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Title Page:

Article Title: Delirium is under-reported in discharge summaries and in hospital administrative systems: a systematic review

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Author Contributions

All authors were involved in the design of the protocol. SDS provided guidance on systematic review methodology. TI and SS performed title/abstract screening, full-text review, quality assessment and risk of bias analysis. AMJM resolved conflicts at title/abstract screening and full-text review. TI drafted the initial manuscript. All authors had access to the data, provided feedback and were involved in the finalisation of the manuscript. All authors read and approved the final manuscript.

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Abstract 300/300

Background:

Accurate recording of delirium in discharge summaries (DS) and hospital administrative systems (HAS) is critical for patient care.

Objective:

To perform a systematic review of studies reporting the frequency of delirium documentation and coding in DS and HAS, respectively.

Method:

Medline, Embase, PsycINFO and Web of Science databases were searched from inception to 23 June 2021. Eligibility criteria included requiring the term “delirium” in DS or HAS; documentation in inpatient records alone was excluded. Screening and full-text reviews were performed independently by two reviewers. Risk of bias (RoB) was assessed using the Effective Public Health Practice Project tool.

Results:

The search yielded 7,910 results; 24 studies were included. The studies were heterogeneous in design and size (N’s=25 to 809,512). Mean age ranged from 57 to 84 years. Studies formed two clear groups. One group did not use additional delirium ascertainment methods and reported overall DS documentation and HAS coding in entire hospital or healthcare database (N=4). The second group used additional delirium ascertainment methods (e.g. chart review) in smaller subsets of patients and reported overall DS and HAS rates in relation to study-ascertained delirium rates (N=20). Studies reported either DS figures only (N=8), HAS figures only (N=11), or both (N=5). Documentation rates in DS ranged from 0.1% to 63.6%. Coding rates in HAS ranged from 1.5% to 48.7%. Some studies explored the impact of race, and nurse versus physician practice. No significant differences were reported for race; one study reported that nurses showed higher documentation rates in DS relative to physicians. Most studies (N=22) had medium to high RoB.

Conclusion:

Delirium is a common and serious medical emergency yet studies show considerable under-documentation and under-coding. This has important implications for patient care and service planning. Healthcare systems need to take action to reach satisfactory delirium documentation and coding rates.

Introduction

Delirium is a severe neuropsychiatric syndrome that affects 1 in 4 hospitalised older adults.[1,2] It is associated with multiple adverse patient outcomes.[3,4] Delirium detection is advocated in numerous guidelines and care standards for improving outcomes.[5-7] Yet delirium remains largely unrecognised in most hospitals[8] and is, consequently, under-documented in medical records including discharge summaries (DS) and under-coded in hospital administrative systems (HAS).[9-11] This is likely mostly due to a combination of inadequate education and limited implementation of effective delirium detection tools.

Hospital administrative coding translates medical information, recorded in patient medical records, to a standard coded format and is used for statistics, reimbursement and case-mix adjustments.[12] Clinical coders rely on the accuracy of the information provided in medical records, including DS, to code delirium in HAS.[13] Delirium is unlikely to be picked up by clinical coders if documentation in medical records is absent or poor, thereby leading to underestimation of the true prevalence and incidence rates for delirium which may result in lower reimbursement and fewer resources allocated for managing delirium in hospitals. DS are a form of medical records that are normally created in secondary care; they provide an overview of patient events from the point of admission up until discharge. Accurate DS are essential for high-quality communication with primary care and to inform future secondary care episodes and care pathways.[14]

Delirium documentation and coding are critical elements in providing high quality, comprehensive delirium care, but there is little scrutiny of this in the academic literature. Here we report a systematic review with narrative synthesis of published studies that have reported rates of delirium documentation in DS and/or delirium coding in HAS.

Methods

The systematic review was registered with PROSPERO on 26 February 2021 (CRD42021239547) and is reported according to PRISMA guidelines (supplementary Table 1, supplementary Figure 1).[15]

Inclusion criteria

Studies using any peer-reviewed study methodology which had:

- all, or a proportion of, patients with delirium in a hospital setting – including specific subtype of delirium, or delirium superimposed on dementia, and
- documented description and/or diagnosis of delirium in DS (or equivalent), or
- description of HAS coding used to record delirium diagnosis, and
- publication in English or translatable to English using translation tools.

No restrictions were placed on demographic variables such as age, ethnicity and sex.

Exclusion criteria

To minimise bias, studies were excluded if they:

- did not include delirium as a diagnosis (e.g. used only synonyms such as 'confusion' or 'encephalopathy' or 'acute psychosis' or 'altered mental status') or used only symptoms of delirium, or
- did not specifically refer to DS (or equivalent) to report on delirium documentation rates, or
- reported delirium in non-hospital settings, such as care homes and hospices, or
- were systematic reviews, meta-analyses, abstracts, letters to editors or opinion pieces.

Search strategy

We sought advice on developing a search strategy from an academic librarian at the University of Edinburgh. The search strategy comprised three concepts: (1) delirium, (2) documentation or coding, and (3) DS or HAS. Search strategies were developed for Medline, Embase, PsycINFO and Web of Science (Supplementary Table 2), searching Embase and Medline from inception (1980 and 1966, respectively) and other databases from 1949 when delirium was first coded in the International Statistical Classification of Diseases.[16]

The search was performed on 13 March 2021 and updated on 23 June 2021. We used the forward citation technique on eligible studies to identify any relevant peer-reviewed publications. We also scoped grey literature using the same concepts (Supplementary Table 3). Title, abstract and keyword screening, and full-text reviews of long-listed publications, were performed independently by two reviewers (TI and SS). Conflicts were resolved by an additional reviewer (AMJM).

Specific Sub-groups

To explore the variations in delirium documentation and/or coding rates, we also extracted data from studies that additionally reported rates based on:

- different sub-groups of the population (e.g. race or gender),
- different hospital settings (e.g. geriatrics, medical, or intensive care units),
- structured and unstructured DS,
- different hospital staff (e.g. physicians or nurses).

Risk of bias

Two reviewers (TI and SS) independently assessed studies for risk of bias (RoB) using the Effective Public Health Practice Project (EPHPP) quality assessment tool.[17] Conflicts were resolved through discussion. Studies were assessed as strong, moderate or weak, across different methodological areas: selection bias, study design, confounding, blinding and data collection (Supplementary Table 4). We applied the global rating criteria for an overall rating.

Global ratings for RoB generally ranged from moderate to high, largely due to study design, confounders and blinding (Figure 1). Two studies had low global RoB ratings.[18,19]

Data extraction and synthesis measures

For each study we extracted the reported delirium documentation and/or coding rates in DS and HAS, respectively. Where studies used a range of codes to denote presumed delirium or synonyms (e.g. encephalopathy) but reported rates by specific code, we calculated the coding rates by delirium-specific codes only (Supplementary Table 5). Similarly, where studies did not use a diagnostic manual or coding dictionary, but instead used text in the DS, we reported the documentation rates only for the specific term 'delirium' rather than synonyms.

