

Delirium upon admission to Swiss nursing homes: a cross-sectional study

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Summary

Questions under study: We wished to investigate the prevalence of delirium in patients upon admission to nursing homes and whether or not the previous place of residence predicts delirium.

Methods: The Resident Assessment Instrument Minimum Data Set (RAI-MDS) and the Nursing Home Confusion Assessment Method (NHCAM) were used to determine whether the previous place of residence (community, nursing home, acute care, psychiatric, rehabilitation hospital) predicted the prevalence of sub-syndromal or full delirium in nursing home residents in three Swiss cantons (n = 11745).

Results: 39.7% had sub-syndromal and 6.5% had full delirium. Lower cognitive performance and increased depressive symptoms were significant predictors of higher NHCAM values inde-

pendent of previous residence. Age, civil status, continence, newly introduced drugs, and basic activities of daily living were predictors in some resident groups. The NHCAM scores explained varied between 25.1% and 32.3% depending on previous residence.

Conclusions: Sub-syndromal and full delirium are common upon nursing home admission. Increased dependence and depression are consistently associated with higher NHCAM scores. Patients from psychiatric settings have an increased risk of delirium. Although factors associated with delirium depend on a patient's previous residence, all patients must be carefully screened for sub-syndromal and full delirium.

Key words: delirium; elderly; nursing home

¹ Authors' contributions: AvG suggested the analysis on delirium reported in this article. He carried out the preliminary analyses, exchanged with the statistician and wrote the first version of the paper. UPM contributed substantially to the analyses and subsequent drafts of the article. Both authors read and approved the final manuscript.

Introduction

Delirium is a clinical syndrome characterised by acute changes in cognition, altered consciousness and impaired and fluctuating attention [1, 2]. Delirium is a protean syndrome and it often occurs in sub-syndromal expression with only some of the clinical features present [3–5]. It occurs in more than a third of hospitalised people and its incidence during hospital stays ranges from 3 to 56% [6, 7]. Delirium is also frequent among nursing home residents in particular in the first weeks after admission. Nearly a quarter of all residents have symptoms of delirium after admission [8], most of them having sub-syndromal delirium [3]. Delirium and signs and symptoms of delirium are often under-recognised [9]. Correct diagnosis is, however, important because untreated delirium is associated with increased morbidity, increased mortality, poor functional recovery as well as increased health services utilisation including re-hospitalisation [3, 10–15]. Sub-syndromal delirium bears similar risks. It favours new complications in nursing home residents, re-hospitalisation, or six month mortality, and reduces the likelihood

for a hospital patient being discharged into the community. The extent of the risk usually lies somewhere between patients without delirium and those with full delirium [8, 13].

We hypothesised that the place of living before nursing home admission – i.e. admission from home, acute medical care, mental health care, rehabilitation unit or by transfer from another nursing home – predicts delirium or sub-syndromal delirium in the first weeks upon admission to a nursing home. In Switzerland as in other western European countries residents are becoming older and frailer when entering a nursing home and the

List of abbreviations

RAI-MDS	Resident Assessment Instrument Minimum Data Set
MDS-HSI	Minimal Data Set – Health Status Index
NHCAM	Nursing Home Confusion Assessment Method
BMI	Body Mass Index
CPS	Cognitive Performance Scale
BADL	Basic Activities of Daily Living

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duration of stay in hospitals is getting shorter due to a lack of acute care beds and for costing reasons [13]. The previous place of origin before admission may therefore affect the prevalence of delirium in the initial phase after nursing home admis-

sion. To our knowledge, this hypothesis is uninvestigated. If true, it may have implications for health care provision, i.e. delirium prevention and treatment after nursing home admission.

Method

Subjects

All nursing home residents in the three Swiss cantons Aargau, Basel-City, and Solothurn (corresponding to 13.5% of the total Swiss population) [16] received a Resident Assessment Instrument Minimum Data Set (RAI-MDS) assessment within the first two weeks upon entry [17]. We obtained the authorisation of the Qualitäts-Systeme Aktiengesellschaft (Q-Sys AG; Systeme zur Qualitäts- und Kostensteuerung im Gesundheitswesen) that pools all RAI-data, as well as of all directors of the nursing homes involved in this study to use this data for anonymous research purposes. Ninety of 160 nursing homes invited agreed to participate in the study. This yielded a total sample of 21821 nursing home residents. The residents' assessment took place between 1997 and 2007. Only residents for whom data on their previous residence was recorded were included in the study (n = 11745). Previous residence included 1) home care (n = 4569), 2) another nursing home (n = 1092), 3) acute care hospital (n = 4472), 4) psychiatric hospital (n = 568), or 5) rehabilitation clinic (n = 1044).

