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ORIGINAL RESEARCH

The diagnosis of delirium in an acute-care hospital in Moscow: what does the Pandora's box contain?

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Background: Delirium, a common problem among hospitalized elderly patients, is not usually diagnosed by doctors for various reasons. The primary aim of this study was to evaluate the effect of a short training course on the identification of delirium and the diagnostic rate of delirium among hospitalized patients aged ≥65 years. The secondary aim was to identify the risk factors for delirium.

Methods: A prospective study was conducted in an acute-care hospital in Moscow, Russia. Six doctors underwent a short training course on delirium. Data collected included assessment by the confusion assessment method for the intensive care units, sociodemographic data, functional state before hospitalization, comorbidity, and hospitalization indices (indication for hospitalization, stay in intensive care unit, results of laboratory tests, length of hospitalization, and in-hospital mortality).

Results: Delirium was diagnosed in 13 of 181 patients (7.2%) who underwent assessment. Cognitive impairment was diagnosed more among patients with delirium (30.0% vs 6.1%, P=0.029); Charlson comorbidity index was higher (3.6±2.4 vs 2.3±1.8, P=0.013); and Barthel index was lower (43.5±34.5 vs 94.1±17.0, P=0.000). The length of hospitalization was longer for patients with delirium at 13.9±7.3 vs 8.8±4.6 days (P=0.0001), and two of the 13 patients with delirium died during hospitalization compared with none of the 168 patients without delirium (P=0.0001).

Conclusion: Although the rate of delirium was relatively low compared with studies from the West, this study proves that an educational intervention among doctors can bring about a significant change in the diagnosis of the condition.

Keywords: delirium, elderly, inpatients, Russia

Introduction

Delirium is a neurocognitive disorder characterized by disturbance of attention or awareness that is accompanied by a change in baseline cognition that cannot be better explained by a preexisting or evolving neurocognitive disorder; the disturbance develops over a short period of time and tends to fluctuate during the course of the day.[1]

Among hospitalized adults, the rate of delirium is within the range of 13%–49%.[2–5] Delirium has severe health and economic consequences, including prolonged hospital stay,[5–7] functional impairment, increased risk of transfer to long-term care,[8] cognitive decline,[8] and even increased mortality.[2,4–6,8] Despite the common occurrence of delirium and its severe outcomes, doctors have difficulty in identifying delirium and only 16%–35% of delirium cases are diagnosed by doctors.[9–11]

Although the problem of delirium is well reported in the professional literature from Western countries, less is known about this issue in Russia. In a PubMed literature search, we found only seven articles that are related to the prevalence of delirium in Russia[12–18] and only one of these was written in English.[15]

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Over the course of a sabbatical leave of one of the authors (YP) in Moscow, Russia, the difficulty in diagnosing delirium among elderly hospitalized patients was brought up often by the Russian colleagues. To our knowledge, the diagnosis of delirium in Russia is difficult due to existing regulatory issues, for example, the need for a daily psychiatric consultation from the moment the diagnosis is recorded. Thus, this is a problematic issue in Russia and represents a type of Pandora's box that doctors prefer not to open in Russian general hospitals. This would appear to be the reason that some of the younger doctors in Russia are not familiar with the issue of delirium in elderly patients, as it is not taught systematically in medical school or in postgraduate medical education. In an effort to increase the awareness of delirium and to improve its diagnosis by hospital doctors, a study was designed to assess the effect of a short training program for the medical team on the identification of delirium and to evaluate the risk factors for delirium among elderly hospitalized patients.

Methods

This prospective study was conducted in a public hospital in Moscow, a primary academic hospital with 990 hospital beds, of which ~70% belong to the internal medicine department. The hospital provides services for all emergency cases as well as elective hospitalizations. Six residents in internal medicine underwent a 1-hour course including a short lecture of 20 minutes on delirium which was followed by training in the use of the following instruments: the confusion assessment method for the intensive care units (CAM-ICU)[19] and the Barthel index (BI).[20] The doctors were asked to recruit, over a period from May 15, 2015, to June 15, 2015, all patients in their ward who met the study inclusion criteria. The inclusion criteria were patients aged ≥65 years who were hospitalized and consented to participate in the study.

The exclusion criteria were unconsciousness, significant neurological impairment, or uncorrected visual and/or hearing disturbances that interfered with the possibility of obtaining informed consent, taking a history, or conducting a cognitive assessment. Furthermore, patients were excluded from the study in all cases where their participation might lead to a delay in diagnosis or treatment.

