



ORIGINAL ARTICLE

Delirium clinical correlates and underdiagnosis in a skilled nursing home



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Received 9 February 2019; accepted 4 June 2019

Available online 15 July 2019

KEYWORDS

Delirium;
Dementia;
Marital status;
Diagnosis;
Subacute care

Abstract

Background and objectives: There is scarce research about delirium risk factors in nursing homes (NH). Our objective was to evaluate in a single day the association of different clinical aspects with delirium in a NH.

Methods: We evaluated all patients hospitalised in a NH. We used a bivariate analysis and performed a logistic regression on significantly different characteristics between groups.

Results: We assessed 131 patients and 30 (22.1%) met DSM-5 criteria for delirium. Only 3 of them were already diagnosed on their medical records by treating physicians, and only one by the nurses. The variables retained in the conditional logistic analysis were: age (OR 1.08, 95%CI 1.01–1.15), widowhood (OR 3.70, 95%CI 1.13–12.09), need of physical restraints (OR 9.22, 95%CI 2.39–35.52) or intravenous catheter during the previous 24 h (OR 46.02, 95%CI 4.95–427.58), hearing impairment (OR 4.26, 95%CI 1.35–13.38), and a main active diagnosis of systemic infection (OR 3.01, 95%CI 0.93–9.71). All of them were significantly related to delirium ($p < 0.05$), except for systemic infection ($p = 0.065$). Unexpectedly, dementia was not retained within the model.

Conclusions: Treating staff underdiagnosed delirium. Delirium was associated with some clinical factors previously described in acute and post-acute medical units. However, the lack of association with known risk factors like dementia, that is very frequent in NH, and relationship with new ones explored, like widowhood, points to the need for further research into the particularities and basal characteristics of NH patients, and for standardisation of the assessment of some critical variables and of delirium itself.

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Introduction

Delirium is a very common condition in different clinical settings, and specifically in Nursing Homes (NH) and other post-acute Long Term Care (LTC) facilities, where prevalence rates range between 9 and 33%,^{1–4} with highest rates in those settings with a high prevalence of dementia.

Aside of dementia, diverse factors have been associated with delirium risk, although some are more relevant in some specific clinical settings than in others.⁵ The studies made in NH and LTC very often obtain conflicting results, probably due to specific characteristics of the population and to methodological shortcomings, such as the focus in specific sub-populations – i.e. only patients with dementia or without previous neuropsychiatric alterations, the use of tools for delirium diagnosis that were not validated for that purpose, or insufficient evaluation of confounding factors. The risk factors that are more frequently described include: age, dementia and its severity, male gender, sensory impairments, low functionality level and falls.^{2,3,6–13}

In a review of delirium prevention programmes, it is found that evidence about them in LTC settings is scarce, including NH.¹⁴ In fact, important current prevention programmes projects are based on risk factors relevant to acute hospitalisation wards.^{15,16}

For these reasons, we found it important to deepen our understanding of the aspects associated to delirium in a skilled NH such as ours. The *Centre Sociosanitari Montserols* is integrated in the public healthcare network of the Tarragona province (Spain). Patients are admitted for convalescence of medical and surgical processes or control of geriatric complications, including psychiatric diseases. Here, we found delirium prevalence rates ranging from 16% to 27.2%, depending of the criteria used for diagnosis⁴ and also a prevalence of dementia of 58%.¹⁷ These are good conditions to further research on risk factors of delirium in post-acute care.

The main objective of this study was to evaluate the association of different clinical aspects of patients from this NH with delirium. Also, since an important aspect of delirium epidemiological studies is its poor identification by clinical teams,¹⁸ with rates of recognition as low as 17% compared to an expert evaluation,^{19–22} we also evaluated the prevalence of diagnosis by the treating clinical team.

Methods

This was a cross-sectional, one-day, prospective study of delirium in a skilled NH. After running a pilot test with 10 patients in a previous day (not included in the study sample) to evaluate logistic difficulties and possible problems in using research instruments, all patients who were hospitalised during the day of the study were evaluated by one of four researchers (two psychiatrists, one resident in psychiatry and one psychologist) for delirium. As each of the four floors of the centre has a similar number of beds, each researcher evaluated patients in one floor, during the same morning. The same researcher gathered clinical and demographical information from medical records, fam-

ily/proxy, the patients themselves when possible, or from any other information source available. Exclusion criteria were: refusal to be evaluated, coma/sedation, severe language disorder or inability to speak Spanish or Catalan.

