IMPLEMENTATION OF THE CONFUSION ASSESSMENT METHOD ON A MEDICAL INTERMEDIATE CARE UNIT

by

Katharine Outen, BSN, RN

Under Supervision of

Bimbola Akintade, PhD, MBA, MHA, ACNP-BC, NEA-BC

Second Reader

Veronica Amos, PhD, CRNA, PHCNS-BC

A DNP Project Manuscript
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Nursing Practice Degree

University of Maryland School of Nursing
May 2019

Abstract

Background

Delirium is a clinical syndrome characterized by acute onset fluctuations in mental status accompanied by inattention, an altered level of consciousness, and impairment in cognition. For all hospitalized adults, the prevalence of delirium is estimated at 20%, with an incidence ranging from 18% to 64%. Several hospital interventions put a patient at risk for developing delirium, including mechanical ventilation, medication interactions, urinary catheters, interrupted sleep cycles, and use of physical restraints. Developing delirium leads to an increased length of stay in an intensive care unit, length of overall hospital stay, likelihood of requiring nursing home care after discharge, and risk of mortality following hospitalization. Longer periods of delirium worsen cognition, executive functioning, ability to complete activities of daily living, and sensory-motor functioning.

Local Problem

The lack of delirium screening was identified as a potential patient safety issue on a medical intermediate care unit of a large, urban academic medical center on the East Coast.

Interventions

The Confusion Assessment Method is a widely used, specific and sensitive tool utilized to screen adult patients for delirium. A quality improvement project was conducted over a 13-week period to implement and assess the nurse-perceived usability of the Confusion Assessment Method screening tool for patients on the medical intermediate care unit. Inclusion criteria was any patient over age 18 who transferred to the medical intermediate care unit directly from a medical intensive care unit. Eligible patients had a Confusion Assessment Method screening completed once per shift by the primary bedside nurse. The nurse was also asked to complete a System Usability Scale survey, a Likert-style questionnaire, to evaluate the nurse-perceived usability of the Confusion Assessment Method for this patient population. Participation by the nursing staff was voluntary.

Results

There were 329 eligible patient encounters with 183 Confusion Assessment Method screenings completed. Nurse compliance rate with completing the screening was 55.6%. Of the completed screenings, 8.7% (n=16) were "positive," or suggestive that a diagnosis of delirium was present. A total of 181 System Usability Scale surveys were completed by the nursing staff with scores ranging from 35 to 100. The mean score was 77.94 (*SD ±12.21*), indicating above average usability.

Conclusions

Healthcare providers need to be aware of the risk of developing delirium for hospitalized adults and routinely screen patients. This quality improvement project provides initial support regarding the usability of the Confusion Assessment Method screening tool for non-critically ill adult patients on a medical intermediate care unit. Integration of delirium screening tools into the electronic medical records may improve compliance with screening.

Implementation of the Confusion Assessment Method on a Medical Intermediate Care Unit

For all hospitalized adults, the prevalence of delirium is estimated at 20%, with an incidence ranging from 18% to 64% (American Psychiatric Association [APA], 2013; Josephson & Miller, 2015). Furthermore, it is estimated that up to 80% of patients who are in an intensive care unit (ICU) will experience delirium (APA, 2013). Delirium is a clinical syndrome characterized by acute onset fluctuations in mental status, accompanied by inattention, an altered level of consciousness, and impairment in cognition that is the direct physiological consequence of a medical condition (APA, 2013). For the general population, the prevalence of delirium is relatively low, estimated at just two percent, but for adults aged 85 and above, the prevalence increases to 14% (APA, 2013). Several hospital interventions put a patient at risk for developing delirium, including mechanical ventilation, medication interactions, use of physical restraints, urinary catheters, and interrupted sleep cycles. Developing delirium increases a patients' length of stay in an ICU, increases ventilator days, and increases overall hospital length of stay (Anand & MacLullich, 2017; Salluh et al., 2015). Untreated, acute delirium can lead to seizures, coma, or even death; the inpatient mortality rate for individuals with delirium is estimated at 25-33% (APA, 2013; Josephson & Miller, 2015). In the United States the cost of delirium is estimated at $143 to $152 billion annually (Josephson & Miller, 2015; Leslie & Inouye, 2011). Delirium has been recognized as a problem that some patients experience while admitted on a medical intermediate care unit (MIMC) in a large academic medical center on the East Coast. The implementation of a delirium screening tool will be used to identify these patients.

Delirium is more than just an acute inpatient issue and the effects of delirium last long after the patient is discharged. Of patients that experienced delirium during hospitalization, 40% had cognition scores that were similar to individuals with moderate traumatic brain injuries on

the Repeatable Battery for the Assessment of Neurological Status (RBRANS) test and 26% had cognition scores similar to individuals with mild Alzheimer's on the Trail Making Test, Part B (Trail B) at three-months after discharge. At twelve-months, 34% of hospitalized patients had cognition scores similar to individuals with moderate traumatic brain injury on the RBRANS test and 24% had cognition scores similar to those with Alzheimer's on the Trail B (Pandharipande et al., 2013). Experiencing delirium in the hospital has also been found to increase the risk of developing dementia in individuals aged 85 and above, and resulted in worsened dementia severity scores for individuals who previously had dementia (Davis et al., 2012). Patients who experience delirium have a fivefold increased risk of mortality following hospitalization and are more likely to need nursing home care after discharge (Josephson & Miller, 2015). Additionally, studies have found that the longer a patient experiences delirium in the hospital, they will have worsened cognition, executive functioning, ability to complete activities of daily living, and sensory-motor functioning after one year (Brummel et al., 2014; Pandharipande et al., 2013; Vasilevskis, Han, Hughes, & Ely, 2012).

