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Review

A Delirium Monitoring Program for Hospitalized Older Adults: An Approach to Age-Friendly Health Systems

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Abstract

Delirium is an acute change in mental status with key features of inattention and disorganized thinking. It is particularly common in older adults, with multiple and varied causes. Delirium increases the risk of morbidity, mortality, institutionalization, and healthcare costs; however, it is often missed because it is difficult to recognize without the use of a validated screening tool. The Age-Friendly Health Systems (AFHS) initiative highlights the need for implementation of a delirium monitoring program in hospitals through early identification, using delirium screening tools and the non-pharmacological approach to prevent and treat delirium. Implementing a delirium monitoring program requires leadership engagement, multidisciplinary team involvement, staff education and training, proper documentation and communication, electronic medical records integration, and addressing identified barriers to success. This review will discuss 1) the impact of delirium in hospitalized older adults, 2) the guidelines of AFHS in establishing delirium monitoring programs, and 3) a practical approach to implementing a delirium program with a focus on screening and treatment.

Keywords
Delirium; screening; implementation; age-friendly health systems; older adults; geriatrics; hospital care; acute care

1. Case Vignette

A 76-year-old female presents for admission to the hospital for a diagnosis of community-acquired pneumonia. She has a history of essential hypertension and mild Alzheimer's type dementia. She lives with her daughter but performs all activities of daily living (ADLs) independently. Upon admission, she is alert and oriented x 4 and able to follow commands but is mildly hypoxic with oxygen saturation of 90%. The rest of her physical exam is otherwise normal. She is treated with oxygen and antibiotics. On day 2 of hospitalization, her daughter notes that since admission the patient is sleeping more, not eating her meals, and does not answer questions appropriately. On exam, she is now disheveled and mumbling, arousable but quickly falls back asleep, and is oriented to person only.

A review of her medications did not reveal any sedatives or other possible offending medications. She however was noted to be missing her eyeglasses and had been in bed since admission. After an extensive work-up, which included unremarkable labs and imaging of her chest and brain, a diagnosis of delirium was made, and non-pharmacological delirium treatment protocols were initiated. By day 5 of hospitalization, the patient is alert and oriented x 4 again and able to follow commands, although sleeping more than usual and not being mobilized. Her daughter also notes that the patient seems to struggle with knitting, which has been her favorite hobby for years. She was discharged to a skilled nursing facility for rehabilitation.

What was wrong with this patient? Could this have been prevented? Could this have been identified earlier? How would you care for this patient?

2. Introduction

This case illustrates an all too common experience for older adults in the hospital setting - delirium. Delirium is an acute or fluctuating alteration in mental status characterized by inattention, altered level of consciousness, and disorganized thinking [1, 2]. Patients may arrive to the hospital with delirium, but often delirium develops over the course of a hospitalization and is now the leading hospital-acquired complication for older adults [2, 3]. The etiology of delirium is usually multifactorial due to an interaction of predisposing and precipitating factors [4]. Delirium is associated with prolonged hospitalization, discharge to settings other than home, and mortality [5]. Additionally, ongoing research has shown that even after the most severe symptoms have resolved, prolonged cognitive impairment may plague patients for years [6-8].

Like many geriatric syndromes, delirium is often preventable but underdiagnosed. Without use of a validated screening tool, 75% of delirium cases may be missed [6]. When a system-wide approach is applied to prevent, detect, and manage delirium, improved patient outcomes can be accomplished [9]. Recently, a social movement was developed, known as Age-Friendly Health systems (AFHS), which advocates for delirium monitoring programs at hospitals, for all older adults (>65 years old). AFHS encourages that hospitals set up initiatives to prevent, identify, and manage delirium.

This paper will discuss 1) the impact of delirium in hospitalized older adults, 2) the guidelines of AFHS in establishing delirium monitoring programs, and 3) a practical approach to implementing a delirium program with a focus on screening and treatment.

2.1 Clinical and Public Health Impact of Delirium

Delirium is very common in the hospital setting, affecting up to 20-40% of older adults on medical and surgical units, and 70-75% in the intensive care setting [8, 10-12]. Although often not considered with the seriousness of other organ failure, such as heart failure or renal failure, "brain failure," as delirium has been colloquially referred to, is potentially a life-threatening condition. In fact, older adults with delirium have been found to have a mortality rate comparable to acute myocardial infarction [13]. Patients who develop delirium have much poorer outcomes compared to similar patients that do not. Delirium is an independent risk factor for mortality. In-hospital mortality rates have been as high as 25-33%, and risk of death remains increased up to 2 years later in those that survive hospitalization [5]. Delirium increases risk for falls, infections, prolonged mechanical ventilation, and functional decline, resulting in loss of independence, depression, post-traumatic stress disorder, and long-term cognitive impairment [5, 6]. Also, patients who become delirious in the hospital are more likely to be discharged to a nursing facility rather than home [5]. Due to the above factors, delirium is extremely costly to the health care system. Costs related to delirium in the United States have been estimated to be $164 billion per year, which nearly matches the cost of diabetes care and complications [14].