Patients who fulfilled the inclusion criteria received an explanation of the study aims, were invited to participate in it, and asked for oral consent. The participants were evaluated by means of the CAM-ICU. Family members and the ward staffs provided information on changes or fluctuations in the patient's cognitive state. The type of delirium (hypo- or hyperactive) was diagnosed by the Richmond Agitation and Sedation Scale (RASS).[21] Participants with a positive score were defined as the hyperactive type and those with a negative score as the hypoactive type. Sociodemographic data (age, sex, family status, education, occupational status, living status), data on the patient's functional status (BI), and comorbidity including cognitive state in the past were collected from the patients and their family members in an interview. Supplementary information was obtained from the participants' medical charts, and the Charlson comorbidity index (CCI) was calculated.[22] Data on indication for hospitalization, type of hospitalization (elective or acute), the length of hospitalization, in-hospital mortality, ICU stay, drugs that the participants received during hospitalization, and the results of laboratory tests carried out during the hospitalization were obtained from the medical charts. The Helsinki Committee of the National Research Center for Preventive Medicine, Moscow, Russia, approved the study and allowed the investigators to obtain oral consent. Thus, the participants were not required to give written consent.

Statistical analyses

The demographic and clinical characteristics of patients with and without delirium were compared. Categorical variables were compared by chi-square or Fisher's exact tests. Continuous variables were compared with Student's *t*-tests.

Results

Over the course of the 1-month study period, 589 patients were hospitalized. Of these, 260 patients underwent a preliminary, nonsystematic review on the days that the doctors who underwent training worked in the wards. Two patients refused to participate in the study, and 260 did not fulfill the inclusion criteria (in most cases because of age <65 years). A total of 181 patients were included in the study: 138 in internal medicine departments, 11 in neurology, 10 in palliative care, and 22 in surgical wards. The participating patients represented 30.7% of the patients hospitalized in the study wards over the study period.

The mean age of the participants was 77.3±7.9 years, and 69 (38.1%) were males. Respiratory difficulties were the most common reason for hospitalization with 90 patients (49.7%). The three next most common reasons were cough (N=57, 31.5%), fatigue (N=37, 20.4%), and abdominal pain (N=29, 16.0%). A total of 14 patients (7.7%) were treated in the ICU during the course of their hospitalization.

The participants were evaluated using the CAM-ICU at a mean of 5.6±6.6 days (range: 1–39) after admission to the hospital. Based on CAM, 13 participants (7.2%)

were diagnosed with delirium. Of these, nine (69.2%) had hypoactive delirium.

Table 1 presents the data on the participants with and without delirium. There were no significant differences between these two groups in sociodemographic variables (age, sex, education, family status, and living conditions), lifestyle (smoking and alcohol consumption), prior head trauma, and the number of chronic medications that the participants received prior to the present hospitalization. There were significant differences between patients with and without delirium in the following pre-hospitalization variables: prior history of cerebrovascular accident (CVA; 45.5% vs 13.3%, P=0.014), history of cognitive decline (30.0% vs 6.1%, P=0.029), number of chronic diseases (6.77±2.1 vs 5.4±2.26, P=0.036),

