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14. ABSTRACT Purpose: This EBP project determined if an evidence-based oral care program resulted in increased nurses' knowledge and improved oral care practices compliance. Design: The project used a counterbalanced design to evaluate the impact of an oral care program, using the Iowa Model. Methods: Evidence-based Oral Care (EB OC) critical care nursing education was conducted over a two-week period using the conceptual underpinning of the Iowa Model, the Diffusion of Innovation process, and project specific oral care evidence-based practice instruction. Knowledge evaluations were conducted at three time points: before, immediately after, and 2 months following implementation of the oral care program. Oral care practices were standardized to be conducted every 2 hours and then every 4 hours during 2 six-week sessions. This was followed by a six-week sustainment period and the collection of OC compliance and nurse knowledge data. Two 10-bed trauma surgical critical care units from one Level I trauma military medical center were evaluated. Sample: The sample included nurses (n = 88) and retrospective electronic medical records from 60 patients. Analysis: Two-way ANOVA and Kruskal-Wallis non-parametric tests were used to evaluate the impact of the oral care program. Findings: Oral care education scores significantly improved over time (p = 0.0051). The following comparisons of the evidence based oral care compliance were statistically significant: baseline compliance when OC was provided every 4 hours (p <.0001), Q4 best clinical - baseline (p <.0001), oral care given every 2 hours as compared to every 4 hours (p <.0001), Q4 best clinical - Q2 (p 0.0079), oral care provided every 4 hours during the sustainment period as compared to baseline (p 0.0285). Breaking out just oral care components (no EBP) was significantly higher post compared to pre-test as well (p-value 0.0036). There was a significant increase in OC compliance from baseline to the period where oral care was given every 2 hours. Oral care compliance was significantly better when OC was given every 4 hours as compared to both baseline and every 2 hour OC. Implications for Military Nursing: The project is highly important to nursing because it increased nurses' awareness and knowledge of the standard of care oral care practices and has the potential to decrease Ventilator-Associated Pneumonia (VAP) and Ventilator-Associated Events (VAE) incidence rates.					
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Abstract

Purpose: This EBP project determined if an evidence-based oral care program resulted in increased nurses' knowledge and improved oral care practices compliance.

Design: The project used a counterbalanced design to evaluate the impact of an oral care program, using the Iowa Model.

Methods: Evidence-based Oral Care (EB OC) critical care nursing education was conducted over a two-week period using the conceptual underpinning of the Iowa Model, the Diffusion of Innovation process, and project specific oral care evidence-based practice instruction. Knowledge evaluations were conducted at three time points: before, immediately after, and 2 months following implementation of the oral care program. Oral care practices were standardized to be conducted every 2 hours and then every 4 hours during 2 six-week sessions. This was followed by a six-week sustainment period and the collection of OC compliance and nurse knowledge data. Two 10-bed trauma surgical critical care units from one Level I trauma military medical center were evaluated.

Sample: The sample included nurses (n = 88) and retrospective electronic medical records from 60 patients.

Analysis: Two-way ANOVA and Kruskal-Wallis non-parametric tests were used to evaluate the impact of the oral care program.

Findings: Oral care education scores significantly improved over time ($p = 0.0051$). The following comparisons of the evidence based oral care compliance were statistically significant: baseline compliance when OC was provided every 4 hours ($p < .0001$), Q4 best clinical - baseline ($p < .0001$), oral care given every 2 hours as compared to every 4 hours ($p < .0001$), Q4 best clinical - Q2 ($p 0.0079$), oral care provided every 4 hours during the sustainment period as compared to baseline ($p 0.0285$). Breaking out just oral care components (no EBP) was significantly higher post compared to pre-test as well (p -value 0.0036). There was a significant increase in OC compliance from baseline to the period where oral care was given every 2 hours. Oral care compliance was significantly better when OC was given every 4 hours as compared to both baseline and every 2 hour OC.

Implications for Military Nursing: The project is highly important to nursing because it increased nurses' awareness and knowledge of the standard of care oral care practices and has the potential to decrease Ventilator-Associated Pneumonia (VAP) and Ventilator-Associated Events (VAE) incidence rates.

