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Articles

Missed and delayed documentation of postoperative delirium in older surgical patients and clinical outcomes: A retrospective cohort study

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Delirium

Objectives

To describe missed and delayed clinician documentation of research-confirmed postoperative delirium and compare hospital stay and discharge destinations descriptively across documentation groups.

Methods

We retrospectively reviewed records of 271 surgical patients aged 65 years or older at a Melbourne tertiary hospital. Delirium was assessed prospectively using DSM-5 criteria during the first five postoperative days. Clinician documentation was classified as on-time (within 8 hours of researcher identification), delayed (more than 8 hours), or missed (no documentation). Baseline comparisons were unadjusted; outcomes across documentation groups were summarised descriptively without regression modelling.

Results

Delirium was identified in 44/271 patients (16.2%). Documentation was on-time in 9/44 (20.5%), delayed in 28/44 (63.6%; observed delays 24–72 hours), and missed in 7/44 (15.9%). Six of seven missed cases (85.7%) were hypoactive. Median hospital stay was 8 days with on-time, 14.5 days with delayed, and 7 days with missed documentation. New long-term care placement occurred in 4/9 (44.4%), 10/28 (35.7%), and 4/7 (57.1%), respectively. Patients with delirium differed substantially from those without delirium in age, cognition, dementia and surgical urgency.

Conclusion

Delayed and missed documentation were common. Hypoactive delirium predominated among missed cases. Differences in outcomes were unadjusted and do not establish an independent or causal effect of documentation timing. Repeated assessment and clear documentation warrant clinical attention.

1. INTRODUCTION

Delirium is an acute, fluctuating disturbance in attention, awareness and cognition.[1] Older people and those with underlying cognitive impairment, dementia, previous history of delirium and those having general anaesthesia are at higher risk of developing postoperative delirium.[2-4] The incidence of delirium in patients admitted to a surgical ward varies widely, ranging from15 to 24% after major elective surgery and 21% to 48% after emergency surgery.[2,5-7]

Postoperative delirium is associated with substantial patient and health-service burden, including impaired activities of daily living, long-term cognitive decline, an increased risk of new episodes of dementia, and increased mortality.[8-11] It is also associated with longer length of hospital stay and increased risk of admission to a long term care facility.[12,13] The impact of delirium extends to nurse's,

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family members and caregivers, who may experience substantial emotional and care burden.[14-16]

A number of international guidelines recommend regular delirium screening among older inpatients, commencing on admission to hospital.[17,18] However, delirium is frequently undiagnosed in both acute care settings and long-term care facilities.[19,20] which is associated with an increased mortality rate.[21]

Because delirium fluctuates, a single assessment can fail to identify an episode, particularly when symptoms are subtle or hypoactive. Repeated postoperative assessment is therefore important in older surgical patients.[17,18] Examining not only whether delirium is documented but also when documentation occurs may therefore provide a more clinically meaningful measure of recognition.[22]

Evidence on under-detection has largely come from medical, geriatric and critical-care populations.[23-25] With fewer examining missed delirium or the timing of clinician recognition. This study therefore aimed to determine the frequency of missed and delayed documentation of postoperative delirium in older surgical patients and to examine differences in hospital length of stay and discharge destinations across documentation groups.

2. METHODS

2.1 STUDY DESIGN AND PARTICIPANTS

We conducted a retrospective review of medical records from patients previously enrolled in a prospective diagnostic-accuracy study of the 3D-CAM and 4AT.[26] The cohort comprised 271 patients aged 65 years or older admitted after elective or emergency orthopaedic, urological, vascular, colorectal, plastic, breast, thoracic or other surgery at a tertiary hospital in Melbourne between July and December 2021.

