University of Nevada, Reno

Delirium screening tool(s) for (ed): Implementation

A thesis submitted in partial fulfillment
of the requirements for the degree of

Bachelor of Science in Nursing and the Honors Program

by

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May, 2015

UNIVERSITY OF NEVADA RENO

THE HONORS PROGRAM

We recommend that the thesis
prepared under our supervision by

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entitled

Delirium screening tool(s) for (ed): Implementation

be accepted in partial fulfillment of the
requirements for the degree of

BACHELOR OF SCIENCE, NURSING

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Dr. Rochelle Walsh

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Tamara Valentine, Ph. D., Director, **Honors Program**

May, 2019

Introduction

Delirium is characterized as a state of acute to subacute confusion that comes on very suddenly and lasts hours or even days (Vyveganathan et al., 2019). This condition is an acute confusional state, characterized by disturbance of consciousness accompanied by variable degrees of cognitive impairment (McCoy, Hart, & Perlis 2017). Other commonly used terms to describe delirium include acute confusion state, ICU psychosis, and organic brain syndrome (Arbabi, Shahhatami, Mojtahedzadeh, Mohammadi, & Ghaeli, 2018). Delirium often occurs due to one or more of the many possible contributing factors. The most common factors include infections, medications, dehydration, pain, cardiovascular accidents, metabolic disturbances, and recent surgeries (Kukreja, Ulf, & Popp, 2015). After identifying, and treating, the underlying disease process, delirium is often wholly reversible and goes away in a few days to weeks. However, approximately 2.6 million older adults annually experience delirium before or during hospitalization, but the diagnosis is missed in up to 70% of cases (Han et al., 2009). Despite the prevalence of delirium amongst the elderly population, healthcare professionals have been found to have little sensitivity for the topic, and avoid evident training needs (Selim & Ely, 2016). Allowing delirium to progress without detection and treatment leads to more extended hospital stays, worse patient outcomes, and may even lead to death (McCoy et al., 2017). Diagnosing delirium and implementing immediate effective treatment is the best way to combat the negative consequences that may present from delirium.

However, delirium is also challenging to diagnose. There is no laboratory or imaging test for the condition, meaning it must be clinically identified by a nurse or physician (Arbabi et al., 2018). Comprehensive clinical assessments exist, but test administration is time-consuming and often forgone in emergencies. To decrease the number of adverse effects that result from

delirium, it is imperative to utilize effective delirium screening tools and to use these tools in a unit that will be able to make the most difference.

To diagnose delirium, and determine appropriate treatment, the first step is to have an appropriate delirium screening tool(s) put in place. The next step would be to implement it into a hospital unit that would have the most influence. On average, there are about 131 million Emergency Department (ED) visits per year. Of those visits, 16% are older adults aged 65 and over (Feller, 2016). Due to the increasing population and longer life expectancies, the number of Americans age 65 and older is projected to increase. In fact, the geriatric age group is the fastest growing age group worldwide, and the population is expected to more than double from 46 million in 2016 to over 98 million by 2060 (Mather, 2016). Due to the high percentage of seniors visiting the ED and experiencing delirium, it seems appropriate to focus this literature review on delirium screening efficacy in the elderly population in the ED. However, it is critical that the selected delirium screening tool is feasible for use in the selected unit. For example, the ED is very fast-paced and therefore has time constraints. Implementing a screening tool that takes an excessive amount of time would not be realistic for use in this type of environments.

Problem Statement

The plethora of tools available can make it difficult for the clinicians to decide which tool to use and in what context (Arbabi et al., 2018). For example, a recent Australian study demonstrated that detection of delirium by staff was poor, with staff correctly identifying only 23% of cases with delirium despite a targeted multimodal educational intervention (Wand et al., 2014). While much of it currently goes unrecognized, prompt identification is the first step in appropriate management and treatment (Arbabi et al., 2018). Therefore, the primary aim of this review was to identify, compare, and evaluate validation studies of delirium screening tools used

in hospital inpatients. A secondary aim was to guide the implementation strategies and clinical applicability of the reviewed screening tools to specific patient populations and hospital units. PICO question: In ED patients, older than 65, is there research to support one delirium screening tool versus a combination of screening tools

Background

As far as the repercussions of delirium, three major themes present itself when analyzing the effects. These themes are effects on patient functioning, increased risk of mortality, and monetary cost. In terms of patient functioning, there are short term and long-term effects of delirium (Arbabi et al., 2018). Delirium in older adults is associated with poor short-term outcomes regarding functional and cognitive consequences (McCoy et al., 2017). Patients with delirium usually become more confused over a few hours or a couple of days. These patients can have severe attention deficits, perceptual disturbances, language disturbances, agitation, sleep-wake cycle alterations, and significant motor activity changes, which can be challenging to manage. They also may become quiet and sleepy; while others may become agitated and disorientated (Arbabi et al., 2018). Therefore, it can be a very distressing condition for the patient, as well as caregivers. Short term cases of delirium also lead to more extended hospital stays, increased unintended removal of catheters and lines, greater use of continuous sedation and physical restraints, self-extubation, higher rates of complications, and even increased mortality (Vyveganathan et al., 2019). As far as long-term consequences, there is much evidence that suggests delirium also has severe long-term effects. After remission, delirium is associated with increased cognitive and functional decline, increased placement in nursing homes or institutions, development or worsening dementia, as well as higher rates of mortality (Kukreja et al., 2015).

Delirium has been proven to be an excellent predictor of postdischarge mortality (McCusker, Cole, Abrahamowicz, Primeau, & Belzile, 2002). Patients who develop delirium during their hospital stay have mortality rates between 22-76%; as well as a high mortality rate in the months immediately following discharge (Trzepacz et al., 1999). Several studies suggest that a patient's mortality rate in the three months following diagnosis is 14 times higher than patients who were diagnosed with other affective disorders. Additionally, patients diagnosed with delirium were more likely to die within six months following diagnosis (Trzepacz et al., 1999). Additionally, McCusker et al. (2002) found that the effects of delirium were sustained over a 12-month timeframe following discharge, and there was a significant association with higher mortality. One study examined elderly survivors of delirium three years following hospital discharge. The authors discovered that these patients had a 33% higher rate of death than other patients their age (Martins & Fernandes, 2012). These studies emphasize the high risk of mortality associated with delirium in the elderly. Due to the increased risk for mortality, delirium should be considered a medical emergency and requires prompt attention to avoid the potential for permanent damage (McCoy et al., 2017). If quick diagnosis and treatment of the delirium occur, the condition may be reversible (Kukreja et al., 2015). However, if the underlying cause of the delirium goes unchecked, or is treated too late, a high incidence of mortality or permanent brain damage often occurs (Arbabi et al., 2018).

