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Nurses' perceptions of screening for delirium in the Post Anaesthesia Care Unit and orthopaedic surgical wards: A qualitative study

Abstract

Purpose: The aims of this study were to explore nurses' perceptions of the usability and clinical utility of two screening tools for delirium detection in the Post Anaesthesia Care Unit (PACU) and orthopaedic surgical wards settings, and to identify nurses' decisions about patient care delivery based on delirium assessment outcomes. The tools studied were the 3D-CAM and 4AT – the three-minute diagnostic interview for CAM (Confusion assessment method) delirium and the 4 'A's test, respectively.

Method: A focus group methodology was used. Five semi-structured focus groups were conducted with 24 nurses working in the PACU and orthopaedic surgical wards. Focus group sessions were digitally recorded and transcribed verbatim. Thematic analysis was used to analyse the data.

Findings: Five major themes were identified: 1. nurses' previous experience assessing patients for delirium, 2. usability of the screening tools, 3. clinical utility of the screening tools, 4. changes to improve the usability of screening tools in clinical practice, and 5. decision-making and clinical judgement.

Nurses in the PACU and orthopaedic surgical wards confirmed that the 4AT tool was quick and easy to use. PACU nurses were largely willing to adopt it into their practice, but nurses working in the orthopaedic surgical wards expressed that the 4AT tool was too generic and could not be used as the only screening tool to detect delirium. On the other hand, nurses working in the orthopaedic surgical wards viewed the 3D-CAM as more thorough and expressed their willingness to adopt it into their clinical practice.

Nurses in both wards believed that in order to increase the utilisation and adoption of the tools in practice some modifications are required; for example, reducing the number of observation-based questions and repetitive questions in the 3D-CAM and having an alternative question to measure attention criteria in the 4AT tool.

Conclusion: While the 4AT screening tool was feasible for use in the PACU the 3D-CAM was feasible for use in orthopaedic surgical wards. However, both tools require some modification to the content to facilitate routine use in clinical practice.

Keywords: delirium, screening tools, usability, utility, focus group, nurses, Post Anaesthesia Care Unit

Background

Delirium is an acute decline in cognition, awareness and attention that tends to fluctuate in severity during the day and arises from physiological disturbance.[1] It is common in post-operative patients, with an incidence of 15 to 25 per cent reported after major elective surgery, and 50 per cent after emergency surgery.[2] In the Post Anaesthesia Care Unit (PACU), the incidence of post-operative delirium varies between 4.1 and 45 per cent.[3,4] Post-operative delirium contributes to several adverse outcomes, including worsening functioning performance, accelerated cognitive decline, increased need for long-term care and increased mortality.[5–7]

The 3D-CAM is a three-minute delirium assessment method derived and simplified from the Confusion assessment method (CAM).[8] The 3D-CAM takes four features into consideration for determining whether a patient is delirious or not:

1. acute change and fluctuating course
2. inattention
3. disorganised thinking
4. altered level of consciousness.[8,9]

Each feature is rated as positive or negative for delirium. To detect delirium using the 3D-CAM tool, information is required from both subjective and objective testing.[8] Subjective testing is usually based on clinician assessment, observation of the patient and information gathered from family and carers. In contrast, objective testing is typically based on structured tests that require direct answers from the patient.[10]

The 4 'A's test (4AT) is a simple delirium detection tool that takes less than two minutes to complete (see www.the4AT.com).

The 4AT comprises assessment of four items:

1. alertness
2. cognition (using the Abbreviated Mental Test-4 (AMT4), which requires the patient to state their age, date of birth, present location and current year)
3. attention (the patient is asked to state the months of the year in reverse order)
4. acute changes (or fluctuating alertness or cognition arising in the last two weeks and still evident in the last 24 hours – a core diagnostic feature of delirium. Information may be obtained from different sources, including next of kin, nurses and carers of the patient, and also from patient medical records.[11]

When the 3D-CAM was evaluated against the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5, reference standard) in the PACU, a value of 100 per cent was achieved for sensitivity and 88 per cent for specificity.[9] Similarly, when the 4AT was evaluated against the DSM-5 criteria in the PACU, it achieved high diagnostic performance, with sensitivity and specificity values of 95.5 per cent and 99.2 per cent, respectively.[3] Nevertheless, despite the availability of highly sensitive and specific tools, delirium is still under-recognised by nurses in the PACU and orthopaedic surgical wards. This is partially due to lack of implementation of recommendations, such as those in the Australian Commission on Safety and Quality in Health Care clinical care standard for delirium screening, in the PACU.[12]