TSNRP Research Priorities that Study or Project Addresses

Primary Priority

Force Health Protection:	<input type="checkbox"/> Fit and ready force <input type="checkbox"/> Deploy with and care for the warrior <input type="checkbox"/> Care for all entrusted to our care
Nursing Competencies and Practice:	<input checked="" type="checkbox"/> Patient outcomes <input type="checkbox"/> Quality and safety <input checked="" type="checkbox"/> Translate research into practice/evidence-based practice <input type="checkbox"/> Clinical excellence <input checked="" type="checkbox"/> Knowledge management <input checked="" type="checkbox"/> Education and training
Leadership, Ethics, and Mentoring:	<input checked="" type="checkbox"/> Health policy <input type="checkbox"/> Recruitment and retention <input type="checkbox"/> Preparing tomorrow's leaders <input type="checkbox"/> Care of the caregiver
Other	<input type="checkbox"/>

Progress Towards Achievement of Specific Aims of the Study or Project

Findings related to each specific aim, research or study questions, and/or hypothesis:

The primary aim of this EBP project was to determine if an evidence-based oral care program, including oral care education (OC Ed), and implementation of an EBP clinical guideline based on the American Association of Critical Care Nurses (AACN) Oral Care Practice Alert, resulted in increased knowledge for the bedside nurse and improved oral care practices compliance.

Team Preparation: A comprehensive project procedure manual was developed and distributed to all project personnel. The procedure manual included a project overview, intervention process, and all data collection procedures. Prior to evidence based oral care education and chart audits, project personnel were trained to perform tasks appropriate to their role in the project. The Project Director was trained by the PI in all EBP implementation project procedures, including nurse recruitment, the project's evidence-based practices, and data collection procedures. The EBP oral care project was Performance Improvement Review Advisory Process (PIRAP) approved and baseline data collection was initiated on 19 February 2013.

Figure 1 Summary of Baseline Oral Care Compliance Based on Chart Audits for 2 North and 2 South

	2N	2S	p-value
Toothbrush	15.63%	32.00%	0.1437
Q2/Q4 Oral Care	43.75%	52.00%	0.5359
Daily Sedation	100.00%	100.00%	n/a
HOB > 30	100.00%	100.00%	n/a
Peptic Ulcer	100.00%	88.00%	0.0441
DVT	100.00%	100.00%	n/a
CHG BID	19.35%	33.33%	0.2379

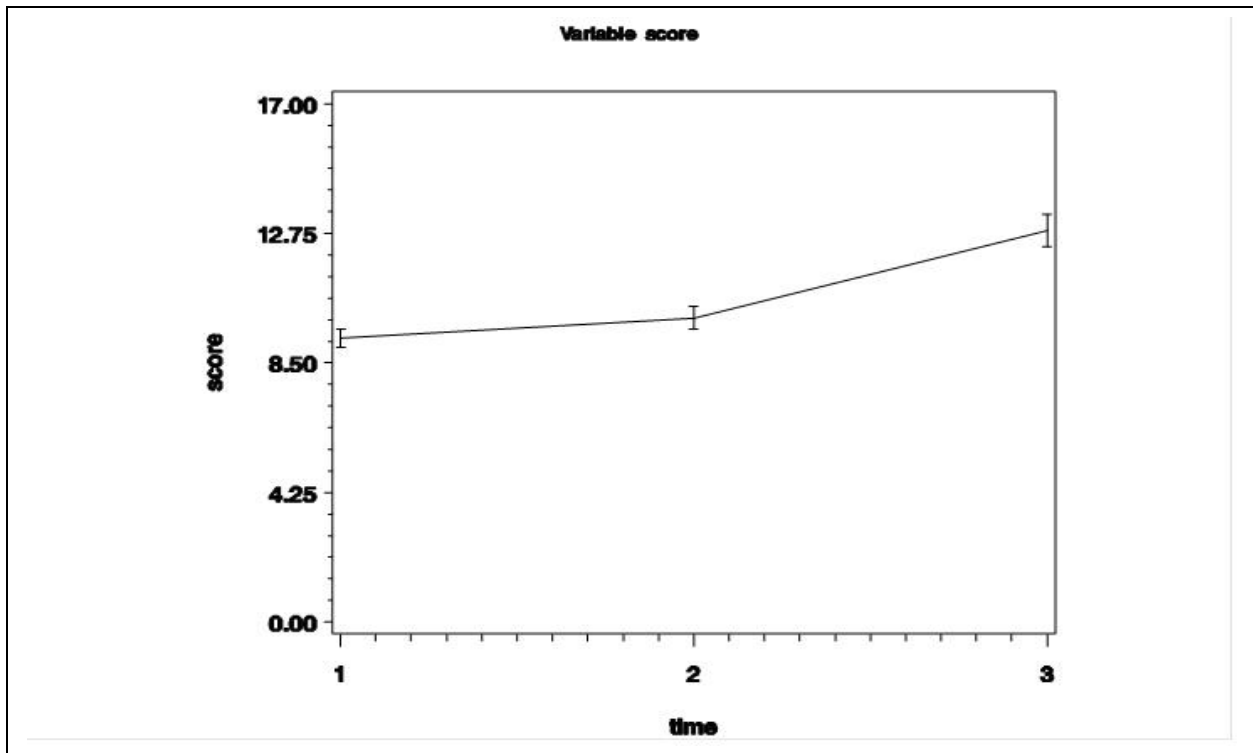
This EBP project addressed the following three practice questions:

