



The Missed and Misdiagnosed: Geriatric Delirium in the Emergency Department

Christienne Shams, MD, Yashar Eshman, MD, Ronan Factora, MD, Stephon Meldon, MD, Saket Saxena, MD

ABSTRACT

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| Introduction | Older patients with delirium are at increased risk for prolonged hospitalization, poor outcomes, higher costs and a greater risk for institutionalization. By identifying those at risk early, interventions can be implemented to prevent or minimize the severity of the delirium. Per hospital policy, our geriatric emergency department (ED) screens for delirium by performing a 4AT only if changes in mental status are noted by caregivers or healthcare providers familiar with the patient. We hypothesize this approach underestimates the prevalence of delirium on presentation to the ED, particularly among high-risk older patients. The aim of this study is to determine how many cases of delirium that are present on admission are missed using this traditional approach. |
| Methods | High risk older patients presenting to the ED were identified using an internally devised Electronic Medical Record (EMR) based risk stratification algorithm with known risk factors for delirium including age (>65 years old), polypharmacy (>10 medications), dementia history, sensory impairment and repeat ED visits or hospitalizations (>5 over the preceding year). Of these high-risk patients, 100 patients were randomly selected to undergo a 4AT delirium screen in the ED on presentation, regardless of whether mental status changes were noted in triage. Incidence of delirium and cognitive impairment on presentation using the 4AT score was calculated and contrasted with the traditional approach using the McNemer test to detect any statistical difference. |
| Results | The average age was 74 years old (65-95 years old), outpatient medication count was 15 (0-40) and average prior ED visits/hospitalizations over the preceding year was 3 (1-68). Seven had a known prior history of dementia, 56 were male and 44 were female. Of the 100 patients screened, 14 scored 4 or above on the 4AT; indicating delirium on arrival. Of these 14, only 3 were detected using the traditional approach. The difference between the number of cases detected by the traditional approach and the EMR based risk stratification method was noted to be significant ($p < 0.05$). 27 of those screened scored 1-3; indicating likely underlying cognitive impairment not meeting criteria for delirium. None of these patients were detected by the traditional method. |
| Conclusion | All high-risk older patients, as identified by the EMR, should be screened for delirium on presentation to the ED at the time of triage using the 4AT screen or comparable screening test. This screening should not be dependent only on report of acute mental status changes by patient or caregivers. Patients with underlying cognitive impairment who do not screen positive for delirium but score 1-3 on 4AT are likely to benefit from the early implementation of delirium prevention strategies. |

INTRODUCTION

Despite a prevalence of 7-20% of those presenting to the emergency department (ED), in most EDs delirium is not routinely assessed for in the older population unless prompted by caregivers or healthcare providers familiar with the patient.¹⁻⁴ Defined as a fluctuation in attention, awareness and

cognition that develops acutely, delirium poses a diagnostic challenge for the older population and their caregivers. This population's presentation is often confounded by multiple medical comorbidities, visual or auditory impairment, polypharmacy or underlying cognitive impairment.^{1,3,4} In this population, delirium often is misdiagnosed or missed amidst the many other variables in their care.

Older patients who develop delirium are likely to experience deleterious outcomes as a result, made more pronounced when the diagnosis is missed. These include longer hospital stays, complications from nosocomial exposures, increased healthcare costs, general decline in function and quality of life and higher rates of institutionalization and mortality following their acute hospitalization.^{1,4-6} When and if detected, it is often too late to implement the interventions needed to prevent or minimize the severity of the delirium by searching for and addressing the precipitants.^{7,8,9}