Table 1 Comparison between patients with and without delirium

Characteristics	Full delirium (CAM)				
	Yes		No		*P*-value
	N	%	N	%	
Age					
Mean ± SD	77.15±7.8		77.3±8.0		0.954
Range	68–99		65–99		
Sex					
Male	8	61.5%	61	36.3%	0.082
Female	5	38.5%	107	63.7%	
	13		168		
Marital status					
Married	6	54.5%	92	60.5%	0.355
Others	5	45.5%	60	39.5%	
	11		152		
Living status					
Alone	1	9.1%	18	11.3%	1.000
Others	10	90.9%	142	88.8%	
	11		160		
Education (years)					
Up to 10	2	18.2%	35	21.7%	0.839
11–14	6	54.5%	73	45.3%	
15+	3	27.3%	53	32.9%	
	11		161		
Current smoker					
Yes	4	36.4%	31	19.3%	0.237
No	7	63.6%	130	80.7%	
	11		161		
Current drinker (alcohol)					
Yes	3	27.3%	19	11.8%	0.232
No	8	72.7%	142	88.2%	
	11		161		
Prior head trauma					
Yes	4	36.4%	31	19.3%	0.237
No	7	63.6%	130	80.7%	
	11		161		
Prior CVA					
Yes	5	45.5%	22	13.3%	0.014
No	6	54.5%	144	86.7%	
	11		166		
Prior cognitive problems					
Yes	3	30.0%	10	6.1%	0.029
No	7	70.0%	155	93.9%	
	10		165		
Number of chronic diseases					
Mean ± SD	6.8±2.1		5.4±2.3		0.036
Range	4–11		0–11		
CCI					
Mean ± SD	3.6±2.4		2.3±1.8		0.013
Range	0–9		0–7		
Number of drugs prior to admission to hospital					
Mean ± SD	1.1±1.6		1.6±1.5		0.210
Range	0–5		0–6		
BI					
Mean ± SD	43.5±34.5		94.1±17.0		0.000
Range	0–100		0–100		
Hospitalization type					
Planned	0	0.0%	22	13.4%	0.375
Emergency	13	100.0%	142	86.6%	
	13		164		
Indication for hospitalization (more than one is possible)					
Abdominal pain	0	0.0%	29	17.3%	0.133
Chest pain	1	7.7%	13	7.7%	1.000
Cough	3	23.1%	54	32.1%	0.758
Dizziness	1	7.7%	22	13.1%	1.000
Dyspnea	4	30.8%	86	51.2%	0.249
Fatigue	2	15.4%	35	20.8%	1.000
Fever	2	15.4%	24	14.3%	1.000
Gait instability	0	0.0%	4	2.4%	1.000
Headache	1	7.7%	16	9.5%	1.000
Leg edema	2	15.4%	9	5.4%	0.181
Nausea	0	0.0%	17	10.1%	0.615
Palpitations	0	0.0%	5	3.0%	1.000
Tinnitus	0	0.0%	1	0.6%	1.000
Vomiting	0	0.0%	5	3.0%	1.000
ICUs					
Yes	4	33.3%	10	6.0%	0.008
No	8	66.7%	156	94.0%	
	12		166		
Temperature >38.0°C					
Yes	2	25.0%	14	12.2%	0.278
No	6	75.0%	101	87.8%	
	8		115		
RBC (10^9 cells/L)					
Mean ± SD	3.9±0.85		4.3±0.8		0.070
Range	2.0–4.8		1.4–6.4		
Hemoglobin (g/dL)					
Mean ± SD	11.1±2.3		12.5±2.5		0.062
Range	5.6–13.7		5.0–19.9		
WBC (10^6 cells/L)					
Mean ± SD	11.7±5.8		9.2±4.4		0.085
Range	3.5–23.00		1.0–35.20		
Hematocrit (%)					
Mean ± SD	33.95±8.0		36.2±7.6		0.370
Range	16.2–43.4		8.3–59.4		

(*Continued*)

Table 1 (*Continued*)

Characteristics	Full delirium (CAM)				
	Yes		No		*P*-value
	N	%	N	%	
ESR (mm/h)					
Mean ± SD	32.0±16.6		25.0±15.4		0.151
Range	8.0–58.0		2.0–60.0		
Glucose (mg/dL)					
Mean ± SD	132.7±67.2		116.6±73.85		0.484
Range	77.5–311.75		70.3–319.0		
BUN (mg/dL)					
Mean ± SD	40.1±35.3		21.2±10.2		0.000
Range	11.5–115.4		7.3–64.4		
Creatinine (mg/dL)					
Mean ± SD	2.2±1.85		1.1±0.4		0.000
Range	0.7–5.7		0.3–2.9		
Potassium (mEq/L)					
Mean ± SD	4.3±0.6		4.2±0.6		0.632
Range	3.4–5.5		2.1–5.6		
Sodium (mEq/L)					
Mean ± SD	143.0±9.6		137.7±3.5		0.002
Range	129.0–162.0		131.0–149.0		
Total protein (g/dL)					
Mean ± SD	6.3±1.0		6.75±0.7		0.080
Range	4.4–7.4		5.0–9.4		
Number of drugs during hospitalization					
Mean ± SD	4.6±1.7		5.2±2.1		0.310
Range	0–6		1–10		
Hospitalization days					
Mean ± SD	13.85±7.3		8.8±4.6		0.000
Range	5–24		1–43		
In-hospital mortality					
Yes	2	15.4%	0	0.0%	0.005
No	11	84.6%	168	100.0%	
	13		168		

Abbreviations: BI, Barthel index; BUN, blood urea nitrogen; CAM, confusion assessment method; CCI, Charlson comorbidity index; ESR, erythrocyte sedimentation rate; ICU, intensive care unit; RBC, red blood cells; WBC, white blood cells; SD, standard deviation.

CCI score (3.62±2.36 vs 2.30±1.76, *P*=0.013), and BI score (43.51±34.47 vs 94.12±17.51, *P*=0.000).

There were no significant differences between the groups in terms of hospitalization data such as type (elective or acute), reasons for hospitalization, fever above 38°C, and laboratory results (erythrocyte sedimentation rate [ESR], white blood cells [WBC], hematocrit, hemoglobin, red blood cells [RBC], plasma glucose, plasma potassium, and total plasma protein levels). There were significant differences in the following hospitalization variables: admission to the ICU (33.3% vs 6.0%, *P*=0.008) and laboratory results including blood urea nitrogen (BUN; 40.1±35.3 vs 21.2±10.2 mg/dL, *P*=0.000), plasma creatinine (2.2±1.85 vs 1.1±0.4 mg/dL, *P*=0.000), and plasma sodium level (143.0±9.6 vs 137.7±3.5 mEq/L, *P*=0.002).