- 1. Does an evidence-based oral care education program result in increased:

 - a. Critical care nurse knowledge regarding best oral care practices and evidence-based strategies that must be implemented to prevent Ventilator-Associated Pneumonia (VAP) across all echelons of care?**
 - b. Compliance with the evidence-based oral care clinical practice guideline?****
- 2. Does a protocol requiring every 2-hour or 4-hour oral care standard result in increased compliance with the evidence-based oral care clinical practice guideline?**
- 3. After implementing an oral care program, are improvements in oral care practice and oral care clinical practice guideline compliance sustained over time?**

In order to evaluate question 1. a., knowledge was evaluated using pre and post education test scores. Training sessions, including content about best oral care practices and evidenced-based strategies known to prevent VAP, were initiated on 10 April 2013, with pre and post education evaluations completed by 88 staff members in Brooke Army Medical Center's (BAMC) 2N and 2S. OC Ed was conducted by the project team and unit champions following the project baseline data collection period. Twenty 1.5-hour oral care sessions were conducted in conference room areas near the ICUs over a two-week period covering all shifts during the week and weekends. Critical care nurses were invited with flyers and emails detailing the time, places, and intent of the OC Ed. Educational flyers, posters, note cards, and tabletop tripods highlighted the AACN Oral Care Practice Alert and relevant evidence supporting oral care. The advertisements were displayed throughout both ICUs and emphasized in critical care morning rounds. At the beginning of each class, the participants were asked to take a pre-knowledge evaluation for current baseline knowledge. Next, the project team outlined the fundamentals of evidence-based practice, the Iowa Model steps, and the Diffusion of Innovation process as well as presented the oral care evidence-based practice instruction. Unit Champions lead participants in discussions about concerns and barriers for performing oral care for intubated patients. The session concluded with completion of an education evaluation, oral care demonstration, and a post-knowledge evaluation. Two months after the OC Ed completion, another post knowledge evaluation (retention of knowledge) was taken by participating nurses. Once oral care education was completed, unit champions became 'train the trainers' for on-the-spot training to sustain the OC Ed. Each unit had an EBP oral care written policy that describes the oral care procedure based on the evidence, as well as a literature reference resource guide.

Knowledge: Although there are surveys of oral care practices described in the literature, no reports of oral care knowledge evaluation instruments were found. Therefore, the project team created a 10-item oral care knowledge test. Test items focus on oral care rationale, purpose, types, definitions, and frequency. Nurses were asked to rate the level of evidence for each item using the AACN Grading Level of Evidence. The item content was derived from previous oral care surveys, with adequate reliability ($r = 0.70$) and established validity (face and content validity measured at $>90\%$). The oral care knowledge evaluation created for this project was evaluated for validity by 4 content subject matter experts. Resulting face and content validity was 100%. The 10-item oral care knowledge test was given to the nurses before, immediately after, and 2 months after the innovative oral care education (IOC Ed). See figure 2 for knowledge test scores.