While recent studies have focused on diagnostic accuracy and validation of screening tools for delirium detection in the PACU and orthopaedic surgical wards settings,[12,13] there have been no known published studies of nurses' perceptions of the usability and clinical utility of these tools. Thus, delirium may be under-recognised if nurses perceive the tool as being unreliable or time consuming to conduct in a busy clinical setting. Understanding nurses' perception of usability and clinical utility of the 3D-CAM and the 4AT may provide insights into how delirium detection in the PACU and orthopaedic surgical wards can be improved. Therefore, this study investigated nurses' perceptions of the usability and clinical utility of the 3D-CAM and 4AT screening tools for delirium detection in the PACU and orthopaedic surgical ward settings. The study also identified nurses' decisions about the delivery of patient care based on delirium assessment outcomes.

Method

Design

A focus groups methodology was chosen for this study to obtain the individual and collective views of nurses participating in the study.[14] It was anticipated that focus groups would promote free expression, conversation and interaction between nurses about their perceptions and experiences of using the 3D-CAM and 4AT tools, and reveal the diversity of opinions and thoughts about the usability and clinical utility of the tools in the PACU and orthopaedic surgical wards. The first author coordinated the recruitment of the nurses, while the first and last author facilitated the focus groups.

Setting and participants

The study was undertaken in the PACU, and two orthopaedic surgical wards (one with elective cases, one with trauma cases) at a tertiary care university hospital that delivers a comprehensive range of health care services in metropolitan Victoria, Australia.[15] The researcher conducting the research obtained permission from the nurse unit managers of the PACU and orthopaedic surgical wards to present details about the study during the units' weekly meetings. Once permission was granted, the researcher visited each of the units twice to provide verbal and written information about the study to nurses who were eligible to participate and answer questions about participation. Nurses were eligible to particate if they were employed at the hospital in a permanent full-time or part-time position and had a minimum of one year of clinical experience. Nurses employed as a casual worker at the hospital were excluded.

Nurses who elected to participate in the study provided written consent. Once the nurses had been recruited, the researcher provided the training required to use the 3D-CAM and the 4AT screening tools. Nurses in the PACU were trained in using both the 3D-CAM and the 4AT screening tools. Nurses in the orthopaedic ward that included patients who had undergone elective surgery were trained to use the 3D-CAM, while nurses in orthopaedic ward that included orthopaedic trauma cases were trained to use the 4AT screening tool. Nurses were required to use the tool as allocated, and screen at least one patient daily for 30 days.

Five focus groups were conducted: two involving PACU nurses, two involving nurses on a trauma orthopaedic surgical ward and one involving nurses on an elective orthopaedic surgical ward.

Data collection

Semi-structured probe questions were developed by the research team (see supplemental material) from prior research in the topic area[16] and integrated into focus group sessions. In collaboration with the nurse unit managers, focus group sessions were conducted at 2.00 pm, immediately after nurses' verbal handover, which maximised nurses' participation and minimised disruption to their work day and patient care processes. Five focus groups were held during April and May 2022, led by two facilitators (RA and PN). Twenty-four nurses participated, including clinical nurse specialists (n = 7) and registered nurses (n = 17). The number of participants in each focus group ranged from four to eight nurses. Focus groups had a mean duration of 38.8 minutes (range 32–45). Focus group sessions were digitally recorded and transcribed verbatim. The study protocol was approved by Melbourne Health Human Research Ethics Committee (Ref: HREC/74575/MH-2021) and Deakin University Human Research Ethics Committee (Ref: 2021-295).

Data analysis

Thematic analysis was undertaken to analyse the qualitative data. The researcher (RA) transcribed each focus group session's audio recording verbatim. The transcripts were checked for accuracy by one researcher (RA). The first transcript was coded by two researchers (RA and PN) and consensus was reached through discussion. The remaining transcripts were coded by the researcher (RA).

