Cognitive impairment in older emergency department patients

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Chapter 7

Early delirium screening in older ED patients

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CAM-ICU may not be the optimal screening tool for early delirium screening in older Emergency Department patients, a prospective cohort study

ABSTRACT

Background: Delirium is a frequent problem among older patients in the Emergency Department (ED) and early detection is important to prevent its associated adverse outcomes. Several screening tools for delirium have been proposed for the ED, such as the Confusion Assessment Method-Intensive Care Unit (CAM-ICU). Previous validation of this tool for use in the ED showed varying results, possibly because they were administered at different or unknown time points.

Objective: To study incidence of delirium in older (≥70-years) ED patients using the CAM-ICU.

Design: Prospective cohort study, taking place in one tertiary care and one secondary care hospital in the Netherlands.

Methods: All patients aged 70-years and older attending the ED were included. We screened for delirium within 1 hour after ED registration using the CAM-ICU performed by trained medical students. We assessed the number of positive CAM-ICU scores. For comparison we determined the Six-Item Cognitive Impairment Test (6-CIT), using a cut-off point of ≥14 points indicating possible delirium, which has previously associated with the presence of delirium using gold standard assessment.

Results: A total of 997 patients were included in the study, with a median age of 78 years (interquartile range 74-84). Delirium as assessed with CAM-ICU was positive in only 13 (1.3%) patients. 95 (9.5%) patients had 6-CIT ≥14.

Conclusion: We found a delirium incidence of 1.3% using the CAM-ICU, which was much lower than the expected incidence of around 10% as been frequently reported in literature and what we find when using the 6-CIT. This low incidence may be explained the early application of the test, lack of observation time or lack of information from family members. The CAM-ICU seems inappropriate for early screening in the ED.

INTRODUCTION

Delirium is highly prevalent in older Emergency Department patients (ED)[1, 2], but is frequently missed[3, 4]. It is important to detect delirium[5, 6] at an early stage because then the associated adverse outcomes may be prevented by[7] protective measures.
Early detection of delirium by a complete, but time consuming assessment by a psychiatrist or geriatrician is not feasible in clinical ED practise. Therefore, several screening tools to detect delirium in the ED have been investigated, such as the Confusion Assessment Method-Intensive Care Unit (CAM-ICU[8]). In two recent studies, the CAM-ICU has been validated for ED use, by comparing it with a gold standard, i.e. assessment by a psychiatrist using the DSM-IV. Van de Meeberg *et al.*[1] investigated the CAM-ICU in the ED setting in the Netherlands and showed a 100% sensitivity and 98% specificity. However this was in discrepancy with a study by Han *et al.*[8] in which the performance of this tool was modest with a sensitivity of 72%.
This difference in sensitivity might be explained by a difference when the tool was performed by different care givers or because it was used at different time points.
The goal of this study was therefore to investigate the incidence of delirium in two EDs in the Netherlands by using the CAM-ICU in clinical practice, performed at an early stage during de ED visit.

METHODS

Study design and setting

This was a prospective multicentre cohort study of which a detailed description has been published previously[9]. For the analysis in this manuscript, data of two hospitals were used as CAM-ICU score was only available in these hospitals. One tertiary care hospital (Erasmus University Medical Center, Erasmus MC, Rotterdam) and one secondary care hospital (Haaglanden Medical Center, location Bronovo, HMC Bronovo, The Hague). During 3 month periods (years 2016/2017) Emergency Department patients aged 70-years and older were included in this study.

Selection of participants

All patients were included consecutively. Patients were included between 10AM and 10PM, 6 days a week in the HMC Bronovo and 4 days a week in the Erasmus MC. Patients with an unstable medical condition, those with a disturbed mental status without an available proxy to provide informed consent and those who did not speak English or Dutch were excluded. Written informed consent was obtained in all participants. The medical ethics committee of both hospitals approved the study.

Methods and measurements

Within 1 hour of arrival to the ED patients were included and a short battery of tests was performed by a selected group of trained medical students.

Delirium was measured using the Confusion Assessment Method-Intensive Care Unit (CAM-ICU)[10]. This is a 4-step assessment method with items on altered mental status or fluctuating course, inattention and altered level of consciousness or disorganized thinking. This test has been previously studied in Emergency Department settings[1, 8].