2.2 Age-Friendly Health Systems

The population of older adults aged 65 years and over in the United States is rapidly growing [15]. This population often requires highly complex health care, posing a great challenge and burden for the current health system [16]. Older adults are at increased risk of developing delirium and its serious consequences due to higher prevalence of predisposing risk factors (e.g. older age, functional impairment, vision impairment, hearing impairment) [4]. Furthermore, frailty in older adults also increases the risk of delirium, due to increased vulnerability and decreased adaptation to stressors [17, 18]. In order to address this, the Institute for Healthcare Improvement (IHI) and the John A. Hartford Foundation partnered with the American Hospital and Catholic Health Associations in 2017 to develop an initiative titled "Age-Friendly Health Systems" [19-21]. This initiative focuses on using the "4Ms framework" to assess and address the multidimensional health care needs of older adults, tailored to their goals, with the aim of improving outcomes. The components of the 4Ms-medication, mentation, mobility, and what matters most-are evidence-based and designed to be implemented together across all care settings (Figure 1). The implementation of this framework has also been shown to provide financial benefits to health systems, with one health system estimating an annual net income potential of $3 million [22]. The mentation component of the 4Ms involves the prevention, identification, and management of delirium in hospitalized older adults, and depression and dementia in outpatients [21].

For delirium, the key actions of age-friendly hospitals are to use non-pharmacologic means to prevent and treat delirium (such as hearing aids, glasses, ensuring oral hydration/nutrition) and screening for delirium at least every 12 hours [21]. In this paper, while we will touch on prevention,

screening, and management, we will focus on the key steps needed to implement a delirium monitoring program.

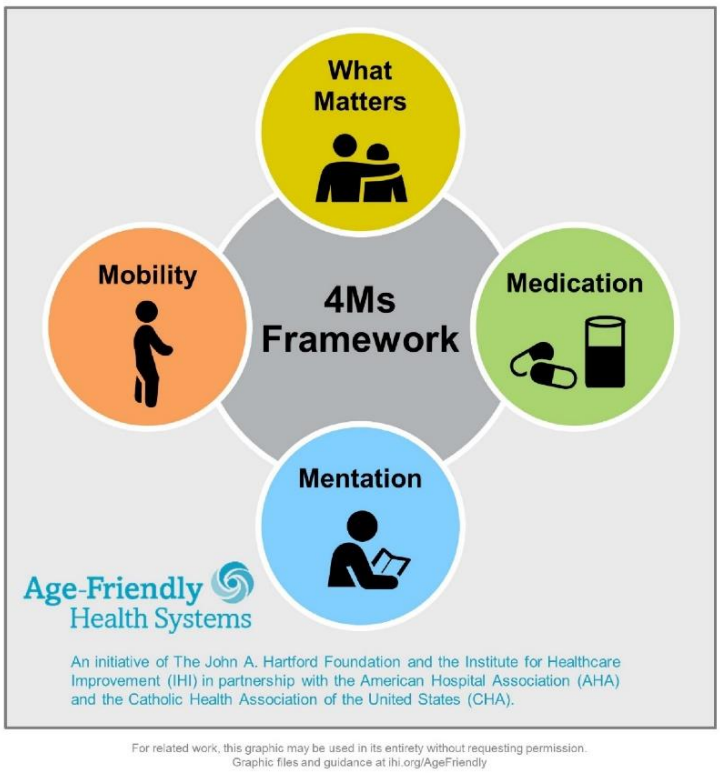

Figure 1 4Ms Framework for Age-Friendly Health Systems. The Institute for Healthcare Improvement and its partners established the 4Ms framework as a process for providing evidence-based, age-friendly healthcare across a health system. Screening hospitalized older adults for delirium at least every 12 hours is a key action of an age-friendly health system [21]. www.ihi.org/engage/initiatives/age-friendly-health-systems.

3. Delirium Prevention

Delirium can occur in any hospitalized older adult, however some populations considered high risk are patients with advanced age, dementia, infections, multimorbidity, high illness severity, prolonged hospital stay, decreased mobility, sensory impairments, dehydration, electrolyte disturbances, urinary catheterization, malnutrition and those on potentially inappropriate medications [23, 24]. This population should be targeted for early screening and prevention of delirium. Up to 40% of delirium is preventable by non-pharmacologic means [25, 26]. Hence, delirium prevention should be based on a non-pharmacological approach [9]. The Hospital Elder Life Program (HELP) has robust evidence demonstrating its effectiveness in preventing delirium using a non-pharmacologic approach [25]. The main components of HELP are included in the recommendations by AFHS for preventing delirium:

- Ensure proper oral hydration and nutrition, as well as trying to eliminate intravenous fluids/medications/nutrition if possible.
- Reorient often, with help from family members.

- Modify the environment by ensuring blinds are open during the day, minimize use of tethering devices.
- Restore sensory mechanisms, such as ensuring eyeglasses and hearing aids are in use.
- Ensure good pain control by having a high index of suspicion and assessing for pain, scheduling pain medications and using non-opioid analgesics.
- Encourage mobility.
- A protocol to minimize sleep disruption, such as the use of earplugs, sleeping masks and reducing nighttime vital signs, should also be put in place [21].

The mnemonic HOMMEEESS can be a helpful way to remember delirium prevention strategies (Figures 2 and 3), and the individual components of this guide are based on the HELP and AFHS recommendations [21, 25]. The Acute Care for the Elderly (ACE) unit is appropriately modeled to allow implementation of these strategies; however, these can also be implemented on a general medical/surgical floor with proper staff training. Pharmacists could also help with medication reconciliation and reduction of deliriogenic medication use (Figure 4). In patients who are admitted to a non-geriatric primary service, early and proactive geriatrics consultation should be placed in order to prevent delirium in patients at high risk [26]. These high risk patients may be identified using the AWOL screening tool, which has been validated to predict the risk of development of delirium in hospitalized patients [27].