Analysis began with familiarisation with transcripts and review of accuracy, which allowed for data immersion to search for meanings and patterns. Themes and sub-themes were organised using the qualitative research software NVivo 11.[17]

An inductive thematic analysis was undertaken, as developed by Ritchie and Spencer.[18, p. 173–194] Thematic analysis was used to generate an understanding of the perceptions of the PACU and orthopaedic surgical ward nurses regarding usability and clinical utility of screening tools, e.g. ease of use and time constraints when screening patients post-operatively for delirium. Themes and sub-themes were identified through careful reading and re-reading of the transcipts.[19] This approach allowed the recognition of patterns in the data, whereby emerging codes became categories and categories became themes and sub-themes. A table of emerging themes and sub-themes was created first by researcher (RA) and revised by other research team members (PN and EM) who are experts in qualitative research analysis. The research team then discussed these emerging themes and sub-themes, with further refinement to ensure that the reported themes accurately reflected participants' perceptions.[20]

Results

A total of 24 nurses working in the PACU and orthopaedic surgical wards were recruited, including eight nurses from each setting (PACU, elective orthopaedic surgical ward, trauma orthopaedic surgical ward). Five major themes and ten sub-themes were derived from the data (see Table 1).

Themes and sub-themes are described below. All quotes have been anonymised and labelled with focus group number (FGx), participant number (Px) and setting – orthopaedic ward (OW) or PACU.

Nurses' previous experience assessing patients for delirium

One sub-theme was identified: 'previous experience of delirium assessment'.

Previous experience of delirium assessment

There were mixed levels of experience in delirium assessment among participants. These differences in experience levels were notable between participants in the PACU and orthopaedic surgical wards. Most participants from orthopaedic surgical wards expressed that they had some experience in delirium assessment using a screening tool.

> I have used DOS [delirium observation scale] previously and it's a scoring system. (FG3/P1-OW)

> I've used multiple different ones, including the DOS and the 4AT. (FG3/P2-OW)

> We generally use the DOS, which is like 50 questions. That's the one we mainly use in our ward. (FG1/P1-OW)

In contrast participants from the PACU shared that they had little or no previous experience in delirium assessment.

> I don't have any experience with a specific delirium tool, but I would use the Glasgow coma scale to assess if a patient is confused. (FG4/P3-PACU)

> I have only used one tool previously, the 4AT tool. (FG5/P1-PACU)

Some participants from the PACU were aware of their limited skills in assessing for delirium, which led to depending on other clinicians to assess and confirm whether the patient had delirium.

> We also rely on anaesthetists giving [confirmation of delirium during] handover if patient is in delirium state out of post-op. (FG5/P2-PACU)

One participant acknowledged the valuable experience of screening patients for delirium.

> Even [though] I have not used a screening tool before, screening with the 4AT in this study I was comfortable using this tool, and I feel I have learnt a lot about delirium. (FG4/P1-PACU)

Table 1: Themes and sub-themes identified

Themes	Sub-themes
Nurses' previous experience assessing patients for delirium	Previous experience of delirium assessment
Usability of the screening tools	Accuracy of the screening tool in detecting delirium
	Content formatting of screening tool
Clinical utility of the screening tools	Time constraints
	Ease of use
	Determining cognitive baseline
	Barriers to using the screening tool
Changes to improve the usability of screening tool in clinical practice	Modification in question types
Decision-making and clinical judgment	Delirium and opioid administration
	Nursing interventions in response to delirium positive screening

Usability of the screening tools

Two sub-themes were identified: 'accuracy of the screening tool in detecting delirium' and 'content formatting of screening tool'.

Accuracy of the screening tool in detecting delirium

Participants from the PACU and orthopaedic surgical wards agreed that the 3D-CAM is thorough and effective in detecting delirium in the PACU and orthopaedic surgical wards.

> I think it's more thorough than other tools I used before. (FG5/P1-PACU)

> I feel like it would pick up a little bit [sic] more cases. If we were to do it on every patient on admission, and then every patient who's [at] post-op showing earlier signs of delirium, I feel like it might help us pick up signs of delirium a little bit earlier because there might be smaller details in how they're responding to these questions that we otherwise [do] not just pick up, that then three days later we would. (FG2/P3-OW)

One participant expressed that when using the 3D-CAM they were better able to identify patients with delirium than when using other tools that required an assessment to be conducted over three shifts.

> With the DOS we use, it takes 24 hours to be able to decide whether or not they're positive for delirium or not. But with the 3D-CAM, you're getting a result straight away over one assessment. So, you are determining straight away whether or not they're positive delirium [sic] or if it's something else or if they're not delirious at all. I feel it is an excellent tool in detecting delirium. (FG2/P2-OW)

Participants also expressed how guidance in using tools helped them in detecting delirium.