Due to the high prevalence of delirium in ICUs, patients are often routinely screened; however, it is inconsistently evaluated and screened for on other inpatient hospital units. Screening for delirium was identified as a potential patient safety issue for adult patients on a MIMC at a large academic hospital on the East Coast. Due to the health and financial impacts of delirium, early recognition is key to preventing or reducing the effects of delirium. Several delirium screening tools exist, but the Confusion Assessment Method (CAM) is the most widely used because it is a relatively simple, yet effective and reliable tool; the CAM tool has a sensitivity of 95% and a specificity of 89% (De & Wand, 2015; Holly, Cantwell, & Kamienski, 2013; Inouye, Westendorp, & Saczynski, 2014; Kalish, Gillham, & Unwin, 2014).

Project Purpose

The purpose of this Doctor of Nursing Practice (DNP) project was to implement and evaluate the nurse-perceived usability and feasibility of the CAM delirium screening tool for patients on a MIMC of a large, urban academic medical center on the East Coast. The short-term goals of this project were that by week four of implementation, 50% of staff on the MIMC were educated about the CAM and 50% of patients transferred to the MIMC from a medical ICU (MICU) were screened for delirium using the CAM. The long-term goals of this project were that 80% of staff on the MIMC were educated about the CAM tool and 80% patients on the MIMC were routinely (every 12 hours) screened for delirium using the CAM tool. The ultimate long-term goal for this DNP project is that nurse-driven protocols are initiated when a patients' CAM screening identifies delirium in order to help reduce the length of time the patient experiences delirium.

Theoretical Framework

The Knowledge-to-Action (KTA) Model was used as the theoretical framework for this DNP project. The KTA model, developed at the University of Ottawa by Dr. Graham and his colleagues, serves to integrate knowledge creation with knowledge application in order to facilitate practice change (Graham et al., 2006; White, 2016). It consists of three stages of knowledge creation: inquiry, synthesis, and development of knowledge tools; at each stage, knowledge is adapted for the targeted audience. The KTA model also contains an overlapping action cycle, consisting of seven steps: problem identification, knowledge adaption, assessment of facilitators and barriers to knowledge use, intervention implementation, knowledge use monitoring, knowledge evaluation, and sustained knowledge use (Graham et al., 2006). The action cycle steps can lead a user to implement knowledge or a new practice process.

Application of the Knowledge-to-Action Model

For this DNP project, the identified problem was the lack of standardized delirium screening for patients on a MIMC. Knowledge adaption occurred through an evaluation of current literature: delirium negatively impacts patients during and post-hospitalization, several effective screening tools exist, yet patients on this MIMC are not evaluated for delirium. Barriers and facilitators to knowledge use were evaluated on this unit; education for the staff was crucial to gain buy-in and rationalize the importance of the practice change. Once staff were educated, implementation of the CAM tool began with the assistance of unit champions, initially focusing use on patients who were transferred from the MICU. Knowledge use was monitored through chart audits in order to evaluate the feasibility of delirium screening on patients transferred from the MICU. Knowledge evaluation was conducted via staff surveys to determine usability and feasibility of routinely using the CAM on all patients on the MIMC. Sustained knowledge use is the ultimate long-term goal of this DNP project: all patients on a MIMC will be routinely screened for delirium, and nurse-driven protocols will be implemented to reduce delirium in these patients.

Utilization of the KTA model to implement this practice change allowed for evaluation and adjustment at all stages. If the CAM tool can be successfully implemented on a MIMC, the KTA model can be implemented on additional inpatient hospital units in the future to evaluate for and implement measures to reduce delirium.

Literature Review

The need for a reliable method of identifying patients potentially experiencing delirium outside of the ICU is the focus of evidence in this literature review. This review will begin with an analysis of four systematic evidence reviews that are focused on the usability of the CAM tool

as a means to identify delirium in non-critically ill patients. Next it will synthesize findings from the systematic evidence reviews. It will conclude with recommendations on how to best implement the CAM tool to identify non-critically ill patients potentially experiencing delirium. See Appendix A.

Analysis

A systematic review conducted by De and Wand (2015) aimed to evaluate and provide guidance in the choice of delirium screening tools for non-critically ill patients. Studies were only included if a screening tool was compared against a standardized diagnosis of delirium, such as the Diagnostic and Statistical Manual of Mental Disorders. De and Wand (2015) reported that the CAM was the most frequently utilized delirium screening tool and that the average length of time to administer the CAM was between five and seven minutes. De and Wand (2015) found that the CAM had high usability for patients in the emergency department, postoperatively, and for mixed inpatient units. However, studies reported sensitivity ranging from 46% to 100% and specificity ranging from 63% to 100%, depending on user training (De & Wand, 2015). The researchers found that individuals who underwent training on administering the CAM tool had higher sensitivity and specificity (De & Wand, 2015). Furthermore, De and Wand (2015) noted that half of the articles included for review did not state the time frame between delirium assessments, which may insufficiently capture a patient experiencing delirium due to the fluctuations in mental status seen in delirium.

Holly, Cantwell, and Kamienski (2013) conducted an overview of systematic reviews to evaluate tools for identification and prevention of acute delirium in non-critically ill patients. Of the 13 systematic reviews included, three focused on delirium screening tools. The CAM was found to be the most widely used tool for non-critically ill patients and had moderately high

interrater reliability, with an overall sensitivity of 95% and specificity of 89%. However, the researchers found that the CAM was less effective as a delirium screening tool if the patient had an altered level of consciousness; because delirium is a disease of fluctuating mental status, patients must be continually screened for delirium (Holly, Cantwell, & Kamienski, 2013). Providers must also be aware that a screening tool is not diagnostic and should not replace clinical judgement, but rather be used in combination with clinical signs to evaluate possible delirium.

A systematic evidence review conducted by Khan et al. (2012) aimed to provide evidenced-based recommendations for practitioners related to delirium care and identify gaps in delirium research. The CAM tool had the most utility for delirium screening outside the ICU, with a sensitivity of 94% and specificity of 89% (Khan et al., 2012). However, according to the researchers, without proper training on CAM administration, its usability is decreased (Khan et al., 2012).