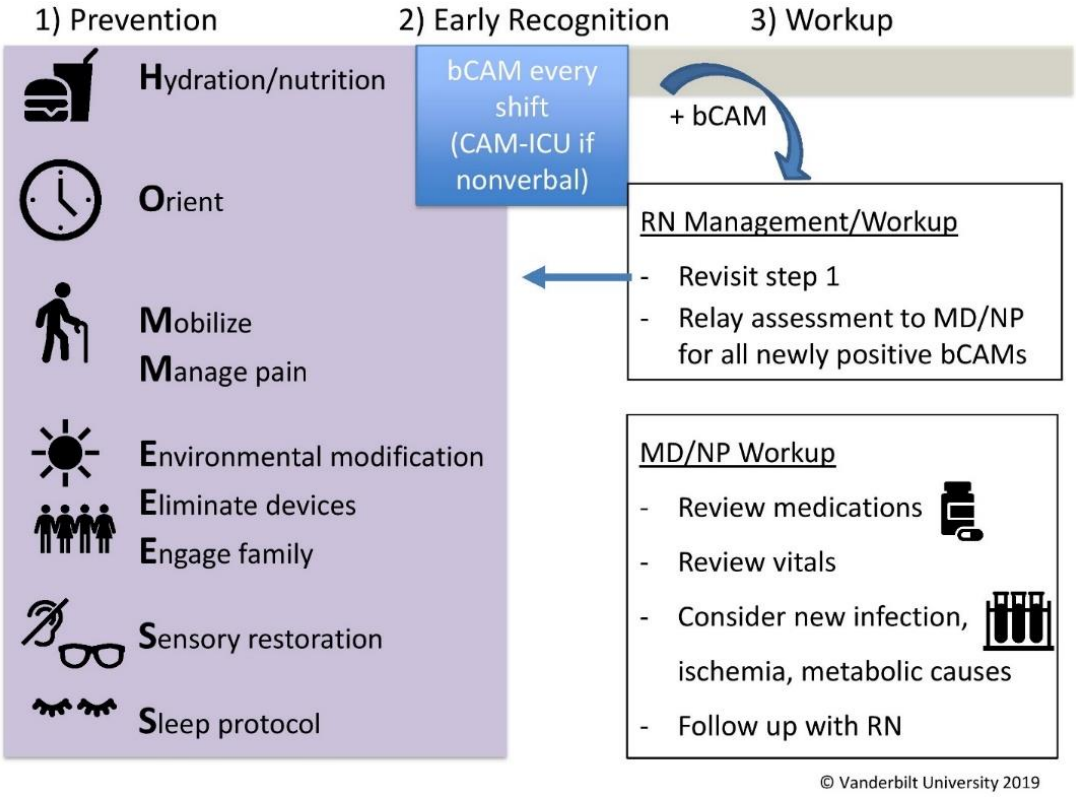

Figure 2 Delirium Care - Nursing Guide. Example of a nursing-focused framework for delirium prevention and screening in the non-ICU hospital setting. bCAM - brief confusion assessment method; CAM-ICU - confusion assessment method for the intensive care unit; MD - medical doctor; NP - nurse practitioner; RN-registered nurse. The evidence for the reliability and validity of HOMMEEESS as a guide is yet to be determined.

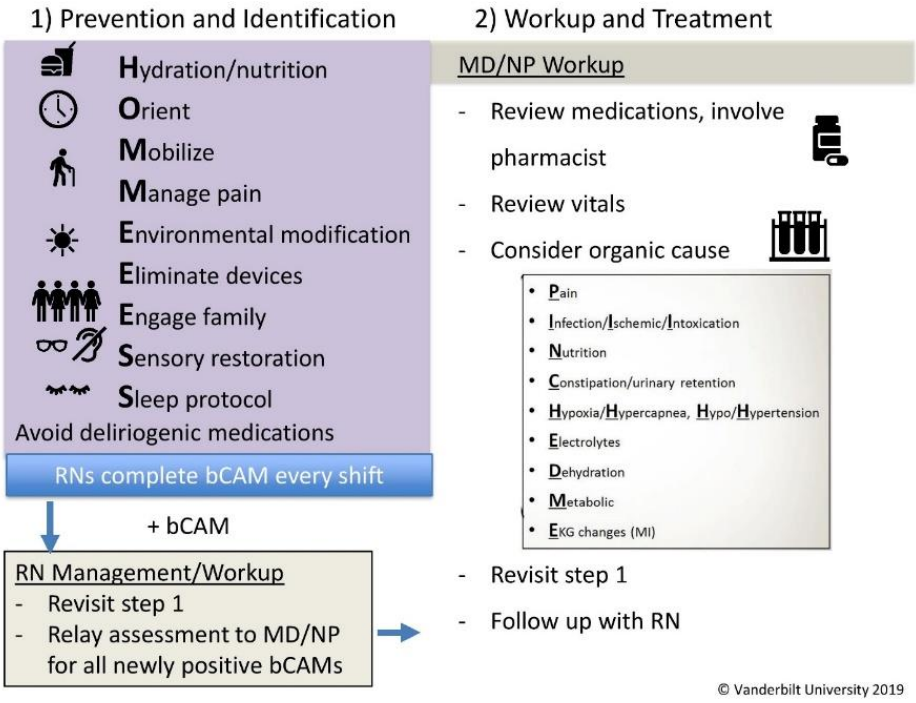

Figure 3 Delirium Care-Provider Guide. Example of a provider-focused framework for delirium prevention, evaluation and treatment in the non-ICU hospital setting. bCAM - brief confusion assessment method; MD - medical doctor; NP - nurse practitioner; RN - registered nurse; MI - myocardial infarction. The evidence for the reliability and validity of HOMMEEESS as a guide is yet to be determined.