> Actually, I feel like it gives [a] more accurate outcome when you use the tool and, especially, it's really nice that there's guidance on how to ask the questions properly. (FG1/P2-OW)

Conversely, participants from the orthopaedic surgical wards expressed that the 4AT tool is more general in nature when using it to detect delirium in surgical patients compared to other tools, such as the DOS.

> I feel like the 4AT's more surface level, whereas the DOS goes into more detail in depth. The DOS, because it is so specific and you do it once a shift, so it's done three times a day, it's better at potentially identifying any changes in their cognitive state in the ward; whereas with the 4AT, we literally normally just do [it] once. (FG3/P6-OW)

Another participant expressed similar concern about the nature of the 4AT.

> I think the DOS is more able to detect more cases of delirium than the 4AT, to be honest. Only because I think the DOS is more specific and thorough. It's got the agitation questions, it's got the 'Do they know where they are? Are they making sense with their train of thoughts?' It's really more specific and thorough. (FG3/P1-OW)

Participants who used the 4AT discussed the need to complete an additional assessment using a different tool, such as the DOS, to detect delirium. They expressed the view that a more thorough examination would be better at detecting delirium in surgical patients.

> We usually do the 4AT when they're admitted to the ward. It's not something that we redo during the day and, sometimes, there could be potential fluctuations in their delirium state so, in this case, we wouldn't score with the 4AT again, we use [an] additional tool, we use the DOS. (FG3/P1-OW)

Further, one participant viewed the 4AT primarily as a tool to identify patients at risk of delirium and not a screening tool for delirium. They felt it was important to establish whether a patient was at risk of developing delirium based on the presence of risk factors rather than using the tool to detect or diagnose delirium, which may prejudice their willingness to implement it as a regular screening tool.

> I think the 4AT identifies that there's a risk for delirium and then DOS is done in more detail for every shift. (FG3/P3-OW)

Content formatting of the screening tool

Although the majority of participants perceived the 3D-CAM tool as a well-structured tool, some participants expressed concern about the content of the tool, particularly the inclusion of numerous observation-based questions.

> My experience of the tool is that some of the questions are observation based. For example 'Did the patient's level of attention fluctuate?' and there are lots of questions like that. That sort of thing is quite subjective and there's a range of determinants that could influence that. Perhaps being able to ask more concrete questions, such as 'Listen, I'm going to ask you three specific words. I want you to remember them in half an hour'. And then asking them in half an hour to repeat that back. That would probably give a more concrete view of the patient's attention versus just eyeballing the patient. (FG1/P1-OW)

Another participant expressed their concerns about the content of the tool, particularly the use of repetitive questions.

> I quite liked that it was well-structured, but I did find that it's quite long and it seemed like a lot of things are being repeated. Particularly with patients that either have a history of dementia or delirium, they can get a bit frustrated when you're asking them the same questions, repetitively. Like 'count backwards by this' or 'go backwards by month', which can be a bit challenging. (FG2/P1-OW)

Conversely, although participants who screened patients using the 4AT praised the simple structure of the tool, concerns were raised about the structure of the questions, particularly the lack of alternative questions to measure attention. There was only one question specifically related to attention criteria.

> I think that because you don't have any other question to assess attention criteria that you can ask as an alternative, with only the month backward question to assess attention. You only got that one question, and a lot of our patients are under strong pain medication and opioids all the time. Just having that one question can put them in a delirious category, even if they're just affected by something else. (FG3/P2-OW)

> I have a 95-year-old patient and she's completely with it. Telling me about all the great-grandchildren, how many she has – completely smart as a tack – but she could not do the months backwards, but I would say she's GCS 15 [normal consciousness on the Glasgow coma scale]. I just feel like having the month backward as the only question to measure attention is a bit tricky. Because obviously when they don't get the months correct, that puts you a point down and then flicks you into [the] delirium-positive side. There are many elderly people who are cognitively intact, they just can't say the months backwards. (FG3/P1-OW)

Consistent with the lack of alternative questions to measure attention criteria in the 4AT, participants were concerned that the tool could potentially affect nursing care. They believed there may be a degree of resistance to routine screening of delirium in clinical practice.

> If you got behavioural patients, and you ask them the months backward, I don't think they feel comfortable. I think that just sort of 'What's the point of asking me this? Why do I have to tell you the months backwards?'. Some of patients are sort of like 'You're wasting my time. Go away', and this can be a tricky way to start a relationship with the patients and assessing them properly. (FG3/P3-OW)

Clinical utility of the screening tools

Four sub-themes were identified: 'time constraints', 'ease of use', 'determining cognitive baseline' and 'barriers to using the screening tool'.

