Delirium Screening and Mortality in Patients with Dementia Admitted to Acute Hospitals.

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Abstract

Objectives

Delirium is associated with increased mortality in older adults. National guidance recommends that all people with dementia who are admitted to hospital are screened for delirium. However, the impact of screening for delirium among inpatients with dementia has not been examined. This study aims to examine this relationship.

Methods

Secondary analysis of data from 10,047 patients admitted to 199 hospitals in England and Wales that took part in the third round of the National Audit of Dementia. Data on patients with dementia who died during their admission were compared with those who survived. We calculated odds of mortality among those who were screened for delirium, received cognitive testing, and, in those with delirium, an expert clinical review.

Results

The mean age of study patients was 84 years (SD=7.9), 40.1% were male and 82.1% white British. 1285 patients (12.8%) died during their admission to hospital. Overall, 4466 (44.5%) patients were screened for delirium, of whom 2603 (58.6%) screened positive. The odds of mortality were lower in patients who underwent delirium screening (OR 0.79, 95% confidence interval 0.69 to 0.90) and in those receiving cognitive testing (OR 0.71, 95%CI 0.61-0.82).

Conclusion

These results demonstrate that, among people with dementia who are admitted to hospital, screening for delirium and assessment of cognitive functioning are associated with lower mortality. While we cannot be certain that these associations are causal, the findings support efforts that are being made to increase levels of screening for delirium among people with dementia who are admitted to hospital.

Introduction

Commented [MC1]: Shouldn’t this come before the ORs?
The number of patients with delirium and dementia admitted to acute medical wards is increasingly being recognised, resulting in a significant challenge for hospital services. Delirium is defined by DSM 4 as “a disturbance of consciousness that is accompanied by a change that cannot be better accounted for by a pre-existing or evolving dementia”; given this, clinical teams can face difficulties when attempting to differentiate these two conditions with significantly overlapping clinical features. Dementia is recognised as a significant risk-factor for delirium and delirium may exacerbate dementia progression and negatively influence the outcome of patients with dementia, including functional outcome, length of stay and both inpatient and post-discharge mortality.

Estimates of the prevalence of delirium among the older adult inpatients vary greatly according to the sample being studied and the method of assessment that is used, although appears higher in patients with dementia. Screening tools for delirium among people with dementia have been developed and validated. Assessment of delirium can consist of a number of aspects including assessment for the symptoms of delirium, collateral history and cognitive testing in order to measure the degree of cognitive impairment associated with the delirium.

Given the strong association between delirium and morbidity and mortality in the inpatient population there has been a significant push toward greater identification of inpatients with delirium. Successful identification of delirium and treatment of the underlying cause has the potential to improve outcomes in this population and current NICE guidelines recommend that all acute inpatients should be routinely screened for delirium, including a ‘standardised and validated cognitive impairment measure’ if cognitive impairment is suspected. It is important that the value of a screening programme be judged by its impact on patient outcomes. Much of the literature on screening for delirium has focussed on the sensitivity and specificity of delirium screening tools, with little examination of the impact of screening on patient outcomes. At present, most advice for treatment of delirium is around symptomatic and pragmatic management (both of environmental/psychological and pharmacological factors) with concurrent treatment of any identified underlying causes.

We therefore set out to examine the relationship delirium screening and mortality among a sample of older adults who are admitted to hospital. We conducted a secondary analysis of data from the third round of the National Audit of Dementia. We hypothesised that screening for delirium would be associated with reduced mortality.

**Methods**

The National Audit of Dementia is commissioned by the Healthcare Quality Improvement Partnership and run by the Royal College of Psychiatrists College Centre for Quality Improvement (CCQI) and audits acute trusts against quality standards in the care of inpatients who have a diagnosis of dementia.
Data for the third round of the audit were collected between April and November of 2016. 199 of 203 (98%) acute hospitals in England and Wales took part in the audit. Individual patient-level data were extracted from the case notes of a consecutive sample of patients who were admitted to hospital for more than 72 hours and were discharged in April or May of 2016. Each hospital was asked to submit data on a minimum of 50 and a maximum of 100 patients admitted during this period. All data were then submitted electronically to the audit team via a bespoke web-based data entry portal.

Patients were identified by hospitals using a list of ICD codes for dementia. For patients with multiple admissions, only data from the first admission during this period were collected.

The audit tool was extensive, covering a range of demographic factors, presenting complaint, whether multidisciplinary assessments had taken place, and outcomes, including discharge destination and whether the patient had died during that admission. It included questions on (1) whether a standardised mental state test had been conducted and (2) whether an assessment had been carried out for recent changes or fluctuation in behaviour that may indicate the presence of delirium. Data were also collected on whether the patient was subsequently discharged from hospital or had died during the admission.

**Data analysis**

The primary exposure was whether the patient was screened for delirium following their admission to hospital. The outcome measured was whether the patient died during their admission. The association between mortality and whether the patient had been assessed using a standardised cognitive test, as per the NICE recommendations, was also examined.