Some studies measured delirium with additional study-specific ascertainment methods, for example through chart reviews for evidence of delirium. For these we calculated *study-prevalence* rates for delirium by dividing the total number of cases (n), as determined by the delirium study-ascertainment method used, by the sample size in which delirium had been ascertained by the study (N) (Supplementary Table 6). Amongst patients with study-ascertained delirium, we extracted the reported number and proportion of patients with either delirium documentation in DS or HAS clinical code for delirium. Where a study did not report the proportion, we calculated this manually.

Results

The searches yielded 7,910 results, and 24 studies were included, with publication dates ranging from 1992 to 2021 (Table 1).[19-42] One study was identified using forward citation.[42] There was a title-abstract agreement between reviewers in 98.8% of cases (Cohen's κ 0.60) and in 85.9% of cases (Cohen's κ 0.70) at full-text review.[43] One article was available in Spanish[25] and translated to English.[44] No other studies in other languages were identified.

Studies were located in the United States (11), United Kingdom (3) Canada (3), Australia (2), New Zealand (1), Thailand (1), Colombia (1), Sweden (1), and Italy (1). Reported mean age ranged from 57 years to 84 years; one study of delirium documentation in paediatric hospital services did not report age.[29] Most studies used an observational approach, including retrospective and/or prospective review of electronic medical records or medical charts (Table 1).

The 24 studies included were heterogeneous in design, delirium study-ascertainment, and sample size (Tables 1-2). Most studies involved patients from hospitals, mainly general medicine wards, surgical wards, or intensive care units (ICU); one study involved patients from a community hospital.[20] Studies reported DS figures only (N=8), HAS figures only (N=11), or both (N=5). Twenty studies used additional methods to ascertain delirium rates to enable comparison with the DS and HAS figures (Table 2).

In the four studies with no additional study delirium ascertainment (Table 2), the sample sizes ranged from 2,521 to 809,512. These studies used whole samples from, for example, entire hospital or healthcare system databases. Delirium documentation rates in DS were 0.1%[29] and 0.9%[28] of the total sample sizes, and delirium HAS coding rates were 1.5%[31], 2.9%[18], and 3.4%[28] of the total sample sizes.

In the 20 studies with additional delirium ascertainment (Table 2), sample sizes ranged from 25 to 1,528; documentation rates in DS ranged from 2.9%-63.6% and HAS coding rates ranged from 2.6%-48.7%. In these studies DS and/or HAS rates were primarily reported for the population of patients with study-specific delirium ascertainment. However, there was some variation in the types of figures reported.

Studies which used additional delirium ascertainment methods reported higher rates of delirium DS documentation and HAS coding compared to studies which did not use delirium ascertainment (Figure 1). Among studies using delirium ascertainment, rates of DS documentation and HAS coding trended with RoB, with low and medium RoB studies reporting higher rates than high RoB studies. Delirium prevalence rates were higher than reported DS documentation and HAS coding rates (Figure 2).

Multiple studies used retrospective methods to determine delirium coding rates in patient DS.[20,33,35,37] Zalon et al. (2017) reported only one out of 34 patients (2.9%) with study-ascertained delirium had documented delirium in the DS.[20] Low documentation rates were also reported by Glick et al. (1996), where delirium DS documentation was reviewed in 195 patients who underwent intra-aortic balloon pump (IABP) treatment. Of these 195 patients, 12 (6.2%) had delirium documentation in DS; in a sub-study identifying 67 of the 195 patients with delirium, 8 patients (11.9%) had delirium documented in DS.[35] In a retrospective review of medical records from 183 emergency department admissions, Detweiler et al. (2014) found 52 patients (28.4%) had delirium using retrospective DSM-IV admission; only 5 of these 52 patients (9.6%) had delirium documented in their DS.[36] Using a chart extraction tool, Hope et al. (2014) examined delirium documentation in DS of 25 patients with study-ascertained delirium; 11 (44%) had delirium documented in their DS.[33] Chuen et al. (2021) identified 110 patients with study-ascertained delirium; 70 (63.6%) had delirium documented in their DS.[37]

Several studies used prospective research methods to determine delirium documentation rates in DS. In a prospective cohort study from Welch et al. (2018), consisting of 1,327 acute admissions, 125 patients (9.4%) were assessed to have delirium based on DSM-IV criteria; delirium was documented in the DS for 61 of these 125 diagnosed patients (49%).[22] A similar prospective study by Welch et al. (2019) identified 222 patients with delirium; 154 DS were available for review, and delirium was documented in 44 of the 154 DS (28.6%).[21] Ruangratsamee et al. (2016) prospectively assessed delirium in an older acute medical population (N=225) and 110 patients had study-ascertained delirium; delirium was documented in only 16 patient DS (14.5%) despite 63 of the 110 (57.3%) delirium cases being recognised by physicians.[26]

Two studies analysed the effect of using a structured DS. Chuen et al. (2021) reported that structured DS was associated with non-significantly reduced odds of delirium documentation in DS (OR 0.55, 95% CI [0.18–1.70]).[37] However, in a smaller study (N=31) delirium documentation was higher in structured DS (five out of nine structured DS, 55.5%) compared to unstructured DS (0 out of 22 unstructured DS).[23]

In studies examining delirium coding in HAS, delirium was coded using the International Classification of Diseases, 9th or 10th revision (ICD-9 or ICD-10).[45,46] Seven studies used ICD-10 to code delirium (Table 2).[24,25,27,30,34,38,41] Three studies reported the specific diagnostic codes used.[25,27,38] ICD-9 or ICD-9CM (clinical modification) were used to categorise delirium in ten studies, with eight specifying the diagnostic codes used.[20,28,31-33,39,40,42] Five studies reported the frequency of the type of codes used in HAS;[18,20,31,39,42] concerning delirium-specific codes, acute delirium (293.0) was the most frequently recorded ICD-9 code.[18,20]

A prospective observational study by Pendlebury et al. (2020) reported an overall coding rate of 34.7%. However, a substantial increase in coding rates, from 12.8% in 2010 to 60.2% in 2018, was observed following a system-wide multicomponent intervention consisting of audits, delirium training and educational seminars.[23]

Some studies reported on delirium DS documentation and HAS coding rates by hospital service type or hospital staff. In a large study (N=267,947) by Kales et al. (2003) using inpatient admissions, 3,978 (1.5%) patients had delirium coded in the HAS. Higher rates of delirium coding came from medical/surgery units; 3,238 of the 3,978 with coded delirium (81.4%) came from medical/surgery units, 464 (11.7%) from psychiatry units, and 276 (6.9%) from nursing homes.[31] A smaller study (N=183), Detweiler et al (2014) retrospectively compared rates of missed delirium documentation in DS; 52 patients were identified with study-ascertained delirium among emergency department (ED), medicine, surgery, and consult/liaison services. The medical services and the ED had the highest rates of missed delirium documentation in DS (29.5% and 28.8% respectively), followed by surgery (23.5%) and psychiatric services (13.8%).[36] Another small study (N=110) from Chuen et al. (2021) reported higher delirium DS documentation in surgical services (76.5%) compared to medical services (52.5%, p=0.02), and admission to surgical services was a strong univariate predictor of delirium documentation in DS (OR 2.94, 95% CI [1.29-6.70]).[37] Only one study investigated the delirium documentation rates in DS by hospital staff discipline (N=142); documentation in DS was higher for nurses (52.5%) than physicians (41%).[24]