Previous studies on the financial impact of delirium have found that the cost of delirious episodes rivals those for diabetes and heart disease. On average, patients diagnosed with delirium stayed in the hospital about four days longer than patients without delirium. Therefore, decreasing the length of stay by just one day would save more than $20 million in health care costs per year (Leslie et al., 2008). The cost of delirium ranged from $16,303- $64,421 per

patient (Leslie, Marcantonio, Zhang, Leo-Summers, & Inouye, 2008). Meaning, delirium contributes to upwards of $164 billion to health care expenditures annually in the United States (Esther, Fong, Hshieh, & Inouye, 2017).

Ideally, implementing a proper delirium screening procedure in the ER will enable staff to detect delirium early in elderly patients. Additionally, an appropriate tool will help maintain patient functioning, reduce mortality rates, and help decrease delirium related health care costs.

Causes & Manifestations

Some factors that may put individuals at risk for developing delirium are a history of cognitive problems, severe illness resulting in hospitalization, dehydration, problems with seeing or hearing, and history of previously diagnosed delirium (Vyveganathan et al., 2019). Additionally, medications, infections and lack of sleep may cause a patient to develop delirium. Often, a combination of factors is the cause of the onset of delirium (Siddiqi, House, & Holmes, 2006). Unfortunately, delirium in elderly patients is frequently overlooked or misdiagnosed as depression, dementia or severe illness (Esther et al., 2017). Older patients with delirium are at increased risk of death within the year following diagnosis.

Patients with delirium may present symptoms in a variety of ways. Some symptom manifestations include: being restless and upset, slurred speech, auditory or visual hallucinations, trouble concentrating, drifting between sleep and wakefulness, and being forgetful. However, experts have identified three types of delirium (Arbabi et al., 2018). The first is hyperactive delirium; which is probably the most easily recognized type. This form of delirium generally presents with restlessness. For example, a patient has often seen pacing, agitated, displaying rapid mood changes or hallucinations, and refusing to cooperate with the plan of care (Hong & Park, 2018). The next type of delirium is hypoactive delirium. This form regularly includes

inactivity or reduced motor activity (Arbabi et al., 2018). An abnormal level of drowsiness, sluggishness, and the appearance that the patient is "in a daze" is often present as well (Hong & Park, 2018). Finally, mixed delirium includes both hyperactive and hypoactive signs and symptoms. With the presence of mixed delirium, the patient may quickly switch back and forth from hyperactive to hypoactive states. In the elderly, delirium is often characterized by “quiet” symptoms (hypoactive delirium), such as confusion and lethargy (Arbabi et al., 2018). Unfortunately, it is not uncommon for these patients to be overlooked, and underdiagnosed. Additionally, these patients often receive a misdiagnosis of depression, dementia, or some other illness (Hong & Park, 2018). Upon the development of delirium, it is crucial for medical staff to be cognizant of things to avoid; as specific interventions can make the delirium worse. These harmful interventions include the utilization of physical restraints, bladder catheters and many different medications (Vyveganathan et al., 2019). The overarching point is that doctors and other medical staff should look for the origin of the delirium and treat them; and they should, additionally, be careful not to do things that might make the delirium worse.

Can We Prevent Delirium

While there are no current systematic interventions for preventing delirium, there are multi-component delirium prevention strategies that have proved to reduce the incidence of delirium. Preventive measures should be implemented in high-risk patients, specifically the elderly (Ghaeli, Shahhatami, Mojtahed Zade, Mohammadi, & Arbabi, 2018). Additionally, those with polypharmacy, malnutrition, infections, previous cases of delirium, or dementia are also determined to be high-risk patients (Ferguson, Montgomery, Mossey, & Duncan, 2018). Studies have shown that it is possible to prevent around a third of delirium cases by providing an

environment and care plan that targets the main risk factors for delirium (Martins & Fernandes, 2012).

The Hospital Elder Life Program (HELP) is an example of a targeted multi-component strategy that has proven effective at preventing delirium in older hospitalized patients (Heim et al., 2017). The objective of HELP is to reduce delirium risk and maintain physical and cognitive function throughout hospitalization. It also focuses on maximizing independence at discharge in an attempt to assist with the transition from hospital to home (Boockvar, Teresi, & Inouye, 2016). These components will, in turn, prevent unplanned future re-admissions. The HELP program assists in implementing intervention protocols targeted toward six evidence-based delirium risk factors. These risk factors include orientation, oral volume repletion, early mobilization, therapeutic activities, vision and hearing optimization, and sleep enhancement. According to the patient's risk factors, tailored interventions are then made and adhered to (Heim et al., 2017).

Some interventions targeted toward maintaining the patient's orientation include: avoiding moving patients around to different rooms unless necessary, providing a 24-h clock and calendar, and talking to the patient to reorient them (Ghaeli et al., 2018). If possible, it would also be beneficial to the patient's orientation if they received regular visits from family and friends (Heim et al., 2017). Interventions focused on maintaining the second risk factor, oral volume repletion, include: ensuring that the person has an adequate fluid intake, evaluating and treating infections, and decreasing infection risk; such as avoiding unnecessary catheterization (Ferguson et al., 2018).

Additionally, encouraging the person to walk or, even carry out active range-of-motion exercises will be successful in getting the patient to mobilize early on (Heim et al., 2017). The

introduction of cognitively stimulating activities, as well as specific exercises, will contribute to the decrease of the patient's risk for developing delirium (Ghaeli et al., 2018). Furthermore, it is crucial to maintain the patient's hearing and vision capabilities by ensuring that all hearing and visual aids are being utilized and are working correctly (Heim et al., 2017). Finally, one of the essential aspects to maintain in an attempt to decrease the patient's risk for delirium is to foster a pleasant sleeping environment so that the patient can get adequate rest (Ferguson et al., 2018). Reducing noise during sleep periods, and avoiding nursing and medical interventions during sleeping hours are essential for sleep enhancement.

How is Delirium Treated

The treatment of delirium begins with the identification of the underlying cause. As previously mentioned, the underlying cause can often be due to an extensive list of possibilities, and may even be due to a combination of factors (Vyveganathan et al., 2019). Most commonly, these factors include an underlying infection, dehydration, and medication side-effects (McCoy et al., 2017). Once the cause of the delirium is understood, a plan can be developed, and treatment may begin. Treatments may include interventions such as medication readjustments/education, antibiotics, removal of catheters, as well as adjusting the patient's environment (Esther et al., 2017). In sum, the treatment of delirium depends on the identification of the cause, and the removal/treatment of the origin(s). If prompt treatment is implemented, delirium can clear in a few days to weeks in most people (McCoy et al., 2017). Unfortunately, some patients, especially the elderly, may not have as positive of outcomes depending on how early the delirium is identified and how timely action was taken. Statistically, the longer it takes to diagnose delirium, and identify the underlying cause, the worse the patient outcomes (Martins & Fernandes, 2012). This may result in permanent cognitive issues, a failure to return to their

baseline, or even death (McCoy et al., 2017).