Currently there are multiple screening tools validated in the detection of acute delirium. The 4AT score has been validated for use in the ED setting due to its brevity and lack of need for specialized training needed for administration.^{6,10} With a sensitivity and specificity of 88% respectively in the older population, the 4AT score consists of four components that evaluate alertness, fluctuation in mentation, cognition, and attention.^{5,6,11} A score of 4 or more indicates the likely presence of delirium and need for follow-up evaluation for definitive diagnosis.^{3,5,11} Though altered mental status is not a requirement for 4AT assessment, it is typically administered only in response to concerns from caregivers or healthcare providers familiar with the patient regarding their mental status. Due to this, we hypothesize many delirium patients go undetected in the ED.¹²⁻¹⁴ As such, an algorithm that identifies patients most at risk for delirium was devised and rates contrasted with those detected through the traditional approach of delirium detection in a busy urban level I geriatric ED to quantify missed cases of delirium with the traditional approach.¹⁵

METHODS

Study Design and Setting

This is a prospective cross-sectional study in which the 4AT screen was administered to older patients who were high risk for developing delirium as determined by an internally devised electronic medical record (EMR) generated algorithm. The study was conducted at a single Level I Geriatric ED in an urban setting with an annual census of approximately 61 000 visits per year, of which 24% are older patients (65 years old and above). Institutional review board approval was waived for this quality improvement study.

Selection of Participants

The 4AT screen (<https://www.the4at.com/>) was administered to a convenience sample of one hundred older patients, with an emergency severity index ranging from 1-5, who were high risk for developing delirium. This was conducted by two independent physicians trained in geriatric medicine and done in parallel to the traditional approach of 4AT, ISAR and TRST screens conducted by the triage nurse at the time concerns regarding the patient's cognition were noted. All patients over the age of 65 were eligible for inclusion in this study once identified as high-risk by a previously validated and published internally devised algorithm that has now been incorporated into the hospital network's EMR (Appendix 1).¹⁵ These were identified using a conglomerate score based on age (≥ 65 years old), polypharmacy (≥ 10 medications), prior ED visits/hospitalizations in the preceding year (≥ 5 encounters) and prior history of dementia. Patients or caregivers were informed of the study purpose and were required to provide verbal consent prior to any screening. Those who were unable to consent, declined participation, were unresponsive, had severe dementia as defined by complete dependence for two or more activities of daily living or were unable to communicate in English were excluded. All 4AT screens were conducted with patients whose ED length of stay had not exceeded 8 hours during the daytime.

This was done to minimize variability influenced by disruptions in circadian rhythms, confounders from staffing changes or new-onset delirium from psychoactive medications administered in the ED.

Measurements and Outcomes

The 4AT screen for delirium evaluates 4 domains; cognition, attention, alertness, and acute fluctuations in mental status as determined through collateral history. It is scored from 0-12, with a maximum score of 4 each for alertness and acute fluctuations in course and 2 each for the abbreviated mental test and attention. Patients scoring 4 and above were considered to have a positive delirium screen. A positive 4AT screen is suggestive but not diagnostic of delirium; a diagnosis that is clinically determined.¹³ Patients who scored 4 or above were identified as having a positive delirium screen. Those who scored 1-3 on the 4AT were identified as possibly having an underlying cognitive impairment. These high-risk patients were then retrospectively reviewed to evaluate how many had undergone a 4AT screen per the traditional, nurse administered approach and how many had a positive delirium screen. The number of acute delirium cases detected by the two approaches were then compared.

Data Analysis

Differences in patients who screened positive for delirium using the 4AT score after being identified by the internally devised algorithm and confirmed by a geriatric physician and the traditional, nurse administered approach were compared using the McNemer test to detect any statistical difference. Given the small sample size, the test statistic, χ^2 is not well approximated by chi-squared distribution and an Edwards correction was applied to approximate the binomial exact p-value.^{15,16} This resulted in a χ^2 value of 9.09 with a p-value <0.05 , indicating a statistically significant difference between the delirium rates detected by the two approaches.