In the original prospective study, preoperative cognitive function was assessed by the researcher (RA) using the Mini-Cog in the preadmission clinic or operating-suite holding bay, depending on the patient's admission pathway[27] The Mini-Cog was used to screen for cognitive impairment rather than diagnose delirium, and patients with preoperative delirium documented by the treating clinical team were excluded. Postoperative delirium assessments commenced in the post-anaesthesia care unit and continued twice daily during the first five postoperative days using the 3D-CAM and 4AT, with DSM-5 criteria as the diagnostic reference standard. Patients meeting DSM-5 criteria at any postoperative assessment were classified as having delirium, irrespective of individual screening instrument results. Inter-rater reliability assessments conducted with a consultant psychiatrist demonstrated excellent agreement (28/30 identical assessments; $\kappa = 0.87$, $p = 0.001$). Delirium motor subtypes were classified as hypoactive, hyperactive or mixed based on observed psychomotor features across serial assessments.

During the prospective cohort study, delirium screening was performed at 30 and 60 minutes after extubation and at discharge from the post-anaesthesia care unit, followed by morning and afternoon assessments on the ward. Hypoactive delirium was characterised by reduced psychomotor activity, lethargy or decreased responsiveness; hyperactive delirium by agitation, restlessness or increased activity; and mixed delirium by features of both during serial assessment.

In accordance with the approved protocol for the original prospective diagnostic-accuracy study, research delirium assessments were conducted independently of routine clinical care, and positive findings were not routinely communicated to treating clinicians. The participant information and consent process explained that clinical diagnosis and management remained the responsibility of the treating team. It also explained that research findings, including delirium findings, would be shared with the treating team if concerns requiring immediate clinical attention arose. This arrangement was intended to minimise the influence of research assessments on routine clinical diagnosis and documentation while allowing escalation of immediate clinical concerns. No concerns requiring such disclosure or escalation arose during the study, and no such disclosures or escalations occurred.

Following completion of the prospective study, additional ethics approval was obtained in February 2024 to undertake a retrospective medical-record review of the same cohort, including the collection of new clinical and outcome data (ref: SSA/74575/MH-2021). Participants had provided written informed consent for the original prospective study. The retrospective cohort study was reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.

2.2 DATA COLLECTION AND OUTCOMES

Medical records were reviewed from February 2024 to June 2024. Extracted variables included age, sex, dementia, admission and surgery type, duration of anaesthesia, antipsychotic medication, delirium subtype, cognitive status, activities of daily living (ADL), length of stay, discharge destination and in-hospital mortality. ADL was assessed using the Katz Index.[28]

Clinician-documented delirium was defined as explicit documentation of delirium by a treating clinician in physician or nursing records. Documentation was compared with the timing of researcher identification. Cases were classified as on time when documented within 8 hours, delayed when documentation occurred more than 8 hours after researcher identification, or missed when no clinician documentation was found. In observed delayed cases, documentation occurred 24–72 hours after researcher identification. A second reviewer independently examined a random 10% sample of records, with no discrepancies identified.

Preadmission residence was also considered when classifying discharge to long-term care. All patients discharged to long-term care had resided at home before their surgical admission; these discharges were therefore classified as new long-term care placements rather than returns to existing residential care.

3. STATISTICAL ANALYSIS

Data were analysed using Stata version 18 (StataCorp, College Station, TX, USA). Descriptive statistics were used to summarise patient characteristics, delirium documentation status, and postoperative outcomes. Continuous variables were presented as means and standard deviations (SD) or medians and interquartile ranges (IQR), as appropriate, while categorical variables were reported as frequencies and percentages. Comparisons between patients with and without delirium were undertaken using appropriate parametric or non-parametric tests for continuous variables and chi-square or Fisher's exact tests for categorical variables, as appropriate. A p-value of less than 0.05 was considered statistically significant.

Patients with delirium were further classified according to the timing of clinician documentation as on-time, delayed, or missed. Given the small number of patients in these subgroups, particularly those with on-time (n = 9) and missed (n = 7) documentation, multivariable regression analyses were not undertaken because of concerns regarding overfitting and unreliable estimates. Hospital length of stay and discharge destination were therefore summarised descriptively across delirium documentation groups. These comparisons were considered exploratory, and no causal inferences were made regarding the relationship between the timing of delirium documentation and postoperative outcomes.