Measures

Trained professionals assessed each resident upon admission to the nursing home with the Swiss version [17] of the RAI-MDS for nursing homes, Version 2.0 1996 [18]. The Nursing Home Confusion Assessment Method (NHCAM) [3] was used to screen for symptoms of delirium. This scale has been derived from the RAI-MDS through rearrangement of its variables to mimic the well-validated Confusion Assessment Method [4]. Thus, the NHCAM defines four features including 1) acute onset and fluctuating course, 2) inattention, 3) disorganised thought or speech, and 4) altered level of consciousness. A further algorithm allows the separation of three delirium levels (level 1: sub-syndromal delirium [SS-1], i.e. only one of the four features is present; level 2: sub-syndromal delirium [SS-2], i.e. two of the four features are present; level 3: full delirium, i.e. features 1 and 2 are present in conjunction with either feature 3 and/or 4).

Independent variables considered a priori in this study were:

- 1) age, 4 categories (≤ 64 years, 64–79, 80–90, and >90 years)
- 2) gender, 2 categories (female, male)
- 3) civil status, 2 categories (single vs. married)
- 4) smoking, 2 categories (smokers vs. non-smokers)
- 5) special food requirements or habits, 2 categories (the group with special eating habits includes vegetarians, patients who eat kosher or who have a specific food intolerance etc. vs. "traditional Swiss cuisine")
- 6) alcohol use before nursing home admission, 2 categories (alcohol consumption at least once a week vs. less than once a week)
- 7) hearing, 4 categories ranging from 0 = good to 3 = very bad
- 8) eye sight, 4 categories ranging from 0 = good to 3 = very bad

- 9) daily contact, 2 categories (daily visits or telephone calls with their family or friends vs. fewer or no contacts)
- 10) spirituality, 2 categories (religious or spiritual beliefs, attitudes, or behaviours vs. no such beliefs, attitudes, or behaviours)
- 11) continence, 2 categories (continence vs. any incontinence [urinary and/or faecal])
- 12) mobility, 5 categories corresponding to the MDS-HSI (Minimal Data Set – Health Status Index [19])
- 13) Body Mass Index (BMI), 4 categories (<19 , 19–24.9, 25–29.9, ≥ 30)
- 14) number of drugs taken upon admission, 5 categories (no drug taken, one drug taken, 2–5 drugs taken, 6–10 drugs taken, >10 drugs taken)
- 15) number of recently prescribed drugs, i.e. within the previous 90 days, vs. no recently introduced drugs
- 16) total number of recorded diseases
- 17) Cognitive Performance Scale (CPS), score ranging from 1 to 6 [20]
- 18) Basic Activities of Daily Living (BADL), score ranging from 4 to 18 [21]
- 19) MDS-Depression score based on a rating scale for use in nursing home, score ranging from 0 to 14 [22]
- 20) MDS-Pain scale, 3 categories [23]

The data included in this analysis were anonymised, i.e. they did not allow any connection to a particular person in a specific nursing home and therefore submission to a research ethics committee was not required.

Analyses

The Statistical Package for Social Sciences (Version 15.0) was used. Frequencies, means and standard deviations were calculated where appropriate. Exploratory frequency analyses were carried out to determine subjects' characteristics and prevalence data of NHCAM levels across residence groups. Non-parametric ANOVA (Kruskal-Wallis test) was used to determine possible differences regarding prevalence of NHCAM levels as well as the different variables across residence groups.

Aiming at data reduction the factor structure of all variables was analysed using a principal components factor analysis with Varimax rotation. This procedure created 19 factors with Eigenvalues varying between 0.44 and 2.29 with no clear-cut bend on the rather shallow scree plot slope. The principal components with eigenvalues above 1 explained only 54.3% of the total variance observed. For these reasons, it was decided to use all the initial variables for the analyses.

A series of ordinal regression analyses were then carried out to look for associations between the variables and NHCAM levels. CPS, BADL, and MDS-depression were entered as covariates. First, all residence groups were pooled and, in a second step, differential associations with NHCAM were looked for separately in each residence group. Given the large sample size and the parallel analyses of the variables in five samples we corrected for multiple comparisons to retain a minimal significance level of $p \leq 0.01$.

Results

Subjects' characteristics

The subjects' characteristics per residence group are shown in table 1.

The non-parametric ANOVA for all variables grouped according to previous residence showed highly significant differences across most variables ($df = 4$; $p < 0.01$) except for eye sight ($df = 4$; $p = 0.056$).