Delirium coding rates in HAS by race was explored in two studies. Campbell et al. (2014) found no difference in reported ICD-9 codes for delirium between African-Americans and Non-African Americans (p=0.92).[19] Among patients with coded delirium (N=3,978), Kales et al. (2003) reported higher rates of delirium coding in HAS in Caucasian (N=3,086 (77.6%)) compared to African-American patients (N=605 (15.2%)).[31]

Discussion

We identified 24 published studies that reported delirium documentation in DS or coding in HAS. Studies were divided into two clear groups, with one group that simply reported delirium rates in large whole hospital or system-wide populations, and another group that compared delirium rates in comparison to study-ascertained delirium mostly in much smaller study samples. The four studies without additional ascertainment reported very low rates of delirium documentation and/or coding rates (0.1%-3.4%). In the three studies in adult populations the mean ages were 79.1,[18] 72.0,[31] and 57.0;[28] delirium rates in inpatients in these age groups are considerably higher than the rates recorded in these studies.[1,2] The recorded rate of 0.1% in the paediatric sample is also certainly much lower than the real rate.[47] The 20 studies that employed additional study-specific delirium ascertainment reported documentation and coding rates ranging from 2.6%-63.6%, but these figures must be interpreted based on study characteristics such as the sample size. Overall, the literature suggests that delirium is under-documented in DS and under-coded in HAS.

UK guidelines on delirium from the National Institute for Health and Care Excellence (NICE) and the Scottish Intercollegiate Guidelines Network (SIGN) recommend that the term 'delirium' is explicitly used in DS to support continuity of care.[5,6] In our review, we identified several studies where descriptors (or synonyms) of delirium were sometimes documented rather than delirium itself. Descriptors varied across studies; terms included 'confusion', 'drowsiness', 'agitation', and 'disoriented'.[20,22,23,36,41] The main factors underlying under-documentation are likely that delirium continues to be under-detected in routine practice. However several studies in the present review also suggest the additional problem that even when delirium is detected in practice that the diagnosis is not always documented in DS.[1,20-22,37] Coders rely on information provided in medical records, including DS, to assign relevant administrative diagnostic codes for delirium. When delirium is missed from DS, this reduces the likelihood of delirium being captured in HAS. A further factor adversely influencing accurate documentation or coding is the use of codes relating to 'encephalopathy' rather than delirium.[25,31,39,41] We note that the majority of studies were set in the USA, where coding practices in relation to delirium are more complex and, frequently, alternative terms such as 'encephalopathy' are used because of greater reimbursement.[48] This emphasises the importance of accurate delirium documentation in DS to inform accurate delirium coding in HAS, and the need for additional training for coders.

There are several consequences of under-documentation and under-coding of delirium.[5-7] Patients and carers may not be informed that an episode of delirium has occurred, and primary care providers, as well as future secondary care providers, will not have accurate information regarding relevant past medical history.[5,7] Patients who have had delirium are at higher risk of developing future dementia; screening for dementia is likely to be missed without clear communication on hospital discharge.[1,4] Further work is needed to understand detection methods that are effective in practice, such as routine use of brief delirium assessment tools that can be executed by non-expert staff,[49] and that can influence rates of documented and coded delirium. Two small studies reported that delirium documentation and coding rates were comparatively higher in surgical services;[31,37] this may be due to more frequent and standardised patient observations occurring peri-operatively. Only two small studies reported coding rates in relation to race,[19,31] finding no significant differences. However this is an important area that requires further research as there is evidence of over-

diagnosis of some mental illnesses in black (and other minority ethnic) populations, and disparities in diagnostic code use.[50]

To our knowledge, this is the first systematic review to examine the literature on delirium documentation and coding rates in DS and HAS. The review was registered in PROSPERO and involved a comprehensive search strategy. Although our initial protocol was only to include English language studies, we did not impose any language restrictions, and we were able to include the only non-English article we found (in Spanish). We acknowledge several limitations in this review. Though we scoped grey literature for relevant publications, we restricted our search to studies published in peer-reviewed journals. We did not explore variations in delirium documentation and coding in hyperactive and hypoactive forms of delirium, or in patients with pre-existing dementia despite some studies reporting on these.[27,31,33,37,39] We only looked at rates of delirium documentation or coding amongst those who had delirium, and did not explore the specificity of delirium documentation or coding in patients without delirium. The majority of studies included were considered to have moderate to high RoB and this may impact the interpretability of the results. It also underlines the need for higher quality work in this area.

Poor documentation of delirium stems from poor recognition of delirium. Therefore a key step is to implement validated screening tools that are proven to work at scale, and to improve how delirium is coded.[23-25,28,33,41] A multicomponent strategy involving education and training of all relevant staff (including coders) and implementing mandatory cognitive screening for delirium via electronic patient records has been shown to improve the rates of delirium detection, documentation and coding.[27,32] Future studies should explore key variables such as hospital settings, demographics and the influence of staff roles in delirium documentation and coding rates. Strategic efforts to improve delirium recognition and documentation are likely to have multiple positive effects on the quality of care of individual patients and in system-wide policy approaches to this common and serious condition.

