

Improving Ventilator Care through Collaborative Daily Goal Setting and  
Enhanced Communication Strategies

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**Abstract**

**Background / Purpose:** Critically ill patients requiring mechanical ventilation have an increased rate of complications including pneumonia, delirium and muscle weakness which may lead to long term complications. Reducing ventilator days may have a direct impact on preventing these complications.

The purpose of this quality improvement project was to implement a daily goal checklist for all Medical Intensive Care Unit (ICU) mechanically ventilated patients based on best practices and evidence to be reviewed systematically during multidisciplinary rounds. The focus was on providing evidence based guidelines including breathing trials, agitation and delirium management and early mobility with an anticipated goal of synchronizing the proposed patient centered plan of care and best practices. The primary anticipated outcome of this intervention was timely extubation with reduced ventilator days. A secondary outcome evaluated was an improvement in the process related to the Awakening, Breathing Coordination, Delirium management, and Early mobility or ABCDE bundle implementation, collaboration and communication among the multidisciplinary team. The feasibility and usability of daily goal checklist completion was also evaluated.

**Design:** Pre- and post-implementation design was used to evaluate the effect of a daily goal checklist to reduce ventilator days.

**Data analysis:** Data was collected for one month without a daily goal checklist and one month using the daily goal checklist for all mechanically ventilated patients. An Independent Groups *t* test was used to analyze correlations among the variables. The independent variable was the daily goals checklist. The dependent or outcome variable was ventilator days.

**Results:** During the pre-implementation phase (March, 2016) ventilator days were directly observed (N=497) by daily rounds. During the implementation phase with a daily goals checklist (April, 2016) ventilator days were directly observed (N=448) by daily rounds and were reduced by 10%. To test the hypothesis that the introduction of the daily goals checklist had a statistically significant impact on reducing ventilator days, an independent-samples t-test was performed. Although ventilator days were reduced, it was not found to be statistically significant when comparing pre-implementation phase ventilator days (M = 16.03, SD = 2.24) to post-implementation ventilator days (M = 14.93, SD = 2.99),  $t(59) = 1.10$ ,  $p = .109$ .

**Conclusions:** Several barriers were identified during data collection, including the inability of the Acute Care Nurse Practitioners to complete the daily goal checklist during rounds because of need to admit new patients, perform urgent patient care procedures or critical care management. The use of daily goal checklists is a method to systematically plan care based on best practices as proposed by the ABCDE protocol. Engagement of other multidisciplinary team members who are stakeholders or a system based intervention using an electronic checklist integrated into the daily progress note may improve the success of this patient safety innovation.

### Overview

Many critically ill patients require mechanical ventilation leading to complications including pneumonia, delirium, acquired weakness and even death (Restrepo et al., 2010). These complications result in extended hospital and ventilator days. For example, ventilator associated pneumonia (VAP) increases mortality, length of stay and overall costs of care (Institute for Healthcare Improvement, 2015a). For critically ill patients over sixty-five years old, VAP is associated with a risk of death as high as 50% (Blot et al., 2014). Delirium is also common with mechanical ventilation and if left untreated is associated with cognitive deficits. Pandharipande, et al. (2013) evaluated patients for three months post-discharge after critical illness associated delirium that was untreated. It was found that global cognition scores were 40% worse than in traumatic brain injury. Delirium can also extend hospital stays with increased resource use costing an estimated seven billion dollars each year for Medicare patients (O'Mahony, Murthy, Akunne, & Young, 2011). Finally, profound weakness due to mechanical ventilation and critical illness affects 60% of patients, requiring extended rehabilitation and can be reduced through early mobility (Vasilevskis, et al., 2010).

Current recommendations for liberation from mechanical ventilation include evidence-based protocols consisting of daily assessment for extubation or removal of the endotracheal tube. These include lightening sedation paired with daily breathing trials. Other strategies should include early mobility, agitation management and delirium management to avert the sequelae of extended mechanical ventilation (Girard et al., 2008; Blackwood et al., 2011; Barr et al., 2013; Schweikert, et al., 2009; Balas, et al., 2014; Pandharipande, P. P., Banerjee, A., McGrane, S., & Ely, E. W., 2010). This combined strategy has also been referred to as the Awakening, Breathing Coordination, Delirium Monitoring / Management and Early Exercise /

Mobility (ABCDE) bundle (Balas et al., 2013). Prevention of common complications associated with mechanical ventilation such as pneumonia, delirium and weakness through early extubation using evidence based guidelines is a key factor to improve patient outcomes.

Strategies to manage patients on mechanical ventilation and prevent associated complications are synchronized during daily multidisciplinary patient care rounds and enhanced using daily goal setting to effect decreased ventilator days, decreased morbidity and mortality, and promote best outcomes. Daily patient care rounds are performed in medical centers to synchronize planned strategies with best practices. Communication of this information among health care providers should be performed to optimize patient centered care (Rawat & Berenholtz, 2014). However, when key multidisciplinary care providers are not present or attentive during patient rounds to discuss the daily patient goals, goals are not systematically evaluated and there is communication failure leading to asynchrony of interventions that ultimately affects the safety and quality of care (Lane, Ferri, Lemaire, McLaughlin, & Stelfox, 2013). This communication failure should be minimized using standardized reliable processes in a quality safety culture (Sujan, Spurgeon, & Cooke, 2015). Daily goal checklists are a systematic communication strategy in the critical care setting encouraging multidisciplinary input and providing a centralized data audit source (Centofanti et al., 2014; Institute for Healthcare Improvement, 2015b).

