

RESEARCH

Open Access



# Improving delirium assessments in acute senior health: A quality improvement project for care of the older person

Charles Taylor<sup>1,2,3\*</sup>, Georgia Peakman<sup>2</sup>, Lauren Mackinnon<sup>2</sup>, Navid Mohamadzade<sup>1</sup>, Wayne Han<sup>1</sup>, Lucy Mackie<sup>1</sup>, Jasmine Gandhi<sup>1</sup>, Oliver Mitchell<sup>1</sup>, Caitlin Bateman-Champain<sup>1</sup>, Joseph Hetherington<sup>1</sup>, Fahed Belarbi<sup>1</sup> and Gaggandeep Alg<sup>1</sup>

## Abstract

**Background** Delirium is a common and reversible neurobehavioral condition with significant morbidity and mortality ramifications for older patients. Consequentially, clear guidelines exist pertaining to its swift identification and management. However, studies suggest that adherence to these guidelines are poor. This audit aimed to evaluate compliance to the National Institute for Health and Care Excellence's (NICE) delirium guidelines in an Acute Senior Health Unit (ASHU) and to present a single centre experience of a low-cost ward-based intervention for improving delirium guideline adherence.

**Methods** A retrospective observational audit was conducted on patients admitted to ASHU between 01/07/2023 and 30/07/2023. Data on delirium assessments, diagnoses and causes of delirium were obtained through retrospective database searches. Posters and education based multidisciplinary team (MDT) interventions were designed and initiated following grounded thematic literature analysis and ward discussion. A methodically equivalent audit was then conducted between 01/09/2023 and 30/09/23. Data was anonymised and blinded and analysis was performed on SPSS V12.0.

**Results** A total of 128 patients were included in the study. Initial audit revealed suboptimal compliance with NICE recommendations. Chi-square test of independence found that patients were statistically more likely to receive a full delirium assessment (1.9% vs. 56.6%,  $p=0.001$ ) and formal diagnosis (5.8% vs. 27.6%,  $p=0.002$ ) after the ward-based intervention.

**Conclusion** This study provides limited evidence in favour of low-cost MDT based interventions for improving adherence to NICE delirium guidelines and provides a 5-step framework for future studies. This study also explores the potential patient implications of these interventions. A repeat audit should be conducted to ensure lasting and sustainable change is achieved.

**Trial registration/clinical trial number** AUDI003614.

**Keywords** Delirium, Dementia, Geriatrics, Frailty, Quality Improvement

\*Correspondence:  
Charles Taylor  
Charles.taylor@stgeorges.nhs.uk

<sup>1</sup>St George's University Hospital NHS Foundation Trust, London, UK

<sup>2</sup>St George's University of London, London, UK

<sup>3</sup>Southampton University, Southampton, Hampshire, UK



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

## Background

Delirium is a common and serious neurobehavioural syndrome characterized by acute changes in cognition and attention [1]. Delirium poses significant challenges for both patients and healthcare systems [3]. In admissions to an older persons ward, in particular, delirium is associated with prolonged hospital stays, increased morbidity, functional decline, and greater healthcare costs [3, 4]. Delirium is also commonly an indicator of important underlying medical conditions for which early detection can lead to timely intervention and improved patient outcomes [5].

It is currently known that the incidence of delirium among older adults in the acute care setting ranges from as far as 29–80% [6–8]. Research has also indicated that delirium has an associated mortality between 22 and 76% [8]. However, these rates may be greater in acute senior health wards due to the generally more vulnerable patient demographic [9].

The National Institute for Health and Care Excellence (NICE) delirium guidelines, '*CG103 Delirium: prevention, diagnosis and management in hospital and long-term care*', emphasize the importance of delirium prevention, identification, and management [10]. Key recommendations include using validated tools, the importance of routine assessment and a multidisciplinary approach to management [10]. Despite the recognised importance, studies have consistently shown that delirium goes undetected and poorly treated [11–14].

Considering the prevalence and consequences of delirium in older person's admissions, it is imperative to continually improve current practices of delirium assessment. Therefore, barriers to guideline adherence such as work time constraints, lack of staff understanding, lack of accountability and ward pressure should be addressed to ensure better compliance and improved management of delirium. These barriers have widely been reported as the leading causes for poor adherence to delirium guidelines and it is these principles that form the focus of interest of our study [13–17].

The aim of this study was firstly to assess an Acute Senior Health Unit's (ASHU) compliance to the 2023 NICE Delirium Clinical Guidance: '*Delirium: prevention, diagnosis and management in hospital and long-term care*'. Secondly, this study aimed to assess the effectiveness of a low-cost, three-part, intervention for improving the rate of completed delirium assessments and diagnoses. Finally, this study also aimed to create a replicable framework to enable this study to be reproduced across different clinical settings.

## Methods

### Study design

This research project was performed as a closed-loop quality improvement study. Both cycles were conducted in 2023 as quantitative retrospective secondary analyses. The interventions were designed following grounded theory thematic analysis. This was performed through inductive reasoning as all authors performed literature searches over 7 days to evaluate current national trends and themes regarding adherence to delirium guidelines. These were further explored and stratified a week later when they were discussed in the multidisciplinary team (MDT) meeting. This two-step process enabled the discursive identification, categorisation and analysis of qualitative guideline adherence data patterns both locally and nationally.