References

1. Wilson JE, Mart MF, Cunningham C, et al. Delirium. *Nat Rev Dis Primers*. Nov 12 2020;6(1):90. doi:10.1038/s41572-020-00223-4
2. Gibb K, Seeley A, Quinn T, et al. The consistent burden in published estimates of delirium occurrence in medical inpatients over four decades: a systematic review and meta-analysis study. *Age Ageing*. Apr 27 2020;49(3):352-360. doi:10.1093/ageing/afaa040
3. Anand A, Cheng M, Ibitoye T, Maclullich AMJ, Vardy ERLC. Positive scores on the 4AT delirium assessment tool at hospital admission are linked to mortality, length of stay and home time: two-centre study of 82,770 emergency admissions. *Age and Ageing*. 2022;51(3):afac051. doi:10.1093/ageing/afac051
4. Girard TD, Jackson JC, Pandharipande PP, et al. Delirium as a predictor of long-term cognitive impairment in survivors of critical illness. *Crit Care Med*. Jul 2010;38(7):1513-20. doi:10.1097/CCM.0b013e3181e47be1
5. Quality statement 5: Communication of diagnosis to GPs | Delirium in adults | Quality standards | NICE. Accessed 30 May, 2020. https://www.nice.org.uk/guidance/qs63/chapter/quality-statement-5-communication-of-diagnosis-to-gps.
6. Scottish Intercollegiate Guidelines Network. Risk reduction and management of delirium Accessed 30 May, 2020. https://www.sign.ac.uk/sign-157-delirium.html.
7. Australian Commission on Safety and Quality in Health Care. Delirium Clinical Care Standard. Accessed 11 Sep, 2021. https://www.safetyandquality.gov.au/sites/default/files/2021-09/delirium_clinical_care_standard_2021.pdf
8. Rohatgi N, Weng Y, Bentley J, et al. Initiative for Prevention and Early Identification of Delirium in Medical-Surgical Units: Lessons Learned in the Past Five Years. *The American journal of medicine*. Dec 2019;132(12):1421-1430 e8. doi:10.1016/j.amjmed.2019.05.035
9. Ryan DJ, Regan NA, Caoimh RÓ, et al. Delirium in an adult acute hospital population: predictors, prevalence and detection. *BMJ Open*. 2013;3(1):e001772. doi:10.1136/bmjopen-2012-001772
10. Panitchote A, Tangvoraphonkchai K, Suebsoh N, et al. Under-recognition of delirium in older adults by nurses in the intensive care unit setting. *Aging Clin Exp Res*. Oct 2015;27(5):735-40. doi:10.1007/s40520-015-0323-6
11. El Hussein M, Hirst S, Salyers V. Factors that contribute to underrecognition of delirium by registered nurses in acute care settings: a scoping review of the literature to explain this phenomenon. *J Clin Nurs*. Apr 2015;24(7-8):906-15. doi:10.1111/jocn.12693
12. Blackpool Teaching Hospitals NHS Foundation Trust. *The Importance of Clinical Coding.* 2021. Accessed 10 Sep, 2021. https://www.blackpoolclinicalcoding.nhs.uk/index.php/the-importance-of-clinical-coding/.
13. Tsopra R, Peckham D, Beirne P, et al. The impact of three discharge coding methods on the accuracy of diagnostic coding and hospital reimbursement for inpatient medical care. *Int J Med Inform*. Jul 2018;115:35-42. doi:10.1016/j.ijmedinf.2018.03.015
14. Spencer RA, Rodgers S, Salema N, Campbell SM, Avery AJ. Processing discharge summaries in general practice: a qualitative interview study with GPs and practice managers. *BJGP Open*. 2019;3(1):bjgpopen18X101625-bjgpopen18X101625. doi:10.3399/bjgpopen18X101625
15. Page MJ, Moher D, Bossuyt PM, et al. PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. *BMJ*. 2021/03/29/ 2021:n160. doi:10.1136/bmj.n160
16. Marshall JT. The Sixth Revision of the International Lists of Diseases and Causes of Death. *The Milbank Memorial Fund Quarterly*. 1949;27(3):289-298. doi:10.2307/3348071
17. EPHPP. *McMaster Evidence Review & Synthesis Centre* blog. 2018. https://merst.ca/ephpp/

18. Bellelli G, Nobili A, Annoni G, et al. Under-detection of delirium and impact of neurocognitive deficits on in-hospital mortality among acute geriatric and medical wards. *Eur J Intern Med*. Nov 2015;26(9):696-704. doi:10.1016/j.ejim.2015.08.006
19. Campbell NL, Cantor BB, Hui SL, et al. Race and documentation of cognitive impairment in hospitalized older adults. *Journal of the American Geriatrics Society*. 2014;62(3):506-11. doi:https://dx.doi.org/10.1111/jgs.12691
20. Zalon ML, Sandhaus S, Kovaleski M, Roe-Prior P. Hospitalized Older Adults With Established Delirium: Recognition, Documentation, and Reporting. *Journal of Gerontological Nursing*. 2017;43(3):32-40. doi:https://dx.doi.org/10.3928/00989134-20161109-01
21. Welch C, McCluskey L, Wilson D, et al. Delirium is prevalent in older hospital inpatients and associated with adverse outcomes: results of a prospective multi-centre study on World Delirium Awareness Day. *BMC Medicine*. 2019;17(1):229. doi:10.1186/s12916-019-1458-7
22. Welch C, Jackson TA. Can delirium research activity impact on routine delirium recognition? A prospective cohort study. *BMJ open*. 2018;8(10):e023386. doi:https://dx.doi.org/10.1136/bmjopen-2018-023386
23. van Zyl LT, Davidson PR. Delirium in hospital: an underreported event at discharge. *Canadian journal of psychiatry Revue canadienne de psychiatrie*. 2003;48(8):555-60.
24. Smulter N, Claesson Lingehall H, Gustafson Y, Olofsson B, Engstrom KG. The use of a screening scale improves the recognition of delirium in older patients after cardiac surgery-A retrospective observational study. *Journal of Clinical Nursing*. 2019;28(11-12):2309-2318. doi:https://dx.doi.org/10.1111/jocn.14838
25. Sanchez JC, Gonzalez MI, Gutierrez JC, Aizawa ACCEFFGGGTGGGGSGSIIIIIL-DLMVMGM. Delirium in patients over 60 years of age in a tertiary level public hospital in the city of Pereira (Colombia): Under-diagnosed and under-recorded. *Delirium en pacientes mayores de 60 anos en un hospital publico de tercer nivel en la ciudad de pereira (Colombia): Subdiagnostico y subregistro*. 2013;42(2):191-197. doi:http://dx.doi.org/10.1016/S0034-7450%2813%2970006-4
26. Ruangratsamee S, Assanasen J, Praditsuwan R, Srinonprasert V. Unrecognized Delirium is Prevalent among Older Patients Admitted to General Medical Wards and Lead to Higher Mortality Rate. *Journal of the Medical Association of Thailand = Chotmaihet thangphaet*. 2016;99(8):904-12.
27. Pendlebury ST, Lovett NG, Thomson RJ, Smith SC. Impact of a system-wide multicomponent intervention on administrative diagnostic coding for delirium and other cognitive frailty syndromes: observational prospective study. *Clinical Medicine*. 2020;20(5):454-462. doi:10.7861/clinmed.2019-0470
28. McCoy TH, Jr., Chaukos DC, Snapper LA, Hart KL, Stern TA, Perlis RH. Enhancing Delirium Case Definitions in Electronic Health Records Using Clinical Free Text. *Psychosomatics*. 2017;58(2):113-120. doi:https://dx.doi.org/10.1016/j.psym.2016.10.007
29. Kelly P, Frosch E. Recognition of delirium on pediatric hospital services. *Psychosomatics*. 2012;53(5):446-51. doi:https://dx.doi.org/10.1016/j.psym.2012.04.012
30. Katznelson R, Djaiani G, Tait G, et al. Hospital administrative database underestimates delirium rate after cardiac surgery. *Canadian journal of anaesthesia = Journal canadien d'anesthesie*. 2010;57(10):898-902. doi:https://dx.doi.org/10.1007/s12630-010-9355-8
31. Kales HC, Kamholz BA, Visnic SG, Blow FC. Recorded delirium in a national sample of elderly inpatients: Potential implications for recognition. *Journal of Geriatric Psychiatry and Neurology*. 2003;16(1):32-38. doi:10.1177/0891988702250535
32. Inouye SK, Leo-Summers L, Zhang Y, Bogardus ST, Jr., Leslie DL, Agostini JV. A chart-based method for identification of delirium: validation compared with interviewer ratings using the confusion assessment method. *Journal of the American Geriatrics Society*. 2005;53(2):312-8.
33. Hope C, Estrada N, Weir C, Teng C-C, Damal K, Sauer BC. Documentation of delirium in the VA electronic health record. *BMC research notes*. 2014;7:208. doi:https://dx.doi.org/10.1186/1756-0500-7-208