The targeted focus for this scholarly project is critically ill patients in a large university based teaching medical center located in the Mid-Atlantic region with over seven hundred fifty beds in a twenty-nine bed Medical Intensive Care Unit. The evidence based strategies of paired sedation halting and breathing trials, agitation and delirium management, and early mobility have been implemented in a staged process within the targeted medical center. It was communicated

by the medical director of the targeted medical center ICU that there is a no systematic manner of communication of daily goals during rounds related to medical planning and implementation in relation to mechanical ventilation strategies (Medical Director, personal communication, August 10, 2015). This lack of systematic goal setting involves coordinating the multifaceted aspects of patient care such as reducing sedation to accommodate a breathing trial, or treating delirium to safely mobilize the patient. Goal planning is not performed in a consistent or systematic manner during daily medical rounds leading to potential fragmentation of care affecting patient outcomes. In a recent multicenter observational study by Sevransky, et. al (2015), examining hospital protocol efficacy in which the target facility participated, only 53% (n = 559) of the 1,058 eligible patients received a spontaneous breathing trial. There is currently no defined daily goal checklist in the targeted Medical ICU to address the combined aspects of paired sedation halting and breathing trials, agitation and delirium management and early mobility which are proven evidence based practices.

The purpose of this quality improvement project was to implement a daily goal checklist for all Medical ICU patients based on best practices and evidence to be reviewed systematically during multidisciplinary rounds. The focus was on providing evidence based guidelines including breathing trials, agitation and delirium management and early mobility with an anticipated goal of synchronizing the patient centered plan of care. The primary anticipated outcome of this intervention was timely extubation with reduced ventilator days. A secondary outcome evaluated was a process improvement related to the ABCDE bundle implementation, collaboration and communication among the multidisciplinary team. The feasibility and usability of daily goal checklist completion was evaluated.

### **Theoretical Framework**

The Donabedian's Quality Theoretical Framework describes the aspects of quality improvement including structures of care, processes of care, and health outcomes (Donabedian, 1968). The framework has been modified for this context (see Figure 1). The structures of care describe the physical and organizational aspects of the care provided. It is also related to the source of data used to formulate a plan to change processes. Processes describe the manner in which care is coordinated and provided. Health outcomes describe the product of the intervention in relation to the quality of the process of care delivery. This also involves how care is measured in relation to scales, reliability, validity and bias. Examples of health outcomes include mortality, morbidity, patient satisfaction and health improvement (McDonald, et al., 2007).

Structure in this context describes the members of the multidisciplinary patient care team representing medicine, advance practice nursing, nursing, respiratory therapy, physical therapy, the patient and family, and other specialty consultants. The processes of care describe the use of a daily goal checklist directing best practices for patient centered care. The improved quality of care provided because of this checklist is also part of the processes of care. The health outcomes describe the desired results of the processes including reduced ventilator days, improved communication and improved patient care outcome. There is a feedback loop that would be inherent between health outcomes and the processes of care. Changing outcome data would certainly drive changes in the way that care is provided in the processes of care. There may be further changes in how the data is measured based on continued analysis of the findings.

### **Literature Review**

Rumpke and Zimmerman (2010) describe that delays in extubation may be reduced by routine daily evaluation of readiness for extubation and protocol use. Jones, Newhouse,

Johnson, and Seidl (2014) described 52% missed opportunities for extubation related to protocol adherence involving sedation or spontaneous breathing trials. Winters, et al. (2009) noted that checklists provide a standard method for knowledge sharing and reliable translation of information to all members of the health care team. There is evidence based support for daily goal checklists to prevent missed opportunities and improve outcomes. There is limited research evidence on the use of daily goal checklists as a strategy. Research data will be presented to describe the significance of using a variety of ICU daily goal checklists.

Teixeira, et al. (2013) evaluated the use of a Quality Rounds Checklist in a surgical ICU from July 2009 to June 2011 using a prospective observational cohort study evaluating 2472 surgical ICU patients over two years. Outcomes included both reduced central line associated blood stream infections (CLABSI) (0.85/1000 vs. 4.98 /1000 catheter days,  $p < 0.001$ ) and ventilator associated pneumonia (VAP) (1.66/1000 vs. 8.74/1000 ventilator days,  $p = 0.07$ ). The thirteen-point checklist included medical therapeutics including VAP and venothromboembolism (VTE) prophylaxis. Compliance was sustained for two years.

An advantage of daily goal checklists is that they provide a method for systematic communication. Rehder, et al. (2012) performed a prospective cohort study involving 736 patients over nine months to improve communication among health care providers. Three distinct sequential interventions were implemented including daily note revision, a performance improvement dashboard and a daily goal checklist. The primary outcome of a daily goal checklist was agreement among the rounding team with the attending physician 57% to 83% ( $p < 0.001$ ). Secondary outcomes included improved communication, fewer interruptions and nurse inclusion in multidisciplinary rounds.