There were no exclusion criteria for this study and all patients that satisfied the ASHU admission criteria (those aged 65 or over, acutely unwell, those with frailty syndrome and at the consultant's discretion) were included in the study if they were subsequently admitted to the unit. The data was reported as per the Revised Standards for Quality Improvement Reporting Excellence 2.0 [18].

### Aims

1. To assess an ASHU's compliance to the 2023 NICE Delirium Clinical Guidance: '*Delirium: prevention, diagnosis and management in hospital and long-term care*'. Specifically, Sect. 1.2 risk factor assessment, 1.3, Indicators at presentation, 1.5 daily observations and 1.6 assessment and diagnosis.
2. To assess the effectiveness of a low-cost, three-part, intervention for improving the rate of completed delirium assessments and diagnoses.
3. To initiate and create a replicable framework to enable this study to be reproduced across different clinical settings within the context of current NHS practical and financial restraints.

### Interventions and measures

The following interventions were designed following a scoping literature search exploring current barriers to delirium guideline adherence and a multidisciplinary ward based discussion. Each intervention was implemented for a month in-between the two audit cycles.:

- 1) A one-off educational intervention at hand-over to explain the need and importance of full delirium assessments and RADAR (Recognizing Acute Delirium As part of your Routine) screening. Hand-over included all members of the nursing and medical team working that day. Those not working

could attend a catch-up session in the following weeks which was also available and advertised to wider members of the MDT including the healthcare assistants and Registered Mental Health Nurses (RMNs). The intervention was designed to be appropriate for doctors, physician associates, nurses and health care assistants. All of whom were represented within the teaching sessions and involved in the adherence to and implementation of delirium guidelines.

- 2) Visual reminders in the form of posters (Fig. 1) across the ward and doctor's office which were visible to all staff members.
- 3) A dedicated tick box to represent completion of the nurse led and medical led delirium assessments. To be completed at the afternoon ward-round by the doctor leading the round that day.

Primary author CT also acted as an audit champion to remind staff intermittently of the guidelines via in-person conversations and written handovers. These reminders occurred at a minimum of twice a week but no formal schedule was enacted.

#### Measures for studying outcomes of the intervention

The impact of these interventions were measured and assessed by a comparison of the number of pre and post-intervention completed delirium assessments and formal delirium diagnoses. Delirium screening assessments consisted of completed online 'Recognizing Acute Delirium As part of your Routine [RADAR]' [19] surveys performed by the nursing team (Fig. 1) and a full delirium assessment consisting of a completed Four A's Test [20] (4AT: Arousal, Attention, Abbreviated Mental Test and Acute change) and associated form (Fig. 2) completed by the Doctors. These tests were chosen as they have both previously been validated for this use in this patient group and are supported by the relevant NICE guidelines.

Baseline demographics, reason for admission and whether patients were deemed as potentially delirious by the admitting medical team along with other clinically relevant data that may influence outcomes were collected and compared in Table 1. To ensure completeness and accuracy of data collection was performed in duplicate by two junior doctors and checked by the ward's physician associate.

#### Sample size calculation

The target sample size was 75 per audit cycle, this was chosen to allow the study to detect a 'moderate' effect size difference 20% in any outcome at 80% power and a 5% significance level (2-tailed).

Sample size calculation was performed using a 20% effect size as it was deemed based on current literature that a 20% improvement in delirium assessment frequency would represent a difference considerable enough to influence current practice. Power of 80% and the standardised minimal level of significance of 0.05 were used. Correction for attrition was not appropriate.

#### Data analysis

Descriptive and analytical analysis were conducted using International Business Machine's Statistical Package for Social Sciences Version 29 (IBM SPSS 29). Chi-squared ( $X^2$ ) or Fishers analysis was performed for all primary and secondary outcomes and baseline characteristics.

#### 1st audit cycle

All new admissions to ASHU between 01/07/23 and 31/07/23 had their data extracted using the hospital's online documentation and recording system; *Cerner Millennium® Electronic Hospital Records (EHR)*. This was performed using the 'form search' function and via review of clinical notes. All researchers were trained in data collection and provided with an information sheet on how to screen patient data along with a common data extraction form to ensure inter-rater reliability. However, no formal analysis of inter-rater reliability was performed as the authors believed that the fixed data extraction template was sufficient in eliminating variation for this study. Collected outcomes for each patient are shown below. No statistical analysis were conducted until both audit cycles were complete to reduce observer bias.

Primary outcomes:

- The percentage change in patients receiving a full medical delirium assessment (Fig. 2) on ASHU after intervention.
- The percentage change in patients receiving a formally documented diagnosis of delirium on ASHU after intervention.