Shi, Warren, Saposnik, and MacDermid (2013) also conducted a systematic review and meta-analysis to determine the diagnostic accuracy of the CAM tool in identifying delirium for non-critically ill patients. A total of 22 studies were evaluated, with nine studies evaluating the usability of the CAM outside of the ICU. Studies were only included if the CAM was compared to clinical diagnostic criteria, as outlined in the Diagnostic and Statistical Manual of Mental Disorders IV. Utilizing this comparison helps to improve the reliability of the CAM because it is being directly compared to the standard diagnostic criteria. Shi et al. (2013) found the CAM took less than 10 minutes to administer and had a pooled sensitivity of 82% and a pooled specificity of 99%. However, the researchers do note that in the majority of the studies the CAM

was not administered by trained psychiatrists, but rather by nurses or physicians, which may contribute to lower sensitivity (Shi et al., 3013).

Synthesis

Evaluation of these systematic reviews indicate that the CAM is a useful and accurate delirium screening tool for use with a variety of non-critically ill patients. The systematic reviews conducted by De and Wand (2015) and Shi et al. (2013) found that the CAM can be administered in less than 10 minutes, which increases the likelihood that utilizing the CAM for delirium screening outside of the ICU can be sustained in practice. Additionally, analysis of these systematic reviews found that sensitivity was decreased when the CAM was administered by individuals who had not received proper training. The review by De and Wand (2013) found sensitivities as low as 46% for those not properly trained on the use of the CAM tool, but as high as 100% with proper training. Shi et al. (2013) found a pooled sensitivity of 82%, while Holly, Cantwell, and Kamienski (2013) and Khan et al. (2012) found sensitivities of 95% and 94%, respectively. Therefore, to ensure best results, individuals administering the CAM should undergo education and training. Furthermore, delirium is a condition of fluctuations in mental status, and therefore assessing patients for delirium should be a routine part of practice, rather than single evaluations.

Conclusion

Healthcare providers need to be cognizant of a patient potentially developing delirium while hospitalized and routinely screen all non-critically ill patients for delirium. Clinicians should not solely use delirium screening tools to diagnose delirium, but rather incorporate the results of screening tools in conjunction with clinical judgement in order to identify patients who are potentially experiencing delirium. The CAM tool has been widely studied and found to be

effective for identifying delirium in non-critically ill patients, if properly administered by individuals' trained in its use.

Project Implementation Plan

Project Description, Sample, and Setting

This quality improvement (QI) project focused on evaluating the nurse-perceived usability of implementing the CAM delirium screening tool for non-critically ill patients. The project was conducted on a 16-bed MIMC unit of a large, urban academic medical center on the East Coast. The inclusion criteria for patients was all adult patients age 18 and older who were transferred from the MICU to the MIMC. There were no exclusions of patients based on medical diagnosis. The patient sample size (N=183) was determined by patient encounters; each 12 hour shift that a patient was on the MIMC counted as one encounter. Inclusion criteria for the nurse survey sample to evaluate usability included the Registered Nurses who work on the MIMC and agreed to participate in the project. This sample size (N=181) was determined by patient encounters and completion of a survey; each eligible patient a nurse cared for per shift was counted as one survey, if the nurse was willing to participate. The patient sample size (N=183*)* and the nurse survey sample size (N=181) were not equal because for two eligible patient encounters where a CAM screening tool was completed, the nurse did not complete a survey.

Procedures and Timeline

This QI project was implemented over a 13-week period from September to December 2018. During the first week, the DNP project leader led a one-hour training session for the three recruited volunteer unit champions. The training session included the DNP project purpose and goals, eligible patients, and how to use the CAM delirium screening tool (see Appendices B and

C, respectively). The unit champions were also educated on the System Usability Scale (SUS) survey that was given to each nurse who utilizes the delirium screening tool on an eligible patient (see Appendix D). At the beginning of the second week, the DNP project leader introduced the project to the unit-based nursing leadership team at the bi-monthly leadership meeting. The DNP project leader also introduced the delirium screening tool to all bedside nursing staff during daily change-of-shift staff huddles.

During weeks two through four, unit champions began education for the unit nursing staff on how to use the delirium screening tool and how to determine patient eligibility. The CAM screening tool was utilized on eligible patients once per shift, for a total of two screenings per calendar day. A master list of the unit nursing staff was provided to the unit champions so that staff could be signed-off once educated (see Appendix E). This helped to ensure that all the unit staff were educated on the project.

During weeks five through thirteen, nurses were notified that CAM delirium screenings would be completed on all patients transferred from the MICU to the MIMC once per shift by the patients' assigned nurse. A folder was left on the unit for completed screening tools. The nurses were also be asked to anonymously complete a SUS survey if they completed a CAM delirium screen for their patient. A folder was also left on the unit for the completed surveys. During that time, the DNP project leader and the unit champions reminded staff during daily change-of-shift huddles to complete the delirium screening tool on eligible patients and to complete the SUS. Periodic evaluation of compliance was conducted and staff were re-educated mid-way through the implementation phase.

During week fourteen, the DNP project leader collected all completed delirium screening tools, conducted an audit to determine the total number of eligible patients throughout the implementation phase, and collected all completed SUS surveys.

Data Collection

The MIMC maintains a daily patient log of admissions and discharges which was used to evaluate the total number of patients that were eligible for delirium screening versus the total number of delirium screenings completed (see Appendix F). Additionally, the number of times a patient screens positive for delirium based on the CAM tools was noted (see Appendix F).

The SUS is a reliable and validated ten-item Likert-style questionnaire that is utilized to assess overall usability of a system intervention (Bangor, Kortum, & Miller, 2008). Each item is ranked from five (strongly agree) to one (strongly disagree). The scores were then normalized to indicate overall usability (see Appendix G). For this DNP project, the "system" indicated within the SUS referred to the CAM delirium screening tool.

Data Analysis

Data collected for this project was analyzed with descriptive statistics on Microsoft Excel. Staff compliance with use of the delirium screening tool was calculated by using the total number of completed delirium screening tools divided by the total number of eligible patient encounters. Analysis of the SUS survey results included the total number completed and the overall percent usability.

