

# BMJ Open Quality Implementing delirium screening in the emergency department: a quality improvement project

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## ABSTRACT

**Introduction** Delirium is a serious medical condition that is common in older adults in acute settings. Clinical practice guidelines recommend that all older patients in acute care settings should be screened for delirium using standardised outcome measures.

**Problem** In our institution, an audit showed that only 16% of older adults presenting to the emergency department were screened for delirium. The goal of this project was to increase the number of patients being screened for delirium using Lean Six Sigma (LSS) methodology and tools and a multidisciplinary approach.

**Method** A multidisciplinary team in the emergency department used LSS tools and methodology over a 12-week period to first identify why patients were not being screened for delirium using root cause analysis and second to implement a multifaceted intervention including education, audits and feedback, documentation changes and team huddles. An audit was performed at the 11th week of the project to measure how many patients were being screened for delirium post project intervention.

**Results** Results at 5 weeks post intervention (11th week of project) showed that the percentage of patients being screened for delirium had increased from 16% to 82%. A follow-up audit at 17 weeks post intervention showed a further improvement in delirium screening to 92%.

**Conclusion** Applying LSS tools and methodology resulted in a healthcare quality improvement. Delirium screening in an emergency department can be improved through multifaceted interventions including education, documentation changes and team huddle changes.

## PROBLEM

Delirium is a clinical syndrome characterised by disturbed consciousness, cognitive function or perception, which has an acute onset and fluctuating course. It is a serious medical condition associated with poor outcomes including increased hospital inpatient stays, increased incidence of dementia, increased hospital acquired complications including falls, infections and pressure sores, increased need for long-term care and increased mortality.<sup>1</sup>

Delirium is common in hospitalised older adults and stays of  $\geq 12$  hours in emergency departments have been shown to be a strong

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Delirium in older adults in emergency departments is common; however, it often goes unrecognised.

## WHAT THIS STUDY ADDS

⇒ This study highlights quality improvement methodology and interventions that were successful at increasing delirium screening and delirium detection in an emergency department setting.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study provides information on practical ways to implement delirium screening to achieve sustainable quality improvement.

independent predictor of the onset of delirium in older adults.<sup>2</sup> Under recognition and inconsistent management of delirium is an international problem.<sup>1</sup> Older patients in acute care settings should be screened for delirium using standardised outcome measures.<sup>3</sup> Early diagnosis of delirium is crucial to improve the prognosis of patients and both national and international guidelines recommend that all older adults ( $\geq 65$  years) presenting to emergency departments are screened for delirium.<sup>1,4</sup>

The Geriatric Emergency Multidisciplinary (GEM) unit is a six bay age attuned area in an emergency department in a level 4 urban tertiary hospital in Ireland, which aims to improve the environment and care for older adults presenting to the emergency department. In 2019, a baseline audit (audit 1) was performed in the emergency department, which showed that from a sample of 40 patients who were  $\geq 65$  years, zero patients were screened for delirium. As a result of this audit, the emergency department documentation was amended to include the 4AT screening tool (online supplemental appendix 1) to provide a visual prompt aimed at improving delirium screening. The 4AT is a validated and recognised tool for assessing

delirium.<sup>5</sup> This was supported at senior level. A follow-up audit (audit 2) conducted in the GEM unit in October 2020 of 5 consecutive days (Monday to Friday) showed out of 38 patients, 6 had been screened for delirium, which equates to 16%. These results highlight that 84% of patients in the GEM unit were not screened for delirium and that documentation changes alone did not result in substantial improvement. In order to improve delirium screening and detection, a quality improvement project was initiated.

## INTRODUCTION

The '4AT' is a validated tool for assessing delirium in older adults and is used widely internationally in clinical practice and research and is one of the most commonly used tools in practice.<sup>5,6</sup> The 4AT has the highest diagnostic test accuracy data in comparison to other delirium tools and it has been shown to have a sensitivity of 88% and specificity of 88% in validation studies.<sup>6</sup> The 4AT tool was selected due to its accuracy as well as it being recommended by the National Document for identification of delirium in the emergency department.<sup>4</sup> Secondly, the 4AT was selected as it takes less than 2 minutes to complete, it does not require special training and is easy to implement and has been proven to improve delirium detection rates in hospital settings.<sup>5</sup>