In addition to enhancing communication among providers, attitudes toward checklist use have been reported to impact its effectiveness in directing care and protocol adherence by providing a systematic approach (Avery, O'Brien, Pierce, & Gazarian, 2015). Centofanti, et al. (2014) used a mixed methods approach to evaluate the attitudes and perspectives of a seven-item daily goal checklist in Medical ICU rounds using field observation, document (goal sheet) analysis and participant interviews. Over six days, 80 patient rounds were observed, 72 ICU daily goal checklists completed, and 56 interviews performed with 93% ICU daily goal checklist compliance as the outcome reported. Communication improvement as an outcome, was a verbal strategy for the daily goal checklist that reflected improvement by feedback of the System Usability Scale. Patient safety through reduced ventilator days was a key outcome.

With a focus on processes of care and clinical outcomes, Weiss, Persell, Wunderink and Baker (2012) researched the role of daily multidisciplinary rounds ICU goal checklist to improve mortality risk in a critical care unit. In a prospective, concurrently-controlled cohort study, 265 patients were evaluated over an 82-day period. The control and treatment group were two medical teams who rotated every other day (N=140 treatment group, N=125 control group). A daily goal checklist using six standard evidence based items was provided to both medical teams. The ICU daily checklist was reviewed verbally in the treatment group and only observed for the control group. There was improved mortality and reduced antibiotic duration within the reviewed ICU daily goals checklist team. This reveals the significant role of ICU daily goal checklist use to improve patient care outcomes.

Improved communication affects patient outcomes including reduced ICU length of stay (Scheunemann, McDevitt, Carson, & Hanson, 2011). In a study by Agarwal, et al. (2008), a daily patient goal sheet was implemented within a longitudinal pre-post study design in a

pediatric ICU to improve communication and decrease ICU length of stay using questionnaires (pre-survey, n=419; post-survey, n=387). The questionnaires were distributed among the multidisciplinary providers with a focus on communication effectiveness, nurse knowledge of physicians involved in the care of each patient, and length of stay in Pediatric ICU. Outcome data noted PICU length of stay did not decrease. There was a perceived improvement in communication among the multidisciplinary team. Although communication was improved, the process could have been improved with greater multidisciplinary involvement in the questionnaire development which was exclusively created with by the physician staff as seen in Table 1.

Winters et al. (2009) reviewed the use of checklists in medical practice and suggested that checklist creation and development in medical care would benefit from a standardized methodology. There are limited randomized control trials due to the diverse nature of checklist implementation. Despite this fact, researchers have conducted multiple cohort studies that have shown improved communication, patient outcomes, reduced infection, and reduced mortality (Teixeira, et al., 2013; Rehder et al., 2012; Centofanti, et al., 2014; Weiss, et al., 2014; Agarwal, et al., 2008). Checklists should be succinct, multidisciplinary and based on current evidence. Checklist fatigue should be avoided maintaining awareness of complexity, time, utility and purpose Bergs, et al. (2015). Gawande (2010) explains that the complexity of medicine is not only impacted by the quantity or quality of knowledge required, but the execution which translates knowledge into action.

### **Methods**

A quality improvement project was implemented in a Medical ICU to evaluate the efficacy of a daily goals checklist used during multidisciplinary rounds and its impact on

reducing ventilator days. The targeted Medical ICU is a 29-bed critical care unit in a large university based teaching medical center in the Mid-Atlantic region. It serves critically ill patients with primarily medical diagnoses including respiratory, kidney and liver failure, sepsis, and shock states. Inclusion criteria included all inpatients during the implementation phase being treated in the Medical ICU on mechanical ventilation.

Four Medical ICU Acute Care Nurse Practitioners volunteered to participate in this project performing a daily goal checklist during multidisciplinary rounds. Each was individually trained in the use of the daily goal checklist before and during daily rounds using a demonstration and return demonstration method. Feedback was provided throughout this process to the volunteer Medical ICU Nurse Practitioner staff in the form of training and support by the project coordinator. The Medical ICU Nurse Practitioners were provided a Medical ICU Doctoral Scholarly Project Summary to supplement other training on use of the checklist. (See Appendix A) Training of the participating Acute Care Nurse Practitioners lasted two weeks. The Medical ICU bedside nurses were informed of the pilot program of daily checklist use was led by the Acute Care Nurse Practitioners in the form of a brief presentation in morning group report and unit safety and quality committee. A handout was provided with basic information about the project and the bedside nurse role in multidisciplinary rounds. The Acute Care Nurse Practitioner attended rounds which is the usual practice. The daily goal checklist was completed during rounds by the Acute Care Nurse Practitioner with input from the multidisciplinary team. This included reviewing each checklist item verbally and documenting the multidisciplinary team members' responses during each patient presentation in rounds.

In relation to data collection, ventilator days data was obtained to provide a baseline prior to implementation of the pilot program. Reporting of this data was obtained by the institution

through a daily observation of ventilator use which was documented by the unit secretary and includes data already collected within the unit. The reporting period begins on the first day of each month. A summary of data concerning ventilator days in the Medical ICU during one month prior and during the month of implementation was obtained to provide a baseline for pre- and post-implementation.