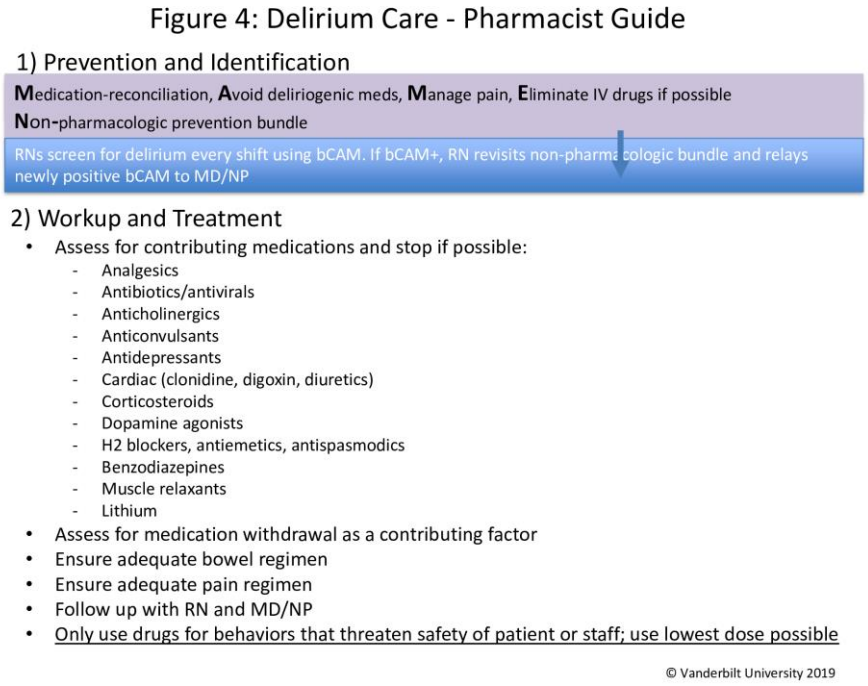

Figure 4 Delirium Care-Pharmacist Guide. Example of a pharmacist-focused framework for delirium prevention, evaluation and treatment in the non-ICU hospital setting. bCAM - brief confusion assessment method; MD - medical doctor; NP - nurse practitioner; RN - registered nurse; IV - intravenous.

4. Delirium Screening

Screening for delirium every 12 hours is recommended by the AFHS and is already recognized as a hospital standard for older surgical patients [28]. The science of delirium screening has advanced rapidly, with many screening tools now available.

4.1 Delirium Screening Tools

The diagnosis of delirium is often missed without the use of a structured diagnostic tool for rapid and accurate screening [6, 29]. Multiple screening tools have been validated over the years [30]. The Confusion Assessment Method (CAM) is one of the most valid and reliable tools for detecting delirium and uses the four feature structure to assess delirium-1) acute change or fluctuation in mental status from baseline, 2) inattention, 3) altered level of consciousness, and 4) disorganized thinking [31, 32]. A patient is considered CAM positive (i.e. delirium present) if features 1 and 2 and either feature 3 or 4 are present. Many derivations of the CAM have been developed for special populations. For example, in the intensive care unit (ICU), the Confusion Assessment Method for the ICU (CAM-ICU) is an accepted and widely used delirium screening tool [33, 34]. Similarly, a modified version of the CAM-ICU called the brief Confusion Assessment Method (bCAM) was developed for use in busy non-critical care settings and can be quickly and reliably performed by non-physicians [35]. The bCAM takes less than two minutes to perform and assesses the four features in the CAM [30, 36]. Figure 5 shows the bCAM algorithm and details how each feature can be assessed. Features 1 and 2 and either Feature 3 or 4 most be present in order to be considered bCAM positive, and thus highly suggestive of delirium [30]. AFHS also recommends the CAM, CAM-ICU and bCAM as some of the many valid delirium tools to implement [21].

