Association of point prevalence diagnosis of delirium on length of stay, 6-month mortality, and level of care on discharge at Waitemata District Health Board, Auckland

Aik Haw Tan, John Scott

Abstract

Background Delirium in hospitalised older persons is common and is correlated with adverse outcomes. Few studies of this have been done in New Zealand. The study aimed to measure the impact of delirium on 6-month mortality, length of inpatient stay and level of care.

Method We performed a retrospective analysis utilising data from the Delirium Point Prevalence Audit conducted at Waitemata District Health Board. The subjects were older inpatients (>65 years) surveyed between 15/05/2012 to 24/07/2012. Delirium was defined as screening positive on the Confusion Assessment Method (CAM). Patients were dichotomised into those with delirium or without.

Results 250 patients were identified. 28(11.2%) were CAM-positive while 222 (88.8%) were CAM-negative. Mortality at 6 months for the CAM-positive group was 39%, compared to 10% in the CAM-negative group (p<0.005). The mean inpatient day stay for the CAM-positive group was 25.4 days; for the CAM-negative group it was 21.6 days (p=0.721). The proportion requiring an increased level of care at discharge was 66.6% for the CAM-positive group, while for CAM-negative persons the rate was 13.8% (p<0.00003).

Conclusion In hospitalised older adults, the presence of a positive CAM test for delirium was strongly associated with both a higher mortality rate at 6 months and a requirement for an increased level of care at discharge as compared to a negative CAM. No effect was observed on inpatient length of stay.

Delirium is defined as an acute change in cognition that occurs within a few hours to days that cannot be accounted for by pre-existing dementia or cognitive impairment.10,11,15 It is very common in hospitalised older adults, with a reported range in studies of medical inpatients of 15–40%1–7 and in the post-surgical setting of 7–52%.1–7

The impact of delirium in the older adults is typically measured by looking at mortality rates, change in level of care and length of inpatient stay.3,7–9,12,13,26,27 A common finding is that delirium is highly correlated with rates of mortality 6–12 months after diagnosis, and also with an increased rate of institutionalisation. Some studies that suggest that inpatient delirium is associated with an increased length of inpatient stay, although this is not consistent.3,7–9,12,13,26,27

Mortality—Most studies show a strong association between inpatient delirium and an increased risk of death between 3 months and 1 year later (see Table 1).7,8,16–19 This association has been noted from medical inpatient, emergency department, and ICU-based studies.8,19 However McAvay et al found that resolution of delirium while an inpatient removed the increase in mortality.16–18
Table 1. Delirium and mortality

<table>
<thead>
<tr>
<th>Authors</th>
<th>Setting</th>
<th>Number</th>
<th>Age</th>
<th>Duration of followup</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>McCusker et al. (2002)</td>
<td>Medical inpatients</td>
<td>Delirium: 243</td>
<td>&gt;65, both groups similar in age on multivariate analysis</td>
<td>12 months</td>
<td>Unadjusted HR 3.44 (95% CI 2.05-5.75)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control: 118</td>
<td></td>
<td></td>
<td>Adjusted HR 2.11 (95% CI 1.18-3.77)</td>
</tr>
<tr>
<td>Han et al. (2010)</td>
<td>Emergency Department</td>
<td>Delirium 108</td>
<td></td>
<td>6 months</td>
<td>HR 1.72 (95%CI 1.04-2.86)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control 520</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McAvay et al. (2006)</td>
<td>Inpatient, medical</td>
<td>Delirium: Resolved 31 Did not 24 Control 378</td>
<td>Resolved 80.2+/7.1 Did not 79.6+/6.1 Control 81.8+/8.1</td>
<td>1 year</td>
<td>Unresolved HR 2.64 (95% CI 1.60-4.35) Resolved HR 1.53 (95% CI 0.96-2.43)</td>
</tr>
<tr>
<td>Van den Boogard (2010)</td>
<td>ICU</td>
<td>Delirium 332</td>
<td>Delirium 61+/35 Delirium 66+/14</td>
<td>Inhospital, up to six months</td>
<td>OR 3.22 (95%CI 2.23-4.66)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control 1408</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gonzalez (2009)</td>
<td>Medical inpatient</td>
<td>Delirium 192</td>
<td>Delirium 81.5 Control 75.8</td>
<td>3 months</td>
<td>25.9% delirious died as opposed 5.8% non delirious, p&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control 350</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Level of care**—Most studies show an association between inpatient delirium and an increased risk of institutionalisation (see Table 2). Some studies have assessed institutionalisation at discharge while others have measured the status 3 to 6 months after discharge. McAvay found that even if delirium resolved as an inpatient, the rate of institutionalisation was still higher compared to controls.18