Delirium Superimposed on Dementia

Delirium and dementia can exist simultaneously, but they are not the same. Dementia is the progressive decline of memory and other cognitive skills due to the gradual dysfunction and loss of brain cells (source). This disease process develops gradually and is permanent. Dementia typically begins with relatively minor symptoms; however, these symptoms gradually worsen over time (Brooke, 2018). In contrast, delirium can develop suddenly and usually dissipates in days to weeks if appropriately treated. Delirium is defined as an acute confusional disorder of attention as well as cognition; which is common, but can often be fatal (Esther et al., 2017). Additionally, the ability to stay focused or maintain attention is significantly impaired with delirium. However, a person in the early stages of dementia remains generally alert.

Finally, the appearance of delirium symptoms can fluctuate significantly and frequently throughout the day. On the other hand, even though the cognitive skills and memory of people with dementia fluctuate throughout the day, their memory and cognitive skills are continually on a gradual decline. Some additional key differences between the symptoms of delirium and dementia include onset, the patient's ability to maintain attention, and fluctuation of symptoms (Brooke, 2018). Then, there are cases in which patients suffer delirium superimposed on dementia (DSD) (Esther et al., 2017). DSD occurs when a patient with preexisting dementia, experiences an acute illness that then leads to delirium (Brooke, 2018). Dementia proves to be the highest risk factor for delirium amongst this population (Arbabi et al., 2018); which emphasizes the need to be able to differentiate the two.

Furthermore, approximately 22% of elderly adults in the community with dementia end up developing delirium at some point; however, if those with dementia become hospitalized, that

rate skyrockets to 89% (Fick & Mion, 2008). Understandably, this can lead to a faster decline in the patient's physical and mental health. Additionally, it is essential to note that people who have dementia are at an increased risk of developing delirium (Brooke, 2018). Due to some overlapping manifestations, dementia and delirium may be particularly challenging to distinguish, and a person may have both. Distinguishing between delirium or dementia is critical when caring for elderly patients. However, a more challenging task is to identify delirium in someone who already has dementia (Esther et al., 2017).

Additionally, patients with DSD had a more than double mortality rate than compared to those with delirium or dementia alone, and they are more likely to have died within a month after their hospital stay (Brooke, 2018). Therefore, knowing how to identify delirium in someone who is already confused is critical for appropriate treatment and a faster recovery. The ability to distinguish between these diagnoses could lead to a faster recovery for the patient and decreased mortality rates (Esther et al., 2017).

Emergency Department Need

In the US, the ED serves as the nexus of the healthcare system and sees upwards of 136 million people annually (Michael, Pinyao, & McCaig, 2017). The emergency department is the entryway to the hospital for unscheduled admissions, and plays a critical role in treating acute medical problems; especially in older adults (Kukreja et al., 2015). Doctors often send patients to the emergency room when they are unavailable to see a patient, or when someone needs specific diagnostic tests to, quickly, determine if they are seriously ill. Patients also frequently go to the emergency room when they feel they have no other alternative; such as those without health insurance. Therefore, the number of emergency room visits in the US are continuing to trend upwards (see Appendix A for demographics on ED visits).

Additionally, in 2009–2010, a total of 19.6 million ED visits in the United States were made by persons aged 65 and over (Michael et al., 2017). The reported incidence of delirium during admission in the hospitalized adult population is 3%–29% (Siddiqi et al., 2006). Additionally, the co-occurrence of delirium in patients with dementia is particularly high in hospitalized older adults at 22%–89% (Fick, Agostini, & Inouye, 2002). Although the rates of delirium are so prevalent, it often goes undetected in older populations (Kukreja et al., 2015). Studies consistently show that emergency providers identify delirious patients in only 16% to 35% of cases (Martins & Fernandes, 2012). Missing delirium in this setting has the potential to compromise patient safety and may have downstream implications for patient health and course of treatment. They include multiple medical complications, greater lengths of stay, and the possibility of not returning to independent living (Kukreja et al., 2015).

Additionally, missing delirium may lead to inadequate diagnostic workups, inappropriate dispositions, and delays in the diagnosis of their underlying medical illness. If delirium goes without recognition in the ED, it often remains unrecognized throughout their hospital stay in 90% of cases (Esther et al., 2017). When delirious ED patients are wrongfully discharged home, they are less likely to comprehend their discharge instructions; which will likely lead to decreased compliance and possibly death (De, & Wand, 2015). For this reason, an instrument for detecting delirium targeted to the ED setting is especially critical.

The wide variety of delirium screening tools available adds to the complexity of delirium screening (Han et al., 2009). The tools themselves vary in the number of items, the time required to administer, level of knowledge assumed, and necessary training prior to use (Esther et al., 2017). The ED, however, represents a unique environment with intense time demands on providers and high volumes of patients that can make caring for older adults more challenging.

Although there are a plethora of delirium screening tools, many of them are complex, time-consuming, and few of them have been studied in the ED, and therefore unfeasible for use in this department (De, & Wand, 2015).

Delirium Screening Tools

In order to determine the efficacy of the delirium screening tools, the sensitivity, specificity, and the average amount of time it takes to perform each tool was analyzed. The sensitivity of a test (also referred to as the true positive rate) is defined as the proportion of people with delirium who will have a positive result (Parikh, Mathai, Parikh, Sekhar, & Thomas, 2008). In other words, a highly sensitive test is one that will correctly identify patients with delirium. For example, a test with 95% sensitivity will identify 95% of patients who have the disease. However, it will miss 5% of the patients who have the disease. Therefore, a highly sensitive test can be useful for ruling out a disease if a person is determined to have a negative result.

Whereas, the specificity of a test is the proportion of people without the disease who will have a negative result. This test is also referred to as a true negative (Parikh et al., 2008). In other words, this refers to the test's ability to identify patients who do not have the disease. For example, a test that is 90% specific will identify 90% of patients who do not have the disease. A highly specific test can be most useful when the result is positive; therefore, it is useful for ruling in patients who have the disease (Parikh et al., 2008).

It is crucial for there to be high sensitivity and specificity when utilizing delirium screening tools, especially in a high stake, fast-paced environment like the ED. Furthermore, it is also crucial for the screening process to be as brief as possible so that it does not significantly increase the workload of the ED staff.

Six different tools were validated across the 31 studies reviewed. The Confusion Assessment Method (CAM), CAM-ICU, and the brief CAM (bCAM) were the most commonly studied tool (13/31 studies) followed by the 4AT, DTS, and the NEECHAM confusion scale. Based off of a convenience sample, these six tools will be the focus of the review and will be further discussed.