The quality improvement methodology chosen for this project was the Lean Six Sigma (LSS) process improvement methodology. The institution where this project occurred is a Lean innovation centre meaning that the institution supports the use of LSS for quality improvement. LSS combines two quality improvement strategies namely Lean and Six Sigma, which have been validated across several areas of healthcare.<sup>7</sup> Using LSS in healthcare projects has been shown to improve quality of care for patients, better health for populations and lower costs.<sup>7</sup> LSS uses DMAIC which stands for design, measure, analyse, improve and control, which is an improvement process with five phases listed above, which provides a formal and logical sequence for understanding the process, identifying opportunities for improvement and sustaining improvements with validated quality improvement tools and processes. The power of LSS is that it requires a team orientated approach and is data driven.<sup>7</sup>

The LSS tools and philosophies that were used during the DMAIC process in this project included Gantt charts, process mapping, root cause analysis, brainstorming, SMART goal setting and the Kaizen philosophy. SMART is an acronym that stands for specific, measurable, achievable, realistic and timely. Kaizen is a philosophy that supports continuous incremental process change that sustain a high level of efficiency rather than larger changes that cannot be sustained.<sup>8</sup> This approach supports smaller incremental improvements through setting achievable targets and goals. SMART goal setting is used in the define phase of the DMAIC cycle as recommended by LSS.<sup>8</sup>

## AIM

The aim of this project was to apply LSS tools and methodology to increase the number of older adults ( $\geq 65$  years) being screened for delirium using the 4AT tool. The SMART goal defined by the project team is for:

70% of patients in the Geriatric Emergency Multidisciplinary (GEM) Unit in the emergency department will be screened for delirium using the 4AT tool by the end of the project (11<sup>th</sup> December 2020) during the teams core working hours (Monday – Friday).

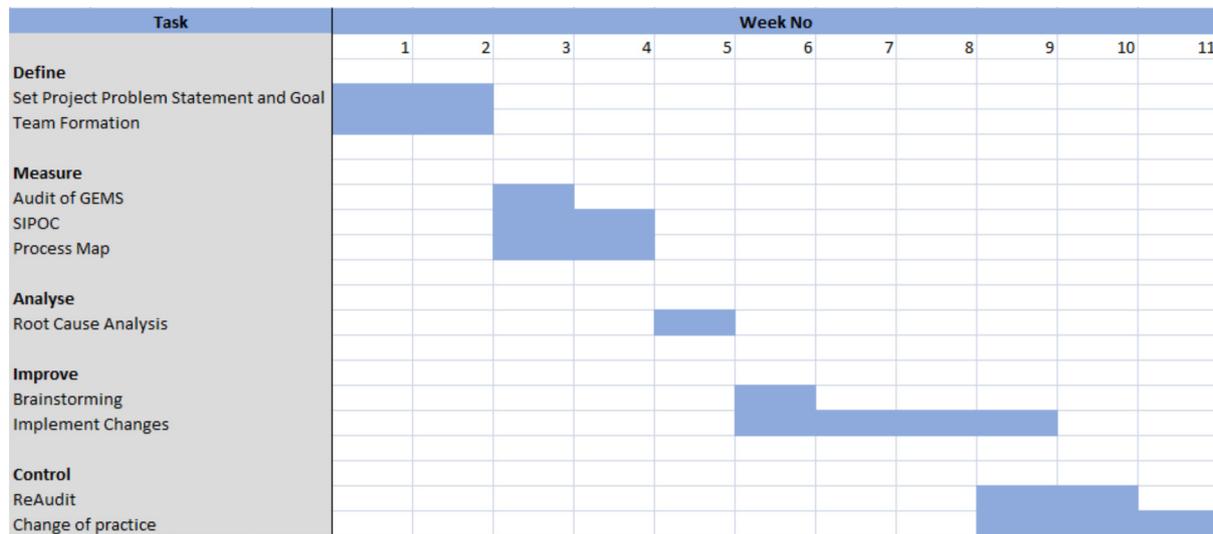
Although the aim is for 100% of all patients ( $\geq 65$  years) throughout the emergency department, this project will be aiming for 70% in the GEM unit, it will be a phased approach to roll out throughout the department, which allows smaller steps of improvement which are shown to have more success<sup>8</sup> and promoted by the Kaizen philosophy.