Protection of Human Subjects and Institutional Review Board Approval

In order to protect patient and nursing staff confidentiality, no identifying information was collected with the completed delirium screening tool. When the DNP project leader conducted patient flow and chart reviews, only the total numbers of patients admitted from the

MICU was collected. The SUS completed by the nurses was anonymous and no identifying demographic data was collected. The folders for the completed delirium screening tool and the completed nurse surveys were checked and emptied at least twice per week by the DNP project leader. Additionally, a description of the project was submitted to the University of Maryland Baltimore Institutional Review Board and received a Non-Human Subjects Research determination.

Sustainability Plan

After completion of this DNP project, sustainability will be accomplished through stakeholder investment. The need for identification of delirium will lead to routine screening of all patients admitted or transferred to the MIMC. Incorporation of the delirium screening tool into the electronic medical records (EMR) will simplify the process for bedside nurses and help delirium screening become part of routine practice.

Results

There were a total of 329 eligible patient encounters over the nine-week implementation period. A total of 183 CAM screenings were completed, resulting in 55.6% compliance by the nursing staff. Of the 183 completed CAM screenings, 16 were "positive," or suggestive of a diagnosis of delirium. This represents an 8.7% incidence of delirium for this patient population.

A total of 181 SUS surveys were completed by the nursing staff. Adjusted scores ranged from 35 to 100, with a mean rating of 77.94 (*SD±12.21)*. According to the SUS tool instructions, a score greater than 68 indicates above average usability. Of the 181 completed SUS surveys, 85.01% (n=154) had adjusted scores over 68.

Each of the 10 questions of the SUS were also evaluated. For this project, "system" in the SUS survey referred to the CAM screening tool. For the first question, "I think I would like

to use this system frequently," 67.9 % (n=123) selected "agree" or "strongly agree." For the second question, "I found this system unnecessarily complex," 89.5% (n=162) selected "disagree" or "strongly disagree." For the third question, "I found this system easy to use," 92.8% (n=168) selected "agree" or "strongly agree." Complete results of each question on the SUS survey are available in Figures 1 and 2.

Changes in Practice

At the start of the project implementation, approximately 70% of the nursing staff working on the MIMC had been educated on the CAM screening tool and the SUS survey, and the remaining were educated with just-in-time training if they were caring for an eligible patient. Mid-way through implementation, compliance with completion of the CAM screening tool was evaluated and found to be approximately 65%. Therefore, all nursing staff were re-educated by the project leader and the unit champions.

Additionally, the charge nurses began to identify eligible patients at each change-of-shift huddle to help encourage nursing staff participation with the project. While this identification of eligible patients by the charge nurses was beneficial for participation in the project, it is not a sustainable practice. However, if practice standards on the MIMC were amended so that all patients on the unit were routinely screened for delirium as part of daily nursing assessment, identification of specific patients and reminders would not be necessary. Screening patients for delirium was a change in practice and added an additional step to the usual nursing workflow; this required frequent reminders and education by the charge nurses, unit champions, and project leader.

Associations between Interventions and Outcomes

Nurses on the unit were noted to be more cognizant of patients who were ineligible for this QI project but that were potentially experiencing delirium. Several nurses notified the project lead and the unit champions that there were patients on the unit that would screen delirium "positive" if they qualified for inclusion in this QI project, but these patients had transferred from units other than the MICU to the MIMC. It was encouraging that nurses were aware of patients who may potentially be experiencing delirium, despite not meeting inclusion criteria, and is an important and promising aspect of sustainability.

Unintended Consequences

An unintended facilitator of this project implementation was the charge nurses identifying eligible patients and announcing at each change-of-shift huddle which patients were to have a CAM screen and SUS completed. It helped clarify which patients should be screened and helped to remind staff daily to participate in this project.

An identified barrier was the completion of the CAM tool and SUS survey on paper rather than in the EMR, where the nurses complete required charting. Having the forms on paper created an extra step in the nursing workflow, and may have been a contributor to decreased compliance. The CAM screening tool is already available within the EMR system utilized on the MIMC, which would make routine delirium screening easier if the unit decided to change practice standards and screen each patient daily.

Additionally, during the implementation period the unit had many shifts that were inadequately staffed, which lead to increased stress and less time to complete required tasks. Participation in this project was voluntary, so it is possible that compliance was decreased due to staffing demands. While staffing demands cannot always be alleviated, utilizing the CAM screening within the EMR and changing practice standards for the MIMC so that it is a required

component of daily nursing assessment will increase compliance and delirium screening in this patient population.

Discussion

Association between Intervention and Outcomes

This QI project provides initial support regarding the nurse-perceived usability of the CAM screening tool for patients on a MIMC, with 85.01% (n=154) of the 181 completed SUS surveys indicating above average usability. Overall, nurses on the MIMC felt the CAM screening tool was usable within this patient population.

Comparison of Results to the Literature

Previous studies estimated the prevalence of delirium at 20%, with incidence ranging from 18% to 64% (APA, 2013; Josephson & Miller, 2015). This project found an incidence of 8.7%, which is markedly lower. However, this project only included patients transferred to the MIMC directly from the MICU, so it is possible the incidence rate would be higher if all patients on the MIMC were screened for delirium. Nurses also noted that there were patients on the unit during the implementation period who did not meet inclusion criteria that would likely screen positive if they were included.

Additionally, patients were only screened for delirium with the CAM tool for nine weeks of the implementation period. The degree of patient illnesses varies greatly on the MIMC, and it is possible that a longer data collection period would detect a higher incidence of delirium. Furthermore, for the duration of the implementation period there were two patients on the unit who met inclusion requirements but were not experiencing delirium; these outliers may have lowered the incidence rate for the MIMC during the implementation period.