Confusion Assessment Method (CAM)

The Confusion Assessment Method (CAM) was designed to allow non-psychiatric clinicians to diagnose delirium quickly and accurately following a brief semi-structured interview. The CAM is currently the gold standard for detecting delirium and has been found to have a sensitivity of 86% and a specificity of 100% when performed in a general hospital setting (Ritter et al., 2018). Whereas, the CAM had a sensitivity of 0.68 and specificity of 0.97 when used by trained nurses among older acute medical patients (Hendry et al., 2016). Because of its accuracy, brevity, and ease of use by clinicians and research assistants, the CAM has become the most widely used standardized delirium instrument for clinical and research purposes (Gagné et al., 2018). The CAM consists of nine operationalized DSM criteria, and four cardinal criteria, that all contribute to an algorithm for detecting delirium. These criteria include acute onset and fluctuation of course, inattention, disorganized thinking, and altered level of consciousness. The presence of acute onset or fluctuating course, and inattention are necessary for a diagnosis of delirium, in addition to the presence of disorganized thinking OR altered level of consciousness. In summary, feature 1 and 2, and 3 or 4 must be positive to be compatible with a delirium diagnosis (Ritter et al., 2018).

While the CAM is deemed to be the best-performing bedside delirium assessment tool, it may not serve as the most appropriate tool for use in the ED. Although non- psychiatric

clinicians can perform the CAM, it still requires a cognitive assessment and substantial interviewer training. According to Ritter et al. (2018), sensitivity and specificity decrease when anyone other than a physician performs it. Although this result is to be expected, it is still something to take into consideration. Additionally, although the CAM yields excellent sensitivity and specificity in many research studies, there have been little studies to examine its efficacy for use in the ED. Most of the research studies have been conducted in slower paced hospital units; which may have yielded different results than it would had it been performed in the ED. This is because the CAM requires raters to assess nine delirium elements and can take anywhere from 10-20 minutes to complete (Gagné et al., 2018). On a slower hospital unit, this time commitment may be feasible; however, in a fast-paced environment such as the ED, it is unrealistic to make this tool standardized.

CAM-ICU

The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) was explicitly developed for non-verbal patients in the intensive care unit; such as those who are ventilated. However, due to the CAM-ICU's brevity and simplicity, it is increasingly being used for detecting delirium in verbal patients outside the ICU setting (Kuczmarska et al., 2016). Typically, the tool takes approximately 4-5 minutes to administer (Lin, Chen, & Wang, 2015). However, this time frame is based on when it is performed on nonverbal patients in the ICU. If the CAM-ICU is performed on verbal patients in a different unit, such as the ED, the time frame will likely take longer. Additionally, the performance time has also been found to take longer when the patient has delirium.

The CAM-ICU assesses the same four diagnostic features as the CAM. These questions do not require verbal responses; which make it especially appropriate for use in ventilated and

nonverbal patients (Hendry et al., 2016). Feature 1 is assessed by observing whether or not there has been an acute change from mental status baseline. This determines whether or not there is evidence of acute change in mental status from baseline (Pop, Dervay, Dansby, & Jones, 2018). If there is evidence of acute change or fluctuation in cognition, the feature would be considered present. Feature 2 is assessed using the Attention Screening Examination (ASE), involving a task that utilizes letters or pictures; which may be utilized on verbal or nonverbal patients. For the ASE letter task, the patient is told that the examiner is going to read them a series of 10 letters. The patient is then instructed to squeeze the examiner's hand every time they hear the letter 'A.' The examiner then proceeds to read the letters SAVEHAART in a normal tone. It is considered to be an error if the patient fails to squeeze on the letter "A" and if the patient squeezes on any letter other than 'A.' Alternatively, the examiner may utilize the ASE pictures task instead of the letters. For this task, the patient is told that they will be shown five pictures. They are instructed to observe the pictures because they will later be asked what pictures they have seen. The examiner then shows the patient each picture for 3 seconds while verbalizing what each picture is. Once the five pictures have been shown, the examiner informs the patient that they will be shown ten more pictures; some of which, they have already seen. The patient is instructed to signal every time they see a picture that was shown to them previously. The patient may signal the examiner by squeezing their hand or nodding their head yes or no. If a patient scores less than an 8 out of 10 on the ASE letter or ASE pictures task, the test is considered to be positive (Kuczmarska et al., 2016).

Additionally, feature three is assessed based on the patient's level of disorganized thinking. Feature three is analyzed based on their ability to correctly answer yes-or-no questions and to follow basic commands. For the first portion, the patient is asked four simple yes or no

questions and is given one point for each correct answer, with a possibility of 4 points total. For the basic command section, the examiner holds up two fingers in front of the patient. The examiner then instructs the patient to hold up the same number of fingers. After this task, if completed, the patient is instructed to do the same with the other hand (except with a different number of fingers being held up). If the patient is unable to move both arms for the second part of the command, the patient may be asked to add another finger to the original hand. If the patient can successfully complete all of the commands, they are given 1 point. After combing the total scores from the yes-or-no questions, and the command task, the patient, can have a total score of 5 points. If the patient receives a score of less than 4, the test is considered positive (Kuczmarska et al., 2016).

Finally, feature four is assessed using the RASS, with values other than 0 considered abnormal (Pop et al., 2018). Similarly, to the CAM, if the patient tests positive for feature 1 and 2, and 3 OR 4, the overall test is considered to be positive. The CAM-ICU has been shown to have a sensitivity of 96% and a specificity of 98% for detecting delirium in mechanically ventilated patients and has proven to be a validated tool in this context (Kuczmarska et al., 2016). Although the CAM-ICU shows reasonable sensitivity and specificity when performed in the ICU, it is unclear how effective it would be when utilized in a faster paced setting such as the ED. Additionally, although the CAM-ICU can be rapidly performed, the scale was developed for non-verbal responses (Lin et al., 2015). Therefore, in addition to its low sensitivity, this tool may not be ideal for routine use in the ED setting.

Brief Confusion Assessment Method (bCAM)

The brief Confusion Assessment Method (bCAM), developed as an adaption of the Confusion Assessment Method (Han et al., 2017). In contrast to the CAM, which takes at least 5-

20 minutes to be completed, the bCAM can be performed in less than 1 minute (Hendry et al., 2016). The bCAM was primarily developed to enhance the CAM's brevity. Similar to the CAM, the bCAM consists of the same four objective assessments with determinant cutoff that still allow its application even if the interviewer barely knows the patient. As previously discussed, these four features for detecting delirium include 1) altered mental status or fluctuating course, 2) inattention, 3) altered level of consciousness, and 4) disorganized thinking. Similar to the CAM, a patient was considered to be delirious if both features 1 (altered mental status or fluctuating course) and feature 2 (inattention) were present, and either feature 3 (altered level of consciousness) or feature 4 (disorganized thinking) were present (Han et al., 2017). The bCAM has previously been validated in 406 patients recruited in an ED in the US, where it showed a sensitivity level of 84.0%, with 95.8% specificity (Hendry et al., 2016). In older ED patients, the bCAM was found to be 84% sensitive and 96% specific when performed by a physician and 78% sensitive and 97% specific when performed by a non-physician (Hendry et al., 2016). These statistics indicate that non-physicians were less likely to correctly rule-out delirium, but they were more successful at ruling in delirium. The inability to correctly rule out delirium (the lower sensitivity) is not too concerning due to the fact that the patient would have had a follow-up, and likely would have been determined not to have delirium. However, the issue with low sensitivity is the need for unnecessary follow-ups, which is going to increase the workload of ED staff. On the other hand, the high specificity amongst both physicians and non-physicians indicate that they can correctly identify (rule-in) delirium in 96-97% of cases. The brevity of this tool, along with the high specificity makes this a possible candidate for use in the ED. However, the lower sensitivity may pose an issue by increasing staff workload due to the number of unnecessary follow-ups that may be needed.