## METHODOLOGY

The project was supported by the Lean Innovation Centre within the hospital. The project took place in the emergency department and the audits were conducted in the GEM unit. Healthcare staff working clinically in the emergency department were invited to join the project group and represented a multidisciplinary team (MDT) including a physiotherapist, occupational therapist, emergency medicine registrar, geriatric medicine registrar and an emergency department nursing clinical facilitator, all of whom were directly involved in patient care in the emergency department. MDT is defined as a group of healthcare individuals from different disciplines working together to deliver healthcare.<sup>9</sup> The physiotherapist was the project lead. The project timeline was set for 12 weeks. A Gantt chart was used to provide a graphical illustration of the project schedule and stages of the lean methodology DMAIC cycle that would occur at each week as well as the LSS tools used at each stage (figure 1). SIPOC refers to a process mapping methodology which identifies the suppliers, inputs, processes, outputs and customer for a process (SIPOC). In this project the customer is the patient.

The team initially process mapped the patients journey from when the patient presents to the emergency department until they are admitted or discharged. Root cause analysis was used in the analysis to determine why patients were not being screened for delirium in the GEM unit and wider emergency department despite the change in documentation and senior level support. The 'Five whys' technique was used to determine the root cause to why older adults are not being screened for delirium. This discussion and process was done by the project team and was facilitated by the team lead.

The next step of this project used brainstorming to identify solutions to address the causes identified in the root cause analysis. This was facilitated by the team lead



**Figure 1** Gantt chart for Project

and a combined document of all the ideas/solutions put forward without altering or influencing ideas was recorded. The next stage was that the team prioritised the ideas in importance from 1 to 10. This method led to five agreed interventions. The results of the root cause analysis and the brainstorming is documented in the result section. The interventions were implemented and are described in more detail in the next section.

Four audits on delirium screening were conducted, two were prior to the intervention and the third and fourth audits were after the project intervention. This is detailed in [table 1](#). The audits after the intervention occurred at 5 weeks and 17 weeks after the project intervention phase. The 4AT was chosen by the project team as the delirium screen due to its documented validity, short-time frame to use and it does not require specialist training.<sup>6</sup> A patient was said to be screened for delirium if they had a documented 4AT score in their medical chart within 24 hours of presentation to the emergency department. The 4AT could be done by any member of staff but the intervention education sessions targeted medical, nursing and therapy staff as they were the clinicians identified as part of patients journey in the first 24 hours.

A data sheet was designed to collect the data and excel was used to document and analyse the data. Team members and staff in the emergency department were unaware of when the audits took place in order to reduce

bias and influencing results. Data for the third audit at 5 weeks post intervention were collected in the GEM unit over two consecutive weeks between Monday and Friday, which was 10 days in total. The project lead completed the data collection for the audit by looking at each patient's medical chart to see if the 4AT was assessed and documented. The fourth audit was to examine if the improvement was sustained, this audit collected data over five consecutive days (Monday–Friday).

The following data were collected:

- ▶ Total amount of patients in the GEM unit.
- ▶ Total patients screened using 4AT.
- ▶ Total patients who screened positive for delirium.

## INTERVENTION

A white board was put up in the GEM unit in an area of high visibility. This was used as an education board illustrating key information on delirium including what is delirium, what is the problem with undiagnosed delirium, what is 4AT, ways to prevent and/or decrease the risk of delirium and a section to update with upcoming courses/resources.

In the GEM unit, there is a whiteboard with patient names and diagnosis as well as key medical information such as outstanding diagnostics. A column was included on this board entitled 'Mind'. In this column, there was space to record 4AT score for each patient. This was to provide a visual reminder and prompt staff to complete the 4AT for each patient. At the daily huddle where the team would discuss each patient the huddle was changed to include reporting and discussion of 4AT score for each patient.