3. RESULTS

3.1 PATIENT CHARACTERISTICS

Among 271 participants, 44 (16.2%) met DSM-5 criteria for postoperative delirium. Of the 44, 25 (56.8%) were women, 42 (95.5%) had a preoperative Mini-Cog score <3, and 10 (22.7%) had documented dementia. Thirty (68.2%) underwent orthopaedic surgery. Emergency surgery was recorded for 37/44 patients (84.1%) with delirium and 78/227 (34.4%) without delirium, a substantial difference in clinical case mix. Compared with patients without delirium, those with delirium were also older (mean age 84.0 versus 75.7 years), more frequently had a Mini-Cog score below 3 (95.5% versus 19.8%) and more frequently had documented dementia (22.7% versus 0%). These differences describe important imbalances in baseline patient characteristics rather than effects attributable to documentation timing.

3.2 CLINICAL DOCUMENTATION AND DELIRIUM SUBTYPES

Of 44 definite delirium cases, 9 (20.5%) were documented within 8 hours, 28 (63.6%) were documented after a delay of 24–72 hours, and 7 (15.9%) were not documented. Among the missed cases, 6/7 (85.7%) were hypoactive and 1/7 (14.3%) mixed. In the delayed group, 27/28 (96.4%) were mixed and 1/28 (3.6%) hyperactive. In the on-time group, 5/9 (55.6%) were mixed and 4/9 (44.4%) hyperactive. In total, subtype classification was 6 hypoactive, 33 mixed and 5 hyperactive.

3. HOSPITAL STAY AND DISCHARGE OUTCOMES

The median hospital length of stay was 10.95 days (IQR 7–25.5) among patients with delirium, compared with approximately 4 days among those without delirium. Among patients with delirium, the median length of stay was 8 days (IQR 7–10) for those with on-time documentation, 14.5 days (IQR 8.5–26.5) for those with delayed documentation, and 7 days (IQR 5–29) for those with missed documentation.

Regarding discharge destination, 18 of the 44 patients with delirium (40.9%) were discharged to long-term care facilities, 11 (25.0%) returned home, 11 (25.0%) were transferred to another hospital, and four (9.1%) died during hospitalisation. All 18 patients discharged to long-term care facilities had been living at home before surgery; therefore, these discharges represented new institutional placements rather than returns to pre-existing care facilities.

4. DISCUSSION

In this cohort of older surgical patients, delirium was identified in 16.2%, and most episodes were eventually documented by clinicians. However, timeliness remained problematic: only approximately one in five delirium cases was documented within 8 hours of researcher identification, nearly two-thirds were documented after a 24–72-hour delay, and 16% were missed altogether. The findings suggest that documentation rates alone may overstate the effectiveness of delirium recognition if delays are not considered.

The overall clinician documentation rate of 84% was higher than rates reported in several previous studies. International studies have reported documentation rates of 20.5% in a US Veterans Affairs setting[29]and 28% after cardiac surgery in Sweden,[30] while other studies have shown substantial variation across settings.[19,31,32] Differences in populations, screening procedures, clinical awareness and documentation practices may explain some of this variation. The Australian Delirium Clinical Care Standard and increasing attention to delirium within hospital quality and safety systems may also have contributed to greater recognition.[17]

Despite the relatively high eventual documentation rate, hypoactive delirium remained particularly likely to be missed. Six of the seven missed cases were classified as hypoactive delirium, which is characterised by reduced activity, lethargy, and decreased responsiveness and may be less noticeable than agitation or restlessness.[33] This pattern is consistent with previous research, Albrecht et al., (2015) reported that hypoactive presentations comprised a substantial proportion of missed postoperative cases, while Bizri et al., (2023) similarly identified hypoactive delirium as a major predictor of missed diagnosis.[34,35] These findings reinforce the limitation of relying on behavioural disturbance to trigger assessment.