Differences between Observed and Anticipated Outcomes

An unexpected finding of this project was that nurse compliance with completing the CAM screening tool decreased after the mid-way point of implementation, despite re-education of nursing staff. It was expected that compliance would increase as nurses became more familiar with the project and became more comfortable utilizing the CAM screening tool. However, the unit had several weeks of understaffing during the implementation period, and because project participation was voluntary, it is possible that staff elected not to participate in order to complete mandatory patient-related activities. While staffing shortages are unavoidable, changing unit-based practice standards to include routine delirium screening on all patients would increase compliance. An electronic version of the CAM screening is already available in the EMR utilized on the MIMC, so adoption into practice would be relatively simple and not create much change in the nursing workflow.

Strengths and Limitations

A particular strength noted with implementation of this project was the engagement of the charge nurses on the unit. The charge nurses noted eligible patients at daily change-of-shift huddles and reminded staff to participate by screening patients and completing the SUS survey. This engagement is crucial for sustainability and these individuals will likely be champions for changing unit-based practices to include delirium screening as part of routine nursing assessment in the future. This implementation also strengthened nurse collaboration within the unit and provided an opportunity for teaching and learning for all involved.

A limitation of this project was screening patients through the use of a paper CAM tool rather than within the EMR. The paper form created an extra step in the nursing workflow, which may have decreased participation. Implementation of practice change can be met with

more resistance when it changes workflows, so future studies to assess usability should incorporate delirium screening tools already available within EMR systems.

Conclusion

Usefulness, Sustainability, and Spread

Experiencing delirium negatively impacts health outcomes for hospitalized adults. Screening for and early treatment of delirium is an important component of reducing the length of time a patient experiences delirium. The CAM was perceived as a usable screening tool for non-critically ill adult patients on a MIMC of a large, urban academic medical center on the East Coast. The incidence rate of delirium for this patient population was 8.7%.

Interventions implemented at the conclusion of this project aided in its sustainability. Nurses on the MIMC were informed of the project results during daily change-of-shift huddles and they were pleased to hear that overall the CAM was perceived as a useful intervention in this patient population. It was recommended to the medical and nursing leadership on the MIMC that delirium screening be incorporated as part of daily nursing assessment. Additionally, delirium screening education should be incorporated as part of annual nursing education.

Implication for Practice

The CAM is a useful delirium screening tool for non-critically ill adult patients. Early and on-going identification of patients who may be experiencing delirium is crucial for delirium management and minimizing its long-term effects on cognition, executive functioning, and sensory-motor skills. Screening patients allows bedside nurses to implement prevention strategies, such as maintenance of sleep/wake cycles and promotion of mobility, in order to reduce the length of time a patient experiences delirium.

The results of this QI project are not meant to be generalizable to other units or organizations because evaluation of the CAM usability was specific to this patient population, but can be used to guide future projects related to implementation of the CAM. Future projects to evaluate usability should be completed by utilizing the CAM tool within the current EMR used for nursing documentation as well as inclusion of all patients on the MIMC; doing so may improve nurse compliance and provide a more accurate delirium incidence rate in this patient population. In addition, future projects examining the usability of the CAM on other units and patient populations should be explored. Future projects could also explore the most beneficial nurse-initiated interventions to reduce the length of time a patient experiences delirium.

Next Steps

Nurses on the MIMC continue to recognize patients that may be experiencing delirium and attempt to reduce or minimize its effects, such as attempting to maintain natural sleep/wake cycles and promoting mobility. Changing the unit-based practice to include delirium screening as part of routine nursing assessment should be considered.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Publishing.

Anand, A. & MacLullich, A.M.J. (2017). Delirium in hospitalized older adults. *Medicine, 45(1),* 46-50. doi: https://doi.org/10.1016/j.mpmed.2016.10.006

Bangor, A., Kortum, P. T., & Miller, J. T. (2008). An empirical evaluation of the System Usability Scale. *International Journal of Human-Computer Interaction, 24(6),* 574–594. doi: 10.1080/10447310802205776

Brummel, N.E., Jackson, J.C., Pandharipande, P.P., Thompson, J.L., Shintani, A.K., Dittus, R.S., … Girard, T.D. (2014). Delirium in the intensive care unit and subsequent long-term disability of survivors of mechanical ventilation. *Critical Care Medicine, 42(2),* 369-377. doi: 10.1097/CCM.0b013e3182a645bd

Davis, D.H.J., Terrera, G.M., Keage, H., Rahkonen, T., Oinas, M., Matthews, F.E., . . . Brayne, C. (2012). Delirium is a strong risk-factor for dementia in the oldest-old: a population-based cohort study. *Brain, 135(9),* 2809-2816. doi: 10.1093/brain/aws190

De, J., & Wand, A.P.F. (2015). Delirium screening: a systematic review of delirium screening tools in hospitalized patients. *The Gerontologist, 55(6),* 1079-1099.

Graham, I.D., Logan, J., Harrison, M.B., Straus, S.E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: time for a map? *The Journal of Continuing Education in the Health Professions, 26(1),* 13-24.

Holly, C., Cantwell, E.R., & Kamienski, M.C. (2013). Evidence-based practices for the

identification, screening, and prevention of acute delirium in the hospitalized elderly: an overview of systematic reviews. *Current Translational Geriatrics and Experimental Gerontology Reports, 2(1),* 7-15.

Inouye, S.K., vanDyck, C.H., Alessi, C.A., Balkin, S., Siegal, A.P., & Horwitz, R.I. (1990). Clarifying confusion: The Confusion Assessment Method. A new method for detection of delirium. *Annals of Internal Medicine, 113,* 941-948.

Inouye, S.K., Westendorp, R.G.J., & Saczynski, J.S. (2014). Delirium in elderly people. *Lancet, 383(9920),* 911-922.

Josephson, S.A. & Miller, B.L. (2015). Confusion and Delirium. In Kasper, D.L., Fauci, A.S., Hauser, S.L., Longo, D.L., Jameson, J.L., & Loscalzo, J. (Eds.), *Harrison's Principles of Internal Medicine* (19th ed.) (Chapter 34). New York: McGraw-Hill.

Kalish, V.B., Gillham, J.E., & Unwin, B.K. (2014). Delirium in older persons: evaluation and management. *American Family Physician, 90(3),* 150-158.