Education occurred through 20–30 min sessions using PowerPoint presentations and handouts. This occurred first at doctor training and the presentation was given by either the emergency doctor, physiotherapist or occupational therapist. The nursing clinical facilitator organised education sessions for emergency department nursing to attend that was led by a physiotherapist in a formal

	Audit	Date
	Audit 1	December 2019
Pre intervention	Audit 2	October 2020
Post intervention	Audit 3	December 2020
	Audit 4	March 2021

presentation or by the nurse clinical facilitator through on floor training. The project group decided to target the education sessions at multiple disciplines based on the SIPOC process mapping, which identified the different disciplines involved in the patient journey. The results from both audit 3 and audit 4 were displayed in the GEM unit in an area of high visibility and throughout the emergency department to provide feedback to staff.

## RESULTS

The process mapping identified the staff involved in the older adult's patient journey in the emergency department and showed different opportunities where delirium screening could occur which included at triage, first contact with doctor, first contact with emergency nursing and through frailty assessment with therapy and geriatric team. The root cause analysis identified two key issues as causes for patient's not being screened for delirium. They are:

1. Lack of staff education around delirium/delirium screening.
2. Unable to complete due to busy environment/competing priorities.

The brainstorming where the team prioritised ideas in importance led to five agreed interventions:

1. Education board in GEM unit.
2. Changing the patient board in GEM unit to include 4AT score for each patient.
3. Introducing 4AT score discussion into daily team huddle.
4. Education sessions for doctors, nurses and therapists in the emergency department.
5. Regular audits with the results displayed through posters in the department.

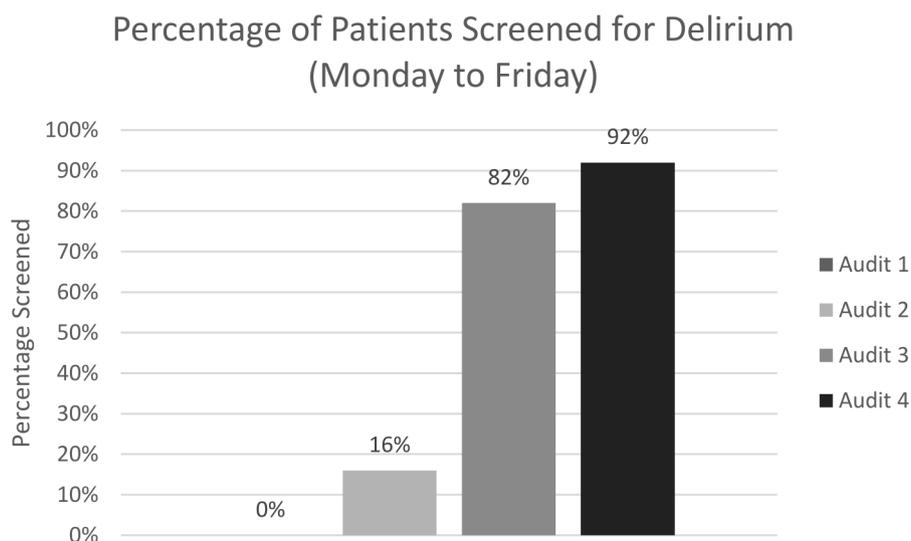
Audit 2 conducted in the GEM unit in October 2020 prior to the intervention showed that out of 38 patients, 6 were screened for delirium which equates to 16%. The results

from audit 3 in December 2020 showed that there were a total of 50 patients in the GEM unit. The mean age of patients was 76.2 years (SD±7.8 years). The percentage of patients screened for delirium was 82% (41 patients). Of the patients screened, 26% screened positive for delirium, which equates to 13 patients. Audit 4 was conducted in March 2021. The results are that there were 28 patients in the unit and 92% of those patients were screened for delirium. During this week, 10 patients (36%) screened positive for delirium, the results of the audits are illustrated in [figure 2](#).