Time constraints

Although most participants perceived the 3D-CAM as easy to use, the length of time required to conduct the assessment in the PACU and orthopaedic surgical wards was a concern.

> Yeah, it just got a bit long-winded in that way at times. (FG4/P1-PACU)

> I just found it quite long, quite timely [sic]. (FG3/P3&4-OW)

Participants spoke about the challenges of using the 3D-CAM and the importance of needing more time to complete a thorough assessment of surgical patients.

> I found the tool quite long-winded; I think having to have the time to go through it with patients has been quite challenging from my experience. I think conducting the tool with the acuity of patients has been quite challenging. (FG2/P2-OW)

Some participants also anticipated that the 3D-CAM tool was too long when completing an assessment of patients recovering from anaesthesia in the PACU.

> It's just the length of the tool, the number of questions – too long for [a] patient recovering from anaesthesia. (FG4/P3-PACU)

Participants felt that the repetitive questions in the tool impacted on the time required to complete the assessment.

> It's probably too long, and there are a few questions that are repetitive, makes it longer to conduct. (FG4/P1-PACU)

In contrast, all participants who screened using the 4AT stated that the tool was quick to use when conducting screening in clinical practice.

> It takes sixty seconds to complete. (FG3/P6-OW)

> It's not a lot of work. (FG3/P2-OW)

> Definitely very quick to conduct. (FG3/P1-OW)

Having only seven questions to measure delirium criteria in the 4AT, one participant appreciated the time required to use the tool taking into consideration their workload and lack of time.

> It's really quick, which is nice because a lot of the things we have to do and document, so much. It's nice just to be able to have something that you just go, 'yes, no, yes, yes, yes, done'. (FG3/P7-OW).

Ease of use

Overwhelmingly, participants from both the PACU and orthopaedic surgical wards who used the 4AT expressed that it was simple to use and did not require extensive training.

> It's quite easy. It's very quick. Well, it's easy. (FG3/P1-OW)

> Yeah, it is simple to use. (FG5/P2-PACU).

> It's so quick. It's straightforward. It does not require training. (FG3/P2-OW)

Similarly, participants who used the 3D-CAM agreed that it is easy to administer in the PACU and orthopaedic surgical wards, and additional education and training was not required to administer it in practice.

> I think the 3D-CAM is quite easy to use. It's quite easy to follow. (FG2/P4-OW).

> I felt comfortable using it without having too much extra training or anything like that. (FG2/P1-OW).

Consistent with its ease of use, participants expressed that the 3D-CAM helped them recognise the features of delirium.

> I think it was easy to use. I think the actual questions and everything, it does come up with a pretty clear answer and interpretations of delirium features [to] make you recognise delirium really easily. (FG1/P3-OW)

Determining cognitive baseline

Determining cognitive baseline was one of the challenges of using the tool for some participants who administered the 3D-CAM, especially for patients admitted to hospital unaccompanied by next-of-kin or a caregiver.

> One of the issues I faced with the 3D-CAM is determining cognitive baseline of a patient. It's hard to really get the baseline, especially when there's no family member to ask. (FG1/P4-OW)

Similarly, another participant expressed the same challenge of determining cognitive baseline when using the 4AT in the orthopaedic surgical ward.

> Sometimes we've got the patients that don't have any family member or next-of-kin so that makes it a little bit tricky and hard as well to know their cognitive baseline when doing this 4AT. (FG3/P1-OW)

Concerns were also raised about difficulties in determining the cognitive baseline for older patients admitted to the hospital with dementia, and trying to establish which symptoms represented delirium and those that represented dementia.

> I found with the 3D-CAM, with regard to certain patients – people who come in with a history of dementia – it can be quite challenging to know what their baseline is and then how much of this is an acute change that would represent delirium versus how much of that is their baseline functioning. It's particularly challenging at the moment where we might have less access to family members with visitor restrictions, so you can't clarify as easily. (FG2/P1-OW)

It was also expressed that determining cognitive baseline was very challenging when using the 4AT tool for surgical patients admitted to the PACU. Participants debated the value of the tool in the PACU, particularly when asking certain questions.