4AT

Although many reliable and valid delirium screening tools exist, very few appear to have all of the features necessary in routine, no specialist care. These critical features include: brevity, requirement of no specialized training, simplicity, does not require physical responses, allows for assessment of 'untestable' patients (those who cannot undergo cognitive testing or interview because of severe drowsiness or agitation), and incorporates general cognitive screening to avoid the need for separate tools for other causes of cognitive impairment (Ritter et al., 2018). However, the 4AT is proven to possess all of these features (Gagné et al., 2018).

Furthermore, the 4AT is simple, does not require specific training, and only takes two minutes to administer. The four A's that are assessed in this tool are alertness, abbreviated mental test, attention, and acute change or fluctuation in course. The first element assessed by the 4AT is a patient's alertness; which evaluates if the patient is normal, experiencing mild sleepiness, or is clearly abnormal. The second item evaluates spatial and temporal orientation. This includes an evaluation of whether or not the patient knows their age, their date of birth, their current location, and the current year. The third component evaluates a patient's level of attention by asking them to recite the months of the year backward, starting at December. Finally, the last item evaluates an acute change or a fluctuating course of cognition, awareness, or any other mental function within the last two weeks that would still be apparent in the last 24 hours. The total score of the 4AT varies between 0 and 12. A score of zero suggests a normal cognitive status, in which case the patient would be determined to be "negative" for delirium. A score between one and three suggests the possibility of a severe to moderate cognitive impairment, and a score of four and more suggests the possibility of a delirium (Gagné et al., 2018).

The 4AT has been found to have a negative predictive value of 98% for delirium, suggesting that it serves as a useful detection tool among older ED patients. In the study, there was a positive predictive value of 19%; meaning, the test was positive for some non-delirious patients (Gagné et al., 2018). However, this is not seen as a downfall since this would avoid the danger of missed cases. Additionally, the 4AT was found to have a sensitivity of 94% and specificity of 91% when performed in a general hospital study (Esther et al., 2017). However, in a separate study, the 4AT was found to have a sensitivity of 84%, and specificity of only 74% when performed in the ED (Gagné et al., 2018). The study suggests moderately good performance as a screening tool for delirium in the ED. However, these results are rivaled by other screening tool's performances. This indicates the 4At may not be the most appropriate tool for us in the ED.

Neelon and Champagne (NEECHAM) Confusion Scale

The Neelon and Champagne (NEECHAM) Confusion Scale is a screening scale which can be used by nurses to rate the patient's behavior while providing routine care to patients (Poikajärvi, Salanterä, Katajisto, & Junttila, 2017). Nurses have frequent round-the-clock contacts with patients and are in a strategic position to observe changes in behavior; therefore, the NEECHAM Confusion Scale was developed to assess acute confusion based on criteria identified by nurses as representing acute confusion. Additionally, the NEECHAM Confusion Scale was initially developed to evaluate delirium in patients with hip fractures; however, it has been subsequently used in other clinical settings like medical wards, nursing homes, and ICUs (Poikajärvi et al., 2017).

The NEECHAM scale takes approximately 10 minutes to complete and consists of 3 subscales with a total score between 0-30 (Sharma, Whelan, & Macdonald, 2010). Subscale 1

has three items that measure cognitive processing with a rating scale that varies from 0-14. These items measure: attention, ability to follow a command, and orientation. For the second subscale, the rating varies from 0-10 and measures the patient's behavior. These measurements assess the appearance, motor, and verbal behavior. Finally, the subscale 3 assesses physiological parameter and vital function on a scale of 0-16. These functions include stability of vital signs, oxygen saturation level and urinary continence control. The patient's overall score ranges from 0 (minimal responsiveness) to 30 (normal function). A score below 20 points may indicate moderate to severe delirium. Whereas, a score between 20 and 24 suggests mild or early stages of delirium. Additionally, a score of 25-26 suggests that the patient is free of delirium, but the patient is at high risk for developing delirium. Finally, a score of 27-30 indicates normal cognitive function (Neelon, Champagne, Carslon, & Funk, 1996). The NEECHAM has been deemed to have high sensitivity (95%) and specificity (78%) (Sharma et al., 2010).

Delirium Triage Scale (DTS)

The Delirium Triage Scale (DTS) was developed to increase delirium screening efficiency, by rapidly ruling-out delirium. When performed by physicians and non-physicians, the DTS is 98% sensitive and 55% specific when performed on older ED patients. Due to the DTS's high sensitivity of 98% in older patients, it has been found to reduce the need for formal delirium assessments by 50% (De, & Wand, 2015). The DTS takes less than 20 seconds to complete, and consists of two components: 1) Level of consciousness, and 2) Attention. The level of consciousness is measured by obtaining a Richmond Agitation-Sedation Scale (RASS) score. The RASS is a 10-point scale ranging from -5 to +4 that is a validated and reliable method to assess patients' level of sedation (Pop et al., 2018). The RASS consists of four levels of anxiety or agitation (score= +1 to +4), one level indicating a calm and alert state (score= 0), and

5 levels of sedation (score= -1 to -5). A RASS score of +4 represents a violent, combative patient who may pose as a danger to themselves or staff. On the other end of the scale, a score of -5 is indicative of a patient who does not respond to voice or physical stimulation, and who is completely unarousable. All patients will be scored a number within the -5 to +4 scale. The RASS may also be used by researchers to sub-type the delirium. A persistent rating of +1 to +4 during all assessments may be indicative of hyperactive delirium while hypoactive delirium may be indicated by a persistent rating of -1 to -5 during all assessments. However, if a patient's ratings fluctuate between hypoactive and hyperactive, they may have a mixed subtype (Pop et al., 2018). The second assessment in the DTS evaluates attention by having the patient spell a word backward; which is a common method of assessing inattention.

In most cases, the patient is asked to spell the word "LUNCH" backward, but it does not have to be that exact word. If the patient has a RASS of 0 (normal level of consciousness) or makes 0 or 1 errors on "LUNCH" backward spelling test, then the DTS is considered negative for delirium. Because the DTS is 98% sensitive, delirium is ruled out in this case, and no additional delirium testing is needed. However, if a patient had a RASS other than 0, or made >1 error on the "LUNCH" backward spelling test, then the DTS was considered positive, and the patient may have delirium (De, & Wand, 2015). A specificity of 55% indicates that the DTS is not as successful at ruling in delirium. Because the DTS is only 55% specific, confirmatory testing is needed to confirm the presence of delirium.