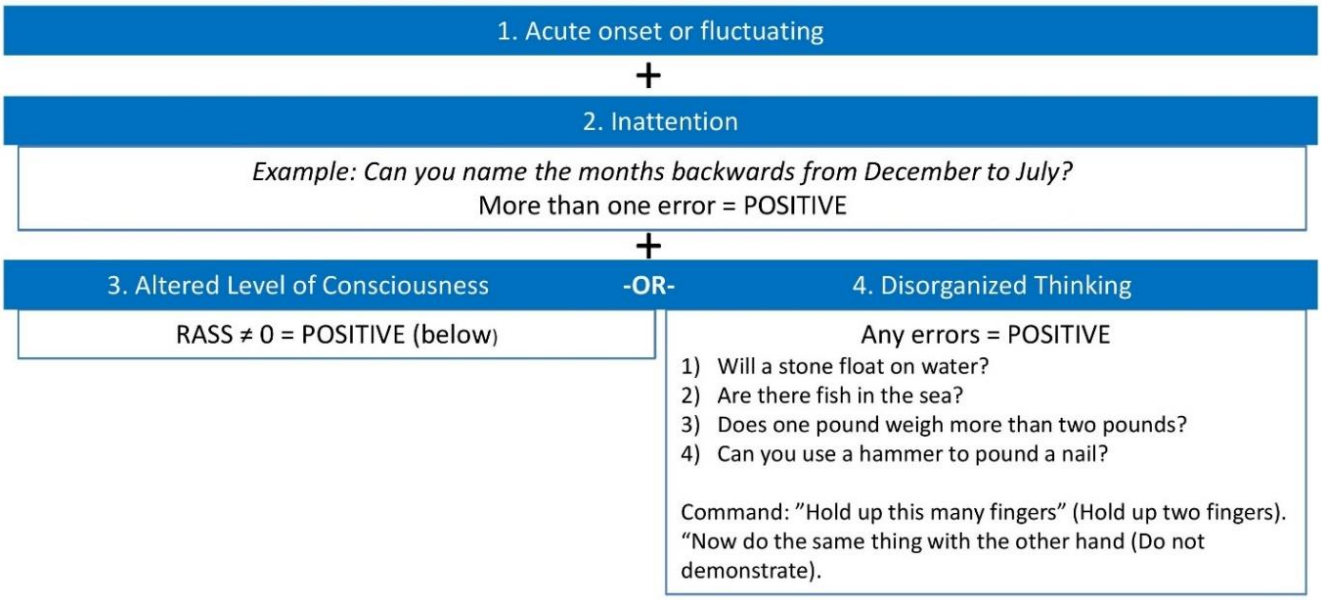

Figure 5 Brief Confusion Assessment Method (bCAM). Features of the brief Confusion Assessment Method (bCAM), which is a validated delirium screening tool. bCAM positive = Features 1+2+(3 or 4) = Delirium. RASS - Richmond Agitation and Sedation Scale.

The efficacy of delirium screening tools in the clinical setting has been well studied. The CAM was shown to be 94-100% sensitive and 90-95% specific when compared to a psychiatrist's assessment in the original validation study [31]. A systematic review and meta-analysis of prospective studies conducted in hospitalized patients showed a pooled sensitivity of 86% and pooled specificity of 93% [29]. The efficacy of the CAM-ICU was examined in two systematic reviews and meta-analyses, with both studies showing a pooled sensitivity of 74% and 80% respectively, and a pooled specificity of 96% [34, 37]. In another study, the bCAM was found to be 84% sensitive and 96% specific when performed by physicians in the emergency department [38]. The specificity of the bCAM was similar when performed by non-physicians (97%), however, the sensitivity was lower at 78% [38]. A modified version of the bCAM was later assessed in a secondary analysis, showing improved sensitivity of 82% when performed by non-physicians, and similar results for physicians [35]. A recent study in hospitalized palliative care patients also showed good sensitivity and specificity of the bCAM at 80% and 87% respectively [39]. There have also been other studies of delirium screening using the CAM-ICU in both the non-ICU and ICU settings that although showed lower sensitivities, consistently demonstrated high specificities [30]. This highlights a limitation of delirium screening tools like the CAM-ICU or bCAM that may give some false negative results, thus missing some delirious patients. However, the low false positive rates of these tools do give a clinician more confidence that delirium is truly present with a positive screen. Overall, the highlighted studies have shown that the bCAM can be used to efficiently screen for and detect delirium by both physicians and non-physicians.

4.2 Implementing Delirium Screening on an Acute Care for the Elderly Unit

The ACE Unit is an inpatient floor unit designed for the hospitalization of older adults aged 65 and over. This unit is designed as a continuous quality improvement care model focused on preserving the functional independence of older adults and improving outcomes by using multi-dimensional interventions [40]. Implementation of delirium screening on the ACE unit is in line with the goals of the unit and is important to allow prevention, early identification, and management of delirium [30]. Although we specify implementation strategies on the ACE unit, these can also be applied to a general medical/surgical floor, with appropriate staff training.

The goal of delirium screening should be to integrate the process into routine daily care [21]. Various studies have shown the possibility of successful implementation of delirium screening using different screening tools and strategies [30]. One study focused on the training of nurses in the correct use of the CAM-ICU to assess delirium every 8 hours, using lectures, videos and bedside application [41]. A different study confirmed that the use of these educational methods improved the rates of delirium screening by nurses when incorporated into standard daily nursing practice [42]. In addition to education, the standardization of delirium screening documentation and communication of delirium status to clinicians increases delirium screening by dayshift nurses to as high as 93% [43]. An implementation strategy used in another study focused on identifying probable barriers and facilitators for screening via medical staff interviews, resulting in significantly improved screening, from 77% to 92% [44]. This strategy allowed them to address the identified barriers using facilitators, for example, integrating the screening tool into the patient data management system, as well as, obtaining support from senior nurses and nursing leadership [44].

There is paucity of data on delirium implementation strategies on the ACE unit, however more data is available in the ICU, and these can be adapted for use on the ACE unit, given the feasibility and success of these strategies. Figure 6 shows an outline of steps and strategies that may be used to implement delirium screening on the ACE unit, using the bCAM as a screening tool. Engaging stakeholders, such as nursing and physician leadership to get buy-in is an important step for successful implementation, after which an interdisciplinary team should be created [30]. This team should consist of physicians, nurse practitioners, nurses, pharmacists, therapists, unit leadership, ancillary staff, as well as patient/family representatives, who could help drive the implementation process. Education and training of nurses and clinicians should focus on knowledge about delirium and the bCAM, as well as bedside applications [30]. The need to assess accuracy of screening, proper documentation, and communication with clinicians should be emphasized. The electronic medical record should be designed to allow easy documentation of bCAM results at every shift, which not only enhances communication but also allows easy daily data collection for analysis [30]. Data should be analyzed regularly, and results communicated to staff and other members of the interdisciplinary team at regular meetings, perhaps monthly. Barriers to delirium screening should be identified, addressed, and reassessed continuously. Throughout the implementation process, it should be noted that education and training may need to be repeated for new staff and reinforced for current staff [30].