Delirium depending on the patients' previous residence

Of a total of 11745 patients 6321 (53.8%) had no sign of delirium, 3394 (28.9%) had SS-1 delirium, 1268 (10.8%) had SS-2 delirium, and 762 (6.5%) had full delirium.

NHCAM levels are not equally distributed across residence groups (Pearson's $X^2 = 61.1$; $df = 15$; $p < 0.001$). In particular, subjects coming from psychiatric hospitals may have slightly more SS-1

Table 1

Characteristics of study participants depending on their previous residence.

		Home	Nursing home	Acute care	Mental health	Rehab unit	p-value
Number		4569	1092	4472	568	1044	
Age groups (%)	<64 y	2.9	3.1	3.2	8.8	8.3	p ≤ 0.001
	65–79 y	18.6	19.7	23.2	43.7	26.2	
	80–90 y	46.4	49.7	46.9	38.7	42.8	
	>90 y	32.1	27.5	26.7	8.8	22.7	
Gender (%)	Female	70.5	73.7	68.4	58.3	67.3	p ≤ 0.001
Civil status (%)	Married	25.5	19.6	26.6	23.1	26.2	p ≤ 0.001
Smokers (%)		7.8	9.8	10.4	16.4	12.3	p ≤ 0.001
Special food habits (%)	Yes	17.1	19.5	20.1	17.8	18.7	p = 0.006
Alcohol consumption (%)	Yes	35.3	31.1	36.1	31.0	33.9	p = 0.006
Daily contact (%)	Yes	61.9	57.3	63.6	42.3	61.5	p ≤ 0.001
Spirituality (%)	Yes	40.7	39.4	39.9	32.4	37.6	p = 0.002
Hearing impairment (%)	None	48.9	49.5	52.2	60.7	53.7	p ≤ 0.001
	Slight	35.5	33.3	33.7	27.3	34.2	
	Moderate	13.3	15.4	12.4	10.4	10.5	
	Severe	2.3	1.8	1.7	1.6	1.6	
Visual impairment (%)	None	56.4	51.2	56.9	57.0	57.8	p = 0.056
	Slight	28.9	33.2	28.7	29.9	29.6	
	Moderate	8.7	9.9	9.0	8.8	7.5	
	Severe	6.0	5.7	5.4	4.3	5.1	
Continence (%)	Yes	49.4	35.5	38.0	38.7	38.1	p ≤ 0.001
Mobility (%)	Excellent	64.5	47.2	38.7	59.9	43.5	p ≤ 0.001
	Slightly imp	9.3	11.1	13.2	11.1	10.2	
	Moderately imp	6.0	8.4	9.7	7.4	8.7	
	Severely imp	5.3	7.8	9.5	6.2	8.8	
	Bed-ridden	14.9	25.5	28.9	14.4	28.8	
BMI categories (%)	<19	11.5	13.6	16.3	12.3	12.6	p ≤ 0.001
	19–24.9	49.7	49.0	48.5	51.3	52.8	
	25–29.9	28.1	26.5	24.5	27.0	25.0	
	≥30	10.7	10.9	10.7	9.4	9.5	
Number of drugs taken (%)	None	4.2	1.7	1.5	3.2	1.2	p ≤ 0.001
	1	7.0	3.5	2.8	4.4	3.5	
	2–5	45.5	39.2	35.2	45.4	32.1	
	6–10	36.0	46.3	47.9	39.3	50.0	
	>10	7.3	9.3	12.6	7.7	13.2	
New drugs (%)	Yes	39.8	43.7	62.3	47.4	48.1	p ≤ 0.001
Number of diseases (%)	None	3.5	2.7	1.9	2.1	1.5	p ≤ 0.001
	1	12.1	9.4	7.6	15.5	7.0	
	2–5	70.3	68.5	68.4	71.1	68.1	
	>5	14.2	19.3	22.2	11.3	23.4	
CPS (mean ± SD)		2.12 ± 1.77	2.59 ± 1.78	2.18 ± 1.79	3.05 ± 1.81	2.21 ± 1.72	p ≤ 0.001
BADL (mean ± SD)		7.02 ± 4.25	8.74 ± 4.78	9.23 ± 4.71	7.52 ± 4.59	9.24 ± 4.85	p ≤ 0.001
Depression (mean ± SD)		1.99 ± 2.52	2.17 ± 2.59	1.93 ± 2.37	2.61 ± 2.63	2.03 ± 2.43	p ≤ 0.001
Pain (%)	None	43.0	40.2	33.4	52.8	35.4	p ≤ 0.001
	Slight	26.7	28.9	29.0	25.7	28.4	
	Moderate	26.3	27.0	31.5	19.2	31.5	
	Severe	4.0	3.8	6.1	2.3	4.6	

CPS: Cognitive performance scale; BADL: Basic activities of daily living

Table 2

Prevalence in % of sub-syndromal and full-blown delirium in nursing homes stratified according to previous residence.