> Another thing with the 4AT is that when you ask the question for acute change or fluctuating course, it requires assessing changes in cognition in the last two weeks, which is quite difficult in the PACU for post-op patients because we only see the patients post-operatively and they normally stay for half an hour to an hour, so it is hard to know the baseline of cognition and any changes. (FG5/P2-PACU)

Barriers to using the screening tool

Although participants reported that both the 4AT and the 3D-CAM were easy to administer in practice, they described a range of practical barriers, including language barriers and communication difficulties, for administering the tools in their clinical settings. These were seen as a practical challenge for both tools' usability in practice.

> Also, we cannot use the tool with non-English-speaking background patients, and a lot of our patients are from a non-English-speaking background. (FG2/P4-OW)

> It is also difficult to use the tool with patients that are deaf or having hearing difficulties. (FG1/P1-OW)

> It is difficult to use the [3D-CAM] tool with patients with tracheostomy. (FG4/P1-PACU).

> We cannot use the 4AT in the PACU with patients with tracheostomies. (FG4/P2-PACU)

Some participants argued against using the 3D-CAM or the 4AT for patients who were administered sedatives. They were concerned

that the tools are not usable for this cohort of patients due to the risk of providing an incorrect diagnosis of delirium.

> Because the patients are, they're sedated, in the post-operative [phase], they are in recovery situations and they're not able to communicate very well using the tool. It is really difficult to use the 3D-CAM with those patients, because if you use it with those patients, it may give [a] wrong diagnosis. I just think its barriers [sic] to using the tool. (FG4/P2-PACU)

Changes to improve the usability of screening tools in clinical practice

One sub-theme was identified: 'modification in question types'.

Modification in question types

Although most participants who used the 3D-CAM perceived the tool to be easy to use and well-structured, participants raised concerns about the lack of space for open-ended text to allow for notes to be added. Participants expressed the need for modifications in the design of the tool to facilitate communication between nurses about the patient's condition.

> It would be good to have like a little section to put comments in. For example, the patient had a really poor sleep, and maybe they're not normally this inattentive, or just something to give a context so the next team can have that to build on. (FG1/P4-OW)

Similarly, with the 4AT, while participants perceived the tool to be brief and easy to use in their practice, participants expressed their concerns about the cognition-related questions (item 2 of the tool). Participants suggested that having different sets of questions to assess cognition would improve the feasibility of the tool, thus, improve delirium detection in clinical practice.

> Asking questions such as 'What is your name and date of birth?' could sometimes give wrong indications of delirium, because some patients learn to answer those questions, especially when they get asked [the] same questions all the time. So, it would be good almost for there to be another option of a question that measures delirium. (FG3/P2-OW)

Decision-making and clinical judgement

Two sub-themes were identified: 'delirium and opioid administration' and 'nursing interventions in response to delirium positive screening'.

Delirium and opioid administration

Participants were aware of patients with complex health care needs, such as those with multiple comorbidities, who screened positive for delirium using the 3D-CAM or the 4AT. They found that screening positive for delirium influenced their clinical judgement and decision-making, especially when patients had been administered an opioid medication. Participants felt that opioids should be discontinued, or the dose altered when caring for those patients with complex health care needs.

> We have a lot of patients who are on opioids, which is like a green light for delirium. Actually, most of our patients are on opioids, so they're all a bit loopy. So sometimes, we need to re-assess the opioid situation when they're diagnosed for delirium with the 3D-CAM. (FG3/P2-OW)

> When a patient [is] identified with delirium in the PACU using the 4AT, and if the patient has required opioids, I am a bit more reluctant using opioids. So, I would need to discuss with the anaesthetists to see what the dosage is, and the dosage might be changed, or change medication to non-opioids. (FG5/P2-PACU)

Some participants anticipated that there were instances when patients with multiple comorbidities had received opioid medications post-operatively and were sometimes wrongly identified as positive for delirium using the 4AT tool.

> The 4AT features include changes in cognition, including paranoia and hallucinations and things like that, and some of our patients have those features, but it's because they're drug affected, on opioids, normally when they're admitted. So, it's an automatic 'yes' for delirium on the 4AT tool. (FG3/P1-OW)

In these instances, the participants described using their clinical judgement to determine whether it was delirium, and therefore perform a full delirium assessment using the DOS, or if it was a side-effect of opioid medications.

> But we use our clinical judgement and trace it back to what it is and decide whether to proceed with full delirium assessment or not. (FG3/P1-OW).

Nursing interventions in response to delirium positive screening

There was consensus among participants about the clinical decisions that were made once

patients screened positive for delirium using the 3D-CAM or the 4AT.