The Six-Item Cognitive Impairment Test (6-CIT) was used to measure both cognition and delirium[11]. This short 2-3 minute test consist of items on memory, orientation and attention. Patients with a 6-CIT score of ≥11, those with self-reported dementia and those unable to perform the 6-CIT were categorized as having cognitive impairment. In a recent study[2] a cut-off score of 6-CIT ≥14 was validated for delirium with expert diagnosis of a geriatrician using DSM-V criteria.

Outcome

The main outcome of this study was the incidence of delirium, defined as a positive CAM-ICU. This was compared with the incidence of 6-CIT ≥14 points.

Statistical analysis

Baseline characteristics and incidence data are presented as mean with standard deviation (SD) in case of normal distribution or as median with interquartile range (IQR) in case of skewed distribution or as numbers with percentages (%). Whether the incidence of delirium measured using the two different tests was significantly different, McNemars test was used. Statistical analyses were performed using IBM SPSS statistics package (version 23).

Declaration of sources of funding

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RESULTS

A total of 1460 patients visited the Emergency Departments of both hospitals during the study period, of which 1182 patients were eligible for inclusion. The 997 included patients represent 84.3% of the eligible patients during the inclusion hours (figure 1).

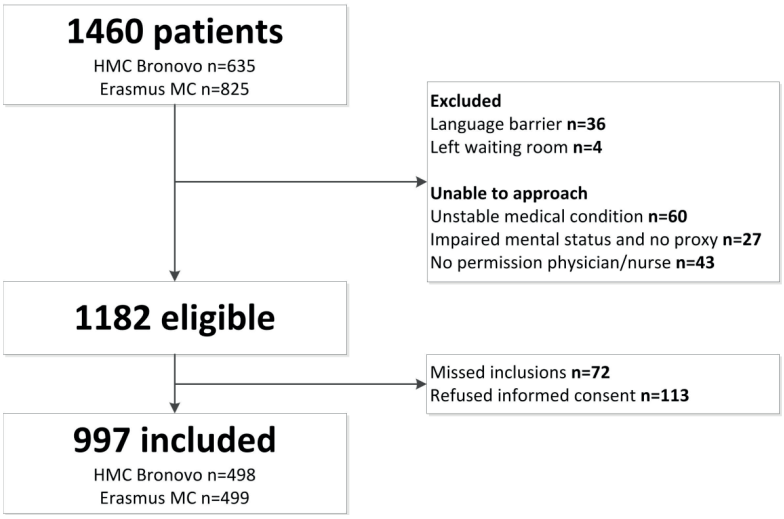

Figure 1: Flowchart of patient inclusion

Patient characteristics

As shown in table 1 the median age was 78 years (IQR 74-84) and 447 patients (44.8%) were male. A total of 267 patients (27.0%) received high education and 84 (8.4%) lived in a residential care or nursing home. Approximately half of the patients (n=502, 50.4%) arrived by ambulance, with a most patients needing help within one hour (n=673, 67.5%). The median number of medications used was 5 (IQR 3-8) and most people were independent in ADL function (Katz-ADL median 0, IQR 0-1).

Delirium

The CAM-ICU was performed in 960 patients, of which only 13 patients scored positive (1.3%) as can be seen in table 2. Of patients with positive CAM-ICU, five were previously diagnosed with dementia, five had cognitive impairment (6-CIT ≥11) and three were unable to perform the 6-CIT test due to confusion. For comparison, 95 (9.5%) patients had a 6-CIT of ≥14 points. The difference between the incidence as measured with these two tests was statistically significant ($p<0.001$). As a sensitivity analysis patients with self-reported dementia were excluded, this showed similar results. Three hundred patients (30.0%) suffered from cognitive impairment in this cohort.

Table 1: Baseline characteristics of study population

Characteristics	All patients n=997
Demographics	
Age (years), median (IQR)	78 (74-84)
Male	447 (44.8)
High education	267 (27.0)
Living in a residential care/nursing home	84 (8.4)
Hospital	
HMC Bronovo	498 (49.9)
Erasmus MC	499 (50.1)
ED presentation characteristics	
Arrival by ambulance	502 (50.4)
Triage urgency	
> 1 hour	205 (20.6)
< 1 hour	673 (67.5)
< 10 minutes	119 (11.9)
Fall related ED visit	256 (25.7)
Main complaint	
Minor trauma	365 (26.6)
Malaise	152 (15.2)
Chest pain	115 (11.5)
Dyspnea	113 (11.3)
Abdominal pain	102 (10.2)
Other	91 (9.1)
Syncope	59 (5.9)
Geriatric characteristics	
Hours of home-care, median (IQR)	0 (0-3)
Use of walking device	434 (43.7)
Number of medications, median (IQR)	5 (3-8)
Katz-ADL, median (IQR)[3]	0 (0-1)