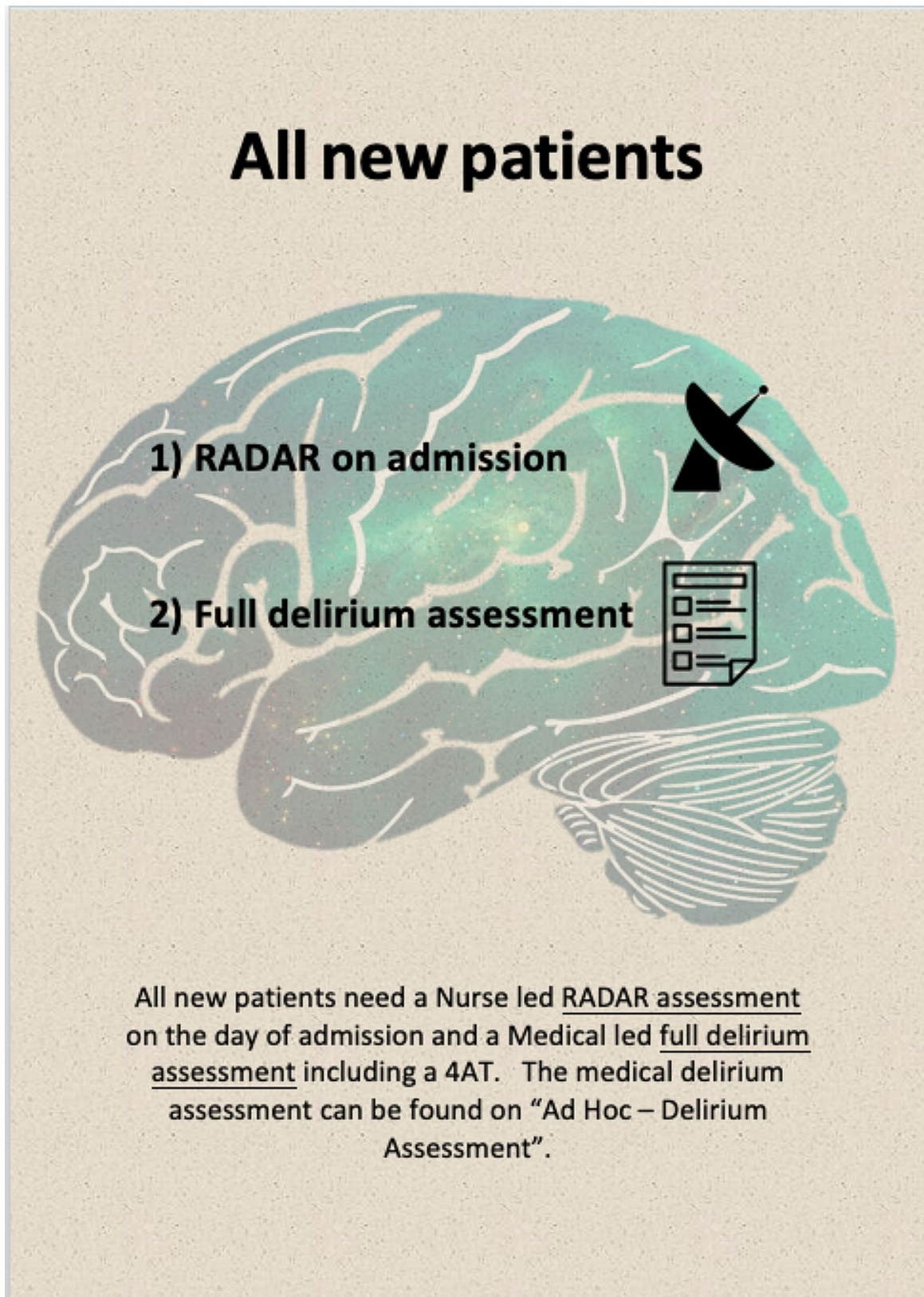
Secondary outcomes:

- The percentage change in patients receiving a RADAR screen on the day of admission post intervention. (Fig. 3)
- The result of the RADAR screen and full delirium assessment.
- Documented cause for delirium.

#### 2nd audit cycle

A repeat audit of identical design was conducted in October 2023 of all patients admitted in September 2023.





**Fig. 1** A copy of the poster reminders put up across the ASHU ward and doctors office

Delirium Screening Assessment

**Risk Factors for developing delirium whilst in hospital**

**Aged 65 or older**  Yes  No

**Admitted with Hip fracture**  Yes  No

**Severely unwell (EWS 5 or more)**  Yes  No

**Cognitive Impairment - Known Dementia**  Yes  No

**Cognitive Impairment - Learning Disability**  Yes  No

---

Delirium Screening Assessment

**Behavioural Indicators of Delirium**

**Problems with cognitive function**  
*Poor concentration, slow responses, obvious disorientation, confusion when asked simple questions*

Yes  No

**Problems with perception**  
*Visual or auditory hallucinations*

Yes  No

**Changes in physical function**  
*Reduced movement or mobility, restlessness, agitation, markedly reduced appetite, sleep disturbance (drowsy, insomnia, reversed sleep)*

Yes  No

**Changes in social behaviour**  
*Lack of cooperation with reasonable requests, withdrawal, change in mood, communication or attitude*

Yes  No

---

4AT Screen for Delirium and Cognitive Impairment

**1. Alertness: Observe patient, ask them to state their name and address, if asleep attempt to wake with touch on shoulder. Abnormal if drowsy or agitated.**

Normal  Clearly abnormal  
 Mild Sleepiness on waking

**2. AMT4: Ask the patient to tell you the following: Age, DOB, Place, Current Year**

No mistakes  =>2 mistakes or untestable  
 1 mistake

**3. Attention: Ask the patient to tell you the months of the year in backwards order starting at December. 1 prompt allowed**

7 months or more correct  Untestable(drowsy/unwell)  
 Starts (scores <7/Refuses)