RESULTS

A total of 100 patients consented to participate in this study. The average age of patients screened was 74 years old (65-95 years old), 56 were male, and 44 were female. Outpatient medication count was 15 (0-40), average prior ED visits/hospitalizations over the preceding year was 3 (1-68 encounters). A dementia history was noted in 7 patients. Of the 100 patients screened, 14 scored 4 or above on the 4AT screen by geriatrician assessment. Of these 14, only 3 were detected using the traditional methodology for identifying delirium in the ED. Of those screened, 27 scored 1-3, indicating the likely presence of a cognitive impairment necessitating further evaluation. None of these cognitive impairments were detected using the traditional approach and no delirium cases were detected solely using the traditional approach (Figure 1). Further information regarding the

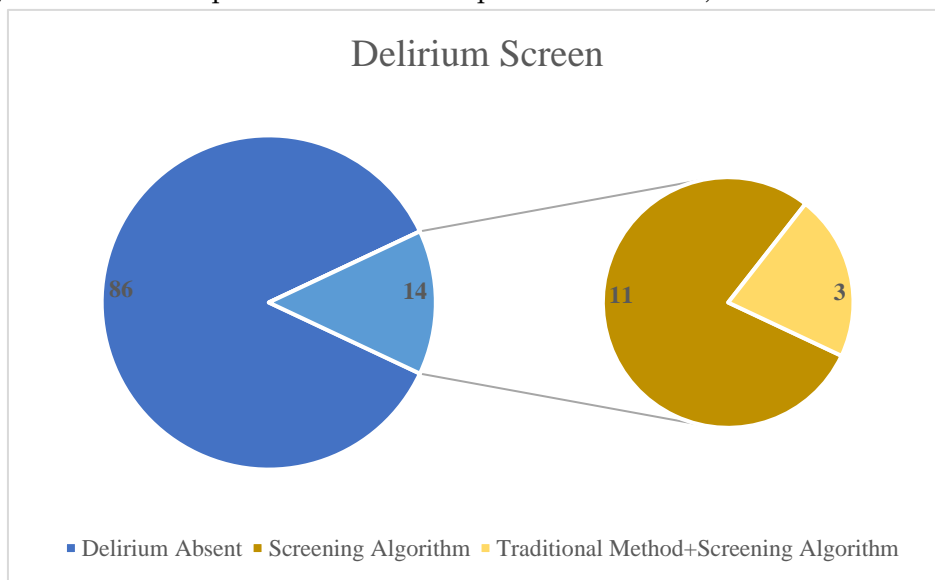


Figure 1. Delirium detection by screen type in the ED

ethnicity of the population serviced by the ED in which the study was conducted in 2022 is outlined in Table 1.

| Race/Ethnicity | |
|----------------------------------|-------|
| Black | 57.3% |
| Caucasian | 34.4% |
| Hispanic | 3.1% |
| Asian | 1.0% |
| Pacific Islander/Native Hawaiian | 0.0% |
| Native American | 0.2% |
| Multiracial | 2.1% |
| Other | 0.0% |
| Declined | 0.3% |
| Unavailable | 1.6% |

DISCUSSION

Our study demonstrates a statistically and clinically significant difference in the number of cases that are missed by the traditional screening methodology. In this prospective qualitative study, our approach of screening high risk patients for delirium resulted in significantly greater recognition of delirium in our level 1 geriatric ED. Current literature identifies delirium as a significant problem facing the older population, particularly during encounters for acute medical care, as it does not present with specific clinical, laboratory or imaging findings.^{19,20} As it is often considered a diagnosis of exclusion, it often is missed or misdiagnosed, particularly in the elderly population and it is believed that delirium missed in the ED is likely to also be missed during the acute hospital stay.^{7, 19-22}