The daily goal checklist is a paper tool used for each patient consisting of defined responses using a checklist format. The daily goal checklist has four categories including breathing coordination, agitation / sedation, delirium management and exercise / early mobility. (See Table 2). Intubation was indicated on the daily goal checklist to foster improved data analysis of ventilator days. Non-intubated patients were not included. Indication of tracheostomy provides information that the patient may have chronic mechanical ventilation and not amenable to the standard liberation or extubation guidelines. Spontaneous breathing trials were evaluated daily. A sedation plan was evaluated daily. The Richmond Agitation Sedation Score (RASS) was used to monitor this plan (Khan, et. al, 2012). The RASS is a scoring system to describe agitation or somnolence negative 5 to zero to plus 4. A score of zero denotes alert and calm which is the goal. Negative 5 denotes an unresponsive state to painful stimuli. Plus 4 denotes a violent or combative state (Barr et al., 2013). Delirium management is monitored by the Confusion Assessment Method for ICU (CAM-ICU) (Barr, et. al, 2013). The CAM-ICU is tool that evaluates four key aspects of delirium including acute mental status change, inattention, disorganized thinking and altered consciousness levels through a series of questions (Cavallazzi, Saad, & Marik, 2012). Early mobility was evaluated by mobilization out of bed or by a physical therapy consultation. RASS and CAM-ICU are common scoring systems currently in daily use in

the Medical ICU with had no anticipated education requirements for the Acute Care Nurse Practitioners.

The daily goal checklists were completed for a one month period beginning March 1, 2016. This coincides with the reporting period used for data reporting of ventilator days in the Medical ICU. The timeline for this scholarly project may be found in Appendix B.

The daily goals checklist was evaluated for ease of use by the Acute Care Nurse Practitioners at the end of the implementation using the System Usability Scale (Brooke, 2013; U. S. Department of Health and Human Services, 2015). This tool was created by John Brooke in 1986 in coordination with Digital Equipment Company, Ltd., United Kingdom, for application in usability engineering (Brooke, 1996). It has been found to be a valid and reliable tool to evaluate the ease of use of tools and checklists. It is made freely available for use without restriction. (see Table 3)

System Usability Scale Reliability was found to have a coefficient alpha for Overall SUS of .92 in a study by Lewis and Sauro (2009) and was compared to a prior study by Bangor et al. (2008) who reported a coefficient alpha .91 for usability and learnability. Validity of this scale was performed by comparing eight separate usability studies including the System Usability Study which showed significant relation between these studies showing validity by Peres, Pham, & Phillips (2013).

The daily goal checklist responses were transcribed and summarized using Microsoft Excel software in a spreadsheet format. The daily goal checklists will be evaluated for completeness and compliance. Statistical data analysis was accomplished using SAS® University Edition software (Version 9.4). Frequency tables were created for the independent variable which is the daily goals checklist and the dependent variables (outcome variables)

including frequency of daily goal sheet completion, completeness of checklist items to include missing data, and ventilator days in the Medical ICU. An Independent Groups *t* test was used to analyze correlations among the variables. The independent variable was the daily goals checklist. The dependent or outcome variable was ventilator days.

To provide iterative improvement to this data collection, within the guidance of Donabedian's Structure-Process-Outcome theory, the data collection tool was evaluated for usability using the System Usability Scale by the volunteer Medical ICU Nurse Practitioners. This provided feedback on the usefulness and efficacy of this daily goal checklist in this patient population. It was not an intention to achieve reliability or validity of the checklist given the context of this evidence based process improvement project.

To protect human subjects during the implementation of this process improvement projects, a University of Maryland Baltimore Institutional Review Board (IRB) for Non-Human Subjects Research (NHSR) query was performed and approved. (See Appendix C) The daily goal checklist contained no patient identifiers. The Acute Care Nurse Practitioner initials and room number were documented. The Acute Care Nurse Practitioners volunteered to participate in this project.

### **Results**

During the pre-implementation phase (March, 2016) ventilator days were directly observed (N=497) by daily rounds. During the implementation phase with a daily goals checklist (April, 2016) ventilator days were directly observed (N=448) by daily rounds. An independent-samples t-test was performed to test the hypothesis that the introduction of the daily goals checklist had a statistically significant impact on reducing ventilator days. Although ventilator days were reduced by 10%, it was not found to be statistically significant when

comparing pre-implementation phase ventilator days ( $M = 16.03$ ,  $SD = 2.24$ ) to post-implementation ventilator days ( $14.93$ ,  $SD = 2.99$ ),  $t(59) = 1.10$ ,  $p = .109$ .

Compliance with completion of the daily goals checklist compared the total number of mechanically ventilated patients over the 30-day period of April, 2016 averaged 39%. Using the System Usability Score (SUS), there was a post-implementation evaluation of the daily goals checklist using a standardized tool for data collection and calculation. A SUS score above 68 is considered above average and below 68 is below average (Brooke, 1996). These scores do not represent a percentage. Survey results of the four acute care nurse practitioners scored 75, 83, 68 and 65 with an above average usability rating of 73. This scoring system is a subjective analysis of usability with a score of 73 being rated as “good”. This would indicate that improvements could be made to make the tool “excellent” or greater than 85.

### **Discussion**

It was the proposed intention to recruit Acute Care Nurse Practitioners to champion the process improvement project due to their motivation to participate as well as their role as engaged stakeholders. They are the only members of the medical provider staff who maintain a constant presence and function as a change agent in the Medical ICU. Several barriers for the Acute Care Nurse Practitioners to complete the daily goal checklist during rounds included the need to admit new patients or provide urgent patient care procedures or critical care management. With only 39% of checklists completed, in retrospect perhaps the addition of other multidisciplinary champions such as the Attending Physician, Critical Care Fellow, critical care nurse, respiratory therapist, physical therapist or occupational therapist would have improved compliance. According to Davenport (2013), another strategy to improve buy-in and commitment to participation and improve compliance could have been to expand the role of the

stakeholders in the process improvement design. Another factor may include the recent addition of another checklist added to the daily rounds presentation one month prior to implementation which included information for other prophylaxis measures including restraints, deep vein thrombosis prophylaxis, gastric ulcer prophylaxis and feeding regimens. The implementation of multiple checklists may also influence compliance through checklist fatigue by the participants which may detract from its importance or be perceived as an additional burden (Romig, Latif, & Pronovost, 2016).