Table 2. Delirium and level of care

<table>
<thead>
<tr>
<th>Author</th>
<th>Setting</th>
<th>Number</th>
<th>Age</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>McCusker et al. (2001)</td>
<td>Older hospital inpatient</td>
<td>Delirium and dementia 164 Only Delirium 56 Only dementia 53 No dementia or delirium 42</td>
<td>All equal, &gt;65</td>
<td>Patients with delirium and dementia likely require higher level of care (Adjusted O/R 3.18, 95% CI 1.19 to 8.49).</td>
</tr>
<tr>
<td>Inouye et al. (1998)</td>
<td>Medical ward</td>
<td>Delirium 88 Non delirium 639</td>
<td>Not stated but overall age 78.9</td>
<td>OR for three month new resthome placement 3.0 (95% CI 1.5-6.0)</td>
</tr>
<tr>
<td>McAvay et al. (2006)</td>
<td>Inpatient, medical</td>
<td>Delirium: Resolved 31 Did not 24 Control 378</td>
<td>Resolved 80.2+/7.1 Did not 79.6+/6.1 Control 81.8+/8.1</td>
<td>Delirium did not resolve, HR 2.64 (95% CI = 1.60-4.35) Delirium resolved, HR 1.6, 95% CI 1.04-3.13</td>
</tr>
<tr>
<td>Adams (2006)</td>
<td>Inpatient elderly care unit</td>
<td>Delirium 33 None 61</td>
<td>Not reported but group mean age 82.8+/6.5</td>
<td>Significant risk of being discharged into a new cared setting, p&lt;0.01</td>
</tr>
<tr>
<td>George (1997)</td>
<td>Hospital inpatient</td>
<td>Delirium 171 Control 95</td>
<td>Delirium = 81 years Control = 80 years</td>
<td>OR to new residential care in six months 4.3 (95% CI 1.58-14.59)</td>
</tr>
</tbody>
</table>
Length of stay—This is a frequently measured outcome in many delirium studies,3,7,20–24 usually defined as total number of days the patient stays in an inpatient unit or hospital.20–24 Most studies show a trend towards longer length of stay with delirium, though this often does not reach statistical difference (see Table 3).7,20–24

The literature also suggests that certain subtypes of delirium may be associated with increased length of stay; for example McCusker found that new onset delirium during an inpatient admission was associated with increased length of stay but that being delirious at admission did not change length of stay.20 O’Keefe found that hypoactive delirium was associated with statistically increased length of stay.22

Table 3. Delirium and length of stay

<table>
<thead>
<tr>
<th>Author</th>
<th>Setting</th>
<th>Number</th>
<th>Age</th>
<th>Length of stay (LOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>McCusker (2003)</td>
<td>Medical Inpatient</td>
<td>Prevalent:- Delirium 204 Incident: Delirium 37 No delirium:- Control 118</td>
<td>Prevalent: - 83.61+/- 7.4 Incident: - 82.30+/- 6.28 Control: - 83.64+/- 6.56</td>
<td>- No increase with prevalence - Incidence increases excess day of stay by 7.78 days (95%CI 3.07-12.48)</td>
</tr>
<tr>
<td>Adams (2006)</td>
<td>Inpatient elderly care unit</td>
<td>Delirium 33 None 61</td>
<td>Not reported but group mean age 82.8+/-6.5</td>
<td>Longer LOS with delirium, (Mann–Whitney U 972.5, p = 0.047)</td>
</tr>
<tr>
<td>O’Keefe (1999)</td>
<td>Acute geriatric unit</td>
<td>Delirium Subtype:- Retarded 27 Agtitated 20 Mixed 40</td>
<td>Retarded: 83 years Agitated: 82 years Mixed: 82 years</td>
<td>Only retarded/Hypoactive delirium stayed longer. p&lt;0.005</td>
</tr>
<tr>
<td>Han et al. (2011)</td>
<td>Emergency department</td>
<td>Delirium 108 None 520</td>
<td>Delirium: 78 years No delirium: 74</td>
<td>Median LOS delirium 2 days (0 5.5), non delirious 1 day (0-3). P&lt;0.0001</td>
</tr>
<tr>
<td>Inouye et al. (1998)</td>
<td>Medical ward</td>
<td>Delirium 88 Non delirium 639</td>
<td>Not stated but overall age 78.9</td>
<td>Delirium (6.5 ) versus delirium (7.3 days), P=0.07</td>
</tr>
</tbody>
</table>

To our knowledge there is only one other published study looking at delirium outcomes in New Zealand—a study by Holden et al that reported data from Kenepuru and the Hutt Hospitals.26