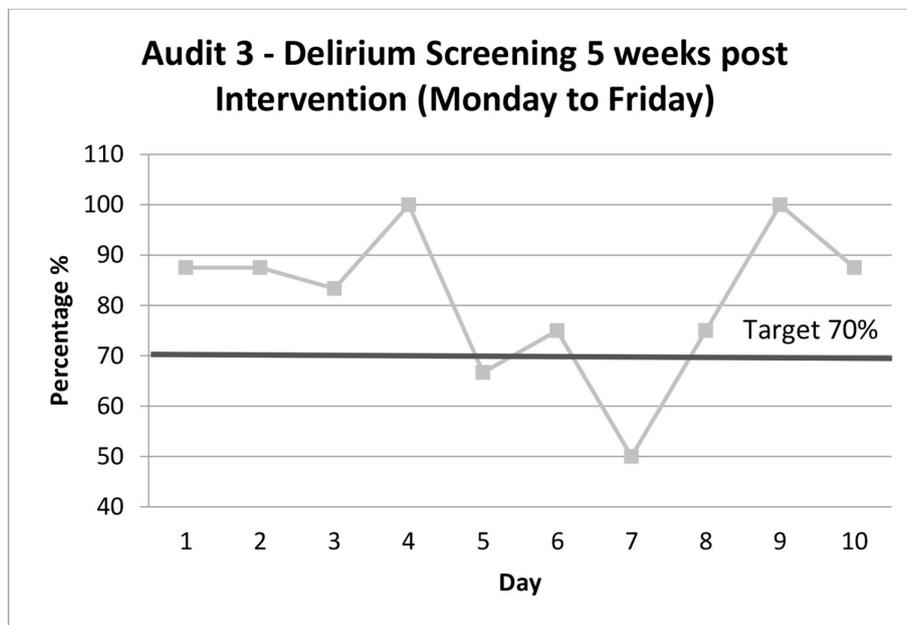
The goal was that 70% of patients would be screened for delirium at the end of the project. At the end of the project audit three showed an 82% screening rate and therefore the goal was achieved. However, run chart plotting of each day of data collection in audit 3 shows that on 2 of the 10 days, the percentage of patients screened was below the goal of 70%. On the 5th day, the average percentage screened was recorded at 66% and on the 7th day recorded at 50% as illustrated in [figure 3](#).

## DISCUSSION

Using LSS methodology provided a systematic approach to successfully implementing delirium screening in the emergency department. Applying the DMAIC approach resulted in an increase in delirium screening from 16% to 82% over a 12-week period. An audit performed at 3 months after the intervention demonstrates the continued quality improvement and sustained benefits of this project as the amount of patients screened increased to 92%. This improvement resulted in increased number of patients being screened and diagnosed with delirium, which can lead to improved outcomes for older adults in acute hospitals.<sup>1</sup> It also improved compliance with national standards on delirium screening in the emergency department. In audit 3 after the intervention phase of the project, 26% of patients screened positive for delirium and at the repeat audit 4, 36% of patients



**Figure 2** Percentage of patients screened for delirium.



**Figure 3** Run chart of percentage of patients screened for delirium.

screened positive for delirium. Research investigating the prevalence of delirium in older adults in acute setting found similar results specifically that out of 1235 patients 29% screened positive for delirium.<sup>10</sup>

The goal of this project was for 70% of patients to be screened at the project end date and that goal was achieved demonstrating the success of this quality improvement project. On 2 days despite being an improvement from initial values, two recordings were under the project goal of 70%, they were recorded as under the target at 66% and 50%. This shows that there is variability from day to day. The LSS approach emphasises real-time analysis. On the day that only 50% of patients were screened it was recorded that the hospital was in red alert meaning that high volume of patients were waiting in the emergency department for inpatient beds. This provides insight that this increased stress on the emergency department and resources potentially negatively impacts daily work such as delirium screening. On this day although significant improvement from the initial audit, it was the lowest percentage recorded showing that although delirium screening improved it may not be prioritised in difficult or stressful situations.

Prior to this, project steps to improve delirium screening such as changing the department documentation to include the 4AT in each patient chart resulted in a small increase from 0% to 16% of patients being screened. This demonstrates that changing documentation alone was not sufficient to produce a large-scale improvement. A systematic review published in 2020 investigating the impact of educational interventions for healthcare professionals on improving delirium care concluded that professional education has positive outcomes for improving delirium care.<sup>11</sup> Research has also shown that education and training alone does not ensure knowledge and implementation and that it is suboptimal to sustain screening

long term.<sup>12</sup> This provides support for interventions to be multifaceted. Further evidence for multifaceted interventions is supported by research into healthcare change, which found that interventions based on actions such as audit, feedback and reminders and education are more likely to succeed.<sup>13</sup> This project employed a multifaceted intervention including education, visual prompts, changing daily practice at team ward rounds and huddles and audit and feedback. The multifaceted intervention design and implementation is likely a key factor in the success in improving delirium screening.