Data were analysed using a two-level mixed model to allow for clustering of patients within hospitals. We used multilevel logistic regression to examine associations between screening for delirium and assessment of cognitive state and mortality, adjusted for potential confounders of age, gender, diagnosis and hospital site. All data were analysed using Stata (version 15.1).

**Results**

Data from 10,047 patients from all 199 hospitals in England and Wales that took part on the audit were analysed. The mean age of patients in the audit was 84 years (SD = 7.9). Among this sample, 4029 (40.1%) were male, and 6018 (59.9%) were female; 8250 (82.1%) were white British, with the ethnicity of 1250 (12.4%) being recorded as other and 193 (1.9%) recorded as British Asian and 1.2% recorded as black/black British. The presenting conditions of patients in the audit were varied (see table 1), with the most common presentations being respiratory (n = 1998, 18.9%), fall (n = 332, 13.3%) and urinary tract infections and other urological problems (n = 901, 9%).

The median length of stay was 12 days, (range = 2 to 775). 4125 (41.1%) of patients were admitted to an elder care or complex care ward, 2359 (23.5%) on a general medical ward and 1574 (15.7%) being cared for on a surgical or orthopaedic ward. A total of 1285 patients (12.8%) died during their admission to hospital. Overall, 4466
(44.5%) patients were screened for delirium, of which 2603 (58.6%) screened positive.

The relationship between mortality and patient demographic and clinical factors are presented in table 1 below.

The results for age showed increased mortality with increasing age (p<0.001). A one-decade increase in age was associated with a 29% increase in the odds of mortality. There was also significant variation between sexes with female patients being less likely to die during their admission than men. This was despite the average age of female patients being slightly older, with an average age of 85.3, compared to the male average of 82.7, and with no significant difference in rates of delirium between the sexes (59.7% of men and 57.3% of women, P=0.1).

The results show significant variation in mortality depending on presentation, with 22% mortality in patients with sepsis and dehydration but only 2.3% mortality amongst surgical patients with dementia.

Univariate associations between whether cognitive functioning and delirium were screened for and whether the patient died during their admission are presented in table 2.

A multilevel logistic regression looking into the relationship between exposure to screening and mortality is presented in table 3 (below).

Among patients for whom data were collected, 4684 (53.9%) received cognitive testing and 4466 (44.5%) underwent delirium screening. Of those screened for delirium, 58.3% (2603 of 4466 patients screened) had features suggestive of a diagnosis of delirium. The right-hand column of table 3 shows the odds ratio and confidence intervals adjusted for age, sex and diagnosis. The odds of mortality were reduced in patients who underwent cognitive testing and those who underwent delirium screening. The presence of delirium was associated with increased mortality (OR 1.6, p<0.001).

Among the 2603 patients in whom delirium screening was positive, a clinical review did not reduce the risk of overall mortality significantly. The odds ratio of death among those who receiving and not receiving a clinical review was 1.07 (CI 0.8-1.5 p=0.7), showing a non-significant decrease in mortality (see fig 1).

Discussion

As predicted in our hypothesis, the study found that there was a reduced mortality in patients with dementia screened for delirium, either with cognitive testing or by screening for delirium symptoms. This association remains positive when adjusted for variations between sites, age, gender and diagnosis. Subsequent specialist assessment did not significantly affect mortality.
In line with previous studies, our data showed that patients with a history of dementia presenting with delirium had an increased mortality, with an increased risk in those of increasing age. The prevalence of delirium in those screened was lower than that previously described in patients with dementia.

There was significant variation in the outcome of dementia according to the underlying cause, with stroke, sepsis and dehydration being particularly high-risk for mortality and lower risk in surgical and pain groups. There also seemed to be an association with gender, with females being at lower risk of mortality.

**Strengths and Weaknesses of this Study**

This study benefits from a large population, containing information from almost all acute hospitals in England and Wales. Each patient had his or her case notes assessed by a clinician who collected the data. The power of the study and the diversity of settings across England and Wales that it represents are a significant strength.

There were significant limitations to the study. Firstly, as a retrospective audit it relied on data being documented in clinical records, we cannot know whether patients for whom there was no record of screening were not assessed or whether they were assessed but did not have this recorded in their notes. Secondly, the sample for the audit was restricted to people with dementia who were admitted to hospital for at least 72 hours and we do not know if these results would be found among other patients who are treated in inpatient units.

The main limitation of the study is that, as with all observational studies, it is possible that factors not included in our analysis explain some or all of the associations we found between screening and mortality. The gold standard in assessing the impact of screening on mortality would be a randomised controlled trial. However, given that NICE already recommend that all inpatients are screened for delirium, allocating people to not be screened would be unethical.