The high proportion of hypoactive delirium among missed cases also highlights the importance of nursing observation. Nurses assess patients regularly across shifts and

Table 1. Baseline characteristics of patients with delirium and patients with no delirium (N=271)

Characteristic		Total (n=271)	Delirium (n=44)	No Delirium (n=227)	P value
Age, years (mean (SD)		76.9 (7.9)	84 (7.9)	75.7 (7.1)	0.001
Gender, n (%)					0.423
Male		132 (48.7)	19 (43.2)	113 (49.8)	
Female		139 (51.3)	25 (56.8)	114 (50.2)	
Documented dementia, n (%)		10 (3.7)	10 (22.7)	0 (0)	0.001
Cognitive function on admission, Pre-MiniCog, n (%)					0.001
	<3	87 (32.1)	42 (95.5)	45 (19.8)	
	≥3	184 (67.9)	2 (4.5)	182 (80.2)	
Activity of daily living on admission, KATZ ADI score, median (IQR)		6 (5-6)	5 (3 – 6)	6 (6 – 6)	0.001
Type of surgery					0.001
Orthopaedic		104 (38.4)	30 (68.2)	74 (32.6)	
General Surgery		43 (15.9)	4 (9.1)	39 (17.2)	
Urology		35 (12.9)	2 (4.5)	33 (14.5)	
Vascular		26 (9.6)	1 (2.3)	25 (11.0)	
Others*		20 (7.4)	1 (2.3)	19 (8.4)	
Plastic		16 (5.9)	1 (2.3)	15 (6.6)	
Thoracic		14 (5.2)	1 (2.3)	13 (5.7)	
Colorectal		13 (4.8)	4 (9.1)	9 (4.0)	
Surgical urgency					0.001
Emergency surgery		115 (42.4)	37(84.1)	78 (34.3)	
Elective surgery		156 (57.5)	7(15.9)	149 (65.6)	

Abbreviations: SD, standard deviation; MiniCog, short cognitive impairment screening. MiniCog Score of 2 or less indicates cognitive impairment. Others*= breast, renal, neck and ear, nose and throat surgeries.

Table 2. Profile of patients with missed documentation

	Missed delirium (n=7)	*All other patients (n=264) *patients)*
Age, years, mean (SD)	82.1 (5.3)	77.0 (8.0)
Gender, n (%) Male Female	4 (57.1) 3 (42.9)	128 (48.5) 136 (51.5)
Documented Dementia, n (%)	1 (14.3)	9 (3.4)
Mini-Cog <3	6 (85.7)	81 (30.7%)
Orthopaedic surgery	4 (57.1%)	100 (37.9%)
Emergency surgery,	5/7 (71.4)	110/264 (41.7%)
Hypoactive	6 (85.7)	0 (0)
Hyperactive	0 (0)	5 (1.9)
Mixed	1 (14.3)	32 (12.1)

*__All other patients__= comprise 28 with delayed documentation, nine with on-time documentation and 227 without delirium. Subtype percentages use the full column denominators, including patients without delirium; consequently, comparator subtype percentages do not sum to 100%. SD, standard deviation.

are well placed to identify changes in attention, communication, mobility, sleep-wake patterns, and activity levels. However, quieter symptoms such as reduced activity or withdrawal may appear less concerning than agitation and therefore may not prompt further assessment or escalation. Education using clinical examples of these less obvious presentations, together with structured delirium screening and documentation of baseline cognition, may improve recognition and reduce reliance on overt behavioural changes.

Lower preoperative function was observed in the delirium population, but the available comparisons do not establish that functional impairment independently predicts

Table 3. Profile of patients with delayed documentation

	Patients with delayed diagnosis (n=28)	**Other Patients (n=243)**
Age, years, mean (SD)	84.3 (8.3)	76.3 (7.5)
Gender, n (%) Male Female	11 (39.3) 17 (60.7)	121 (49.8) 122 (50.2)
Dementia Diagnosis, n (%)	7 (25.0)	3 (1.2)
Mini-Cog <3	28 (100)	59 (24.3)
Orthopaedic surgery	18 (64.3)	86 (35.4)
Emergency surgery	24 (85.7)	91(37.4)
Type of Delirium, n (%)		
Hypoactive	0 (0)	6 (2.5)
Hyperactive	1 (3.6)	4 (1.6)
Mixed	27 (96.4)	6 (2.5)

All other patients include patients without delirium (n = 227), patients with on-time documentation (n = 9), and patients with missed documentation (n = 7).