**4. Acute change or fluctuating course: In alertness, cognition, other mental function e.g. hallucinations, paranoia**

No  Yes

**Total**

*4 or Above - possible delirium +/- cognitive impairment  
1 to 3 - possible cognitive impairment  
0 - Delirium or cognitive impairment unlikely (but delirium still possible if collateral history incomplete)*

**Can you make a diagnosis of delirium?**  Yes  No  Unsure

*Yes - Identify and treat causes as per delirium pathway (see intranet) (Selecting Yes adds Delirium diagnosis to the patients record)*

*No - Remains at risk for developing delirium on this admission*

*Unsure - Seek senior advice and reassess in 24 hrs*

---

Specific risk factors for developing delirium

**Infection**  No  Yes *Look for and treat infection as per Trust Guidelines*

**Catheter**  No  Yes *Remove short term catheters as soon as possible*

**Multiple Medications**  No  Yes *Review all medications and consider risks and benefits of: opiates, benzodiazepines, anticholinergics, antiparkinsonian drugs, high dose steroids, tricyclics. Look for risk of drug or alcohol withdrawal*

**Pain**  No  Yes *Actively assess for pain and ensure adequate analgesia. If communication difficulties - look for non-verbal signs of pain - use Abbey Pain Scale*

**Dehydration - or at risk**  No  Yes *Encourage oral fluids (subject to any fluid restriction)  
Start fluid balance chart (Consider SC or IV fluids)*

**Constipation - or at risk**  No  Yes *Start Stool Chart - Consider PR exam - Consider laxatives*

**Hypoxia or at risk**  No  Yes *Ensure O2 prescription written up  
Optimise O2 sats according to prescription*

Fig. 2 A copy of the full medical delirium assessment

**Table 1** Comparison of baseline characteristics pre- and post-intervention

	September	July	$\chi^2$	<i>p</i>
<b>Age % (n)</b>				
51–60	3 (2)	2 (1)	0.86	0.35
61–70	9 (7)	10 (5)	1.72	0.19
71–80	20 (15)	22 (11)	3.94	0.08
81–90	39 (29)	23 (18)	13.68	<0.01
> 90	29 (22)	31 (16)	6.68	<0.01
<b>Mean</b>	<b>83 (43)</b>	<b>82 (62)</b>	<b>0.03</b>	<b>0.85</b>
<b>Sex % (n)</b>				
Male	35 (26)	37 (19)	8.46	0.06
<b>Reason for admission % (n)</b>				
Fall/collapse	44 (33)	45 (23)	0.02	0.89
Confusion	5 (4)	12 (6)	3.15	0.06
Stroke/Seizure	5.3 (3)	14 (7)	4.71	0.03
Reduced GCS	5 (4)	4 (2)	0.12	0.73
UTI	1 (1)	0 (0)	1.00	0.41
Cough	5 (4)	0 (0)	0.06	0.03
Fever	3 (2)	0 (0)	0.25	0.06
Pain	5 (4)	4 (2)	0.12	0.73
SOB	13 (10)	10 (5)	0.44	0.67
Cellulitis	1 (1)	0 (0)	1.00	0.41
Diarrhoea or vomiting	3 (2)	2 (1)	0.21	0.16
Other	8 (6)	10 (5)	0.24	0.62
<b>Hx of dementia or cognitive decline/MCI % (n)</b>	43 (32)	39 (20)	0.33	0.57
Flagged as possibly delirious prior to admission % (n)	40 (21)	30 (23)	2.20	0.14
<b>Admission location % (n)</b>				
Home	80 (60)	79 (41)	0.03	0.86
Nursing Home	16 (12)	19 (10)	0.31	0.58
Rehab unit	3 (2)	0 (0)	0.25	0.16
Psychiatric unit	1 (1)	0 (0)	1.00	0.41
<b>Number of co-morbidities % (n)</b>				
0–2	9 (7)	16 (8)	2.24	0.13
3–5	37 (28)	43 (22)	0.85	0.40
6–8	37 (28)	25 (13)	3.19	0.07
9–11	12 (9)	14 (7)	0.18	0.67
> 11	1 (1)	2 (1)	0.34	0.56
<b>Number of medications in Hx</b>				
0–2	9 (7)	13 (7)	0.82	0.37
3–5	19 (14)	19 (10)	0.00	1.00
6–8	31 (23)	23 (12)	1.62	0.20
9–11	24 (18)	27 (14)	0.24	0.60
> 11	17 (13)	17 (9)	0.00	1.00

Legend: MCI; mild cognitive impairment

### Ethical considerations

**Ethical approval** was waived by the St. Georges University of London local ethics board owing to all data being retrospective with no further patient involvement. Data were securely stored in compliance with data protection regulations. Access to patient information was restricted to authorized personnel only via Hospital Desktops.

### Results

#### Baseline characteristics

Baseline characteristics were collected for both audit cycles, tabulated and presented in Table 1 with statistical comparison. Statistically significant variance was only seen in those aged 81–90, >90 and those admitted with stroke/seizure or cough.