Khan, B.A., Zawahiri, M., Campbell, N.L., Fox, G.C., Weinstein, E.J., Nazir, A., Farber, M.O., . . .Boustani, M.A. (2012). Delirium in hospitalized patients: implications of current evidence on clinical practice and future avenues for research – a systematic evidence review. *Journal of Hospital Medicine, 7(7),* 580-589.

Leslie, D.L. & Inouye, S.K. (2011). The importance of delirium: economic and societal costs. *Journal of American Geriatrics Society, 59(S2),* S241-S243. doi: 10.1111/j.1532-5415.2011.03671.x

Pandharipande, P.P., Girard, T.D., Jackson, J.C., Morandi, A., Thompson, J.L., Pun, B.T.,… Ely, E.W. (2013). Long-term cognitive impairment after critical illness. *The New England Journal of Medicine, 369,* 1306-1316. doi: 10.1056/NEJMoa1301372

Salluh, J.I.F., Wang, H., Schneider, E.B., Nagaraja, N., Yenokyan, G., Damluji, A.,. . .Stevens, R.D. (2015). Outcome of delirium in critically ill patients: systematic review and meta-analysis. *BMJ, 350,* h2538. doi: https://doi.org/10.1136/bmj.h2538

Shi, Q., Warren, L., Saposnik, G., & MacDermid, J.C. (2013). Confusion assessment method: a systematic review and meta-analysis of diagnostic accuracy. *Neuropsychiatric Disease and Treatment, 9,* 1359-1370.

Vasilevskis, E.E., Han, J.H., Hughes, C.G., & Ely, E.W. (2012). Epidemiology and risk factors for delirium across hospital settings. *Best Practice & Research: Clinical Anaesthesiology, 26(3),* 277-287. doi: 10.1016/j.bpa.2012.07.003

White, K. M. (2016). The science of translation and major frameworks. In K. M. White, S. Dudley-Brown, & M. F. Terhaar (Eds.), *Translation of evidence into nursing and health care* (2nd ed.) (pp. 25-55). New York, NY: Springer Publishing Company, LLC.

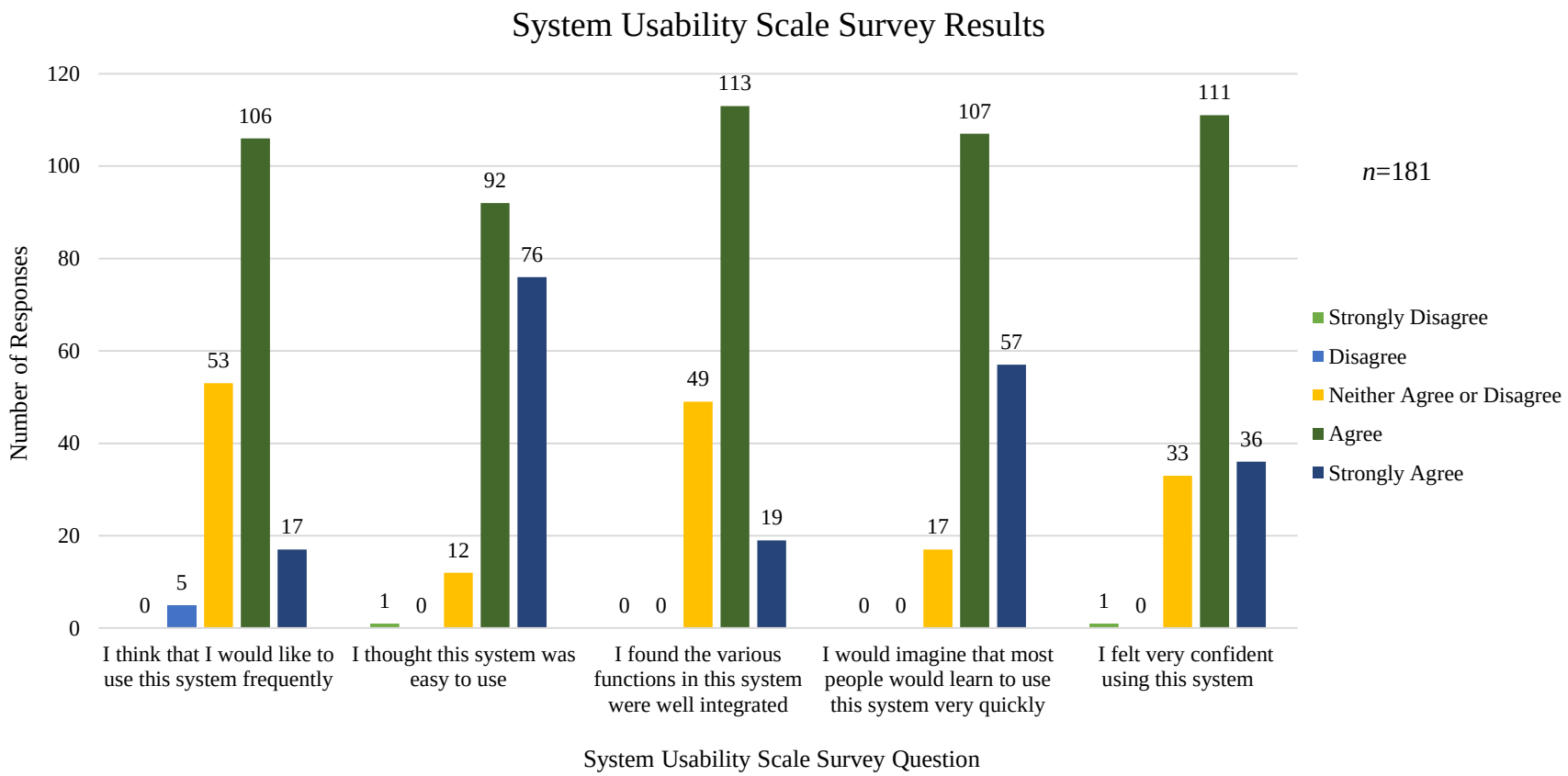

Figure 1. System Usability Scale Survey Question Results. For this project, "system" refers to the Confusion Assessment Method delirium screening tool.