Nonetheless we cannot be sure that the associations we found in this study result from the impact of screening for cognitive function on inpatient mortality. It is possible that other factors such as severity of the persons health condition explain some or all of the associations that were found. For instance, when patients are admitted who are severely ill, they may be less likely to be screened for cognition and more likely to die prior to their discharge from hospital.

This study was performed with high-level population data that were collected by a large number of clinicians at different sites and subsequently aggregated. Although the questions were designed to be as unambiguous as possible, it is likely that there will have been some inter-rater variation as to what is classed as evidence of delirium screening or cognitive testing.

There has been very little examination of the effects of screening for delirium on mortality, particularly within the dementia population, with Greer et al. finding no
evidence from randomised controlled trial. We also reviewed the literature and were unable to find papers investigating the impact of delirium screening on patient outcomes.

Possible Mechanisms

It was outside the scope of this research to investigate the mechanism through which delirium screening may reduce mortality. It seems unlikely that delirium screening in itself is responsible for reduced mortality, and so we propose a number of alternative explanations.

One hypothesis is that lower mortality among those screened for delirium may be the result of detection and treatment of previously undiagnosed underlying illness. This is potentially undermined by the lack of mortality benefit conferred by delirium-specific assessments, although it is possible that good clinical care for delirium could be carried out without such a review. If this is the case, this would present the most convincing argument for increasing screening for delirium among inpatients with dementia.

It is also possible that delirium screening and improved mortality are both correlated with mediating factors. One potential explanation is that there are organisational factors mediating the correlation, with patients who are screened more likely to have been admitted to a hospital with good organisational awareness of delirium and its risks. The statistics used a mixed level model with patients nested within sites, accounting for the variation that is likely to exist between hospitals. This makes it less likely that organisational factors played a significant role.

It is also possible that delirium screening is a good proxy for improved care on an individual level, with individuals screened for delirium more likely to have received holistic input from the Multi-Disciplinary Team, as often delirium screening is carried out by more specialist teams skilled in the holistic treatment of older adults.

Finally, it is possible that the results represent reverse-causality and that patients are less likely to be conducted when clinical teams judge that the patient is at greater risk of dying during their admission to hospital. The association we found between assessment of cognitive functioning and reduced mortality provides evidence to support possible reverse causality, as it is less clear how awareness of cognitive functioning could in itself lead to reduced mortality.

Clinical Implications

Despite these uncertainties, our main finding, that screening for delirium among inpatients with dementia is associated with reduced mortality strengthens calls for routine screening for delirium among inpatients. While further research is needed to examine the mechanism through which screening for delirium influences mortality, improved practice in this area has the potential to improve the outcomes of people admitted to hospital who have dementia.

Funding
The National Audit of Dementia is managed by the Royal College of Psychiatrists' College Centre for Quality Improvement. It is commissioned by the Healthcare Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme. The views expressed in this publication are those of the authors and not necessarily those of the NHS or the Department of Health.
References


Table 1. Risk of mortality presented against patient demographics and presenting complaint

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Died n/N (%)</th>
<th>Odds Ratio (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (*)</td>
<td>-</td>
<td>-</td>
<td>1.29 (1.18, 1.40)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>567/4029 (14.1%)</td>
<td>1</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>718/6018 (11.9%)</td>
<td>0.82 (0.73, 0.93)</td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Hip fracture</td>
<td>75/754 (10.0%)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Respiratory</td>
<td>377/1998 (18.9%)</td>
<td>2.14 (1.63, 2.81)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Variable</td>
<td>Alive N (%)</td>
<td>Dead N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive test completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>3496 (87.4%)</td>
<td>502 (12.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4249 (90.7%)</td>
<td>435 (9.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delirium screening undertaken</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4812 (86.2%)</td>
<td>769 (13.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3950 (88.4%)</td>
<td>516 (11.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delirium result (#)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>1690 (90.7%)</td>
<td>173 (9.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>2260 (86.8%)</td>
<td>343 (13.2%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*) Odds ratio given for a 10-year increase in age.

Table 2 Mortality in patients based on exposure to cognitive testing, delirium screening and the results of delirium screening.
Table 3 Results of multilevel logistic regression – association between exposure to cognitive testing and delirium screening and mortality, and outcome of delirium screening and mortality.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Unadjusted OR (95% CI)</th>
<th>p-value</th>
<th>Adjusted OR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive test</td>
<td>0.71 (0.61, 0.82)</td>
<td>&lt;0.001</td>
<td>0.74 (0.63, 0.86)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Delirium screening</td>
<td>0.79 (0.69, 0.90)</td>
<td>&lt;0.001</td>
<td>0.84 (0.73, 0.96)</td>
<td>0.01</td>
</tr>
<tr>
<td>Presence of delirium</td>
<td>1.51 (1.23, 1.85)</td>
<td>&lt;0.001</td>
<td>1.55 (1.26, 1.94)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

(1) Analysis in patients undergoing delirium screening only

Figure 1: Mortality Rates of Patients with Delirium against Assessment