On the day of the study (17/03/2017) bed occupancy in the NH was at 91.2%, with a total of 145 hospitalised patients. Of these, 14 were excluded due to communication problems ($n=8$), severely altered consciousness level ($n=2$), and absence in the day of evaluation ($n=4$), leaving 131 patients for assessment.

This work was not supported by any funding agency in the public, commercial, or non-for-profit sectors.

Ethics, consent and permissions

This study was performed in accordance to Declaration of Helsinki and approved by the Hospital San Joan Ethics Committee (our corresponding evaluation centre). All patients or their proxy, when the patient was not capable to do so, gave their written consent to use their clinical information for research purposes at admission to the centre. We did not perform any evaluation different from those usual in patient's care and there was no intervention.

Measures and instruments

We collected demographical data, including age, sex, marital status, occupational status and years of education.

We reviewed medical records for clinical data routinely assessed by the in-house treating professionals (e.g. geriatricians, nurses and physiotherapists) for the following variables: a previous diagnosis of dementia, the Charlson Comorbidity Index (Short form, CCI-SF, where a score of 0 or 1 indicates no comorbidity, a score of 2 low comorbidity, and ≥ 3 high comorbidity),²³ the functionality Barthel index (which measures independence in personal care activities, with a modified scoring system from 0: dependent to 100: independent),²⁴ the quantity and type of medications administered during the previous 24h, the current most important medical diagnosis requiring clinical attention, the presence of visual or hearing impairment, the time the patient has been hospitalised and use of urinary, intravenous catheter or physical restraints during the previous 24h.

Determination of dementia antecedents was made according to patients' medical records. In Tarragona patients are regularly evaluated by their primary care physician (and by a psychologist if living in a LTC setting), and referred to the corresponding specialised team when dementia is suspected.

Also, we looked for a diagnosis of delirium by the treating physician or nurse during the current clinical phase. For this, we searched in the NH medical electronic charts for the term *delirium* or its denotations (confusion/confusional state, acute encephalopathy).

Anticholinergic effect of medications

To evaluate the possible impact of anticholinergic agents we used an adapted version of the Anticholinergic Burden Scale,²⁵ 2012 version.²⁶ This scale gives medications a score

of 0 when there is no known anticholinergic activity, 1 when there are possible anticholinergic effects and 2 or 3 when cognitive anticholinergic effects are established and clinically relevant.

Delirium status

Delirium was determined using the DSM-5 criteria by applying all the available information from the clinical assessment of the patient, discussion with nursing staff and available collateral sources. We designed a diagnostic criteria checklist to dichotomously rate if every item was present and to ensure their complete evaluation, according to the subjective impression of the assessing clinician, where "awareness" (under the complex definition of criterion A²⁷) was rated on the patient engaging appropriately with the interviewer and their environment.

Statistical analysis

Data were analysed using SPSS v 21 (IBM). Continuous variables are expressed as medians with interquartile range (IQR). Chi-square test was used to compare categorical variables (continuity correction was used when appropriate) between delirium or non-delirium patients, and Mann-Whitney *U* for continuous ones. Statistical significance was set at $p < 0.05$.

Then, we performed a conditional logistic regression with the backward (likelihood ratio) method with 0.05 value for entry and 0.1 for exclusion of those variables that were significant in the previous step of bivariate analyses. Delirium status was the dependent variable for this multivariate analysis. Logistic regression is reported according to standard recommendations.²⁸

Results

The median age of the 131 patients was of 78.0 (IQR 67.0–84.0) years, of which 51.9% were women and 43.5% had a documented previous dementia diagnosis. Thirty patients (22.1%) were diagnosed with DSM-5 delirium. However on medical records only 3 of them had already been given this diagnosis by the treating physician, one of which also by a staff nurse. The low number of patients identified by the treating staff precludes a subsequent analysis to define the possible characteristics that hinder the proper identification of patients with delirium.

Table 1 shows characteristics of the sample according to their delirium state. In the bivariate analysis, patients with delirium were older, more functionally impaired, more frequently widowed, with a previous dementia, with hearing impairment, required the use during the previous 24 h physical restraints or intravenous catheter, and with a current main diagnosis of systemic infection.

In the conditional logistic analysis (Table 2) performed with variables obtained from the bivariate analysis, age, widowhood, use of physical restraints, use of intravenous catheter, hearing impairment and the main active diagnosis of systemic infection were retained in the model and all of them, excepting the diagnosis of systemic infection, remained as significantly different between patients with

and without delirium. Presence of previous dementia and functional impairment were not retained inside the model.