Table 4. Length of hospital stay and discharge destination: comparison between delirium groups:

Variable	All Delirium (n = 44)	On time (n =9)	Delayed (n =28)	Missed (n =7)
Length of stay, median (IQR)	10.95 (7 – 25.5)	8 (7 – 10)	14.5 (8.5 – 26.5)	7 (5 – 29)
Discharge Destination, n(%)				
long term care facility	18 (40.9)	4 (44.4)	10 (35.7)	4 (57.1)
Home	11 (25.0)	2 (22.2)	8 (28.6)	1 (14.3)
Other hospital	11 (25.0)	1 (11.1)	9 (32.1)	1 (14.3)
Deceased in hospital	4 (9.1)	2 (22.2)	1 (3.6)	1 (14.3)

All patients discharged to long-term care had lived at home before admission; these discharges were therefore new placements rather than returns to pre-existing residential care. Results are descriptive; no adjusted associations or causal effects are claimed.

delayed documentation. Functional dependence, frailty and postoperative complications may coexist with delirium and influence both detection and recovery. Repeated delirium assessment alongside a documented functional baseline remains clinically relevant.[36-38]

Pre-existing cognitive impairment may also contribute to delayed delirium recognition and documentation. Although the Mini-Cog is useful for identifying cognitive impairment, it does not distinguish delirium from dementia. Furthermore, cognitive assessment undertaken shortly before urgent surgery may be influenced by acute illness, pain, or medication effects. Delirium superimposed on dementia is particularly challenging to recognise because an acute and fluctuating change in attention, awareness or cognition must be distinguished from the patient's usual cognitive impairment. As delirium is characterised by an acute change from baseline cognitive function, obtaining information from family members or caregivers about the patient's usual cognitive status and conducting repeated assessments are important for supporting timely recognition.[10,39]

Interpretation is further complicated by urgency and surgical case mix. Emergency surgery occurred in 37/44 patients with delirium compared with 78/227 without delirium. Preoperative Mini-Cog testing in urgent or emergency patients may be influenced by acute illness, medication and pain. Together, the marked differences in emergency surgery (84.1% versus 34.4%), preoperative cognition, dementia and age suggest that delirium status and the timing of documentation may reflect differing baseline vulnerability and surgical risk. Because these factors were not simultaneously adjusted for, the observed outcome differences cannot be attributed independently to delayed or missed documentation.

Hospital length of stay was longer among patients with delirium than among those without delirium, and the delayed-documentation group had the largest median among the small delirium documentation subgroups (14.5 versus 8 and 7 days). These unadjusted differences should not be interpreted as evidence that delayed documentation caused prolonged hospitalisation. Delirium, emergency surgery, dementia, baseline functional impairment and illness severity may influence both documentation and hospital stay. In addition, the on-time and missed groups were small, the range of stays was wide, and the analyses were not adjusted for confounding.

Timely assessment remains important regardless of whether timing has an independently measurable effect on subsequent outcomes. Delirium can be distressing to patients and families, and prompt evaluation may facilitate

investigation of pain, infection, hypoxia, medication effects, dehydration or other contributors. Documentation audits could distinguish time of first clinical suspicion, screening, formal diagnosis and treatment, rather than use a single chart entry as a proxy for all these events[40,41]

Discharge destination warrants the same cautious interpretation as hospital length of stay. Among the 44 patients with delirium, 18 (40.9%) were discharged to long-term care, including 4/9 (44.4%) in the on-time group, 10/28 (35.7%) in the delayed group and 4/7 (57.1%) in the missed group. All patients discharged to long-term care had been living at home before surgery; these discharges therefore represented new institutional placements rather than returns to an existing residential care facility. Nevertheless, the small subgroup denominators and the absence of a consistent increase across documentation categories do not support a conclusion that delayed documentation led to new placement. Discharge decisions may also reflect pre-existing cognitive and functional impairment, emergency surgery, postoperative recovery, family support and available services.