Delirium Screening Assessment

**Risk Factors for developing delirium whilst in hospital**

**Aged 65 or older**  Yes  No

**Admitted with Hip fracture**  Yes  No

**Severely unwell (EWS 5 or more)**  Yes  No

**Cognitive Impairment - Known Dementia**  Yes  No

**Cognitive Impairment - Learning Disability**  Yes  No

---

Delirium Screening Assessment

For ALL patients

AVOID ward and bed moves and facilitate visits from friends and family

	Yes	No	Comment
Cognitive Impairment			Follow confused patient nursing care plan Start Butterfly scheme
Immobility or at risk			Complete manual handling assessment and seek physiotherapy advice as needed Encourage patient to mobilise as soon as possible Sit out of bed as much as possible Ensure normal mobility aid available Encourage active range of motion activities if unable
Pressure Ulcer or at risk			Complete PUP score Ensure has pressure relieving aids if required
Poor Nutrition or at risk			Do MUST score. Refer to dietician if indicated Start Food Chart Ensure Red Tray and mealtime assistance, consider finger foods Check dentures clean and available, Check mouth for sores/thrush. Ensure regular oral hygiene
Delirium - Visual Impairment			Ensure glasses are clean and used If concerned about their sight, ask doctor to check
Delirium - Hearing Impairment			Ensure hearing aids used and working - if not contact audiology for advice If concerns about hearing, ask doctor to check for wax
Delirium - Continence Problems			Follow trust continence guideline and toilet regularly
Delirium - Sleep Disturbance			Reduce ward noise to minimum and dim lighting during sleeping hours Avoid medical and nursing procedures and drug rounds during sleeping hours if possible

**Fig. 3** A copy of the nurse led RADAR screening tool

**Intervention**

Following the literature search and ward discussion, it was concluded that there were three main barriers to adherence:

- 1) MDT members not understanding the importance of why assessments are needed.
- 2) Assessments not being habitual and a lack of daily reminders.

- 3) Lack of accountability for completing assessments and a lack of clarity regarding responsibility for completing the assessment.

The dedicated tick box was used each day during the afternoon ward round. The percentage tick-box completion reflected the percentage completion of full delirium assessments. However, as the study progressed the authors noticed a decline in use of the tick box intervention in correlation with a decline in full assessment completion.

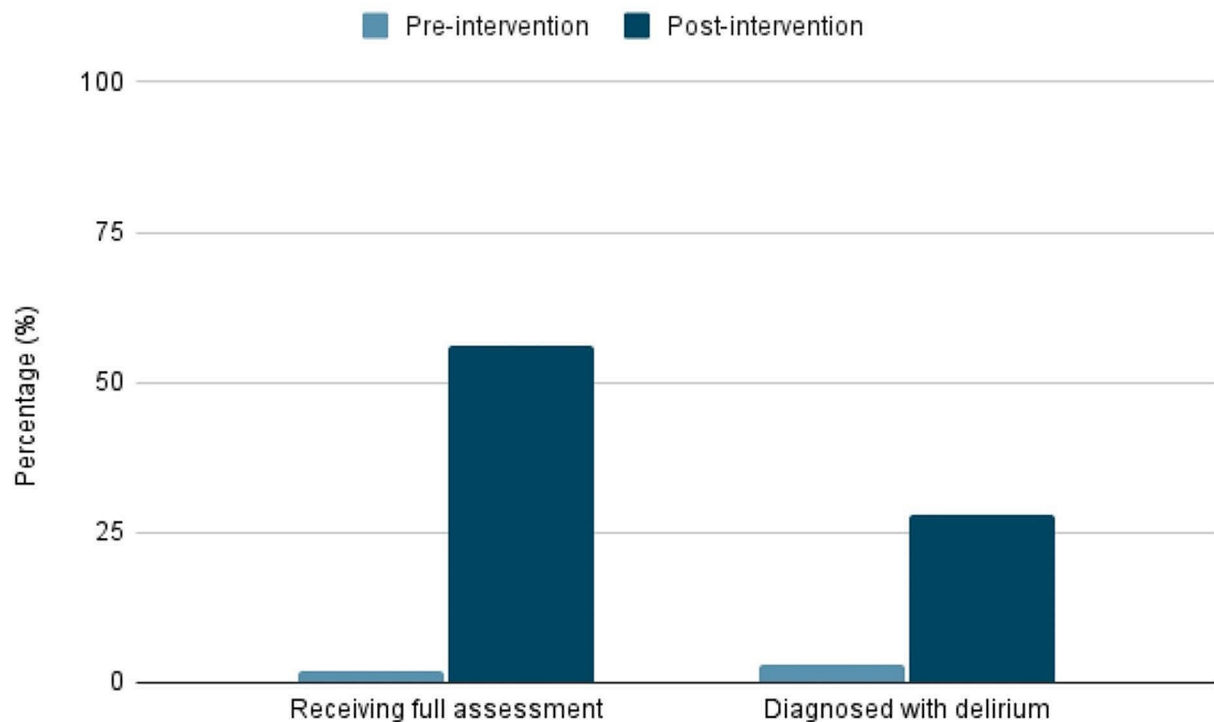
Throughout the course of the study these interventions were subtly modified and adapted to best suit the dynamic ward environment. For example, the posters were moved to more accessible areas of the doctor's office. The catch-up educational sessions were attended predominantly by nursing and medical staff working shift rotations who were not previously available. Although no formal data was collected on attendance, it is estimated that the majority of nursing staff and all doctors attended either the original or a catch-up session. Despite efforts, variability in nursing staff participation may have contributed to the lack of significant uptake in RADAR screening. This has been discussed in the context of our findings.

