL competencies utilized in this project are:

- Clinician: design, coordinate, evaluation care process for individuals, families, groups, and populations
- Outcomes manager: identification and collection of care process outcomes
- Educator: providing appropriate learning tools to support and improve clinical process
- Information manager: use of information systems and technology to improve healthcare outcomes
- Risk anticipator: assess risks in individuals, groups and populations
- Team manager: lateral integration of care for individuals or cohorts of patients

Appendix P

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

STUDENT NAME: Jennifer Teng Yu

DATE: 9/30/2019 .

SUPERVISING FACULTY: Generations Health Care – Tunnell Center .

Instructions: Answer YES or NO to each of the following statements:

Project Title:	**YES**	**NO**
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	✓	
The specific aim is to improve performance on a specific service or program and **is a part of usual care**. ALL participants will receive standard of care.	✓	
The project is **NOT** designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does **NOT** follow a protocol that overrides clinical decision-making.	✓	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards.	✓	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience.	✓	
The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	✓	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	✓	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., **not** a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	✓	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: *"This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."*	✓	

ANSWER KEY: If the answer to **ALL** of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. IRB review is not required. Keep a copy of this checklist in your files. If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.