Key

Time 1 = pre knowledge test (n = 88)

Time 2 = post knowledge test (n = 88)

Time 3 = 2 month post knowledge test (n = 22)

Results

Time 1 to time 2 was not significant $p = 0.1819$

Time 2 to time 3 was significant $p < .0001$

Time 1 to time 3 was significant $p < .0001$

Figure 2 Knowledge Test Scores

Retrospective Medical Record Chart Audits were conducted to evaluate compliance with evidence-based oral care clinical practice guidelines (question 1.b.). All medical records of intubated STICU patients were selected for chart audits. The project team member conducting the audit used a checklist to evaluate and record compliance with each element of the oral care guideline: tooth brushing twice a day; at minimum every 4 hours oral mucosa and lip moisturizing; and if the patient was a cardiac surgical patient, chlorhexidine gluconate oral rinse used perioperatively. Documentation evaluations were accessed via the Essentris Oral Care Note, Nursing Initiated Orders (NIOs) and Oral Assessment Guide (OAG). Essentris is the name of the hospital's computer information system. Additional Essentris screens (specifically admission, history and physical, nursing assessment, medication, and treatment screens) were accessed to attain demographic and additional data as described in the measures section of the protocol.

Each medical record review encompassed a 24-hour period from 0700 to 0659 the previous day (oral care already provided).

Figure 3 Oral Care Compliance

<u>Q4</u>	<u>Comparison group</u>	<u>p-value</u>
Q4	Baseline	<.0001
Q4	Q2	<.0001
Q4 Best clinical	Baseline	<.0001
Q4 Best clinical	Q2	0.0079
Q4 Sustainment	Baseline	0.0285

To address question 2, units were asked to provide oral care every 2 hours for the 6-week session initiated on 27 April 2013 and completed on 8 June 2013, and then provide every 4-hour oral care during the 6 weeks following 15 June 2013. This was followed by 6 weeks of every 4-hour oral care based on compliance and knowledge data completed on 1 October 2013. The sustainment phase of the project concluded on 10 December 2013.

Oral Care Frequency: The two-hour oral care standard was implemented on participating units for six weeks; then after the nursing staff education had been employed for 2 months, the 4-hour oral care standard was used for an additional 6 weeks. Nurses were informed of the change in oral care frequency by flyers, emails, and direct communication from the project team. Each respective unit was stocked with either the every 2-hour or every 4-hour oral care kits at the appropriate intervals. Other kits were removed and only the appropriate ones were on the units. The frequency used in the last evaluation phase of the project was determined based on previous compliance results. Every 4-hour oral care had better compliance; therefore, Q4 oral care was tracked for an additional 6 weeks and also used during the sustainment phase.

Compliance: Oral care practice compliance was evaluated using audits of patient electronic medical records. Chart audits were evaluated using a data collection sheet that targets the three evidenced-based practice items in the AACN practice alert. (1) Brush with a toothbrush twice a day; (2) Provide oral moisturizing to oral mucosa and lips every 2 to 4 hours; and (3) Use CHG rinse twice a day for cardiac surgical patients. The project director performed the chart audits. See figure 1 for baseline data and figure 3 for all data collection time points.