Results/Discussion

Delirium has the possibility of occurring at any age; however, it is more common among the elderly (Esther et al., 2017). The co-occurrence of delirium in patients with dementia is particularly high in hospitalized older adults; ranging anywhere from 22%–89% (Fick et al.,

2002). Brief scales with fewer items typically have inherent problems with lower sensitivity and specificity. Scales with more items have better accuracy, superior interrater reliability, less variability, and higher sensitivity and specificity. However, a screening instrument with a plethora of items is unrealistic for use in the ED (Han et al., 2017). That being said, it is crucial to evaluate each screening to determine the effectiveness, as well as the practicality of using it in the ED. Taking these into consideration, according to a review of the literature, a combination of two screening tools may be the most appropriate for this occasion.

One method to improve delirium detection would be to use a two-step approach (De, & Wand, 2015). A reliable delirium assessment that can be performed by healthcare professionals of all backgrounds, as well as being brief and valid is critical for success in this department. The first step would be to perform a very brief, highly sensitive delirium screen to rule-out delirium. Ideally, this step would take 20 seconds or less to complete. A negative screen would rule out delirium, enhance screening efficiency, and reduce the number of formal delirium assessments needed. A positive screen would result in a formal delirium assessment that would be highly specific to rule-in delirium (Hendry et al., 2016). This step would be performed by another health care provider, such as a physician, and it would be performed at the patient's bedside. Ideally, this rule-in assessment should still be brief to maximize feasibility. A reasonable timeframe for this step would be around 1 minute or less to complete (see Appendix B for the synthesis of all reviewed screening tools).

DTS- bCAM

A combination of the Delirium Triage Screen (DTS) and the Brief Confusion Assessment Method (bCAM) would serve as effective rule-out and rule-in tests for the two-step approach to delirium screening (Han et al., 2013). The DTS is an optimal first step in a two-step delirium

monitoring process for hectic clinical environments; such as the ED. The DTS is only a 20-second assessment designed to rapidly rule-out delirium and reduces the number of formal delirium assessments needed. With a sensitivity of 98% in older ED patient, the DTS is a reliable rule-out tool (De, & Wand, 2015). However, the DTS revealed to have 55% specificity (De, & Wand, 2015); which suggests it is not reliable in diagnosing delirium. Due to the low specificity, a confirmatory test is needed in order to rule in delirium. Despite the low specificity, the high sensitivity and brevity of the DTS make it is a clear choice for a rule-out delirium screening method over any of the other previously mentioned tools. The DTS is essential for higher detection of delirium in the ED; however, a reliable rule-in test for delirium, coupled with the DTS, is also imperative.

As previously addressed, the bCAM has a specificity of 97% when performed on elderly ED patients. The bCAM was highly specific, and those with a positive bCAM were 20 to 25 times more likely to have delirium than those with a negative bCAM (Hendry et al., 2016). Additionally, in comparison with the other screening tools evaluated in this review, the bCAM was found to have the highest specificity. Aside from the bCAM's high specificity, it was also selected as the most appropriate tool, over the other previously mentioned tools, due to its ability to be rapidly administered (<1 min). The brevity of the tool is crucial because the implementation of these tools should be aimed at increasing the workload of ED staff as little as possible. In sum, because the DTS had excellent sensitivity (98%) (De, & Wand, 2015), and the bCAM had excellent specificity (96%) (Hendry et al., 2016), patients should be initially screened with the DTS to assess level of consciousness and attention (Han et al., 2013). This initial assessment can be done in the ED triage, or upon first assessment. Those who screen positive using the DTS should then be assessed with the bCAM. This second step can be performed

immediately following the initial positive DTS result, or it can be performed later upon first assessment (De, & Wand, 2015). Furthermore, both these assessments can be reliably performed by healthcare professionals regardless of clinical background and experience; which is an essential component (Han et al., 2013). This evidence supports the efficacy of the implementation of a two-step delirium screening process utilizing the DTS and bCAM tools.

Implementation

The first step in implementing this delirium system into the ED is to inform ED staff of the initiative and assess their readiness to learn. Everyone should be made aware of the initiative through staff meetings, as well as through a letter via group email. The staff's readiness to learn should be assessed following them being made aware of the initiative. Staff should be asked their thoughts on the importance of delirium screening in the elderly, and if they believe it is vital to make reforms in that area. Furthermore, to successfully implement these tools, it is necessary to follow four key steps: 1) select an appropriate tool for implementation, 2) identify key team members to support the implementation, 3) provide proper education and use of tool, and 4) evaluation of efficacy (Selim & Ely, 2016).

Selecting an Appropriate Tool for Implementation

After reviewing the literature on the subject, this review concludes that a combination of the DTS and bCAM would be most appropriate for implementation into the ED. Once again, this conclusion was based primarily on three components. These components included: the brevity and easy of the tool(s), the rate of sensitivity, and the rate of specificity of the tool(s). The brevity and ease of use are critical when considering implementing anything into the ED; primarily a standardized screening tool (De, & Wand, 2015). The objective is to be able to perform the tool rapidly and efficiently, as to not increase the workload of the ED staff any more

than necessary (Hendry et al., 2016). As for the sensitivity, it is imperative that the first tool utilized to screen the patient, be one that is highly sensitive. In this case, the tool that is determined to be highly sensitive, and most appropriate for this role is the DTS. The DTS will take approximately 20 seconds to complete on a patient while having a sensitivity of 98% (De, & Wand, 2015). This will rule out patients who do not have delirium; while also increasing the efficiency of the screenings. Although the sensitivity of the DTS is supreme, the specificity rating is lacking. The low specificity is why it is critical to implement a second step with a tool that has been validated to have a high specificity. In this occasion, the bCAM is determined to be the most appropriate tool for use as the second step (De, & Wand, 2015). The bCAM takes approximately less than one minute to complete and has a specificity of 96-97% (Hendry et al., 2016). Overall, if the patient does not have delirium, it will take approximately 20 seconds to assess for the presence of delirium (De, & Wand, 2015). Alternatively, if the patient does have delirium, it will take approximately two minutes to asses for the presence of delirium. This time frame to utilize these screening tools, and assess for the presence of delirium, is a feasible amount of time, and should not increase the workload of ED staff significantly (see Appendix C for comparison of bCAM and DTS brevity, sensitivity, and specificity).

Identification of Key Team Members to Support the Implementation

For effective deployment of the DTS-bCAM screening method into the ED, it is essential to gain the support of all ED staff. As a first step for the hospital assessment, it is necessary to contact the chief nursing officer, director of nursing informatics, and directors of nursing education to obtain support for the implementation and to collaborate on implementation strategies. The next step would then be to meet with nursing leadership groups; such as the nurse educator council, leadership board, and staff council. In the meeting, the best methods for

incorporating the tools into the existing workflow would be discussed to optimize the use by the ED staff (Cawthon, Mion, Willens, Roumie, & Kripalani, 2014). It is crucial for any new project to have leadership on board with the reforms so that they can explain the why behind the change. If a leader cannot adequately explain why something needs to change, underground resistance and cynicism towards the movement may develop. Recruiting the right leadership will also provide people that will lead by example, and encourage other staff to participate in the change (Warrell, 2017) actively.