Participants emphasised that modifying the environment to provide a safe environment for surgical patients who screened positive for delirium was a priority decision when caring for those patients.

> We modify the environment, reduce the noise levels in environment, or keeping them nice and warm and comfortable, that's what we could do when we have patients screened positive for delirium. (FG4/P3-PACU)

> Well, it depends on the patients, if they are highly agitated and hyperactive, I make sure that they're in a high visibility bed. Also, lowering the bed, depending on the severity of their delirium, and providing them with nursing special [care], I prioritise what they need to make sure they are safe. (FG2/P4-OW)

Some participants explained that when a patient screened positive for delirium using the 4AT or the 3D-CAM this instigated conducting further investigations. Participants felt they are responsible for communicating with the medical team the need to further investigate and identify causes of delirium and commence treatment.

> We notify a consultant once we screen positive for delirium and then the team just have to order a delirium screen, to do a chest x-ray, urine cultures, blood cultures. Just kind of head-to-toe stuff to find the cause of the delirium. So that getting a positive screen should take all this over then to start. But sometimes we have to tell the medical team you have to do all these things, then put through the referral to get the patients started on delirium treatment. (FG2/P2-OW)

Participants also emphasised that when a patient screened positive for delirium, involving the family was a priority when decisions were made about ongoing care for surgical patients.

> For me as well, first thing [I] will do is talking with the family and trying to get strategies. A lot of the time you'll see with delirium, they'll be worse because they're in an environment that they're not familiar with. So, finding things that they like helps in bringing their cognitive [function] back. (FG1/P2-OW)

Others supported patient's cognitive re-orientating as a priority strategy when screened positive for delirium using the 3D-CAM or the 4AT.

> Yeah, re-orientating them. Every time we come in, we're like 'Oh, hi, my name's this and today's Tuesday' or something like that. That always helps them kind of get back into reality. (FG3/P2-OW)

Participants also discussed communicating with the treating team and documenting their observation of the patient's condition when screened positive for delirium using the 3D-CAM or the 4AT in medical records.

> We notify the anaesthetist and report in the EMR, and also hand over to the ward nurses, because more testing needs to be done. (FG4/P3-PACU)

Discussion

This study contributes valuable insight into nurses' perceptions of the usability and clinical utility of the 3D-CAM and the 4AT in the PACU and orthopaedic surgical wards. Our findings demonstrate that nurses working in the PACU are willing to adopt the 4AT tool in their practice as they perceived the tool to be brief, easy to use and not requiring extensive training to administer. On the other hand, nurses working in the orthopaedic surgical wards viewed the 4AT as general in nature, suitable for one-time screening and less appealing than a more thorough tool to assess patients for delirium. Thus, they perceived the 3D-CAM as being appropriate for ongoing delirium assessments in their practice, as they perceived the tool as being easy to use and well structured. Further, participants from the PACU and the orthopaedic surgical wards expressed concerns regarding determining cognitive baseline and recommended some modifications to both tools to make them more usable in practice. Considering the lack of evidence concerning nurses' perceptions of the usability and clinical utility of these two delirium screening tools in the PACU and orthopaedic surgical wards, we believe our study contributes new knowledge.

Participants from the PACU perceived the 4AT as a brief, well-structured tool and easy to use for delirium screening in their unit. They highlighted that having a tool with short questions will support the usability and adoption of the tool in clinical practice, considering the short amount of time spent with surgical patients in the PACU. This finding is consistent with a previous study which highlighted the simplicity of the 4AT tool and structure using short questions, supporting its use in routine clinical practice.[11] On the other hand participants from the PACU perceived the 3D-CAM as not suitable for the PACU setting as it required a long time to conduct the assessment and, considering their workload, this could limit its usability. According to Shenkin et al.[21] the longer the test takes to screen for delirium, the less

likely nurses will perform the test, which could lead to this condition being under-detected in practice.

Participants from both elective and trauma orthopaedic surgical wards expressed that the 4AT tool is suitable for one-time screening and regarded the tool as not being suitable for ongoing delirium assessment in orthopaedic surgical wards. On the other hand, participants from both elective and trauma orthopaedic surgical wards supported the use of the 3D-CAM tool for ongoing delirium assessment, as they perceived the tool as well structured and more thorough in nature.