That study sampled 216 adults over age 65 in a medical inpatient setting. Delirium was assessed with the Confusion Assessment Method (CAM). In this cohort of patients, 56 patients were CAM-positive, giving a prevalence of 23.4% and an incidence of 5.7%.26

Holden et al reported an inpatient mortality of 7% in their population with delirium as opposed to 3.7% in those with no delirium. However this did not reach statistical significance. Length of inpatient stay for patients with delirium was eight days versus four days for those without, though no significance value was given. Delirium was strongly associated with requiring higher level of care on discharge, with a p-value of <0.001.26

Research question—To determine if a diagnosis of delirium in elderly inpatients (>65 years ) made during a point prevalence study was associated with mortality at 6 months post diagnosis, length of stay in the hospital (total inpatient stay ), and /or a change in level of care from admission to discharge.
Method

The study is an extension of the Delirium Point Prevalence Audit conducted at the Waitemata District Health Board which started in 2012. The study is registered under RM12152 with an ethics approval number of NTX/12/EXP/052.

The main audit aimed to assess all elderly patients once every fortnight for a period of 18 months in one medical ward, one orthopaedic ward and one assessment, treatment and rehabilitation ward.

Delirium was assessed in the audit using the Confusion Assessment Method (CAM) Diagnostic Algorithm. All audit patients were administered the Mini Mental State Examination (MMSE) which served as a standardised clinical interaction during which the subject was observed for signs of inattention, altered level of consciousness or disorganised thinking. If any of these were observed, further information was sought to determine whether or not the observed findings represented an acute departure from the subjects’ normal state.

The assessment was done by a team of doctors, specialist nurses, and occupational therapists who were trained in administration of the CAM and used the CAM training manual and coding guide.

The study excluded patients who were unable to communicate in English, who were not available for assessment at the time of ward visit by the audit team, who declined consent, or who in the clinical judgment of the interviewer were too unwell to be burdened with assessment.

A positive CAM is assumed to be equivalent to a diagnosis of delirium. A negative CAM is taken to be equivalent of having no delirium at the time of the audit. However in common with all studies of delirium ascertainment will have been less than 100% as it is inevitable that some persons with resolved delirium, or who had not yet developed delirium, were included in the “negative” count.

All three outcome measures are based on information recorded in the patient management system used throughout Waitemata District Health Board. Mortality at 6 months was timed from the date of the CAM assessment. (PIMS data is updated at least 3-monthly with information from Births, Deaths and Marriages)

Inpatient stay is defined as the time from admission into hospital to the time of discharge back into the community or into long term residential care. Inter-hospital transfers, where a patient is transferred from one hospital to another for medical treatment or investigations as well as inter-ward transfers were all counted as part of the total inpatient stay.

Increase in level of care is defined as persons living in the community being discharged to residential aged care facilities, or persons in lower level (rest home) care prior to admission being discharged to private hospital care.

In addition to the entry criteria to the Point Prevalence Study, to be included in this extension study, the patient had to have a CAM score, be over 65, have attempted between 28 to 30 questions of the MMSE, and have been in audit cycles 3 to 7 (15/05/2012 to 24/07/2012).

Exclusion criteria for this study is anyone under 65 years of age, incorrect NHI, absent CAM scores, less than 28 questions of the MMSE attempted and inability to communicate in English.

Results

There were 341 assessments attempted during the above audit cycle. 75 were excluded due to incomplete forms/wrong NHI, 14 were duplicates (i.e. patients were in hospital during more than one audit cycle and thus assessed more than once), 3 were excluded as the total attempted MMSE questions were below 28.

As a result, 250 patients were included in this analysis.
Table 4. Characteristics of CAM-positive and CAM-negative patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>CAM-positive</th>
<th>CAM-negative</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>28 (11.2%)</td>
<td>222 (88.8%)</td>
<td>P=0.06</td>
</tr>
<tr>
<td>Age</td>
<td>83.44</td>
<td>79.86</td>
<td>P=0.06</td>
</tr>
<tr>
<td>MMSE total</td>
<td>13.92</td>
<td>23.0</td>
<td>P&lt;0.001</td>
</tr>
</tbody>
</table>

In this study, 11.2% of the patients were found to be CAM-positive while 88.8% of the patients were found to be CAM-negative. While the CAM-positive group were slightly older, with an average age of 83.44 years versus the CAM-negative group of 79.86, this was not statistically significant.

The average MMSE in the CAM-positive group was 13.92 while the total MMSE in the CAM-negative group was 23.0. This difference was highly significant, with a p<0.001.

Table 5. Delirium and mortality at 6 months

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAM-positive</td>
<td>222</td>
<td>10%</td>
</tr>
<tr>
<td>CAM-negative</td>
<td>28</td>
<td>39%</td>
</tr>
</tbody>
</table>

There was a substantially increased mortality rate in the CAM-positive group.