#### Audit

A total of 52 patients were admitted to ASHU in July and 76 in September, all patients were included in each respective cycle of the study. In July, 63.5% ( $n=33$ ) had delirium assessments prior to admission compared to 65.8% ( $n=50$ ) in September. 40.4% ( $n=21$ ) of July patients and 30.3% ( $n=23$ ) of September patients had a positive diagnosis prior to admission. Neither of these were statistically significantly different ( $p=0.79$  and  $p=0.24$  respectively) and both groups may therefore be considered comparable within this respect.

Pre-intervention, 1.9% ( $n=1$ ) of patients received a full medical delirium assessment and 3 (5.8%) received a formal diagnosis. Post-intervention, 56.6% ( $n=43$ ) received a full delirium assessment and 21 (27.6%) received a formal diagnosis (Fig. 4). The relationships between full delirium assessments and formal delirium diagnoses before and after intervention were both statistically significant,  $\chi^2(1, N=128)=40.89, p=0.001$  and  $\chi^2(1, N=128)=9.69, p=0.002$  respectively. Causes of delirium were themed and categorised per Table 2 and 3.

40.4% ( $n=21$ ) of pre-intervention and 46.1% ( $n=35$ ) of post-intervention patients received a nurse led RADAR on the day of admission. A further 23.0% ( $n=12$ ) of pre-intervention and 14.4% ( $n=11$ ) of post-intervention patients received a RADAR at any time during their stay.



**Fig. 4** A bar chart on the percentage of patients receiving a full delirium assessment and formal delirium diagnosis



**Table 2** Audit cycle 1 causes of delirium

Cause of delirium	Total
CAP or HAP	0
Fall	0
Constipation	0
Pain	0
Environment change	0
Urinary retention	1
Infection/Sepsis	1
Dehydration/AKI	1
Other	0

Legend: CAP; Community Acquired Pneumonia. HAP: Hospital Acquired pneumonia. AKI: Acute Kidney Injury

**Table 3** Audit cycle 2 causes of delirium

Cause of delirium	Total
CAP or HAP	7
Fall	1
Constipation	5
Pain	3
Environment change	1
Urinary retention	2
Infection/Sepsis	5
Dehydration/AKI	3
Other	2

Legend: CAP; Community Acquired Pneumonia. HAP: Hospital Acquired pneumonia. AKI: Acute Kidney Injury

Neither of these outcomes were statically significant. Results are summarised in Table 4.

There was no missing data encountered in the study as the absence of an assessment or diagnosis was interpreted as 'not completed' and was therefore recorded as zero.

Finally, in each audit cycle an additional analysis was performed assessing the association between those with a positive RADAR and those receiving a subsequent positive delirium assessment in keeping with the NICE recommendation 1.61. In both cycle 1 ( $\chi^2(1, N=52)=1.48, p=0.22$ ) and cycle 2 ( $\chi^2(1, N=76)=0.95, p=0.33$ ) no statistically significant associations were observed.

## Discussion

This study aimed to design and implement a low-cost and sustainable ward-based initiative to improve adherence to the NICE delirium guidelines. The results showed that implementation of the interventions significantly increased the proportion of patients receiving delirium assessments (1.9% vs. 56.6%,  $p=0.001$ ) and formal delirium diagnosis (5.8% vs. 27.6%,  $p=0.002$ ). These data also show an increase in the attributed diagnostic causes of delirium. Table 2 and 3 show that in cycle one only 4 (7.7%) patients with confirmed delirium had their delirium attributed to a diagnosis whereas in cycle two, 34 (44.7%) did. With regards to secondary outcomes, an additional 5.7% of patients received a RADAR on the day of their admission in cycle 2. However, a total 3% less patients receiving a RADAR during their stay.

Given that a statistically comparable number of delirious patients were admitted in both cycles ( $p=0.79$ ) it may not be unreasonable to suggest that the increase in formal delirium diagnoses seen in cycle 2 represents a decrease in missed delirium diagnoses. Additionally, the increased frequency of an attributed cause of delirium noted in this study may lead to improved aetiological identification and subsequently more targeted patient care [21–24]. However, this has not been explicitly studied here.

When compared to the marked improvements seen in the doctor-led delirium assessments, the poorer RADAR results may represent a breakdown in discourse between the interventions and the allied healthcare professionals compared to that of the doctors. This may suggest that the interventions were inappropriately targeted towards doctors. Additionally, the poor association demonstrated between positive RADAR assessments and formal delirium diagnoses may bring into question the utility and effectiveness of the screening assessments.

This preliminary evidence of an increased frequency of delirium assessments and diagnoses supports better adherence to national guidelines and imply that patients post-intervention are more likely to receive a comprehensive assessment of their cognitive state. This may in turn result in a lower rate of missed delirium diagnoses

**Table 4** Comparison of audit cycle 1 and 2

Outcome	1st Audit Cycle, n (%)	2nd Audit Cycle, n (%)	Change (%)	p value
<b>Primary outcome</b>				
Number of patients admitted	52 (100)	76 (100)	0	n/a
Patients receiving a full medical-led assessment	1 (1.9)	43 (56.6)	+54.7	$p=0.001$
Patients with a formal diagnosis	3 (5.8)	21 (27.6)	+21.8	$p=0.002$
<b>Secondary outcomes</b>				
Patients with delirium assessment prior to the ward	33 (63.5)	50 (65.8)	+2.3	$p=0.79$
Patients admitted already flagged as potentially delirious	21 (40.4)	23 (30.3)	-10.1	$p=0.24$
Patients receiving a RADAR on day of admission	21 (40.4)	35 (46.1)	+5.7	$p=0.53$
Patients receiving a RADAR during their stay	33 (63.5)	46 (60.5)	-3.0	$p=0.74$
Patients with positive RADAR	10 (19.2)	14 (14.0)	-5.2	$p=0.91$

as it well reported among current nosologies that a diagnosis helps clinicians to structure and compartmentalise thinking to guide appropriate treatment and to aid communication to relatives [21].