34. Heriot NR, Levinson MR, Mills AC, Khine TT, Gellie AL, Sritharan G. Diagnosing delirium in very elderly intensive care patients. *Intensive & critical care nursing*. 2017;38:10-17. doi:https://dx.doi.org/10.1016/j.iccn.2016.07.002
35. Glick RE, Sanders KM, Stern TA. Failure to record delirium as a complication of intra-aortic balloon pump treatment: a retrospective study. *Journal of Geriatric Psychiatry and Neurology*. 1996;9(2):97-9.
36. Detweiler MB, Kenneth A, Bader G, et al. Can improved intra- and inter-team communication reduce missed delirium? *The Psychiatric quarterly*. 2014;85(2):211-24. doi:https://dx.doi.org/10.1007/s11126-013-9284-0
37. Chuen VL, Chan ACH, Ma J, Alibhai SMH, Chau V. The frequency and quality of delirium documentation in discharge summaries. *BMC Geriatrics*. 2021;21(1):307. doi:10.1186/s12877-021-02245-3
38. Casey P, Cross W, Mart MW-S, Baldwin C, Riddell K, Darzins P. Hospital discharge data under-reports delirium occurrence: results from a point prevalence survey of delirium in a major Australian health service. *Internal Medicine Journal*. 2019;49(3):338-344. doi:https://dx.doi.org/10.1111/imj.14066
39. Bui LN, Pham VP, Shirkey BA, Swan JT. Effect of delirium motoric subtypes on administrative documentation of delirium in the surgical intensive care unit. *Journal of Clinical Monitoring and Computing*. 2017;31(3):631-640. doi:https://dx.doi.org/10.1007/s10877-016-9873-1
40. Bellelli G, Nobili A, Annoni G, et al. Under-detection of delirium and impact of neurocognitive deficits on in-hospital mortality among acute geriatric and medical wards. *European Journal of Internal Medicine*. 2015;26(9):696-704. doi:https://dx.doi.org/10.1016/j.ejim.2015.08.006
41. Alhaidari AA, Allen-Narker RA. An evolving approach to delirium: A mixed-methods process evaluation of a hospital-wide delirium program in New Zealand. *Australasian journal on ageing*. 2017;36(2):E20-E26. doi:https://dx.doi.org/10.1111/ajag.12406
42. Johnson JC, Kerse NM, Gottlieb G, Wanich C, Sullivan E, Chen K. Prospective versus Retrospective Methods of Identifying Patients with Delirium. https://doi.org/10.1111/j.1532-5415.1992.tb02128.x. *Journal of the American Geriatrics Society*. 1992/04/01 1992;40(4):316-319. doi:https://doi.org/10.1111/j.1532-5415.1992.tb02128.x
43. McHugh ML. Interrater reliability: the kappa statistic. *Biochem Med (Zagreb)*. 2012;22(3):276-282.
44. Google Translate. Accessed 14 Dec, 2021. https://translate.google.co.uk/.
45. WHO. World Health Organization. The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. Geneva. 2019.
46. WHO. World Health Organization. The ICD-9 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. Geneva. 1978.
47. Dechnik A, Traube C. Delirium in hospitalised children. *Lancet Child Adolesc Health*. Apr 2020;4(4):312-321. doi:10.1016/S2352-4642(19)30377-3
48. Oldham MA. Delirium disorder: Unity in diversity. *General Hospital Psychiatry*. 2022/01/01/ 2022;74:32-38. doi:https://doi.org/10.1016/j.genhosppsych.2021.11.007
49. Pendlebury ST. Delirium screening in older patients. *Age and Ageing*. 2018;47(5):635-637. doi:10.1093/ageing/afy103
50. Schwartz RC, Blankenship DM. Racial disparities in psychotic disorder diagnosis: A review of empirical literature. *World J Psychiatry*. 2014;4(2220-3206 (Print)):133-140. doi:10.5498/wjp.v4.i4.133

Tables

Table 1: *Summary of included studies*

Author, year of publication	Country	Study design	Type of Hospital (unit)	Mean Age (SD)[a]	Summary of study aims	Summary of study selection criteria
Alhaidari et al, 2018	New Zealand	Retrospective review of medical records	Tertiary teaching hospital (general medicine)	N/A	To assess and potentially improve a hospital-wide delirium program.	Latest 100 general medicine patients discharged prior to 14 September 2014 with a minimal LOS of three days.
Bellelli et al, 2015	Italy	Prospective cohort multicentre study	Acute hospitals (medical wards)	79.1 (7.3)	To describe the prevalence and impact on in-hospital mortality of delirium identified through ICD-9 codes.	Adults aged ≥65 years who underwent SBT assessment within 72 hours of admission.
Bui et al, 2017	United States	Retrospective cohort study	Tertiary academic medical centre (surgical ICU)	61.0 (16.0)	To compare the proportions of surgical ICU patients with delirium detected using CAM-ICU who received administrative delirium documentation.	Adults aged ≥18 years admitted to surgical ICU from 1 June 2012 to 31 May 2013.
Campbell et al, 2014	United States	Secondary data analysis from an RCT	Public hospital (general medical ward)	Overall: N/A African American: 78.6 (8.3) Non-African American: 75.3 (7.4)	To evaluate the influence of race in the screening and documentation of delirium.	Adults aged ≥65 years admitted to a general medical ward of Eskenazi Hospital who spoke English.
Casey et al, 2019	Australia	Cross-sectional point prevalence survey	Australian metropolitan public health service consisting of 5 hospitals	73.0 (16.4)	To determine the extent to which ICD codes represent delirium occurrence.	Adults aged ≥18 years admitted as overnight stay on medical, surgical, specialist medicine, rehabilitation, or palliative care wards.
Chuen et al, 2021	Canada	Retrospective chart review	Academic tertiary acute care Hospital (medical and surgical)	79.6 (8.4)	To determine the frequency and quality of delirium documentation in DS.	Adults aged ≥65 years admitted to any one of 3 academic tertiary acute care hospitals by a medical or surgical service between 1 April and 30 June 2016.
Detweiler et al, 2014	United States	Retrospective review of medical records	Veterans medical centre (ED, medicine, surgery, psychiatry and consult liaison)	70.0 (12.9)	To assess the prevalence of missed delirium in acute care veterans coded as not having a diagnosis of delirium.	Inpatient cases of veterans that had not been coded at admission and/or discharge as having delirium
Glick et al, 1996	United States	Retrospective chart review	General hospital (N/A)	63.8 (N/A)	To determine whether diagnosis and treatment of delirium in IABP- treated patients correlates with delirium recording at discharge.	IABP placement at the Massachusetts General Hospital in 1988.
Heriot et al, 2017	Australia	Retrospective study	Large metropolitan private hospital (CICM)	N/A	To compare incidences of delirium in elderly intensive care patients.	Participants drawn from a larger 24 month QoL follow-up study in patients aged ≥80 years following ICU admission.