Providing Proper Education and Use of Tool(s)

Education about the screening tools and their importance should take place no less than one month before staff begins to utilize them. This time frame will give the trainees an adequate amount of time to learn the material, and ask any follow-up questions or concerns they may have (Cawthon et al., 2014). Additionally, the training should also be delivered to staff through several methods. First, a train-the-trainer model would be a beneficial model to ensure comprehension. The Train the Trainer model is commonly used in the workplace as a training strategy. In the train-the-trainer model, the trainer, a subject-matter expert, trains other employees. The trainer simultaneously teaches the trainees how to train others in the use of the program. Additionally, this method tends to offer distinct advantages over other training models. Some of these advantages include learning the material faster, retaining the information better, and leading to feelings of satisfaction and fulfillment (Gleeson, 2017).

To further educate the staff, various methods should be applied. These methods include: during staff and board meetings, providing information during change of shift report, posting flyers in break rooms, and observing the unit staff administer the screening items. Additionally, education should be delivered electronically. Electronic delivery includes incorporating a secure

e-mail communication that is regularly sent to all RNs. This will help to educate the staff further, as well as serve as a constant reminder of the initiative to detect and decrease delirium. Web pages on the hospital's nursing website should also be developed and implemented to continue education on the subject. These pages should include details about the tools, how to utilize them, as well as information about the effects on patient function and mortality due to delirium (Agar et al., 2015). A brief video on the web page may also be beneficial to ED staff. The video would provide a rationale for the new implementation, as well as a demonstration on how to administer the DTS and bCAM. The webpage and video should also include information regarding whom to contact in the event that the staff member has follow up questions or concerns.

Evaluation of Efficacy

Once implementation has begun, it is crucial for staff to do occasional evaluations to assess the efficacy of the tools. These outcome assessments should be focused on acceptability, appropriateness, fidelity, and sustainability of the utilization of the DTS-bCAM combination for detecting delirium. The acceptability of the tools can be assessed by interviewing the staff regarding how supportive they were of the implementation. The appropriateness of the tools should also be assessed during the interviews with staff. Staff should be questioned on how feasible they thought the tools were for the setting; as well as if there were any shortcomings of the tool(s). The appropriateness of the tool should also be evaluated by looking at the trends in delirium diagnoses, illness, and death rates among the elderly population. If the delirium screening tools that were implemented prove to be effective, the trends in delirium diagnoses are projected to increase. If more cases of delirium are detected, this will lead to investigating the underlying cause of the delirium; therefore, an increasing number of illness diagnoses in the elderly will occur. As for the death rates, they are projected to decrease if the tools are useful.

Next, fidelity should be evaluated. Fidelity assessment can be done by examining the electronic health record system to see how consistent staff is with utilizing the tools. The staff's compliance with the tools could also be assessed by questioning them on their consistency. Finally, the sustainability of the tools should also be assessed. The trend in the usage of the tools should be evaluated monthly to see if it is sustainable. If the usage is trending significantly downwards, the tools may not be feasible for use in this department, or staff may need follow up training/reminders to use the tools.

Limitations

This review evaluated a convenience sample of screening tools gleaned from the literature, which means that not every tool was evaluated. There are a large number of tools designed for the purposes of detecting delirium. However, instruments vary in their purposes such as diagnosis or symptom severity. In order to effectively decrease the rates of mortality and morbidity in patients experiencing delirium, the treatment process starts with a diagnosis of delirium. Then, the patient's level of delirium and the cause of the delirium must also be assessed. This review did not go over the most effective tools to assess the severity of delirium, nor did it cover how to diagnose the underlying cause of the delirium. An error in either of these two areas may hinder the improvement in the levels of mortality and morbidity no matter the validity of the delirium screening tool and the accuracy at which the delirium was diagnosed.

Additionally, given the genre of the literature review, there has not been a test of the efficacy of these tools; therefore, these results are all theorized. The setting of the ED may also play a significant role in the outcome of the study due to the variability of the ED. These screening tools may also yield different results depending on whether they were performed in an urban versus a rural area. Further, this review did not focus on detecting delirium in dementia

patients. Rather, this project's objective was to assess the efficacy of delirium screening tools. As such, patients with delirium superimposed on dementia may skew these results.

Conclusion

Although developing delirium may have detrimental side effects on patients of all ages, the outcomes are consistently more fatal in older populations (McCoy et al., 2017). Additionally, one in five people are estimated to be aged 65 and over by the year 2030 (Ortman, Velkoff, & Hogan, 2014). Due to the growing proportion of the elderly population, the ED can anticipate that older individuals will comprise an increasing share of the ED in the upcoming years. In 2016, the percentage of ER patients over the age of 65 were over 23%. Each year this percentage increases, and with the baby boomer generation aging, this number is projected to increase substantially in the years to come. The reported incidence of delirium during admission in the hospitalized adult population is 3%–29% (Siddiqi et al., 2006), and the co-occurrence of delirium in patients with dementia is particularly high in hospitalized older adults ranging from 22%–89% (Fick et al., 2002). Considering the large number of elderly patients who enter the hospital through the ER, and the underdiagnoses of delirium in this population, it is important to have appropriate and effective delirium screening tools put in place. Due to these facts, the aim of this review was primarily focused on delirium screening in elderly patients (ages 65+).

There has been an ongoing need to develop a validated delirium screening tool that is brief and can be used by operators without specific training. Additionally, it is also imperative that the tool can be administered rapidly and be easy to incorporate into a busy clinical environment. Although there are a plethora of validated delirium screening tools, it has previously been unclear as to which tool would best suit screening older populations in the ED. Therefore, this synthesis of the literature was aimed at evaluating some of the most commonly

used delirium screening tools. Six of the most commonly used tools were selected across 31 different studies. The brevity of each tool, along with the sensitivity and specificity were analyzed and discussed in an attempt to find the most appropriate tool for detecting delirium in older adults in the ED.

In conclusion, this review provided a novel two-step approach to delirium surveillance that is brief and may enable healthcare professionals of all backgrounds to screen for this under-recognized cognitive condition. A negative DTS essentially rules-out delirium and reduces the number of formal delirium assessments needed, increasing screening efficiency (De, & Wand, 2015). The brevity and high sensitivity of the DTS make it a clear choice to be implemented as a first step in the screening process. Additionally, the bCAM's brevity along with its diagnostic accuracy makes it a practical rule-in delirium assessment (Han et al., 2013). The combination of these two assessment tools, as well as the strategies of implementation, have the potential to ameliorate a patient safety issue and improve delirium recognition in the ED.