The Donabedian's Quality Theoretical Framework was adapted to provide a framework for process improvement (See Figure 1). The outcome of this project is reflected by a decrease in ventilator days and salient aspects of the implementation of the daily goal checklist. The process is revised in an iterative manner changing how daily patient goal setting is performed by planning for integration of the daily goal checklist into the medical provider daily progress note.

Guided by the Donabedian Quality Theoretical Framework with a structure – process – outcome model, improvements in future implementation of a similar project are recommended. Related to Donabedian's Structure aspect, it is recommended that champions be expanded to other multidisciplinary health care providers including the respiratory therapist, nursing, attending and fellow physicians. This would entail a phase of training and evaluating learning gaps related to the ABCDE initiative but would be prudent in creating engaged stakeholders. Family engagement in activities such as encouraging mobility should be promoted as this is a significant part of patient care (Schweikert et al., 2009).

Related to Donabedian's Process aspect, it became apparent that the completion of a paper checklist was challenging and involved the nurse practitioner to be present on rounds. It is recommended that the daily goal checklist should be incorporated into the daily progress note

completed by the attending physician and nurse practitioner electronic medical record. A checklist is currently in use with drop down menus requiring mandatory responses within this note template including restraints (yes/ no), gastric ulcer prophylaxis (proton pump inhibitor / H<sub>2</sub> blocker / not indicated), deep vein thrombosis prophylaxis (Heparin / Enoxaparin / Sequential compression devices / not indicated or contraindicated), ventilator associated pneumonia prophylaxis (head of bed elevated / Chlorhexidine mouthwash / not indicated). Modifications to the current checklist could easily be adapted through editing of the progress note template. Adapting the daily goal checklist to the electronic medical record may improve compliance and be a more practical solution.

Middleton, et al. (2013) describe the use of the electronic health record for clinical decision support and reconciliation of clinical information such as daily goal assessment improves the safety of care provided to patients. The additional checklist items with mandatory drop down menus would include: Mechanical ventilation spontaneous breathing trial (yes / no / not indicated), Plan to manage / halt sedation (yes / not indicated), Delirium plan (yes / not indicated), Early mobility plan for out of bed (yes / contraindicated). In some drop down menu selections, a “No” response would not be included which is purposeful to promote best practices. The modified daily goal checklist may be seen in Figure 2. The use of the medical record for checklist completion would allow for retrospective review of compliance and root cause analysis for best practices evaluation. The modifications to the daily medical provider progress note template would need approval of the medical director but would not be difficult to implement within a pilot plan in the Medical ICU. If found to be an effective strategy, approval would be sought for implementation by all critical care areas within the targeted medical center through the Critical Care Operations Committee.

Related to Donabedian's Outcome aspect, another process improvement initiative could be completed. Ventilator day reduction and checklist compliance would be evaluated. Based on Donabedian's Quality Theoretical Framework, outcome data would guide process improvement through iterative changes in approach while integrating ongoing evidence based research. The reduction of ventilator days and ultimately reducing ICU length of stay reduces attributable risk of mortality (Melsen et al., 2013).

Other limitations in data collection included the recent adoption of the Epic electronic health record software (Epic Systems Corporation, 2016) by the targeted institution for most processes in patient care including documentation, procedures, medication administration and medical orders. This changed how ventilator data were documented, managed and reported. To avoid error, a daily rounding and direct observation of patients on mechanical ventilation was performed. Performing this process improvement initiative over more than one month may have improved checklist compliance over time.

Dissemination of the results of this scholarly project would include a presentation within the targeted medical center at advance practice nursing conferences and unit based presentations in the Medical ICU to medical providers and nursing staff. Presentations may include podium presentations, poster presentations and publication of in a peer-reviewed journal such as the American Journal of Critical Care. Other forums include presentations to advance practice nursing fellowships at regional medical centers, advance practice nursing conferences and schools of nursing within Baltimore City and surrounding counties. On a wider basis, results of this scholarly project could be submitted for review and possible podium or poster presentation to national and international nursing association conferences. The American Association of Critical-Care Nurses' (AACN) National Teaching Institute (NTI). The AACN will issue a call

for abstracts in the Spring 2017 for the May 2018 NTI. This topic would be of interest to the many providers and critical care nurses in attendance.

### **Conclusion**

Improving patient outcomes and optimizing patient safety should be approached in a systematic manner. The use of daily goal checklists is a viable method to synchronize care which is evidence based. Engagement of multidisciplinary team who are stakeholders with adequate training would improve the success of this patient safety innovation. Checklists and system-based tools such as electronic integrated checklists in the daily progress note are an effective strategy to reduce patient safety risk (Wachter, Pronovost, & Shekelle, 2013) (Thongprayoon et al., 2016). These strategies may improve compliance with the daily goals checklist. With integration of best evidence based practices and a daily goal checklist, a synchronization of planned and best practices will reduce ventilator days and improve patient outcomes. The implications of reducing ventilator days and ultimately reducing ICU stay leads to a reduction in attributable risk of mortality (Melsen et al., 2013). This process improvement project will act as an impetus for further study and continued improvement in the care of mechanically ventilated patients.