Author, year of publication	Country	Study design	Type of Hospital (unit)	Mean Age (SD)[a]	Summary of study aims	Summary of study selection criteria
Hope et al, 2014	United States	Stimulated reporting design and chart review	VA medical facility (acute medicine, surgery, neurology and ICU)	Documented delirium: 68.4 (12.0) Undocumented delirium: 71.0 (12.2)	To assess how confirmed cases of delirium are documented in EHR.	Admitted patients with bedside diagnosis of delirium between 1 December 2009 and 31 May 2010.
Inouye et al, 2005	United States	Prospective validation study	Urban teaching hospital (general medicine)	80.0 (6.5)	To validate a chart-based method for identification of delirium and compare it with direct interviewer assessment.	Patients aged ≥70 years with no delirium on admission, but at least intermediate risk for delirium at baseline.
Johnson et al, 1992	United States	Prospective observational design and retrospective record review	University hospital (non-critical care medical unit)	N/A	To determine the sensitivity of using alternative retrospective approaches for diagnosing delirium.	Medically ill patients aged >70 years admitted between Sunday afternoons and Friday evenings who were not patient transfers, terminally ill, not admitted on weekends or for short-stays.
Kales et al, 2003	United States	Retrospective study	VA medical facility	72.0 (7.4)	To determine the rate of recorded delirium.	Veterans aged ≥60 years at discharge with ICD-9CM code from VA.
Katznelson et al, 2010	Canada	Prospective and retrospective study	General hospital (ICU)	63.0 (13.0)	To determine the incidence of delirium after cardiac surgery.	Cardiac surgical patients.
Kelly et al, 2012	United States	Retrospective chart review	Tertiary referral hospital (surgery, oncology, neurology, PICU, general paediatrics, haematology, cardiology and pulmonology)	N/A	To identify the frequency of recognised and documented delirium at discharge.	Discharged patients between January 2003 and January 2011
McCoy et al, 2017	United States	N/A	Academic medical centres	57.0 (18.7)	To characterise incidence of recorded delirium across 2 major health centres.	Inpatients aged ≥18 years with documented discharge from non-obstetrical care between 2005 and 2013.
Pendlebury et al, 2020	United Kingdom	Prospective observational study	General hospital (acute general medicine)	70.0 (19.2)	To determine the impact of the multicomponent intervention on hospital administrative coding for delirium.	Consecutive unselected admissions to one acute medicine team over five 8-week cycles.
Ruangratsamee et al, 2016	Thailand	Prospective and retrospective patient evaluation	Tertiary referral hospital (geriatric medicine)	78.6 (5.9)	To investigate the rate of under-recognised delirium and explore the effect of unrecognised delirium on patient mortality.	Adults aged ≥70 years admitted to general medicine between January and March 2009.
Sanchez et al, 2013	Colombia	Cross-sectional study	Tertiary hospital (acute medicine)	N/A	To clarify the state of delirium diagnosis and records in a tertiary level public hospital in the city of Pereira.	Hospitalised adults aged >60 years.
Smulter et al, 2019	Sweden	Retrospective observational analysis	University hospital (cardiothoracic surgery)	N/A	To analyse POD in clinical practice after cardiac surgery.	Adults aged ≥70 years scheduled for routine cardiac surgery with the use of cardiopulmonary bypass.

Author, year of publication	Country	Study design	Type of Hospital (unit)	Mean Age (SD)[a]	Summary of study aims	Summary of study selection criteria
van Zyl et al, 2003	Canada	Chart review	General teaching hospital (psychiatry)	73.3 (13.8)	To investigate prevalence of delirium reporting in DS.	Referrals to a consultation-liaison psychiatry service in a university teaching general hospital between July 2000 and September 2001.
Welch et al, 2018	United Kingdom	Prospective cohort study	Tertiary university teaching hospital (acute admissions)	84.4 (N/A)	To assess if ongoing delirium research activity within an acute admissions unit impacts on prevalent delirium recognition.	Patients aged ≥70 years diagnosed with delirium.
Welch et al, 2019	United Kingdom	Prospective observational study	Acute care trusts (acute medicine, geriatric medicine, other medicine, stroke, general, orthopaedic surgery and other surgery)	80.0 (8.3)	To ascertain the point prevalence of delirium across UK hospitals and the relationship to adverse outcomes.	Hospitalised adults aged ≥65 years, admitted between 12 March 2018 and 14th March 2018.
Zalon et al, 2017	United States	Retrospective chart review	Community hospital	N/A	To analyse delirium documentation for hospitalised older adults.	Hospitalised patients aged ≥71 years, with known delirium who were enrolled in HELP at a community hospital.

a: Mean age is provided where reported. SD = standard deviation.

Table abbreviations - CAM-ICU: Confusion Assessment Method (Intensive Care Unit), CICM: College of Intensive Care Medicine, ED: Emergency Department, EHR: Electronic Health Record, HELP: Hospital Elder Life Program, IABP: Intra-Aortic Balloon Pump, ICD-(9, 9CM): International Classification of Diseases (9th Revision, 9th Revision Clinical Modification), ICU: Intensive Care Unit, LOS: Length of Stay, PICU: Paediatric Intensive Care Unit, POD: Post-Operative Delirium, RCT: Randomised Controlled Trial, UK: United Kingdom, VA: Veterans Affairs.

Table 2: *Delirium documentation and coding rates in studies with and without additional delirium ascertainment methods*

Author, year of publication	RoB rating[a]	Sample size (female %)	No. of patients with ascertained delirium (prevalence rate %)[b]	No. of Patients with delirium in DS (%)[c]	No. of patients with delirium in HAS (%)[d]	Delirium ascertainment method	Hospital coding format
Alhaidari et al, 2017	M	100 (46.0)	49/100 (49.0)	19/49 (38.8)	19/39 (48.7)[e]	Documented features sufficient to fulfil short CAM	ICD-10
Bui et al, 2017	M	1055 (51.0)	423/1055 (40.1)	N/A	22/423 (5.2)	CAM-ICU	ICD-9-CM
Campbell et al, 2014	L	424 (N/A)	163/424 (38.4)	N/A	52/163 (31.9)	CAM	ICD-9
Casey et al, 2019	H	559 (54.6)	91/559 (16.3)	N/A	Overall: 58/559 (10.3) Study-ascertained delirium: 31/91 (34.1)	4AT 3D-CAM	ICD-10
Chuen et al, 2021	H	110 (44.5)	110/110 (100.0)	70/110 (63.6)	N/A	CHART-DEL	N/A
Detweiler et al, 2014	H	183 (3.3)	52/183 (28.4)	5/52 (9.6)	N/A	DSM-IV TR	N/A
Glick et al, 1996	H	Overall: 195 (N/A) Sub-study: 67 (N/A)[f]	67/195 (34.4)	Overall: 12/195 (6.2) Sub-study: 8/67 (11.9)[f]	N/A	DSM-III	N/A
Heriot et al, 2017	M	348 (41.9)	104/348 (29.9)	N/A	36/104 (34.6)	DSM-IV Chart review	ICD-10
Hope et al, 2014	H	25[g] (4.0)	25/25[g] (100.0)	11/25 (44.0)	7/25 (28.0)	DMHC notes Chart review	ICD-9
Inouye et al, 2005	H	919 (60.0)	115/919 (12.5)	N/A	3/115 (2.6)	CAM MMSE	ICD-9CM
Johnson et al, 1992	H	235 (N/A)	48/235 (20.4)	N/A	2/47[h] (4.3)	MMSE BPRS DSM-III Clinical/Psychiatric examination	ICD-9CM
Katznelson et al, 2010	M	1528 (29.0)	182/1528 (11.8)	N/A	46/182 (25.3)	CAM-ICU	ICD-10
Pendlebury et al, 2020	M	1281 (52.0)	320/1281 (25.0)	N/A	111/320 (34.7)[i]	DSM-IV	ICD-10[j]
Ruangratsamee et al, 2016	M	225 (59.1)	110/225 (48.9)	16/110 (14.5)	N/A	DSM-IV	N/A
Sanchez et al, 2013	H	5325 (N/A)	410/5325 (7.7)	N/A	N/A (29.5)	DSM-IV	ICD-10
Smulter et al, 2019	M	142 (30.8)	78/142 (54.9)	41/78 (52.6)	16/78 (20.5)	OBS Scale MMSE DSM-IV-TR	ICD-10
van Zyl et al, 2003	H	31 (64.5)	31/31 (100.0)	5/31 (16.1)	N/A	DSM-IV DRS DRS-R-98	N/A
Welch et al, 2018	M	1327 (62.0)	125/1327 (9.4)	61/125 (49.0)	N/A	DSM-IV	N/A
Welch et al, 2019	H	1507 (54.2)	222/1507 (14.7)	44/154 (28.6)[j]	N/A	4AT DSM-V	N/A
Zalon et al, 2017	H	34 (82.4)	34/34 (100.0)	1/34 (2.9)	13/34 (38.2)	CAM	ICD-9