Exclusion of dementia from the multivariate model and inclusion of widowhood were unexpected results, based on previous studies. Therefore, we performed a posteriori analysis grouping the sample according to the presence/absence of each one of these variables, to explore characteristics related to each of them and then better understand their behaviour in the sample (see, bivariate comparisons in Table 3). Then, two conditional logistic regressions (one with dementia as a dependent variable and other with widowhood as dependent variables) were performed as described in Methods and are displayed in Table 4. Age and Charlson score were related to dementia, as well as the use of antipsychotics and physical restraint at any moment during the last 24 h. Regarding widowhood, female sex and dementia antecedents were related to it, and functional impairment was also important (although non-significant). Contrary to dementia patients, widowed patients had a lower probability of taking antipsychotics.

Discussion

We evaluated the association of delirium with different clinical and sociodemographic variables, and overcame some shortcomings of previous studies in NH, not excluding any specific population group and using the currently accepted DSM-5 criteria for the diagnosis of delirium. We confirmed findings of previous studies regarding some variables related to delirium⁵ such as age and hearing impairment. However, other results were unexpected, such as the association of widowhood with delirium, which had not been described previously and the lack of association with dementia, which had been widely reported in previous works. Some of these positive and negative findings merit further discussion.

To the best of our knowledge, the use of intravenous catheter has not been considered in previous works in this setting, but the association we found with delirium could be related to the actual movement limitation it imposes to the patient or to the severity of their underlying condition, since the use of intravenous catheters is mainly undertaken to administrate antibiotics to patients for whom oral antibiotics would not suffice. The use of physical restraints has been reported as a risk factor,^{3,12} a precipitating factor^{29,30} or a contributor to the severity of delirium.³¹

Marital status has not been consistently linked to delirium, with only one study in a NH³² finding married patients to be at a higher risk and other relating it to the severity of the delirium episode.³³ The association between widowhood and delirium might be due to the relation of widowhood to cognitive impairment or to the tendency of widowed patients to be more functionally impaired (see Tables 3 and 4), which may turn this demographic characteristic into a risk marker variable. Other possible characteristics of widowed patients, such as the absence of close family members, among others, need to be included in further studies.

Some studies have also found like us that in LTC/NH settings older age is associated with delirium,^{7,16,29,32} although others have failed to find this link.^{2,3,6,9,11–13} Also, results about sensory impairments have been contradictory; we

Table 1 Demographic and clinical characteristics according to delirium diagnosis groups. Delirium is diagnosed according to DSM-5 criteria. Data shown as medians (interquartile ranges) unless denoted by frequencies (percentages).

	No delirium (n = 101)	Delirium (30)
Age (years)	74.0 (67.0–83.0)	82.5 (74.0–88.0)*
Female sex	50 (49.5%)	18 (60.0%)
Marital status		
Single	41 (40.6%)	8 (26.7%)
Married/stable relationship	14 (13.9%)	7 (23.3%)
Separated/divorced	27 (26.7%)	3 (10.0%)
Widowed	19 (18.8%)	12 (40.0%)*
Dementia antecedents	37 (36.6%)	20 (66.7%)*
Barthel index	35.0 (15.0–55.0)	15.0 (0.0–25.0)*
Charlson score	2.0 (1.0–3.0)	2.0 (1.0–3.0)
Number of Active Medications ^a	10.0 (7.0–13.5)	12.0 (9.0–14.0)
Medications used ^a		
Antipsychotics	71 (70.3%)	18 (60.0%)
Benzodiazepines	42 (41.6%)	17 (56.7%)
Cognitive enhancers	4 (4.0%)	2 (6.7%)
Opioids	13 (12.9%)	4 (13.3%)
Antidepressants	30 (29.7%)	8 (26.7%)
Anticholinergic Cognitive Burden score	3.0 (1.0–4.0)	2.0 (1.0–3.2)
Hospitalisation days	259.0 (39.5–279.0)	65.0 (22.7–306.5)
Physical restraints ^a	11 (10.9%)	10 (33.3%)*
Urinary catheter ^a	6 (5.9%)	3 (10.0%)
Intravenous catheter ^a	2 (2.0%)	7 (23.3%)*
Visual impairment	54 (53.5%)	21 (70.0%)*
Hearing impairment	15 (14.9%)	15 (50.0%)*
Five most common main active diagnoses		
Systemic infection	16 (15.8%)	13 (43.3%)*
Dementia	10 (9.9%)	5 (16.7%)
Organ insufficiency	9 (8.9%)	5 (16.7%)
Fracture	7 (6.9%)	2 (6.7%)
Cerebrovascular disease	4 (4.0%)	1 (3.3%)