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Table 1.

*Pertinent literature review*

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating
Teixeira et al. (2013)	A Quality Rounds Checklist (QRC) was evaluated for use in a surgical ICU with an outcome goal of reduced VTE, VAP and CLABSI.	Prospective observational cohort study	N = 2,472 Surgical ICU patients over 2 year period (2009 – 2011). SICU patients.  Male 79% Female 21%.	Compliance compared pre and post implementation rate of VAP, VTE and CLABSI.  Checklist evaluated: Sedation holiday, Ventilator days, Vent weaning assessment	Sedation halt (holiday) stable 94%  VAP reduced (1.66/1000 vs. 8.74/1000 ventilator days, p=0.07)	4 A
Rehder et al. (2012)	Improve communication after three distinct sequential interventions are implemented	Prospective cohort study	N = 736 patients over 9 months	Sequential interventions were timed 8–12 weeks apart: (1) New resident daily progress note format, (2) New performance improvement “dashboard,” (3) Daily goals on written on bedside whiteboards.  The primary outcome was	By the end of all three interventions, team goals compared to attending goals rose from 57% to 83% (p<0.001).  Results by team member: Fellows 65% to 89%(p<0.001) Residents 55% to 84% (p<0.001) Nurses 54% to 77% (p<0.0001)  Secondary outcomes : Reduced barriers to communication. Facilitation to communication fostered by reviewing prior day goals and nurse inclusion.	4 A

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating
				shared goal agreement as compared to the attending physician.	Satisfaction with communication among the providers rose from 43% to 78% (p<0.001).	
Centofanti et al. (2014)	Understand ICU clinicians attitudes regarding medical rounds daily checklist use.	Mixed methods – Field observation, Document analysis (goal sheets) and Interviews	Field observations - 80 ICU patient rounds over 6 days  Documents -72 completed goal sheets  Interviews -56 clinicians interviewed individually and group	Checklist compliance / Inclusion of key concepts in care including:  Breathing trial  Sedation interruption  Central lines	Field observations:  93% goal checklist compliance for rounds 86%. Verbal review (83%)  Document analysis: Domains with high completion rates: Ventilation, Sedation, Central venous access, Nutrition, Prophylaxis  Interviews: Communication, learning and patient care was improved.  Multidisciplinary (RN, MD, PharmD).  Structured, helped individualize plan of care.  The daily goals checklist inspired further discussion about sedation, weaning and medication management.	5 B
Weiss, Persell, Wunderink and Baker	To evaluate if an ICU checklist assisted by prompting improves patient care outcomes.	Prospective, concurrently-controlled cohort study	N = 265 patients enrolled prospectively in an 82 day	A daily rounding checklist was developed with six parameters:	183 patients received empiric antibiotics.	3 B

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating
(2012)			<p>intervention time period.</p> <p>N = 140 in prompted group.</p> <p>N = 125 in in control (unprompted) group)</p>	<p>Antibiotics, Ventilator weaning, central venous catheters (CVC), urinary catheters, VTE prophylaxis, Peptic ulcer prophylaxis.</p> <p>Mortality was compared between a prompted checklist ICU team compared to a non-prompted checklist ICU team.</p>	<p>Hospital mortality was directly correlated with antibiotic duration (i.e. longer duration led to higher mortality) (<math>p &lt; 0.001</math>).</p> <p>Lower antibiotic duration within the treatment group (with prompting), associated with decreased mortality (OR 0.41, 95% CI 0.18-0.92, <math>P = 0.032</math>). (after risk adjustment)</p> <p>Mechanical ventilation use was unable to be fully assessed due to population size.</p>	
Agarwal et al. (2008)	To evaluate how multidisciplinary communication and ICU length of stay are influenced by a daily patient goal sheet used in a pediatric intensive care unit.	Longitudinal pre-post study design	<p>N = 806 nurses and physicians</p> <p>PRE: 419 questionnaires completed by nurses and physicians before goal sheet implementation.</p> <p>POST: 387 questionnaires about goal sheet implementation were completed by nurses and physicians.</p>	Questionnaires pre and post implementation to assess communication effectiveness, nurse knowledge of physicians in charge, and length of stay in PICU using Likert and dichotomous (yes/no) responses.	<p>Improvement in patient goal understanding was perceived by healthcare staff (<math>p &lt; .001</math>)</p> <p>Total patient care goal numbers increased (<math>p &lt; .01</math>).</p> <p>Helpfulness of goal sheet was 76%.</p>	3 A

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating

Table 2.