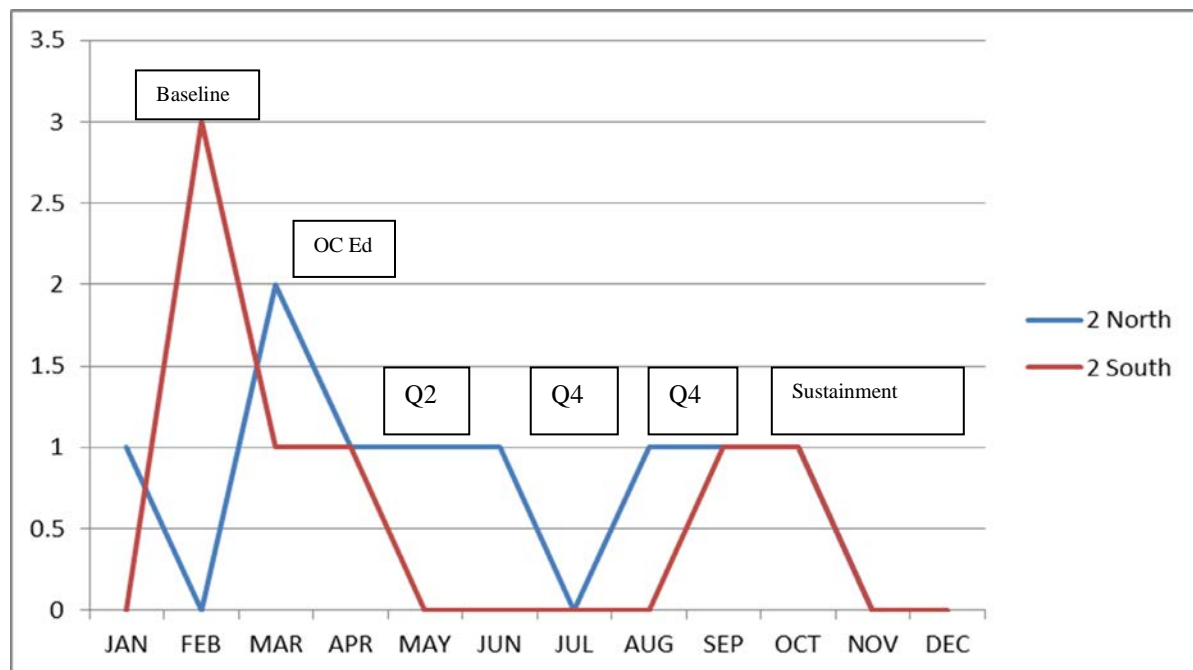
Two aspects were evaluated to answer question three: after implementing an oral care program, are improvements in oral care practice and oral care clinical practice guideline compliance sustained over time? Measurement included the pre and post EB OC training knowledge tests taken by nurses and oral care compliance measured by chart audits of inpatient electronic medical records. Two-way ANOVA and Kruskal-Wallis non-parametric tests were used to test the significance with compliance in implementing the EB OC guideline. After receiving oral care education, nursing scored significantly higher on post-tests compared to pre-test scores ($p = 0.0051$). After breaking out just oral care components (no EBP), nurses scored significantly

higher on post-tests as compared to pre-tests ($p = 0.0036$). The following comparisons of oral care compliance were significant:

1. Baseline scores when oral care was performed every 4 hours ($p < .0001$)
2. Q4 best clinical compliance - baseline ($p < .0001$)
3. Oral care performed every four hours as compared to oral care performed every two hours ($p < .0001$)
4. Q4 best clinical compliance - Q2 ($p 0.0079$)
5. Baseline oral care (standard care) as compared to oral care provided every 4 hours during the sustainment time period ($p 0.0285$)

The definition of VAP changed to Ventilator Associated Event in January 2013, just one month before data collection began. The VAP/VAE rates were provided from the Infection Control Department at BAMC and were able to compare project data with theirs (see figure 4). This was an unexpected positive outcome for the project, as it validated the real time VAE rates collected from the chart audit documentation. There was a significant reduction in VAP/VAE rates in 2013.

Figure 4 VAP/VAE Rates from Jan –Dec 2013



Relationship of current findings to previous findings:

Several studies addressing VAP have been previously funded by The TriService Nursing Research Program (TSNRP). A study conducted by Bingham et al., (2008) focused on the effect of hand washing, head of bed elevation, and oral care on the incidence of VAP in five critical care units (four at San Antonio Military Medical Center [SAMMC] and one at Wilford Hall Medical Center [WHMC]). One specific aim of the study was to determine if the rate of VAP

could be decreased by focusing on the education of clinical staff to improve compliance with the CDC's hand hygiene guidelines and current recommendations for oral care (defined as brushing patients' teeth twice a day). There were no significant findings for oral care practices.

Despite gains in VAP education, there has been limited success in changing and sustaining clinical nursing practices, highlighting the need for a focused innovative oral care education program that provides knowledge and awareness of the best report EBP oral care nursing practices. Of equal importance is that the EBP proposal incorporates comprehensive and routine oral care as well as using standard reliable and valid oral health measures (OAG and Disclosing Agents). This project adds to the body of evidence regarding strategies to translate research into practice by employing innovative oral care education based on an evidence-based clinical practice guideline.

Oral care policies and practices vary from state to state, hospital to hospital, and even within intensive care units. In addition, protocols guiding oral care are inconsistent, impractical, difficult to follow, or lacking altogether. Few research studies address comprehensive or individual oral care practices for VAP/VAE prevention in mechanically ventilated patients. These inconsistencies and omissions have led to confusion and knowledge gaps regarding the best products, processes, and frequencies for oral care aimed at preventing VAP/VAE.