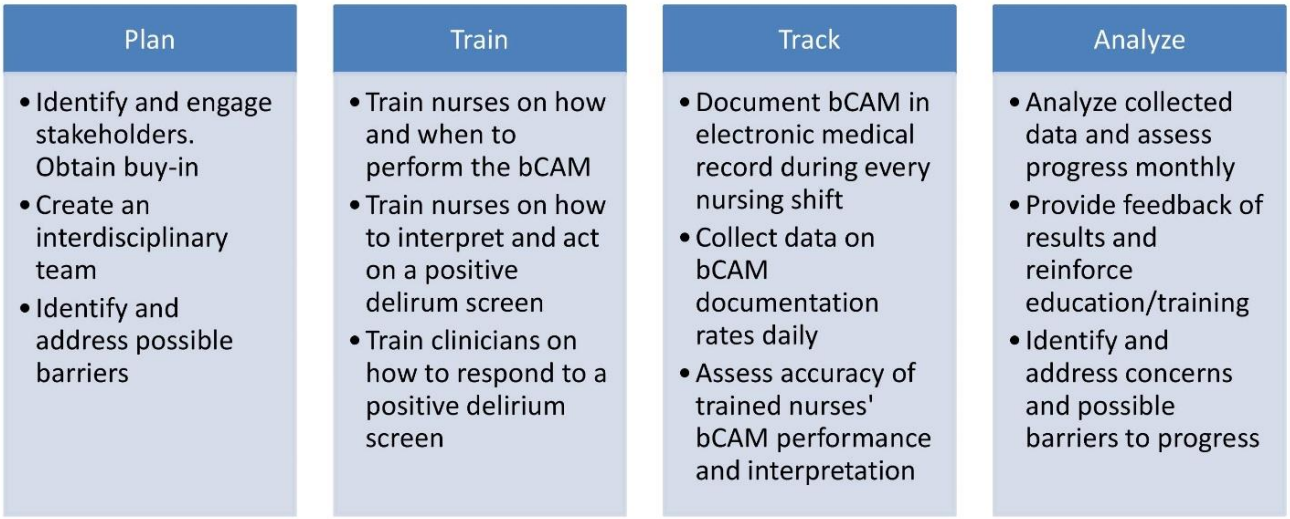

Figure 6 Implementation of Delirium Screening Using the Brief Confusion Assessment Method (bCAM). Example of steps involved in implementation of the bCAM as a delirium screening tool on an inpatient unit, with emphasis on buy-in, interdisciplinary teamwork, education, training and communication. These strategies are necessary to achieve successful implementation. bCAM - brief confusion assessment method.

5. Delirium Management: Evaluation and Treatment

Delirium screening implementation can be discouraging if care teams do not intervene when there is a positive delirium screen [45]. Hence, care teams need to work closely together not only to prevent and detect delirium early but also to evaluate for possible delirium triggers and provide the appropriate treatment. While all members of the interdisciplinary team are important in

optimizing outcomes for patients with delirium, three key players in this process are the nurses, clinicians/providers, and pharmacists who should work together to achieve this goal. Figures 2-4 illustrate each key player's role in the prevention, early identification, evaluation, and treatment of delirium. Family member integration into this care model has also shown improved outcomes [3, 46].

5.1 Evaluation

The diagnosis of delirium should trigger a prompt and thorough evaluation to identify reversible causes of delirium [3]. The first step is for nursing staff to feel empowered to quickly communicate the positive bCAM screen to clinicians, and while awaiting this evaluation, revisit the delirium prevention strategies and address any possible predisposing factors. The clinician evaluation should include a thorough history and physical exam, focusing on new symptoms, medication review (with the help of the pharmacist), vital signs, lung exam and neurologic exam [3]. Some organic causes of delirium include pain, infection (urinary tract infection, pneumonia), ischemia, constipation/urinary retention, dehydration and electrolyte derangements. The mnemonic PINCHEDME can be a helpful way to remember delirium etiology (Figure 3). The causes of delirium are frequently multifactorial, and laboratory testing/imaging should be guided by history and physical exam.

5.2 Treatment

It is important to address factors contributing to delirium that have been identified during the evaluation early on, in order to reduce poor outcomes from delirium [30]. This step requires proper integration within the care team. The mainstay of treatment should be focused on non-pharmacologic interventions such as reorientation, ensuring water and oral fluids are easily accessible, providing an adequate pain regimen, modifying the environment, restoring sensory mechanisms, minimizing sleep disruption, encouraging mobility, removing tethering devices, avoiding restraints, and stopping/tapering off all offending medications [21]. Pharmacologic treatment should be targeted at the underlying etiology, such as the use of laxatives for constipation and antibiotics for infections. The use of sedating medications should generally be avoided, particularly the use of benzodiazepines, which have been shown to worsen delirium [47]. In challenging cases, benzodiazepine use should be limited to delirium due to alcohol or benzodiazepine withdrawal if possible [3]. Medications used to treat behavioral disturbances, such as antipsychotics, should also be avoided and only used for behavior that threaten safety of the patient or staff [30]. When needed, the lowest dose possible should be used, for the shortest duration that is necessary [3]. Studies have shown no benefit with the use of antipsychotics otherwise [48, 49].