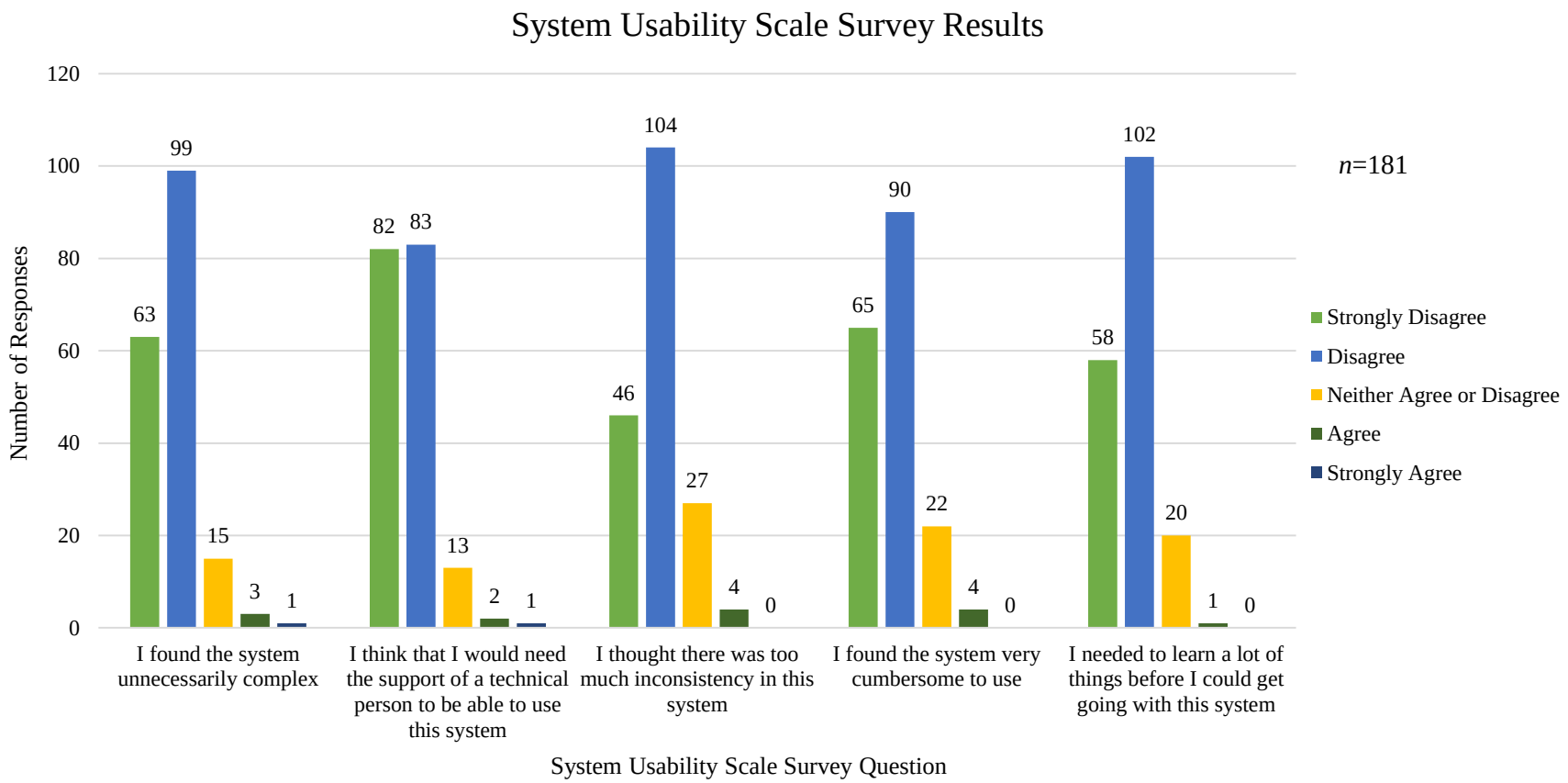

Figure 2. System Usability Scale Survey Question Results. For this project, "system" refers to the Confusion Assessment Method delirium screening tool.

Appendix A

Evidence Review Table

Author, Year	Study Objectives	Design	Sample (N)	Outcomes Studied	Results	Level and Quality Rating
De & Wand, 2015	To evaluate delirium screening tools in non-critically ill hospitalized patients	Systematic review	31 total research studies included that evaluated the use of 21 different delirium screening tools	Databases searched for primary research that compared a delirium screening tool against a standardized diagnostic measure (Diagnostic and Statistical Manual of Mental Disorders or International Classification of Diseases).	Confusion assessment method (CAM) had greater than 95% specificity and sensitivity. Interrater reliability was high (Cohen's kappa rating 1.0) when using the CAM compared to the Delirium Symptom Index. Optimum results for CAM are achieved with staff training before testing.	I B
Holly, Cantwell, & Kamienski, 2013	To provide a summary of existing systematic reviews related to identification and prevention of delirium in elderly hospitalized patients	Overview of systematic reviews	Papers published between 2000 and October 2012 were searched to find systematic reviews related to delirium: 13 systematic reviews were included in the overview	Seven systematic reviews focused on risk factors for delirium, three on delirium screening methods, and three on preventing delirium in elderly hospitalized patients	CAM had an overall sensitivity of 95% and specificity of 89%. Use of beside screening tools (such as CAM) are optimally achieved with trainings for staff All bedside screening tools need to be corroborated with clinical judgement, especially in patients with underlying psychiatric illness, depression, or dementia	I B
Khan et al., 2012	To provide evidenced-based	Systematic review of all published	22 Systematic Evidence Reviews	Evaluated evidence reviews meeting the	CAM had the most evidence to support its use	I B