The distinction between clinical recognition and medical-record documentation is important when interpreting these findings. In the original prospective study, research delirium assessments were conducted independently of routine clinical care, and positive screening results were not routinely communicated to treating clinicians, reducing the potential for research findings to influence clinical documentation. Nevertheless, the timing of a medical-record entry may not reflect when delirium was first suspected, recognised or managed: clinicians may have identified cognitive changes before documenting a diagnosis, while research-identified delirium may not have been apparent to the treating team at the same time. Accordingly, the reported delays refer to clinician documentation rather than proven delays in clinical recognition or treatment. Future studies should record the timing of clinical suspicion, screening, diagnostic confirmation, escalation and intervention separately[42]

This study has several strengths, including the use of repeated delirium assessments across different surgical specialties, employing validated screening instruments and DSM-5 diagnostic criteria. Furthermore, independent review of a sample of medical records supported the consistency of data extraction. However, it was conducted at a single site using an existing research cohort, potentially limiting generalisability. The small on-time (n = 9) and missed (n = 7) documentation groups limited the feasibility of reliable multivariable analyses. Detailed data on comorbidities and perioperative illness severity were unavailable for these analyses. Although it was established that patients discharged to long-term care had previously lived at home, preadmission residence was not reported for the full cohort by delirium status. Consequently, the overall distribution of baseline residential circumstances could not be compared between groups. Finally, although patients with clinician-documented preoperative delirium were excluded, formal research delirium assessments were not performed before surgery. As a result, unrecognised preoperative delirium cannot be excluded, and establishing an acute change from baseline may have been especially difficult in patients with dementia or those undergoing emergency surgery.

5. CONCLUSION

In this retrospective cohort study involving additional medical-record data collection, only 9 of the 44 research-confirmed delirium cases were documented within 8 hours, 28 were documented after a delay and seven were not documented by treating clinicians. Hypoactive delirium predominated among missed episodes. Although documentation groups differed in hospital stay and discharge outcomes, the observational design, differences in baseline vulnerability and the small recognition subgroups preclude attributing adverse outcomes to the timing of documentation itself. Repeated screening, attention to acute changes in cognitively impaired patients and clearly defined communication and escalation procedures are priorities for practice and future research.

USE OF GENERATIVE AI

No generative AI tools were used to conduct the review or prepare the manuscript.

EDITORIAL ROLES

None of the authors serves as an editor or a member of the Editorial Board of Delirium.

CREDIT AUTHOR CONTRIBUTIONS

Conceptualization and methodology – RA, ET, EM and PN. Investigation – RA and PN. Formal analysis – RA and ES. Writing – original draft – RA. Writing – review & editing – RA, ET, EM, ES and PN.

DECLARATION OF INTERESTS

The authors declare no conflicts of interest.

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ETHICAL APPROVAL

Ethical approval was obtained from the Royal Melbourne Hospital Research Ethics Committee on July 2021 (ref: 74575/MH-2021). An ethics amendment was submitted for further data to be collected including the rate of delirium detection in medical records and other variables such as hospital length of stay and rates of discharge to long-term care facilities with ethical approval granted in February

2024 (ref: SSA/74575/MH-2021). All participants provided written informed consent prior to taking part in the study.

DATA AVAILABILITY

The study data are stored in a hospital-managed REDCap database and are not publicly available due to participant confidentiality requirements, ethics approval conditions, and institutional data-governance policies. Direct database access is restricted to authorised hospital-affiliated researchers. Requests for access to de-identified study data may be directed to the corresponding author at raldwikat@qu.edu.qa and will be considered subject to applicable ethical and institutional governance approvals.

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