Studies which did not use additional delirium ascertainment methods

Author, year of publication	RoB rating[a]	Sample size (female %)	No. of patients with ascertained delirium (prevalence rate %)[b]	No. of Patients with delirium in DS (%)[c]	No. of patients with delirium in HAS (%)[d]	Delirium ascertainment method	Hospital coding format
Bellelli et al, 2015	L	2521 (50.8)	N/A	N/A	72/2521 (2.9)	N/A	ICD-9
Kales et al, 2003	H	267947 (2.0)	N/A	N/A	3978/267947 (1.5)[m]	N/A	ICD-9CM
Kelly et al, 2012	H	Overall: 64046 (44.0) Sub-study: 53 (N/A)[l]	N/A	Overall: 89/64046 (0.1)[k] Sub-study: 8/53 (15.1)[l]	N/A	N/A	'Delirium' or 'encephalopathy' in 'discharge problem list'
McCoy et al, 2017	H	809512 (54.8)	N/A	7579/809512 (0.9)[k]	27513/809512 (3.4)[m]	N/A	ICD-9

a. RoB = Risk of Bias. RoB was assessed using the EPHPP tool. In this table, we provide the Global RoB rating.
*b. Number of patients with study-ascertained delirium is provided in relation to the overall sample size. We assessed study prevalence rate for delirium as the number of patients with delirium (cases), as assessed by the study delirium ascertainment method, divided by the overall sample size * 100.*
c. Number of patients with delirium in discharge summary in relation to study-ascertained delirium N (%) and/or in relation to whole study sample if different.
d. Number of patients with delirium in hospital administrative databases in relation to study-ascertained delirium N (%) and/or in relation to whole study sample if different.
e. The authors reported ICD-9 coding rates in 39 of the 49 patients with delirium documented in clinical records.
f. The authors reported on a sub-group of patients who had diagnosis of delirium made by a retrospective chart review.
g. The authors reported documentation and coding rates in reference to the overall sample size (N=25).
h. The authors reported patient records for 47 of the 48 patients with delirium were available.
i. Though the authors reported an overall coding rate of 34.7% in HAS, there was a big increase over time in coding rates from 12.8% in 2010 to 60.2% in 2018.
j. The authors reported that discharge documentation were available for 154 of the 222 patients identified with study-ascertained delirium.
k. Number of patients with delirium in DS in relation to whole study sample N(%).
l. The authors also reported on a sub-group of patients who had a diagnosis of delirium previously made by the clinical team.
m. Number of patients with delirium in HAS in relation to whole study sample N(%).

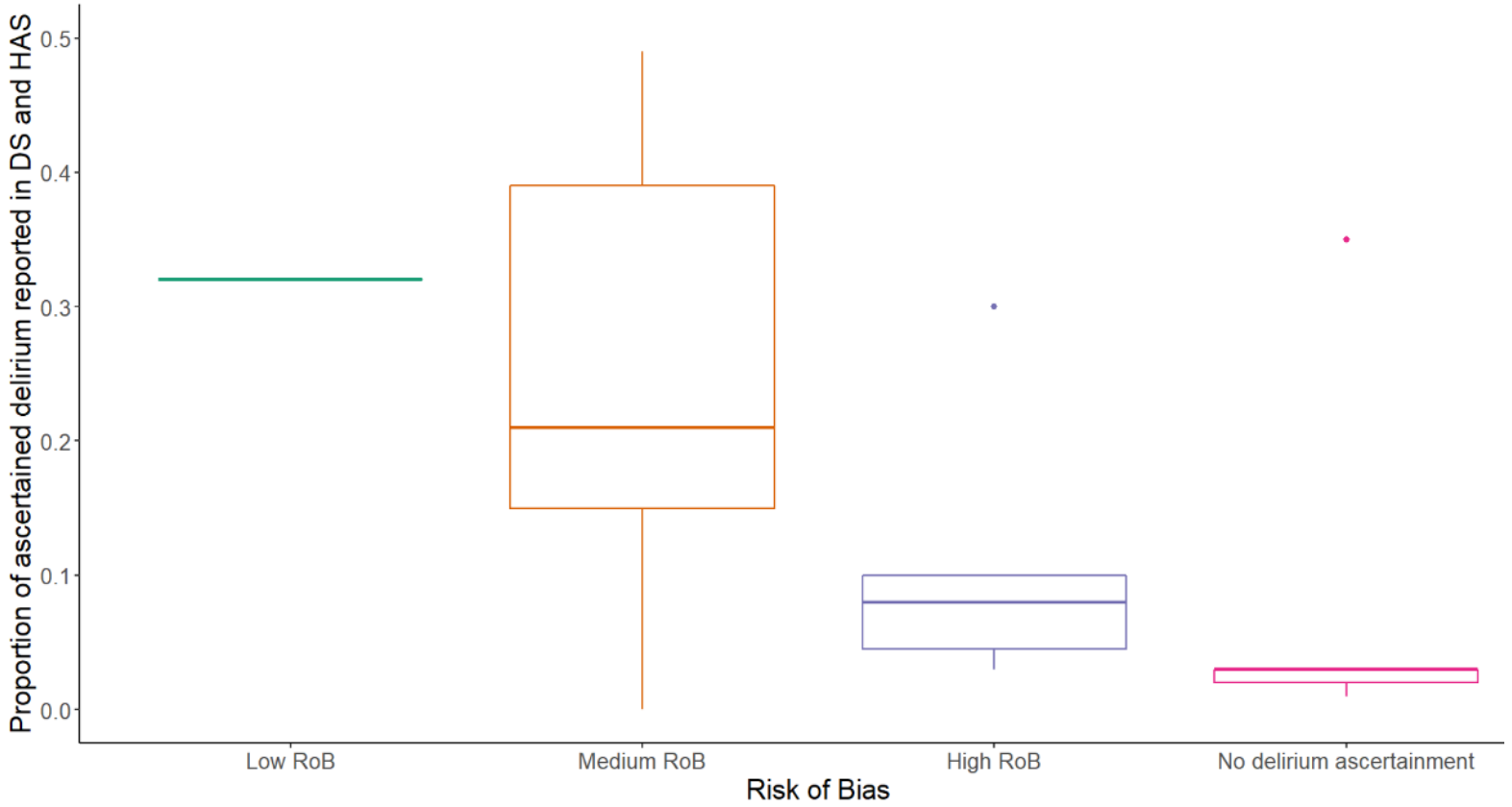
Data not given in published study or where data is not applicable is denoted as "N/A" (not available/applicable).