Of the numerous evidence-based guidelines for preventing VAP, the most recognized national oral care guideline for orally intubated adult critically ill patients is the 2006 and 2010 American Association of Critical Care Nurses (AACN) Practice Alert. Extensive work by Grap culminated in the original development of the AACN Oral Care Practice Alert. The AACN Oral Care Practice Alert emphasized that oral care should be provided every 2 to 4 hours. Because the frequency of the delivery of oral care remains somewhat in question, this EBP implementation project examined which compliance frequency, every 2 hours or every 4 hours, was optimal for moisturizing the oral mucosa and lips. The results showed that compliance rates were significantly higher for Q4 oral care. By switching to Q4 Oral Care kits, the hospital saved approximately \$125,000 in 2014 with this change in evidence based practice and no longer using the Q2 oral care kits.

The definition of VAP changed to Ventilator Associated Event in January 2013, just one month before we began data collection. We received the VAP/VAE rates from the Infection Control department at BAMC and were able to compare our data with theirs. This was an unexpected positive outcome for the project.

Effect of problems or obstacles on the results:

AHRPO audit from US Army Medical Research and Materiel Command (MRMC) IRB approved protocol on 10 January 2013. A teleconference with Dr. Loan and MRMC IRB on 22 January 2013 concluded informed consent was required for retrospective chart audits. The BAMC HPA concurred the EBP Project was EBP and not human subject research; their determination letter was provided. Data collection began on 19 February 2013.

Limitations:

It was challenging to get the nurses to complete the two-month post knowledge test due to deployments and permanent change of station moves.

During the last two phases of the study (Q4 Best Clinical Practice Compliance and Q4 Sustainment), few patients qualified to be screened because they were not on the ventilator for more than 24 hours. We got approximately half as many records to screen as we did in the other three phases. The sustainment phase participants were all males.

Conclusion:

The outcomes of this EBP implementation project increased nurses' awareness, practices, and compliance of evidence-based oral care practices in a military Level 1 trauma setting. By switching from Q2 to Q4 oral care kits the hospital saved approximately \$125,000 as well as identified best oral care compliance clinical practice with potential reduction in VAE/VAP.

Significance of Study or Project Results to Military Nursing

The project is aligned with two of the TriService Nursing Research Programs' research priorities—*Translating Research Findings into Practice in a Military Context* and *Developing and Sustaining Military Nursing Competencies*. The project has military significance and is highly important to nursing because it is a direct attempt to increase nurses' awareness and knowledge of the best standard of care oral care practices. Preventing VAP/VAE is a priority among the Joint Commission Patient Safety Goals (2008)¹ and the Institute for Healthcare Improvement (IHI) 5 Million Lives Campaign (DOD Patient Safety Program Newsletter, 2007).² Finally, preventing VAP/VAE is vital because new pay for performance standards state that hospitals will not be reimbursed for hospital acquired infections. This is true for TriCare for Life military beneficiaries. The expected outcomes of this EBP implementation project were to increase nurses' awareness, practices, and compliance of evidence-based oral care practices in a military setting. New evidence based oral care policies hospital-wide impacted the oral care delivery, coupled with increased compliance for every 4-hour oral care and cost savings of \$125,000.

Changes in Clinical Practice, Leadership, Management, Education, Policy, and/or Military Doctrine that Resulted from Study or Project

Nurses scored significantly higher on the post knowledge test after receiving the EBP Oral Care education class.

VAP/VAE rates decreased significantly during the data collection phases of the project after the EBP OC education class. (Figure 4)

By switching from Q2 to Q4 oral care kits the hospital saved approximately \$125,000 as well as identified best oral care compliance clinical practice with potential reduction in VAE/VAP.

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Summary of Dissemination

Type of Dissemination	Citation	Date and Source of Approval for Public Release
Publications		
Publications in Press		
Published Abstracts		
Podium Presentations	<p>TSNRP Research and Evidence-Based practice Dissemination Course, SEP 15-18 2014, San Antonio, Texas</p> <p>COL Laura Feider, Ms. Sybil Allison & Major David Allen. Implementing Evidence Based Oral Care for Critically Ill Patients</p> <p>Western Institute of Nursing (WIN) conference March 2014. COL Laura Feider, Ms. Sybil Allison & Major David Allen. Implementing Evidence Based Oral Care for Critically Ill Patients</p> <p>* not presented due to no conference packet approval to attend.</p>	<p>BAMC (May 2014) and AMEDDC&S HRCoE (August 2014) PAO and OPSEC approval.</p> <p>BAMC PACO/OPSEC approval FEB 2014.</p>
Poster Presentations	<p>Karen Rieder Research and EBP Poster Session at the TSNRP Research and Evidence-Based practice Dissemination Course, SEP 15-18 2014, San Antonio, Texas. COL Laura Feider, Ms. Sybil Allison, Major Tracee Rose, Mr. Harry Bradstreet, & Major David Allen. Implementing Evidence Based Oral Care for Critically Ill Patients</p>	<p>BAMC (May 2014) and AMEDDC&S HRCoE (August 2014) PAO and OPSEC approval.</p>