6. Conclusions and Recommendations

The patient in this vignette had a diagnosis of delirium evidenced by her change in mental status from baseline, inattention, and altered level of consciousness. This may have been identified earlier if delirium screening during every shift was done using a validated screening tool. Furthermore, this scenario may have been prevented if delirium prevention strategies such as

reorientation, early mobilization and restoration of sensory mechanisms were already in place on the unit. Although her delirium resolved with appropriate non-pharmacological delirium treatment, she now has a decline in her functional status and requires post-acute care for rehabilitation. This case highlights some adverse outcomes of delirium and emphasizes the importance of delirium screening in hospitalized older adults. Implementation of delirium screening using a validated tool addresses the mentation component of the 4Ms and incorporates delirium prevention, detection, evaluation, and management into the plan of care-a step towards becoming an age-friendly health system.

Author Contributions

Study concept and design: TA, JP, MCD; Acquisition of subjects and/or data: TA; Analysis and interpretation of data: TA, JP, MCD; Preparation of manuscript: TA, JP, MCD.

Competing Interests

The authors have declared that no competing interests exist.

References

1. Edition F. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: American Psychiatric Association; 2013.
2. Hshieh TT, Inouye SK, Oh ES. Delirium in the elderly. Clin Geriatr Med. 2020; 36: 183-199.
3. Marcantonio ER. Delirium in hospitalized older adults. N Engl J Med. 2017; 377: 1456-1466.
4. Inouye SK, Westendorp RGJ, Saczynski JS. Delirium in elderly people. Lancet. 2014; 383: 911-922.
5. Witlox J, Eurelings LSM, Jonghe JFM de, Kalisvaart KJ, Eikelenboom P, Van Gool WA. Delirium in elderly patients and the risk of postdischarge mortality, institutionalization, and dementia: A meta-analysis. JAMA. 2010; 304: 443-451.
6. Inouye SK, Marcantonio ER, Kosar CM, Tommet D, Schmitt EM, Travison TG, et al. The short-term and long-term relationship between delirium and cognitive trajectory in older surgical patients. Alzheimers Dement. 2016; 12: 766-775.
7. Saczynski JS, Marcantonio ER, Quach L, Fong TG, Gross A, Inouye SK, et al. Cognitive trajectories after postoperative delirium. N Engl J Med. 2012; 367: 30-39.
8. Pandharipande PP, Girard TD, Jackson JC, Morandi A, Thompson JL, Pun BT, et al. Long-term cognitive impairment after critical illness. N Engl J Med. 2013; 369: 1306-1316.
9. Hshieh TT, Yue J, Oh E, Puelle M, Dowal S, Travison T, et al. Effectiveness of multicomponent nonpharmacological delirium interventions: A meta-analysis. JAMA Intern Med. 2015; 175: 512-520.
10. Francis J. Delirium in older patients. J Am Geriatr Soc. 1992; 40: 829-838.
11. Schubert M, Schürch R, Boettger S, Garcia Nuñez D, Schwarz U, Bettex D, et al. A hospital-wide evaluation of delirium prevalence and outcomes in acute care patients-a cohort study. BMC Health Serv Res. 2018 ;18: 550.
12. McNicoll L, Pisani MA, Zhang Y, Ely EW, Siegel MD, Inouye SK. Delirium in the intensive care unit: Occurrence and clinical course in older patients. J Am Geriatr Soc. 2003; 51: 591-598.

13. Gower LEJ, Gatewood MO, Kang CS. Emergency department management of delirium in the elderly. West J Emerg Med. 2012; 13: 194-201.
14. Leslie DL, Marcantonio ER, Zhang Y, Leo-Summers L, Inouye SK. One-year health care costs associated with delirium in the elderly population. Arch Intern Med. 2008; 168: 27-32.
15. National institute on aging. Introduction [Internet]. National institute on aging. 2020 [cited 2020 Apr 10]. Available from: https://www.nia.nih.gov/living-long-well-21st-century-strategic-directions-research-aging/introduction
16. Kennedy T. Strength in age-friendly health systems: An innovative integrated interprofessional model. Innov Aging. 2019; 3: S829.
17. Eeles EMP, White SV, O'Mahony SM, Bayer AJ, Hubbard RE. The impact of frailty and delirium on mortality in older inpatients. Age Ageing. 2012; 41: 412-416.
18. Walston J. Frailty research moves beyond risk assessment. J Gerontol A Biol Sci Med Sci. 2017; 72: 915-916.
19. Fulmer T, Mate KS, Berman A. The age-friendly health system imperative. J Am Geriatr Soc. 2018; 66: 22-24.
20. Mate KS, Berman A, Laderman M, Kabcenell A, Fulmer T. Creating age-friendly health systems-A vision for better care of older adults. Healthc (Amst). 2018; 6: 4-6.
21. IHI. Age-friendly health systems: Guide to using the 4ms in the care of older adults [Internet]. Institute for healthcare improvement; 2019 [cited 2020 Apr 9]. Available from: http://www.ihi.org/Engage/Initiatives/Age-Friendly-Health-Systems/Documents/IHIAgeFriendlyHealthSystems_GuidetoUsing4MsCare.pdf
22. IHI. The business case for becoming an age-friendly health system [Internet]. Institute for healthcare improvement; 2019 [cited 2020 Jun 29]. Available from: http://www.ihi.org/Engage/Initiatives/Age-Friendly-Health-Systems/Documents/IHI_Business_Case_for_Becoming_Age_Friendly_Health_System.pdf
23. Vasilevskis EE, Han JH, Hughes CG, Ely EW. Epidemiology and risk factors for delirium across hospital settings. Best Pract Res Clin Anaesthesiol. 2012; 26: 277-287.
24. Ahmed S, Leurent B, Sampson EL. Risk factors for incident delirium among older people in acute hospital medical units: A systematic review and meta-analysis. Age Ageing. 2014; 43: 326-333.
25. Inouye SK, Bogardus ST, Charpentier PA, Leo-Summers L, Acampora D, Holford TR, et al. A multicomponent intervention to prevent delirium in hospitalized older patients. N Engl J Med. 1999; 340: 669-676.
26. Marcantonio ER, Flacker JM, Wright RJ, Resnick NM. Reducing delirium after hip fracture: A randomized trial. J Am Geriatr Soc. 2001; 49: 516-522.
27. Douglas VC, Hessler CS, Dhaliwal G, Betjemann JP, Fukuda KA, Alameddine LR, et al. The AWOL tool: Derivation and validation of a delirium prediction rule. J Hosp Med. 2013; 8: 493-499.
28. Koebrugge B, Koek HL, van Wensen RJA, Dautzenberg PLJ, Bosscha K. Delirium after abdominal surgery at a surgical ward with a high standard of delirium care: Incidence, risk factors and outcomes. Dig Surg. 2009; 26: 63-68.
29. Wong CL, Holroyd-Leduc J, Simel DL, Straus SE. Does this patient have delirium?: Value of bedside instruments. JAMA. 2010; 304: 779-786.