*Medical ICU Daily Goal Checklist*

MICU DAILY GOAL CHECKLIST			
	DATE: ____/____/____		
	ROOM: _____	ACNP INITIALS: _____	
	INTUBATED: <input type="checkbox"/> YES <input type="checkbox"/> NO		
	TRACH: <input type="checkbox"/> YES <input type="checkbox"/> NO		
	QUESTION	ASSESSMENT	RECOMMENDED ACTION
BREATHING COORDINATION	Is a spontaneous breathing trial considered?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A (Deferred)	If passed, extubate. Deferral based on institutional guidelines. (See Failure Criteria, Form OA45)
AGITATION / SEDATION	Is there a plan to halt and manage sedation?  (with goal Richmond Agitation Sedation Score)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	(See Screen to Wean Criteria, Form OA45) RASS goal = 0
DELIRIUM	Is there a delirium plan?  (including Confusion Assessment Method - ICU (CAM-ICU) assessment and /or anti-delirium interventions)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A (no delirium or contraindication to treatment)	Pharm: Anti-delirium medication  Non-Pharm: OOB, reduce stimuli, avoid restraints
EXERCISE/ EARLY MOBILITY	Is there an early mobility plan?  (plan for out of bed and/or Physical Therapy consultation)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A (contraindication)	Consider OOB and Physical Therapy consult

Table 3.

*System Usability Scale*

<b>System Usability Scale:</b>		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
<b>Daily Goal Checklist NP Feedback</b>						
	Question	0	1	2	3	4
1	I think I would like to use the checklist frequently.					
2	I found the checklist unnecessarily complex					
3	I thought the checklist was easy to use					
4	I think that I would need the support of a technical person to be able to use the checklist					
5	I found that the various functions in the checklist were well integrated					
6	I thought that there was too much inconsistency in the checklist					
7	I would imagine that most people would learn to use the checklist very quickly					
8	I found the checklist very awkward to use					
9	I felt very confident using the checklist					
10	I needed to learn a lot of things before I could get going with the checklist					