All values rounded to 1 decimal place.

Table abbreviations - 3D-CAM: 3 Minute Diagnostic Assessment using Confusion Assessment Method, 4AT: The 4 'A's Test, BPRS: Brief Psychiatric Rating Scale, CAM-(ICU): Confusion Assessment Method (Intensive Care Unit), CHART-DEL: Chart-based Delirium Identification Instrument, DMHC: Delirium Mental Health Consult, DRS: Delirium Rating Scale, DRS-R-98: Delirium Rating Scale Revised, DSM (III, IV, IV-TR, V): Diagnostic and Statistical Manual of Mental Disorders (3rd Edition, 4th Edition, 4th Edition-Text Revision, 5th Edition), ICD- (9, 9CM, 10): International Classification of Diseases (9th Revision, 9th Revision Clinical Modification, 10th Revision), MMSE: Mini-Mental State Examination, OBS Scale: Organic Brain Syndrome Scale.

Figures

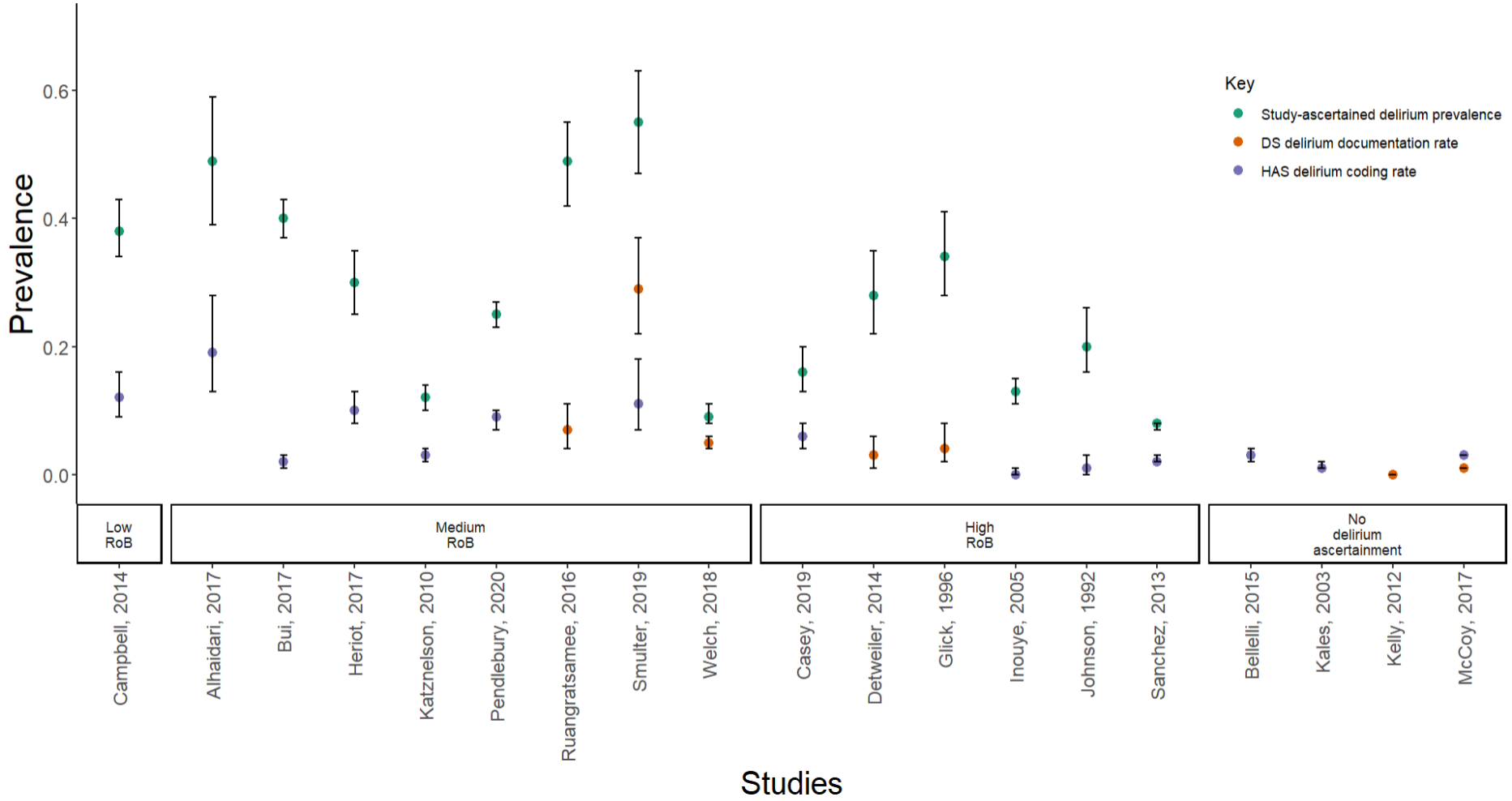
Figure 1. *Proportion of delirium discharge summary documentation and hospital administrative coding rates*



[1] Figure 1 presents the proportion of ascertained delirium documented or coded in discharge summary documentation (DS) and hospital administrative system (HAS) respectively, from eligible studies. Documentation and coding rates are expressed as a fraction of the ascertained delirium sample size.

[2] We excluded studies where the overall sample comprised 100% delirium patients as determined by, e.g., retrospective chart review. As a result, the following studies were excluded: Chuen et al., 2021, Hope et al., 2014, van Zyl et al., 2003 and Zalon et al., 2007. We also excluded Welch et al., 2019; the authors reported that discharge documentation were available for 154 of the 222 patients identified with study-ascertained delirium.

Figure 2. Study-ascertained delirium, DS Documentation and HAS Coding Rates



[1] Figure 2 presents studies that reported study-ascertained delirium prevalence from a sample and reported DS documentation and/or HAS coding rates. We excluded studies where the overall sample comprised 100% delirium patients as determined by, e.g., retrospective chart review. As a result, the following studies were excluded: Chuen et al., 2021, Hope et al., 2014, van Zyl et al., 2003 and Zalon et al., 2007. We also excluded Welch et al., 2019; the authors reported that discharge documentation were available for 154 of the 222 patients identified with study-ascertained delirium.
[2] DS documentation and/or HAS coding rates are expressed as a fraction of the overall sample size.
[3] 95% confidence intervals are represented by the vertical black bars