30. Brummel NE, Vasilevskis EE, Han JH, Boehm L, Pun BT, Ely EW. Implementing delirium screening in the intensive care unit: Secrets to success. Crit Care Med. 2013; 41: 2196-2208.
31. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI. Clarifying confusion: The confusion assessment method: A new method for detection of delirium. Ann Intern Med. 1990; 113: 941-948.
32. Wei LA, Fearing MA, Sternberg EJ, Inouye SK. The confusion assessment method (CAM): A systematic review of current usage. J Am Geriatr Soc. 2008; 56: 823-830.
33. Ely EW, Inouye SK, Bernard GR, Gordon S, Francis J, May L, et al. Delirium in mechanically ventilated patients: Validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). JAMA. 2001; 286: 2703-2710.
34. Gusmao-Flores D, Salluh JIF, Chalhub RÁ, Quarantini LC. The confusion assessment method for the intensive care unit (CAM-ICU) and intensive care delirium screening checklist (ICDSC) for the diagnosis of delirium: A systematic review and meta-analysis of clinical studies. Crit Care. 2012; 16: R115.
35. Han JH, Wilson A, Graves AJ, Shintani A, Schnelle JF, Ely EW. A quick and easy delirium assessment for non-physician research personnel. Am J Emerg Med. 2016; 34: 1031-1036.
36. Adult Non-ICU Care: Monitoring Delirium [Internet]. [cited 2020 Apr 10]. Available from: https://www.icudelirium.org/medical-professionals/adult-non-icu-care-monitoring-delirium
37. Neto AS, Nassar AP, Cardoso SO, Manetta JA, Pereira VGM, Espósito DC, et al. Delirium screening in critically ill patients: A systematic review and meta-analysis. Crit Care Med. 2012; 40: 1946-1951.
38. Han JH, Wilson A, Vasilevskis EE, Shintani A, Schnelle JF, Dittus RS, et al. Diagnosing delirium in older emergency department patients: Validity and reliability of the delirium triage screen and the brief confusion assessment method. Ann Emerg Med. 2013; 62: 457-465.
39. Wilson JE, Boehm L, Samuels LR, Unger D, Leonard M, Roumie C, et al. Use of the brief confusion assessment method in a veteran palliative care population: A pilot validation study. Palliat Support Care. 2019; 17: 569-573.
40. Palmer RM. the acute care for elders unit model of care. Geriatrics (Basel). 2018; 3: 59.
41. Souza R, Bersaneti M, Siqueira E, Meira L, Brumatti D, Prado N. Nurses' training in the use of a delirium screening tool [Internet]. 2017 [cited 2020 Apr 10]. Available from: http://www.scielo.br/scielo.php?pid=S1983-14472017000100801&script=sci_arttext&tlng=en
42. Scott P, McIlveney F, Mallice M. Implementation of a validated delirium assessment tool in critically ill adults. Intensive Crit Care Nurs. 2013; 29: 96-102.
43. Aparanji K, Kulkarni S, Metzke M, Schmudde Y, White P, Jaeger C. Quality improvement of delirium status communication and documentation for intensive care unit patients during daily multidisciplinary rounds. BMJ Open Qual. 2018; 7: e000239.
44. van den Boogaard M, Pickkers P, van der Hoeven H, Roodbol G, van Achterberg T, Schoonhoven L. Implementation of a delirium assessment tool in the ICU can influence haloperidol use. Critical Care. 2009; 13: R131.
45. Pun BT, Gordon SM, Peterson JF, Shintani AK, Jackson JC, Foss J, et al. Large-scale implementation of sedation and delirium monitoring in the intensive care unit: A report from two medical centers. Crit Care Med. 2005; 33: 1199-1205.

46. Cotton D, Taichman D, Williams S, Marcantonio ER. Delirium. Ann Intern Med. 2011; 154: ITC6-1.
47. Pandharipande P, Shintani A, Peterson J, Pun BT, Wilkinson GR, Dittus RS, et al. Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. Anesthesiology. 2006; 104: 21-26.
48. Neufeld KJ, Yue J, Robinson TN, Inouye SK, Needham DM. Antipsychotic medication for prevention and treatment of delirium in hospitalized adults: A systematic review and meta-analysis. J Am Geriatr Soc. 2016; 64: 705-714.
49. Girard TD, Exline MC, Carson SS, Hough CL, Rock P, Gong MN, et al. Haloperidol and ziprasidone for treatment of delirium in critical illness. N Engl J Med. 2018; 379: 2506-2516.