^a During 24 h before research evaluation.* $p < 0.05$.**Table 2** Multivariate logistic analysis of factors associated to delirium in patients from a nursing home facility.*

Variable	B	Wald test	p-Value	OR	95% CI
Age	0.067	4.539	0.033	1.076	1.006–1.151
Widowhood	1.198	4.696	0.030	3.701	1.133–12.091
Physical restraints ^a	0.714	10.424	0.001	9.221	2.394–35.521
Intravenous catheter ^a	3.768	11.335	0.001	46.019	4.953–427.579
Hearing impairment	1.411	6.139	0.013	4.255	1.353–13.379
Systemic infection	1.191	3.395	0.065	3.009	0.932–9.710
Constant	−8.794	10.019	0.002	<0.001	–

^a During 24 h before research evaluation.* Data fit the model, Chi-square for Hosmer and Lemeshow test = 10.408; $p = 0.238$.

found only an association with hearing but not with visual impairment: one previous study yielded similar results,⁹ two others found association with both impairments,^{10,16} while others found no association.^{2,3,6–8} Regarding functional impairment, some works^{2,8,12,16,29} have described it as a risk factor for delirium, in contraposition with ours and other previous results.^{3,11,13}

Studies in different settings, including NH/LTC, have consistently described cognitive impairment or dementia^{2,3,5–8,11–13,16,29,32} as probably the most important risk factor for delirium. Our opposite results may have different possible interpretations. We found that more than four patients out of 10 had a dementia diagnosis, which is higher than in other settings such as general hospitals or

Table 3 Demographic and clinical characteristics according to dementia and widowhood. Data shown as medians (interquartile ranges) unless denoted by frequencies (percentages).

	No dementia (n = 74)	Dementia (n = 57)	No widow (n = 100)	Widow (n = 31)
Age (years)	74.0(63.0–83.2)	81.0 (72.0–86.0)*	74.0 (67.0–83.7)	81.0 (74.0–87.0)*
Female sex	38 (51.4%)	30 (52.6%)	41 (41.0%)	27 (87.1%)*
<i>Marital status</i>				
Single	35 (47.3%)	14 (24.6%)*	49 (49.0%)	na**
Married/stable relationship	11 (14.9%)	10 (17.5%)	21 (21.0%)	na**
Separated/divorced	16 (21.6%)	14 (24.6%)	30 (30.0%)	na**
Widowed	12 (16.2%)	19 (33.3%)*	na	na**
<i>Dementia antecedents</i>				
Barthel index	30.0 (18.7–55.0)	20.0 (0.0–45.0)*	32.5 (10.0–58.7)	20.0 (5.0–26.0)*
Charlson score	1.0 (1.0–2.0)	2.0 (1.0–3.5)*	2.0 (1.0–2.7)	2.0 (1.0–3.0)
Number of Active Medications ^a	10.0 (8.0–14)	10.0 (8.0–13.5)	10.0 (8.0–13.0)	11.0 (7.0–14.0)
<i>Medications used^a</i>				
Antipsychotics	44 (59.5%)	45 (78.9%)*	75 (75.0%)	14 (45.2%)*
Benzodiazepines	38 (51.4%)	21 (36.8%)	44 (44.0%)	15 (48.4%)
Cognitive enhancers	na	6 (10.5%)*	3 (3.0%)	3 (9.7%)
Opioids	10 (13.5%)	7 (12.3%)	11 (11.0%)	6 (19.4%)
Antidepressants	21 (28.4%)	17 (29.8%)	29 (29.0%)	9 (29.0%)
Anticholinergic Cognitive	1.5 (0.0–4.0)	3.0 (1.0–4.0)	3.0 (1.0–4.0)	1.0 (0.0–3.0)*
Burden scale score				
Hospitalisation days	258 (36.0–269.2)	115 (36.5–488.5)	258.0 (40.7–271.7)	73.0 (23.0–283.0)
Physical restraints ^a	6 (8.1%)	15 (26.3%)*	17 (17.0%)	4 (12.9%)
Urinary catheter ^a	4 (5.4%)	5 (8.8%)	5 (5.0%)	4 (12.9%)
Intravenous catheter ^a	5 (6.8%)	4 (7.0%)	8 (8.0%)	1 (3.2%)
Visual impairment	41 (55.4%)	34 (59.6%)	57 (57.0%)	18 (58.1%)
Hearing impairment	12 (16.2%)	18 (31.6%)*	19 (19.0%)	11 (35.5%)
<i>Five most common main active diagnoses</i>				
Systemic infection	18 (24.3%)	11 (19.3%)	22 (22.0%)	7 (22.6%)
Dementia	na	15 (26.3%)*	9 (9.0%)	6 (19.4%)
Organ insufficiency	5 (6.8%)	9 (15.8%)	8 (8.0%)	6 (19.4%)
Fracture	6 (8.1%)	3 (5.3%)	7 (7.0%)	2 (6.5%)
Cerebrovascular disease	3 (4.1%)	2 (3.5%)	3 (3%)	2 (6.5%)