As the results indicate, there is a statistically significant difference between the traditionally employed method in detecting delirium in the ED and those detected using the new algorithm. The new algorithm identifies patients who are high risk for delirium based on known risk factors for delirium and screens them whether caregivers and family members note any change in mentation or cognition, or not. The clinical application of these findings is noteworthy. The data presented shows 79% or 11 of the 14 cases of delirium were detected by the EMR based algorithm but missed by the traditional methodology. Additionally, 100% or all 27 patients of those with likely underlying cognitive impairment who scored 1-3, went undetected in the ED using the traditional approach. This implies that providers should not wait for concerns to be verbalized before assessing for delirium and that all high-risk patients should be screened on arrival. Furthermore the 27% of high-risk patients presenting to the ED who did not meet criteria for delirium based on 4AT score but whose score indicated a likely underlying cognitive impairment (1-3) were not detected by the traditional approach. This is important to note as this is the cohort who would benefit most from the implementation of intervention strategies early to prevent the development of delirium during their acute hospitalization.²² As the demands on the ED continue to mount, it is imperative that the quickest screening tool with a high specificity be employed. With a

specificity of 88% and administration time of less than two minutes, the 4AT score serves as one efficient and reliable screening tool for delirium in the ED.^{6,10}

There were numerous limitations with this study. One such limitation is the relatively small sample size of 100 patients in an urban, tertiary care, academic ED that may limit the generalizability of these findings to rural or non-academic settings. It is possible that with a larger sample size there would not be as significant of a clinical or statistical difference between the two methodologies and thus it is important that future studies utilizing this algorithm recruit larger sample sizes to confirm the findings presented here. Secondly, while testing patients only during the daytime was done to minimize other confounders, this design missed patients who presented early in the morning or late at night who may have more acute presentations and would be more likely to present with delirium. Additionally, as only patients who were able to consent or assent following consent from caregivers and who had no language or cognitive barriers were included in this study, it is plausible conclusions drawn here underestimate the true prevalence in the population. Finally, as these patients were not followed beyond the ED setting and the true prevalence of delirium in the study population not known, the sensitivity and specificity of the newer algorithm in detecting delirium could not be determined.

Overall, the utilization of this novel algorithm is promising, but further research employing larger sample sizes across different ED settings is needed to confirm its effectiveness in detecting delirium in the older population. If future studies confirm its effectiveness, this could have significant implications in improving the detection of delirium in the ED setting; a task that, as this study demonstrates, has much room for improvement and whose clinical implications have significant impact on the care of the elderly in the acute care setting.^{1,3,22} To our knowledge, this is the first study to identify older patients that are high risk for delirium and screen them regardless of concerns regarding their mental status, in order to quantify the number of delirium cases that are undetected in the ED.

CONCLUSION

Delirium is a common presentation in older patients presenting to the ED. Its timely detection is imperative in addressing the underlying precipitators, reversing, and preventing the long-term complications of delirium. Delayed diagnosis increases mortality and morbidity rates.^{10,23-26} The findings of this study add to the existing literature that highlights the importance of early detection of delirium. It also calls to attention the need for revision of current practices of delirium assessment in the ED, which likely misses a significant number of delirium cases in the ED. This study highlights the need to have more standardized approaches to delirium screening in the ED. Electronic identification of a subset of geriatric patients at high risk for delirium and requiring screening is an important avenue of research that warrants further research.

KEYWORDS

Delirium, Geriatrics, Emergency Department, Detection, 4AT

AFFILIATIONS

| | |
|-----------------------|--|
| Christienne Shams, MD | Cleveland Clinic Foundation, Center for Geriatric Medicine |
| Yashar Eshman, MD | Cleveland Clinic Foundation, Center for Geriatric Medicine |
| Ronan Factora, MD | Cleveland Clinic Foundation, Center for Geriatric Medicine |
| Stephen Meldon, MD | Emergency Service Institute, Cleveland Clinic Foundation, Cleveland, OH, USA |
| Saket Saxena, MD | Cleveland Clinic Foundation, Center for Geriatric Medicine |

CORRESPONDING AUTHOR

Christienne Shams, MD
Cleveland Clinic Foundation
Center for Geriatric Medicine
cshams0000@gmail.com

CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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