Figure 1. Adapted Donabedian Quality Theoretical Framework

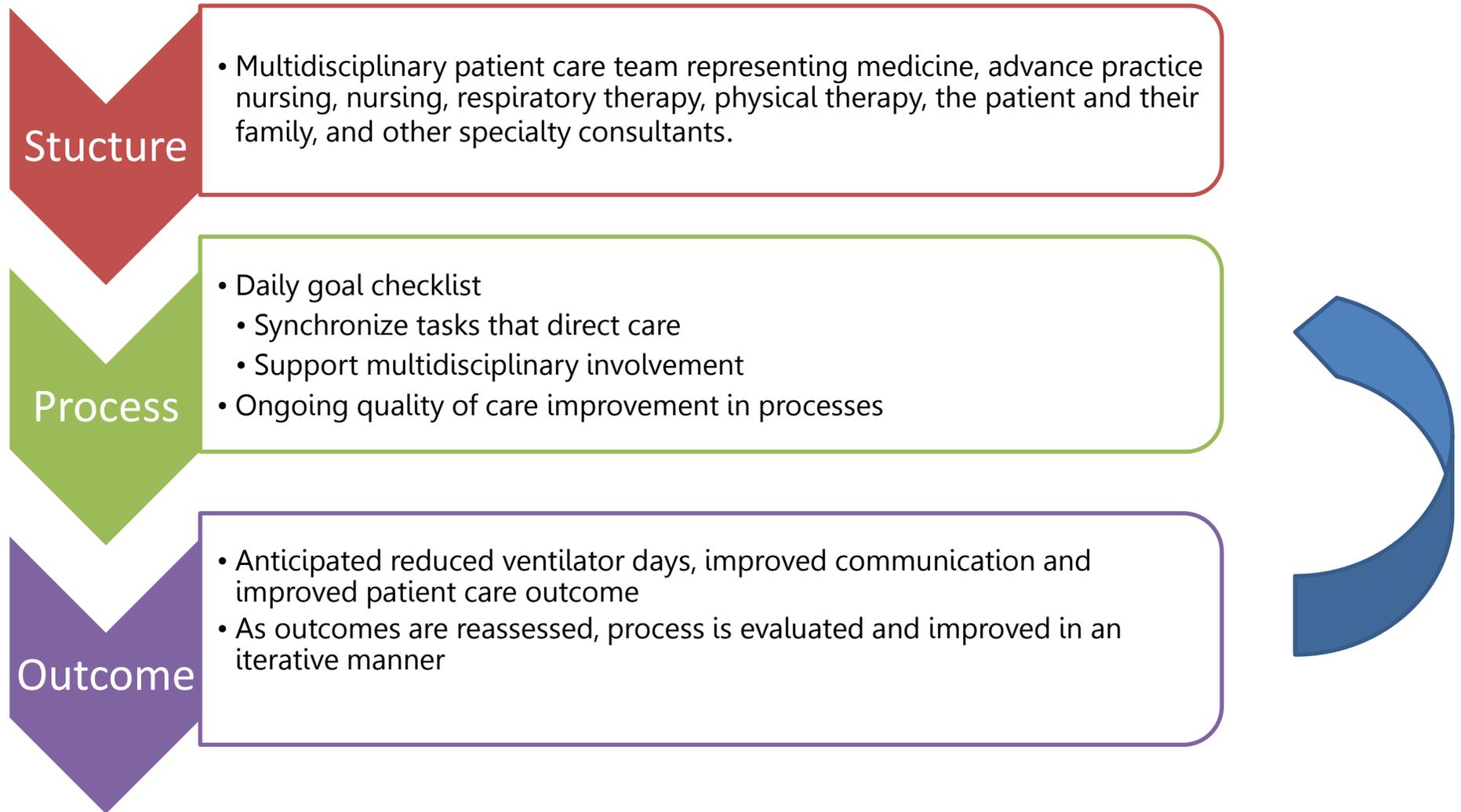


Figure 2. Modified daily goal checklist

**Restraints:**

Yes

No

**Gastric ulcer prophylaxis:**

Proton pump inhibitor

H<sub>2</sub> blocker

Not indicated

**Deep vein thrombosis prophylaxis:**

Heparin

Enoxaparin

Sequential compression devices

Not indicated or contraindicated

**Ventilator associated pneumonia prophylaxis:**

Head of bed elevated

Chlorhexidine gluconate mouthwash

Not indicated

**Mechanical ventilation spontaneous breathing trial:**

Yes

No

Not indicated

**Plan to manage or halt sedation**

Yes

Not indicated or contraindicated

**Delirium management plan**

Yes

Not indicated

**Early mobility plan for out of bed**

Yes

Contraindicated

## Appendix A

## Medical ICU Doctoral Scholarly Project Information Summary

**To: Medical ICU providers**

**From: John Hagan, RN, MS, CCRN, ACNP-BC, Acute Care Nurse Practitioner, Medical Intensive Care Unit**

**RE: Doctoral Scholarly Project**

**Date: April 1 to April 30, 2016**

**Purpose:**

The purpose of this quality improvement project is to implement a daily goal checklist for all Medical ICU patients based on best practices and evidence to be reviewed systematically during multidisciplinary rounds.

The focus is on providing evidence based guidelines including awakening, breathing coordination, agitation and delirium management and early mobility (ABCDE) bundle with an anticipated goal of synchronizing the patient centered plan of care to promote best practices and reduce ventilator days.

**Summary:**

- Mechanical ventilation is required by 90% of critically ill patients. Each day, up to 50,000 patients are on ventilators in the U.S. risking pneumonia, delirium, weakness and death leading to increased hospital length of stay (LOS) and ventilator days.
- Delirium is common, 74% in a large cohort study, and left untreated causes significant cognitive deficits (Pandharipande, 2013). Weakness affects 60% of patients, needing extensive rehabilitation (Vasilevskis et al, 2010). Prevention of these complications is a key factor to improve outcomes.
- Educating one VAP would save \$40,000 as a return on investment and reduce risk of death (IHI, 2015)
- **Critical care bundle checklists provide a daily goal synchronization of planned goals and best practices leading to process improvement and improved patient outcomes.**
- **Checklists in critical care have been associated with improved communication, patient outcomes, reduced infection, and reduced mortality** (Teixeira et al., 2013; Rehder et al., 2012; Centofanti et al., 2014; Weiss et al., 2014; Agarwal et al., 2008).

**Background:**

- Ventilator associated pneumonia (VAP) is the number one cause of infection related deaths with 46% risk (IHI, 2015).
- A meta-analysis showed protocol driven ventilator weaning led to 25% less vent days and 10% decreased hospital stay (Blackwood, 2011).
- Delirium treated by standard protocol reduced ventilator days and LOS reducing hospital costs overall in a randomized control trial by Barr et al. (2013).
- Three months after delirium at post-discharge, global cognition scores were 40% worse than in traumatic brain injury (Pandharipande, 2013).
- Early mobility reduced hospital LOS by 3 days, decreased delirium, and improved independent functional status (Vasilevskis et al, 2010).
- The Awakening and Breathing Coordination, Delirium management and Early mobility (ABCDE) initiative included a team approach and basic strategies such as getting patients out of bed which led to 50% less delirium and saved 3 ventilator days (Balas et al, 2014).

**Methods:**

- During daily multidisciplinary patient care rounds, a daily goal checklist will be reviewed of the basic aspects of the ABCDE bundle on mechanically ventilated patients by the Acute Care Nurse Practitioner.
- These questions include:

1. Is a spontaneous breathing trial considered?
  2. Is there a plan to halt and / or manage sedation?
  3. Is there a delirium plan?
  4. Is there an early mobility plan?
- The project will last one month.

#### **Anticipated Outcomes:**

- The primary anticipated outcome of this intervention is timely extubation with reduced ventilator days.
- A secondary outcome may be improved process improvement related to the ABCDE bundle implementation, collaboration and communication among the multidisciplinary team.
- The feasibility and usability of daily goal checklist completion will be evaluated.

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For questions about this or a related topic, email

John Hagan, CRNP-AC [jhagan@umm.edu](mailto:jhagan@umm.edu)



Appendix C

Institutional Review Board approval letter

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[jdavenport@son.umaryland.edu](mailto:jdavenport@son.umaryland.edu)

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**From:** [CICERO@som.umaryland.edu](mailto:CICERO@som.umaryland.edu) [mailto:[CICERO@som.umaryland.edu](mailto:CICERO@som.umaryland.edu)]  
**Sent:** Thursday, March 24, 2016 12:57 PM  
**To:** Davenport, Joan  
**Subject:** Research is Not Human Subjects Research

Joan Davenport  
Asst. Professor & Vice Chair



[Show details](#)

**Not Human Subjects Research (NHSR) Confirmed**  
**To:** Joan Davenport  
**Link:** [HP-00068984](#)

An IRB Analyst has reviewed the information provided and has determined that the project meets the definition of *Not Human Subjects Research* (NHSR). IRB oversight is not required and no further actions are required.

**Description:**

**Submission Title:** Ventilator daily goal setting

**POC:** Joan Davenport

Please contact the HRPO at [410-706-5037](tel:410-706-5037) or [HRPO@umaryland.edu](mailto:HRPO@umaryland.edu) if you have any questions.

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