The rate of death at 6 months in the CAM-negative group was 10% while that in the CAM-positive group was 39%, with an absolute difference of 29.4% (95% CI 9.6% to 490%), with a p<0.05.

Table 6. Delirium and length of inpatient hospital stay

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean length of stay (days)</th>
<th>Standard Deviation (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAM-positive</td>
<td>222</td>
<td>21.6</td>
<td>18.6</td>
</tr>
<tr>
<td>CAM-negative</td>
<td>28</td>
<td>25.4</td>
<td>19.7</td>
</tr>
</tbody>
</table>

There was a trend towards increasing mean length of inpatient stay in the CAM-positive group (25.4 days) as opposed to the CAM-negative group (21.6 days ), p=0.34.

Table 7. Delirium and increase in level of care (note that the denominator here is 244 as 6 patients who died while in hospital were excluded)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAM-positive</td>
<td>219</td>
<td>13.8%</td>
</tr>
<tr>
<td>CAM-negative</td>
<td>25</td>
<td>66.6%</td>
</tr>
</tbody>
</table>

There was a substantially higher rate of patients requiring increased level of care on discharge from hospital in the CAM-positive group.

The rate of patients requiring increased level of care following discharge from hospital in the CAM-negative group was 13.8%. This rate was 66.6% in the CAM-positive group. This difference was very significant, at a p<0.00003.
Discussion

Our study confirmed that a positive CAM score on a point prevalence study was strongly associated with higher mortality at 6 months. It is also associated with an increased rate of discharge to a higher level of care at discharge. We did not show a significant difference in inpatient length of stay.

These findings are consistent with the results of previous trials.3,7–9,12,13,26,27

This study is limited by the following factors:

- These figures are derived from a point prevalence study, meaning that for most patients only one assessment is taken during the entire admission. The assessment was done during office hours (0800hrs to 1600hrs) on weekdays. Given the fluctuating and evolving nature of delirium, this method is certain to have undercounted the incidence of delirium. This is likely one of the explanations as to why the prevalence of delirium in this study, which is 11.2% is relatively low by the standards of published studies.

- For the same reasons though it is also possible that those delirious patients we did detect were likely to be members of the subgroup who had a more prolonged delirium, which may help to explain the strong correlation with poor outcomes.

- Because we only analysed patients who were able to complete the assessment, it is likely that some of the patients were excluded due to communication difficulty secondary to active delirium. Once again, this would lead to a falsely low prevalence of delirium in this study. The exclusion of very unwell persons will also produce a bias towards a lower count.

- Our audit was not able to take into account differences in disease burden or frailty between the groups. Studies show that delirium is more common in frailer individuals and in individuals with higher comorbidity.35,36,37 The higher mortality rate and higher level of institutionalisation of the delirium group may be caused by increased frailty or disease burden.

- Similarly, as we did not evaluate cognition after the end of the trial we cannot say whether the lower MMSE found in the CAM-positive group represents a dementia or whether it is an effect of the delirium. As dementia alone is known to be associated with worse health outcomes in the older adults, the higher level of institutionalisation and mortality of the delirium group may be due to dementia.38,39

- We did not differentiate between subtypes of delirium in this study. This differentiation may have assisted in the assessment of the outcome of inpatient length of stay as one study had shown that it is the hypoactive variant of delirium that results in longer length of stay.22

A strength of the study is its representative patient population. The patients were all elderly individuals sampled on specific days from one medical, orthopaedics and rehabilitation ward. The results from this study are more generalisable to a busy acute hospital than studies studying single department presentation of medicine, ICU or emergency medicine.

An area of growing interest is the interaction between frailty and delirium and to determine if the deleterious outcomes often associated with delirium may be driven by frailty.35,37 The authors recommend future studies to utilise a validated frailty measurement indices such as the Studies of Osteoporosis Index or Cardiovascular Health Study Index to include frailty measures into the analysis.40,41 A multivariate analysis utilising various morbidities, including delirium as dependent variables may be able to provide guidance on whether frailty, disease burden or delirium contributes to the many deleterious outcomes that are associated with delirium.
In summary, based upon this study a single positive point prevalence CAM is associated with a markedly higher rate of mortality at 6 months and high risk of increase in level of care from admission to discharge, though not with length of inpatient stay.

The challenge of providing appropriate care for hospital inpatients who are increasingly elderly, frail, comorbid and likely to have cognitive impairment due to dementia or delirium is an international one.

We hope that this data will help emphasise the importance of delirium and its association with poor outcomes when planning for and providing hospital care in New Zealand.

Competing interests: Nil.

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34. Statistics New Zealand, Census 2006, QuickStats about Auckland Region.