However, this study highlighted a significant risk associated with our educational interventions, notably their attrition of effectiveness over time. This was evidenced by a decline in the use of the tick box intervention, which appeared to correlate with a decrease in the completion rates of full assessments over time. Specifically, as the study progressed, the initial high adherence to the tick box intervention waned, leading to a noticeable drop in comprehensive assessment completions. This trend underscores the necessity for ongoing engagement strategies to maintain the effectiveness of educational interventions.

Additionally, more frequently assessing of patients and attributing a diagnoses of delirium carries psychosocial implications for both the patient and family, care implications by opening or closing treatment pathways and treatment implications by providing diagnostic certainty and understanding [21]. Further to this, early and accurate diagnoses enable quicker preventive measures and monitoring for new delirium in subsequent health-care encounters [24]. Our study therefore recommends the following translatable framework as a low-cost, easy to implement series of interventions that can be applied across several clinical settings:

#### **Framework recommendation:**

1) Develop an understanding of global and local barriers to delirium guideline assessments.

- Global and national barriers should act as an overarching framework. However, interventions should be tailored to local barriers.

2) Audit current practice to establish baseline and understand adherence to existing guidelines.

- This may also be used as an opportunity to further explore barriers to adherence and may provide insight into effective intervention design.

3) Design and implement your intervention.

- This should be tailored to the local barriers identified in step one and should be designed for all members in the MDT. Key global barriers to address are; education and understanding, reminders, accountability and time.

4) Elect a champion for each MDT discipline whose responsibility it is to maintain standards.

- Ideally this role will be voluntary and appropriate incentive is key to ensure this role is conducted suitably. This will help ensure sustainability of the intervention.

5) Re-audit practice and use these results to assess the effectiveness of your intervention.

- The value of the re-audit is not to demonstrate change but rather to generate insight into local barriers and how they may be addressed. Use this information to begin at step one again.

#### **Study limitations**

This study is limited by its single-centre approach and small patient sample limiting the generalisability of findings. The retrospective nature of the audit presents further limitations specific to retrospective data, namely a dependency on the accuracy of previous note taking. There is likely a degree of selection bias and temporal variation as patients admitted in July and September may not be representative of patients admitted throughout the year. However, baseline characteristics between cycles showed no statistical difference with the exception of those 81–90, >90 and those admitted with stroke/seizure or cough. Despite this, the majority of delirium risk factors and the percentage of confirmed delirious admissions were statistically comparable between cycles. It is important to note that dementia and pre-existing cognitive decline are important risk factors for the development of delirium. In our cohort, one patient in cycle one and five in cycle two had these risk factors documented. However, these conditions themselves are not direct causes of delirium, rather independent risk factors.

Furthermore, there is no way of confirming if those diagnosed as delirious or not-delirious were diagnosed correctly which is therefore an assumption of this study. Additionally, the length of follow up of the study will likely have resulted in an overestimated effect size due to an acute increase in motivation of staff. Further long-term follow up is essential to evidence sustainable and lasting change.

It is also estimated that the low medical led delirium assessment completed pre-intervention may be an underestimate of true practice as delirium assessments may have been performed during ward-rounds but not formally documented. All authors of this study are members of clinical staff working on the St. George's Acute Senior Health Unit or St. George's medical students who were present on ASHU during both audit cycles. To mitigate this individual researcher reflexivity was considered at all stages. This was achieved by seeking input and feedback from colleagues who were not directly involved in

the study to provide an external perspective and reduce subjective bias. Whenever possible, data were anonymized and analysed by team members who were not directly involved in the intervention to prevent conscious or unconscious bias and we maintained thorough and transparent documentation of all research activities and decision-making processes to allow for independent verification by non-research team members and replication of the study.

## Conclusion

In conclusion, this study provides limited evidence in favour of low-cost MDT based interventions for improving adherence to delirium guidelines. This study emphasizes the importance of basing these interventions in a thorough understanding of local and global barriers and provides a useful and practical 5-step framework for future studies that is likely to be sustainable.

Future studies should be performed to ensure that these changes are truly sustainable and this framework should be evaluated in other clinical settings such as post-operatively in the context of postoperative cognitive dysfunction (POCD). Future studies should also aim to quantify the impact of these changes on patient care outcomes.

## Acknowledgements

Not applicable.

## Author contributions

All authors; CT, GP, LM, NM, WH, LM, JG, OM, CB-C, JH, FB, AG made substantial contribution to the conception, design, acquisition, analysis and interpretation of data. CT lead statistical analysis and manuscript write up. All authors reviewed the final manuscript.

## Funding

Not Applicable.