	Home	Nursing home	Acute care	Mental health	Rehab unit
SS-1	28.1	31.3	27.8	37.5	29.5
SS-2	9.9	9.4	11.9	13.2	10.1
Full delirium	6.4	5.9	6.6	7.7	6.3

SS-1: level 1 sub-syndromal delirium

SS-2: level 2 sub-syndromal delirium

delirium than those entering the nursing home from other settings (cf. table 2).

Regression analyses

An exploratory ordinal regression analysis with all variables entered into the equation and after adjustment for previous residence showed that age, gender, incontinence, newly introduced drugs, CPS, and MDS-depression were significantly associated with NHCAM as opposed to all the other independent variables considered. Male gender (0.164 [female gender as reference = 0]; CI95% [0.070, 0.258]), incontinence (-0.252 [incontinence as reference = 0]; CI95% [-0.346, -0.158]), the number of newly introduced drugs (-0.448 [newly introduced drugs as reference]; CI95% [-0.532, -0.364]), as well as higher CPS (0.544; CI95% [0.516, 0.573]) and higher MDS-depression scores (0.216; CI95% [0.200, 0.232]) were associated with higher NHCAM values. Fur-

thermore, younger age categories were less correlated with higher NHCAM scores than the oldest age category (age category ≤64 years [-0.317 (reference age category >90 years = 0); CI95% [-0.552, -0.082]; age category 65-79 years (-0.193 [reference age category >90 years = 0]; CI95% [-0.316, -0.069]; age category 80-90 years (-0.004 [reference age category >90 years = 0]; CI95% [-0.101, 0.093])). All variables together accounted for 28.1% (Cox and Snell) of the observed variance of the NHCAM. Finally, nursing home was added as a further variable into the multiple regression model which explained a further 5.4% of the observed variance.

A series of analogous ordinal regression analyses were then carried out for each residence group independently (cf. table 3).

In summary, higher CPS and MDS-depression scores were highly significant predictors of high NHCAM values in all five residence groups. Age, civil status, continence, newly introduced drugs, and BADL were differential predictors depending on the residence group.

The variance of NHCAM explained by these models depending on previous residence was as follows: home care → 32.3% (Cox and Snell), another nursing home → 29.0%, acute care hospital → 25.1%, psychiatric hospital → 29.2%, rehabilitation hospital → 30.2%.

Table 3

Variables associated with NHCAM.

	Home	Nursing home	Acute care	Mental health	Rehab unit
Age	<64 y	-0.443 [-0.873, -0.014]			
	65-79 y	-0.378 [-0.586, -0.169]			
	80-90 y	0.040 [-0.112, 0.192]			
	>90 y	0 (reference)			
Civil status	Single	-0.467 [-0.800, -0.134]			
	Married	0 (reference)			
Continence	Continent	-0.239 [-0.390, -0.088]		-0.215 [-0.368, -0.063]	
	Incontinent	0 (reference)		0 (reference)	
New drugs	No	-0.496 [-0.634, -0.359]	-0.372 [-0.646, -0.097]	-0.447 [-0.585, -0.309]	
	Yes	0 (reference)		0 (reference)	
CPS	0.618 [0.570, 0.667]		0.515 [0.416, 0.613]	0.497 [0.452, 0.543]	0.547 [0.414, 0.680]
BADL			-0.144 [-0.226, -0.062]		
MDS-Depression	0.235 [0.209, 0.262]		0.228 [0.175, 0.281]	0.190 [0.163, 0.217]	0.172 [0.101, 0.242]
					0.251 [0.194, 0.309]

Variables significantly ($p \leq 0.01$) associated with NHCAM (odds ratios, with 95% confidence intervals; only significant results are shown). Predictors of NHCAM across residence groups were CPS as well as MDS-depression. Age, civil status, continence, newly introduced drugs, and BADL were differential predictors. Note that gender fell short off the retained significance level ($p = 0.016$)

in the group admitted from home, newly administered drugs in those from psychiatric clinics ($p = 0.015$), and the number of diseases ($p = 0.016$) in those coming from rehab units.