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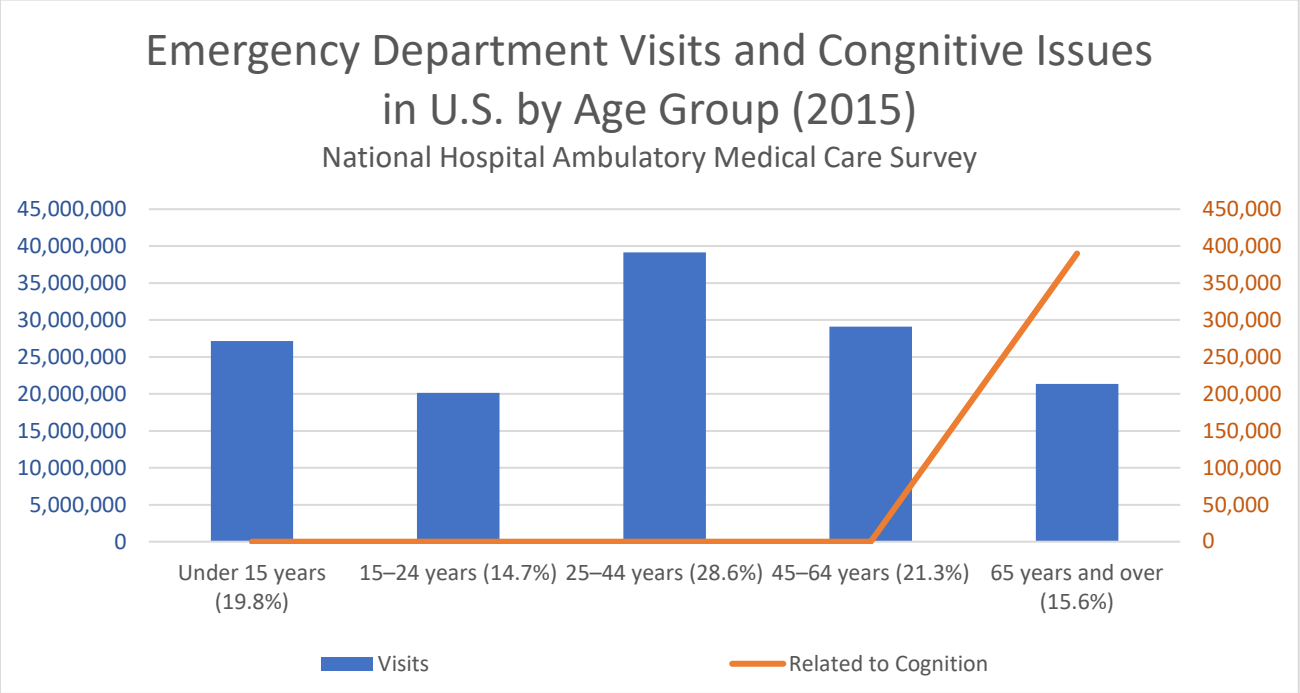
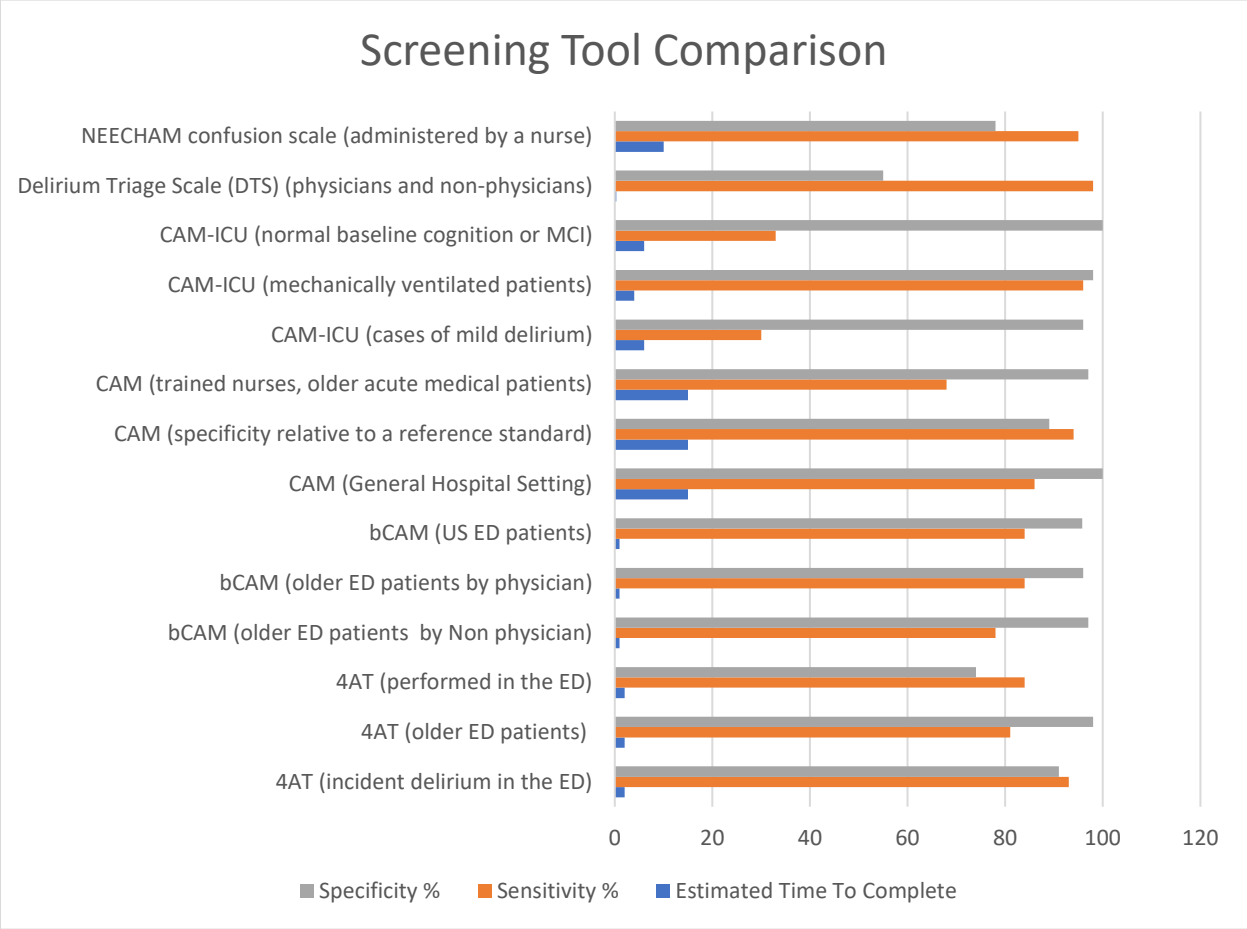
Appendix A
Demographic Information for ED visits



Rui P, Kang K. National Hospital Ambulatory Medical Care Survey: 2015 Emergency Department Summary Tables

Appendix B
Synthesis of Tools



Appendix C
Comparison of Brevity, Sensitivity, and Specificity amongst bCAM and DTS