## Data availability

All data is provided within the manuscript and associated files.

## Declarations

### Ethics approval and consent to participate

Ethical approval was waived by the St. George's research ethical committee owing to the observational design and all data being anonymised and retrospective.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

Received: 9 January 2024 / Accepted: 2 August 2024

Published online: 25 September 2024

## References

- Lauretani F, Bellelli G, Pelà G, Morganti S, Tagliaferri S, Maggio M. Treatment of delirium in older persons: what we should not do! *Int J Mol Sci*. 2020;21(7):2397.
- Morandi A, Di Santo SG, Cherubini A, Mossello E, Meagher D, Mazzone A, et al. Clinical features Associated with Delirium Motor subtypes in older inpatients: results of a Multicenter Study. *Am J Geriatr Psychiatry*. 2017;25(10):1064–71.
- Caplan GA, Teodorczuk A, Streatfeild J, Agar MR. The financial and social costs of delirium. *Eur Geriatr Med*. 2020;11:105–12.
- Inouye SK, Bogardus ST Jr, Baker DI, Leo-Summers L, Cooney LM Jr. The hospital elder life program: a model of care to prevent cognitive and functional decline in older hospitalized patients. *Hosp Elder Life Program J Am Geriatr Soc*. 2000;48(12):1697–706.
- Gravante F, Giannarelli D, Pucci A, Gagliardi AM, Mitello L, Montagna A, et al. Prevalence and risk factors of delirium in the intensive care unit: an observational study. *Nurs Crit Care*. 2021;26(3):156–65.
- Fong TG, Tulebaev SR, Inouye SK. Delirium in elderly adults: diagnosis, prevention and treatment. *Nat Rev Neurol*. 2009;5(4):210–20.
- Siddiqi N, Stockdale R, Britton AM, Holmes J. Interventions for preventing delirium in hospitalised patients. *Cochrane Database Syst Rev*. 2007(2):Cd005563.
- Ali S, Patel M, Jabeen S, Bailey RK, Patel T, Shahid M, et al. Insight into delirium. *Innovations Clin Neurosci*. 2011;8(10):25.
- Inouye SK. Delirium in older persons. *N Engl J Med*. 2006;354(11):1157–65.
- NICE. Delirium: prevention, diagnosis and management in hospital and long-term care clinical guideline [CG103] NICE; 2010. [updated 18/01/2023].
- Pompei P, Foreman M, Rudberg MA, Inouye SK, Braund V, Cassel CK. Delirium in hospitalized older persons: outcomes and predictors. *J Am Geriatr Soc*. 1994;42(8):809–15.
- Cavallazzi R, Saad M, Marik PE. Delirium in the ICU: an overview. *Ann Intensiv Care*. 2012;2(1):1–11.
- van Bochove-Waardenburg M, van der Jagt M, de Man-van Ginkel J, Ista E. Sustained adherence to a delirium guideline five years after implementation in an intensive care setting: a retrospective cohort study. *Intensive Crit Care Nurs*. 2023;76:103398.
- Alhaidari AAO, Matsis KP. Barriers to completing the 4AT for delirium and its clinical implementation in two hospitals: a mixed-methods study. *Eur Geriatr Med*. 2022;13(1):163–72.
- Eagles D, Cheung WJ, Avlijas T, Yadav K, Ohle R, Taljaard M, et al. Barriers and facilitators to nursing delirium screening in older emergency patients: a qualitative study using the theoretical domains framework. *Age Ageing*. 2022;51(1):afab256.
- Van De Steeg L, Langelaan M, Ijkema R, Nugus P, Wagner C. Improving delirium care for hospitalized older patients. A qualitative study identifying barriers to guideline adherence. *J Eval Clin Pract*. 2014;20(6):813–9.
- Martin L, Lyons M, Patton A, Driscoll MO, McLoughlin K, Hannon E, et al. Implementing delirium screening in the emergency department: a quality improvement project. *BMJ Open Qual*. 2022;11(2):e001676.
- SQUIRE. Revised standards for quality improvement reporting excellence SQUIRE 2.0. 2015.
- Vlissides PE, Ragheb JW, Leis A, Schoettinger A, Hickey K, McKinney A et al. Recommendations and alerting for delirium alleviation in real-time (RADAR): protocol for a pilot randomized controlled trial. *F1000Research*. 2019;8.
- Bellelli G, Morandi A, Davis DH, Mazzola P, Turco R, Gentile S, et al. Validation of the 4AT, a new instrument for rapid delirium screening: a study in 234 hospitalised older people. *Age Ageing*. 2014;43(4):496–502.
- Sims R, Michaleff ZA, Glasziou P, Thomas R. Consequences of a diagnostic label: a systematic scoping review and thematic framework. *Front Public Health*. 2021;9:725877.
- American Psychiatric Association, Association D. AP. Diagnostic and statistical manual of mental disorders: DSM-5. American psychiatric association Washington, DC; 2013.
- Frances A, First M, Pincus HA, Widiger T, Davis W. An introduction to DSM-IV. *Psychiatric Serv*. 1990;41(5):493–4.
- Garand L, Lingler JH, Conner KO, Dew MA. Diagnostic labels, stigma, and participation in research related to dementia and mild cognitive impairment. *Res Gerontol Nurs*. 2009;2(2):112–21.

## Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.