^a During 24 h before research evaluation.* $p < 0.05$.

** na: not applicable, no comparisons made.

some NH (around 20%),^{16,22,34} and similar to other studies in LTC and NH (34–65%)^{2,3,8,11–13} that have found that dementia is a risk factor for delirium in similar contexts. Even though dementia prevalence in our delirium patients was around 30 percentage points above the no-delirium group, it was not related to delirium when controlling for other variables. The characteristics of our NH could explain this, because many patients are convalescent in subacute care, hence those with dementia could have been recently treated for delirium symptoms without a specific diagnosis of the syndrome. This is concordant with the significantly higher use of antipsychotics and physical restraints during the previous 24 h in patients with dementia.

Other possible causes for the disparity of results among studies are the specific characteristics of populations assessed, differences in the way delirium is diagnosed, the criteria used and how variables related to the syndromes are measured. However, any of this possibilities are only

speculative and could only be correctly addressed by further longitudinal follow-up studies.

Finally, similar to previous reports in populations with a high prevalence of dementia,^{19–22} we found a low rate of delirium diagnosis by patients' usual health providers. Although many patients may be treated as delirious even without this explicit diagnosis in the medical chart, its correct detection and denomination is necessary to obtain an adequate diagnosis, improve the communication among all members of the clinical team and hence the treatment of the entity, with a positive impact on the prognosis of the patient.¹⁸ Efforts should be directed towards the implementation of easy, quick and reliable screening tools for staff members who are not psychiatrists.

This study has limitations that should be remarked. Because it is cross-sectional, we cannot report on the temporal links of delirium-related characteristics. Also, we did not rely on standardised assessments for variables such

Table 4 Multivariate logistic analysis of variables related to dementia and to widowhood in patients from a nursing home facility.^a

Variables related to dementia	β	Wald test	p-Value	OR	95% CI
Age	0.080	12.339	<0.001	1.084	1.036–1.133
Charlson score	0.495	7.479	0.006	1.641	1.151–2.234
Antipsychotics ^a	1.779	10.777	0.001	5.921	2.048–17.122
Physical restraints ^a	1.646	6.533	0.011	5.186	1.468–18.321
Single	−1.788	12.059	0.001	0.167	0.061–0.459
Constant	−8.222	16.943	<0.001	0.000	–
Variables related to widowhood	β	Wald test	p-Value	OR	95% CI
Female sex	2.304	14.060	<0.001	10.014	3.003–33.390
Dementia antecedent	1.406	6.294	0.012	4.080	1.360–12.237
Barthel index	−0.022	3.341	0.068	0.978	0.956–1.002
Antipsychotics ^a	−1.684	9.008	0.003	0.186	0.062–0.558
Constant	−1.792	6.537	0.011	0.167	–

^a During 24 h before research evaluation.^{*} The data fit within each model according to Hosmer and Lemeshow test ($p > 0.050$).

as dementia or sensory impairments, so that, good medical records and assessment protocols notwithstanding, their presence could have been underestimated. Wide 95% CI for some variables in the multivariate analysis suggests the need for larger samples. This study was made in single centre, which limits the generalizability of data to all NH. On the other hand, our exploration of the relationship between diverse clinical and sociodemographic aspects and delirium highlights the need to consider a wider spectrum of characteristics in subacute care, where the syndrome has been understudied.

The main strengths of this report are its naturalistic sampling, including all in-patients on a specific day assessed for diverse demographic and clinical aspects, and the diagnosis of delirium with the most accepted current system, the DSM-5.

Research has identified some factors related to delirium, which constitutes an invaluable input for the implementation of preventive measures. However, the scarce and sometimes contradictory information from NH leads to a lack of specific measures for this population. Much more studies are required in this field, along with improved standardised detection and register of delirium in this kind of facilities.

Funding

There was no funding for this work.

Conflict of interest

None.

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