	<p>Brooke Army Medical Center Nurse Week Poster Presentation, May 2014</p> <p>COL Laura Feider, Ms. Sybil Allison, Maj Traceee Rose, Mr. Harry Bradstreet, & Major David Allen. Implementing Evidence Based Oral Care for Critically Ill Patients</p> <p>Twenty-second National Evidence Based Conference in Iowa, FEB 2014</p> <p>COL Laura Feider, Ms. Sybil Allison, Maj Traceee Rose, Mr. Harry Bradstreet, & Major David Allen. Implementing Evidence Based Oral Care for Critically Ill Patients</p> <p>* not presented due to no conference packet approval to attend.</p>	<p>BAMC PAO and OPSEC approval, April 2014.</p> <p>BAMC PAO and OPSEC approval, JAN 2014</p>
Media Reports		
Other		

Reportable Outcomes

Reportable Outcome	Detailed Description
Applied for Patent	none
Issued a Patent	none
Developed a cell line	none
Developed a tissue or serum repository	none
Developed a data registry	none

Recruitment and Retention Table

Recruitment and Retention Aspect	Number
Medical or Data Registry Records Available	60
Medical or Data Registry Records Screened	60
Subjects Ineligible	N/A
Subjects With Complete Data	60
Subjects with Incomplete Data	0

Each patient was tracked for several 24-hour periods after being on a ventilator for more than 24 hours. Many patients did not qualify for the screening process because either they were not on a ventilator or they were not on a ventilator for more than 24 hours. Data collection goals were achieved. All information that was necessary for our data collection purposes was available in Essentris, Clinical Information System; Electronic Health Record. When we compared our data to the infection control department's data, we confirmed we had tracked all of the patients diagnosed with VAP/VAE during all of our data collection phase time points.

Baseline data phase (6 weeks)- 17 medical records screened

Q2 Phase (6 weeks)- 16 medical records screened

Q4 Phase (6 weeks)- 13 medical records screened

Q4 Best Clinical Practice Phase (6 weeks)- 8 medical records screened

Q4 Sustainment Phase (Aug-Dec)- 6 medical records screened

Demographic Characteristics of the Sample

Characteristic-Baseline Data

Age (yrs)	51±20
Women, n	(8)
Men, n	(8)
Race	
White, n	(0)
Black, n	(0)
Hispanic or Latino, n	(5)
Native Hawaiian or other Pacific Islander, n	(0)
Asian, n	(0)
Other, n	(12)

Characteristic-Q2 Data

Age (yrs)	47.6±13
Women, n	(4)
Men, n	(12)
Race	
White, n	(0)
Black, n	(0)
Hispanic or Latino, n	(1)
Native Hawaiian or other Pacific Islander, n	(0)
Asian, n	(0)
Other, n	(15)

Characteristic-Q4 Data

Age (yrs)	57±20
Women, n	(6)
Men, n	(7)
Race	
White, n	(0)
Black, n	(0)
Hispanic or Latino, n	(4)
Native Hawaiian or other Pacific Islander, n	(1)
Asian, n	(0)
Other, n	(8)

Characteristic-Q4 Best Clinical Data

Age (yrs)	46.5±17
Women, n	(4)
Men, n	(4)
Race	
White, n	(0)
Black, n	(0)
Hispanic or Latino, n	(1)
Native Hawaiian or other Pacific Islander, n	(1)
Asian, n	(0)
Other, n	(7)

Characteristic-Q4 Sustainment Data

Age (yrs)	34±20
Women, n	(0)
Men, n	(6)
Race	
White, n	(0)
Black, n	(0)
Hispanic or Latino, n	(0)
Native Hawaiian or other Pacific Islander, n	(0)
Asian, n	(0)
Other, n	(6)