Data are presented as number, percentage unless noted otherwise.
Abbreviations: n: number, IQR: interquartile range, ED: Emergency Department
Data is complete, except for use of walking device (n=3 missings), living in residential care home (n=1 missings), level of education (n=8 missings), Katz-ADL (n=12 missings), hours of home care (n=12 missings).

Table 2: Incidence of delirium measured using the CAM-ICU

	Total n=997
Delirium - Positive CAM-ICU	**13 (1.3)**
Q1. Acute change/fluctuating course[a]	118 (12.3)
Q2. Inattention[b]	24 (2.4)
Q3. Altered level of consiousness[c]	13 (1.3)
Q4. Disorganized thinking[d]	2 (0.2)

Abbreviations: CAM-ICU: Confusion Assessment Method -Intensive Care Unit, Q: question.
[a]Number of measured values n=960 (missing from total n=37), [b] Number of measured values 106 (missing from previous question n=12), [c]Number of measured values n=19 (missing from previous question n=5), [d]Number of measured values n=2.

DISCUSSION

The main finding of this study is that the incidence of delirium, as assessed by the CAM-ICU, was only 1.3% when performed early after ED arrival. 9.5% of patients had a 6-CIT score of ≥14 points, which is comparable with delirium incidence as reported in literature.

This study is in strong contrast with a previous study by Van de Meeberg *et al.*[1]. In this study, the CAM-ICU was implemented in the ED and compared to a subsample of patients in which delirium was independently evaluated using the DSM-IV criteria. It showed a sensitivity of 100% and specificity of 98%. In this study CAM-ICU was performed by ED nurses, doctors or the study investigator at an unknown time after ED arrival. The subsample of patients which was used to validate the CAM-ICU was selected which could have led to verification bias.

Han *et al.*[8] performed a study in which the CAM-ICU was compared to a reference standard of a psychiatrist assessment in all patients. These assessments were conducted within 3 hours. Both research assistants and doctors performed the CAM-ICU. Sensitivity of the research assistants to detect delirium was 68%, that of the doctors was 72%, both had a specificity of 98.6%.

The differences between raters as shown by Han *et al.* might have influenced our results, as we used trained medical students to perform the test.

In addition, the test in our study was performed sooner (<1 hour of ED arrival), possibly making this test less reliable as this decreases observation time. This might be relevant because answering the first question of the CAM-ICU needs either observation time or informant history, the latter of which is only available in 50% of older ED patients[2]. The discrepancy between the incidence of a positive CAM-ICU and 6-CIT ≥14 may be explained by the fact that the 6-CIT contains no items needing informant history or

observation time. The incidence of a 6-CIT ≥14 approximated the ED delirium incidence reported in the literature[4, 5, 12, 13].

We propose that rather than focussing solely on delirium and using the CAM-ICU, cognition should be tested using a reliable tool at an early stage of ED visit to get patients with possible delirium or risk of delirium (i.e. cognitive impairment) into the physicians scope. Several tools which test for both delirium and cognitive impairment exist, such as the 6-CIT or 4-AT. Differentiating between delirium and previously existing impaired cognition can be difficult and it has been recently proposed that making the distinction is not needed in the ED, as patients should be treated on a 'need of care' basis[14].

This study has several weaknesses, first we did not perform a gold standard assessment of delirium using a clinical judgement by a psychiatrist or geriatrician. Second, we trained the medical students to perform the tests, but it could be argued that these students may have fewer clinical knowledge or observational skills than trained doctors or nurses. The students were not observed and we did not perform inter-rater reliability measures. However, when using the 6-CIT we found an incidence that approximates current literature. A major strength of the study is the large sample size of nearly 1000 patients and the unselected patient group.

To conclude, delirium as assessed by CAM-ICU, early after arrival to the Emergency Department leads to a unexpectedly low incidence. The CAM-ICU might not be an appropriate screening tool to detect delirium at an early stage in the ED.

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