	recommendations to practitioners for delirium care and to identify research gaps related to delirium	systematic evidence reviews between January 1966 and April 2011	met inclusion criteria	rating of "good" or "fair" evidence as defined by the United States Preventive Services Task Force Critical Appraisal for Systematic Evidence Reviews criteria	as a bedside delirium screening tool and demonstrated a sensitivity of 94% and specificity of 89%	
Shi et al., 2013	To evaluate the diagnostic accuracy of the Confusion Assessment Method (CAM) and the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU).	Systematic review and meta-analysis	Two researchers conducted literature searches to include articles that evaluated the CAM or CAM-ICU. 22 total studies included. Nine studies evaluated the CAM (n=1033) and 13 studies evaluated the CAM-ICU (n=1409).	Inclusion criteria were studies that were observational, case studies, or cross-sectional designs; written in English; utilized the DSM-IV diagnostic criteria for delirium as the comparison standard; and accuracy estimates included sensitivity and specificity, and true positives, true negatives, false positives, and false negatives.	Mean age of patients was 54 to 85 years old. Incidence of delirium ranged from 14 % to 87%. Most studies evaluated the utility of the CAM or CAM-ICU administered by general practitioners or nurses rather than trained psychiatrists. Pooled sensitivities: CAM 82%; CAM-ICU 81%. Pooled specificities: CAM99%; CAM-ICU 98%. Both the CAM and CAM-ICU can be quickly administered to assess for delirium in a variety of hospitalized patients.	I A

Appendix B

Staff Training and Education Plan

1. Project Background
    a. Statistics of delirium occurrence
    b. Consequences of a patient experiencing delirium
2. Project Purpose
    a. Implementation of the CAM delirium screening tool for patients on the MIMC
3. Patient Eligibility
    a. Patients transferred from the MICU during implementation period
    b. All adults aged 18 and above
    c. No exclusions based on medical diagnoses
4. Procedures
    a. Bedside nurse who has an eligible patient to complete CAM once per shift
    b. Complete nursing questionnaire
5. Resources
    a. Folder left on unit with project background, purpose, and goals
    b. CAM completion instructions
    c. Blank CAM forms
    d. Blank survey forms
6. Outcomes
    a. Compliance with CAM
        i. Audits of number of eligible patients compared to number of CAM screening tools completed
    b. Evaluation of frequency CAM screening tool is positive for delirium
    c. Nursing staff questionnaire
        i. Evaluates perceived usability within this patient population
        ii. Anonymous and optional

Appendix C

Confusion Assessment Method Worksheet

I. ACUTE ONSET AND FLUCTUATING COURSE

a) Is there evidence of an acute change in mental status from the patient's baseline? No ____ Yes ____

b) Did the (abnormal) behavior fluctuate during the day, that is tend to come and go or increase and decrease in severity? No ____ Yes ____

II. INATTENTION

Did the patient have difficulty focusing attention, for example, being easily distractible or having difficulty keeping track of what was being said? No ____ Yes ____

BOX 1

III. DISORGANIZED THINKING

Was the patient's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject? No ____ Yes ____

IV. ALTERED LEVEL OF CONSCIOUSNESS

Overall, how would you rate the patient's level of consciousness?

-- Alert (normal)

-- Vigilant (hyperalert)

-- Lethargic (drowsy, easily aroused)

-- Stupor (difficult to arouse)

-- Coma (unarousable)

Do any checks appear in the box above? No ____ Yes ____

BOX 2

If Inattention and at least one other item in Box 1 are checked and at least one item in Box 2 is checked a diagnosis of delirium is suggested.

Note. Adapted from "Confusion Assessment Method. © 1988, 2003, Hospital Elder Life Program. All rights reserved. Adapted from: Inouye SK et al. Ann Intern Med. 1990; 113:941-8."

Appendix D

System Usability Scale

	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
Question	1	2	3	4	5
1. I think that I would like to use this system frequently	☐	☐	☐	☐	☐
2. I found the system unnecessarily complex	☐	☐	☐	☐	☐
3. I thought the system was easy to use	☐	☐	☐	☐	☐
4. I think that I would need the support of a technical person to be able to use this system	☐	☐	☐	☐	☐
5. I found the various functions in this system were well integrated	☐	☐	☐	☐	☐
6. I thought there was too much inconsistency in this system	☐	☐	☐	☐	☐
7. I would imagine that most people would learn to use this system very quickly	☐	☐	☐	☐	☐
8. I found the system very cumbersome to use	☐	☐	☐	☐	☐
9. I felt very confident using the system	☐	☐	☐	☐	☐
10. I needed to learn a lot of things before I could get going with this system	☐	☐	☐	☐	☐

Note. Adapted from Bangor, A., Kortum, P. T., & Miller, J. T. (2008). An empirical evaluation of the System Usability Scale. *International Journal of Human-Computer Interaction, 24(6),* 574–594.

Appendix E

Medical Intermediate Care Unit Staff Training

Name	Unit Champion Trainer	Date Educated
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		
29.		
30.		

Appendix F

Data Collection Tool

Week	Number of CAM screenings completed	Number of eligible patients	Number of CAM positive screenings
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
Totals			

**CAM=Confusion Assessment Method*

Appendix G

System Usability Scale Scoring

The System Usability Scale (SUS) score represents the overall usability of a system. For this DNP project, the system is the Confusion Assessment Method (CAM) delirium screening tool. SUS scores range from 0-100, with anything above a 68 indicating above average and anything below 68 indicating below average.

Even numbered questions represent negative aspects of the system.
Odd numbered questions represent positive aspects of the system.

Scoring:

1. Determine the numerical value of each question.
    a. Strongly disagree = 1
    b. Strongly agree = 5
2. For each of the even numbered questions, subtract the obtained numerical value from 5.
    a. Range of 4 to 0.
3. For each of the odd numbered questions, subtract 1 from the obtained numerical value.
    a. Range of 0 to 4.
4. Add the adjusted scores of all 10 questions.
5. Multiply the adjusted score by 2.5 to obtain a final normalized value.

Note. Adapted from Bangor, A., Kortum, P. T., & Miller, J. T. (2008). An empirical evaluation of the System Usability Scale. *International Journal of Human-Computer Interaction, 24(6),* 574–594.