Discussion

Both sub-syndromal and full delirium are prevalent in subjects within the first two weeks upon their entering a Swiss nursing home with an average of 39.7% of all patients showing at least some signs of delirium and 6.5% presenting with full delirium. These figures are within the range of those reported in the literature that vary, however, between nearly a quarter to over half of all nursing home residents exhibiting delirium symptoms on post-acute admission [8, 13, 24]. Differences between findings may be due to the fact that some of the studies assessed admissions to specific post-acute units in nursing facilities only, whereas the present study included all admissions to a nursing home. Although there seems to be a “monotonous greater risk of mortality with each level of delirium severity” [3], re-hospitalisation or non-discharge to the community is increased in delirious patients even for those with sub-syndromal features [13].

Despite the high prevalence of delirium and negative prognostic implications, delirium or its signs are commonly under-recognised [9]. To increase diagnostic accuracy identifying groups of patients with an increased risk of delirium at admission may be useful. Although patients admitted from rehabilitation hospitals and skilled nursing facilities had a similar prevalence of delirium after admission [8], this is to our knowledge the first study assessing whether the place of residence before nursing home admission is associated with delirium after admission. The prevalence of delirium in our study was high for all residence groups; however, it was even higher for those coming from psychiatric settings. The association of a higher BADL score with higher NHCAM scores is in keeping with the association between increased dependency and delirium. However, as the average BADL score in the psychiatric group is lower than in most other residence groups, one possible explanation is that patients with mental illness are particularly vulnerable to incident delirium, a hypothesis that our data do not allow us to test. Our data suggest that sub-syndromal and full delirium may be more frequent in nursing homes than in acute care hospitals [6, 7]; thus, delirium may neither be sufficiently treated in hospitals nor perceived as a reason to stay in the hospital despite its negative prognostic meaning. Furthermore, admission to a nursing home may be a precipitating factor for delirium.

All residence groups had similar prediction patterns of NHCAM determinants. Increased dependence including more marked cognitive impairment and incontinence in some residence groups are known predictors for delirium as in our study. More pronounced depression was a clear predictor for delirium in our as well as a previous study [25], although this is less established in the literature. In this study, MDS-pain, the number of

drugs and the number of diseases were not associated with NHCAM. This seems to contradict other studies where drugs are most often considered as either precipitating or predisposing factors [26–29]. However, the number of drugs administered within 90 days prior to nursing home admission was associated with NHCAM in three residence groups. Thus, the result is only in apparent contradiction with the literature. However, these parameters may not be pivotal in nursing home cohorts with notoriously high amounts of drugs taken.

Why the married had more full (9.1%) and SS-1 (35.8%) delirium than the single (5.3% and 27.3%) in those coming from rehab clinics is open to speculation. The married may be more prone to delirium as they have to abandon their partners as opposed to the single. Premorbid habits are not important predictors of delirium. Interestingly, we have found no studies investigating the issues of premorbid habits and civil status as possible determinants of delirium although psychosocial variables may be stress factors and as such precipitators of delirium.

Despite the large sample size, which is a strength of this study, a number of shortcomings must be mentioned. Firstly, data collection was done for quality control in nursing homes and this may have introduced some unidentified bias as assessment of delirium by clinical staff may be less accurate than assessment done by trained research personnel [30]. We believe, however, that this bias did not influence our main findings. Furthermore, the consistency of the data had been regularly monitored as part of the RAI-MDS programme. The independent variables in this study predicted approximately 30% of the variance of the observed NHCAM scores suggesting that other variables substantially co-determine delirium in new nursing home residents within the first two weeks after admission. The data available for this study leave the question whether or not the variables identified are precipitating or predisposing factors unanswered. It would be most important to know whether delirium is new upon admission or persistent from before admission. The important question whether delirium newly evolves within the first weeks after nursing home admission or persists from before admission can only be addressed in prospective longitudinal studies. Both are, of course, possible. Nursing home was another variable influencing the occurrence of delirium suggesting that factors not assessed in this study such as staff number, training level, type and quality of medical and nursing activities as well as others significantly affect either detection or occurrence of delirium upon admission to a nursing home. Clearly, further studies are needed to improve the detection of delirium, to identify residents at risk and to reduce its occurrence.

Conclusions

Sub-syndromal and full delirium are astonishingly frequent upon entry into Swiss nursing homes. Patients from psychiatric settings may have an increased risk of delirium when entering a nursing home. Increased dependence including more pronounced cognitive impairment and depression are consistently associated with higher NHCAM scores. Although factors associated with delirium differ somewhat as a function of a patient's previous residence, all patients, whatever their previous residence, must be equally carefully screened for delirium, especially for sub-syndromal delirium due to adverse outcome of these patients.

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