Further, there was strong consensus among participants about the tool's ability to detect delirium in orthopaedic surgical patients in comparison to other screening tools such as the DOS. This finding is supported by recent research that demonstrated that the 3D-CAM is more likely to be adopted in practice due to the structure of the tool and the high diagnostic performance.[22]

An interesting finding was that most participants from the PACU and orthopaedic surgical wards expressed that both tools, the 4AT and the 3D-CAM, did not detect changes in patients' cognition, especially when their next of kin or caregiver were not present. Failure to detect changes in cognition and attention from baseline presents a great challenge to clinicians when attempting to diagnose delirium[23] and could thus lead to delirium being under diagnosed. This is supported in a previous study where the lack of ability to establish a cognitive baseline is of critical significance in under-diagnosis of delirium when screening using the 4AT.[24]

Another finding of this study is that participants from the PACU and orthopaedic surgical wards recommended modifications to the content of both tools to increase the usability in practice. This included having fewer observation-based questions and more open-ended questions in the 3D-CAM. Participants expressed that the current format of the 3D-CAM incudes too many observation-based questions which, from their point of view, may limit its usability in clinical practice. According to Tieges et al.[25] subjective testing of inattention and disorganised thinking may lead to under-detection of delirium in clinical practice because judgements based on observation are open to more variability between delirium assessors than objective testing.

Regarding the 4AT tool, participants agreed that the tool lacked alternative questions to measure attention. Given that only one question asks patients to list the months backwards, this could easily lead to an inaccurate assessment of attention which, in turn, could lead to an inaccurate delirium diagnosis.[26] According to O'Regan et al.,[27] for correct measurement of attention a minimum of three questions are required including, spelling 'world' backwards, counting down from one hundred by sevens ('serial sevens' from Folstein's mini-mental state examination) and reciting the months of the year or the days of week backwards. Therefore, participants recommended having more questions to assess attention could perhaps improve the recognition of delirium in practice.

Lastly, the nurses had similar responses to clinical judgment and decision-making actions in regard to positive delirium screening. Their decision-making included employing safety measures, communicating with the treating team, instigating further examinations and assessments, documenting the outcome in patient medical records and communicating during handover to nursing staff when changing shifts. These decision-based actions are supported by the American Geriatrics Society that has called for an interdisciplinary program to be implemented with patients screened positive for delirium. The Hospital Elder Life Program (HELP) is such a program and has been shown to reduce the incidence and severity of delirium cases in older patients.[28]

Strengths and limitations

This study was conducted at a single site in a tertiary care metropolitan hospital in Victoria. Therefore, its findings may not be transferable to other diverse care settings, such as those in regional, rural and remote areas.

Furthermore, night shift nurses were less represented because of difficulties in recruitment. However, we believe our findings are applicable to nurses across a broad range of clinical settings because we used a wide range of selection criteria. We included nurses with different levels of experience from three different clinical settings: PACU, elective orthopaedic ward and trauma orthopaedic ward within the hospital.

The key strength of this study is its inclusion of nurses' voices about their experiences of using the 3D-CAM and 4AT screening tools to detect delirium in two clinical settings where post-operative delirium is common. Investigating nurses' perceptions about using screening tools such as these is an important aspect of delirium detection and recognition, given that nurses are responsible for detecting delirium when caring for surgical patients and can make significant contributions to improving delirium detection in practice.

Conclusion

This study evaluated nurses' perceptions of screening for delirium in the PACU and orthopaedic surgical wards and identified important elements in the usability and clinical utility of the 3D-CAM and 4AT screening tools which may provide direction for improving delirium detection and recognition in these clinical settings. Nurses working in the PACU and orthopaedic surgical wards perceived the 4AT tool to be brief and easy to use. PACU nurses were willing to adopt it into their clinical practice, although this was conditional on further investigation of its content and accuracy prior to campaigning for routine use.

Nurses working in the PACU and orthopaedic surgical wards perceived the 3D-CAM tool as easy to use, and more thorough and accurate than other tools in detecting delirium. Nurses working in the orthopaedic surgical wards were willing to adopt the 3D-CAM tool into their practice; however, they highlighted some issues with the clinical utility and feasibility of the tool and stressed that some of those issues may limit the usability of the tool in practice. Nurses perceived that it is important that a tool should be brief, easy to use, accurate and have content that involves fewer repetitive questions and more objective testing in seeking to enhance delirium screening and delirium recognition for ongoing practice.

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Conflict of interests

The authors have no competing interests to declare.

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