Process improvement stresses the importance of engaging front-line staff in successfully implementing processes. Change management strategies promote and support the need of teams of front-line workers to implement change.<sup>14</sup> The project group consisted of front-line workers that were involved in direct care of patients, which was a contributing factor for the success of this project. LSS and the tools used in this process such as process mapping and brainstorming have strong evidence and support for improving staff engagement and improved team working.<sup>15</sup> Quality improvement work has also reported on multidisciplinary collaboration can result in significant positive outcomes.<sup>13</sup> The team purposefully was made up of multidisciplinary professions and research has detailed that collaborative MDTs are essential for successful quality improvement. This project engaged an MDT and demonstrates the impact of an MDT of front-line workers on improving care standards and practice.

## CONCLUSION

This quality improvement project has improved screening and detection of delirium for older adults presenting to the emergency department. LSS methodology was

successful in improving healthcare outcomes for patients and improving system performance. A multidisciplinary project team implementing a multifaceted intervention was successful in improving delirium screening and detection in the acute setting. This project provides support for using LSS methodology in sustained healthcare quality improvement.

## LIMITATIONS

Lack of formal evaluation of the educational approach is a potential limitation. Patients admitted to the unit at weekends were not included in the data, therefore the improvement can only be said to occur during Monday–Friday and project extensions should include capturing weekend activity. A potential limitation of this study is it was performed in one institution and results cannot be generalised.

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**Contributors** All contributors reviewed the manuscript and gave final approval. LM acting as guarantor. LM—redesigned department documentation to include 4AT. Started and led project group. Member of the MDT project group and involved in all stages of DMAIC cycle and project implementation. Responsible for data collection, measurement, analysis and reporting. Responsible for drafting article. Provided education sessions to emergency department nursing staff and acute medical medical staff. Designed a education board on delirium. ML—contributed to study concept and design and acquisition of data. Member of the MDT project group and involved in all stages of DMAIC cycle and project implementation. Designed a education board on delirium. EH—member of the MDT project group and involved in the root cause analysis, brainstorming and implementation phase of the project. AP—delivered education sessions to emergency department doctors, designed and distributed education tools and delirium lanyards. Member of the MDT project group and involved in root cause analysis, brainstorming and implementation phase of the project. MOD—member of the MDT project group and involved in all stages of DMAIC cycle and project implementation. Delivered education sessions to emergency department nursing staff and organised and facilitated all nursing education sessions. Involved in the redesign of department documentation. KMCL—delivered education session to emergency department staff and acute medical staff. Involved in the documentation redesign to include 4AT. CD—involved in the documentation redesign and change of department documentation. Education, promotion and senior support of implementing delirium screening across emergency department.

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**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Ethics approval** This study involves human participants. Due to the nature of the project ethical approval was not required. The project was improving standardised care for older adults in line with national guidelines.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as supplementary information.

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APPENDIX

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### CLINICAL NOTES MEDICAL

Use drawings where possible to locate injury/complaint

#### 4AT Delirium assessment tool (16+ years and over)

<b>1</b>	<b>Alertness</b> Normal (fully alert, but not agitated)	0
	Mild sleepiness for <10 seconds after waking, then normal	0
	Clearly abnormal	4
<b>2</b>	<b>ATTN</b> Ask your patient the following: age, date of birth, name of hospital/clinics, current year	
	No mistakes	0
	1 mistake	1
	2 or more mistakes or unobtainable	2
<b>3</b>	<b>Orientation</b> Ask your patient to list the months of the year	
	7 months or more correctly	0
	6 or less	1
	Unobtainable (cannot start because unwell, drowsy)	2
<b>4</b>	<b>Acute changes or fluctuating course</b> Evidence of significant change or fluctuation in alertness, cognition, other mental functions arising over the last 2 weeks and still evident in last 24 hours	
	Yes	0
	No	4

0-4 or more = possible delirium - use the Delirium pathway  
 5-8 = possible cognitive impairment  
 9 = delirium or severe cognitive impairment unlikely (but delirium still possible if info not complete)

**Total**  
 0-4 = possible delirium  
 5-8 = possible cognitive impairment  
 9-12 = unlikely delirium or severe cognitive impairment