Differences were also found between the groups in the length of hospitalization (13.85±7.3 vs 8.8±4.6 days, *P*=0.000) and mortality rates (15.4% vs 0%, *P*=0.005).

The diagnosis "delirium" or any related diagnosis was not included in any of the discharge letters of the 13 patients with delirium, and in six letters there was no mention whatsoever of the patient's cognitive state.

Discussion

Occurrence rate

In the current study, we found an occurrence rate of 7.2% for delirium in hospitalized patients aged ≥65 years. This rate is low compared with the rates published in most studies from the Western world (11%–42%).[23] There are very few reports from Russia in the medical literature, and according to those the rate of delirium in hospitals ranges from 2.8% among all hospitalized adults[12] to 41.4% among hospitalized patients with dementia.[18] The relatively low occurrence rate in the current study, compared with the most other studies in the field, is most likely associated with the study methodology, which is discussed in depth in the "Strengths and limitations" section.

Risk factors for delirium

Age

In the current study, advanced age was not associated with delirium in hospitalized adults. Some of the previous studies had similar results,[5,9,11,24,25] but in others there was a correlation between age and a higher risk for delirium.[2–4,7,10]

Sex

In the current study, there was also no association between sex and delirium, and previous publications have inconsistent results in relation to this factor as well. While in most studies no association was found between sex and delirium,[4,7,9–11] in two other studies female sex increased the risk for delirium,[5,24] and in another male sex increased the risk.[2]

Comorbidity and illness severity

In the current study, we found an association between comorbidity, measured by CCI, and delirium. We used stay in the ICU as a measure of the severity of the disease or diseases that led to hospitalization, and in this measure we also found a statistically significant association with delirium. Most earlier studies also found an association between comorbidity[4,5,7,9] or illness severity[4,7,10] and the risk for delirium in the hospital or in the emergency ward. A prior CVA was associated with delirium in the hospital. Edlund et al[2] also found that prior

CVA increased the risk for delirium during acute hospitalizations. An association between previous coronary artery bypass graft surgery and preoperative cerebral infarcts on magnetic resonance imaging (MRI) has also been reported.[26]

As was found in most of the previous reports,[3–5,7,10,27] we also found a significant association between cognitive decline before hospitalization and the onset of delirium during hospitalization.

Activities of daily living

In the current study, functional decline prior to hospitalization had a strong and significant association with the onset of delirium during hospitalization. These findings are supported by most,[4,5,7,10,27] but not all, studies in the field.[24]

Laboratory findings

In the current study, we found an association between plasma BUN and creatinine levels and the risk to be diagnosed with delirium during hospitalization. These findings are consistent with those of some of the studies that investigated this association,[5] but are not in agreement with the results of other studies.[2,3] We also found an association between delirium and plasma sodium level, but the results of other studies on sodium levels and delirium are not consistent.[2]

Length of hospitalization and mortality

We found that delirium is associated with longer periods of hospitalization (13.85±7.3 vs 8.8±4.6 days) and mortality (15.4% vs 0%). Our findings are similar to those in the literature on the length of hospitalization[5–7] and on higher mortality rates during hospitalization.[2,5]

Effect of doctor training on the identification of delirium

One of the known factors for the low rate of diagnosed delirium is the lack of expertise on the part of doctors. A survey was conducted among 784 doctors in 34 hospitals in the UK, of those 51% had experience in geriatric medicine, 7% in neurology, and 4% in psychiatry. The investigators found that 97% of the participants strongly agreed that doctors who work in hospitals need to have a good level of knowledge on delirium, but only 21% of the participants in the survey said that they had good knowledge of the diagnostic criteria for delirium and only 30% said that they felt confident in the treatment of delirium. Only 16% reported that they had received adequate training in delirium. Experienced doctors had higher rates of adequate training (24% vs 9%), but even these rates were far lower than expected.[28]

The idea for the execution of the current study came up at meetings with doctors in Moscow. One of the goals of the study was to check the effect of education and training on the recognition of delirium. We found that a small investment of effort in terms of time (a short lecture and short bedside training) led to the diagnosis of delirium in 13 of the 181 hospitalized patients. To our knowledge, up to this point, the diagnosis of delirium (other than delirium tremens) had never been made in the study wards. In a previous study, the authors reported that enrichment programs on the subject of delirium, with the addition of a geriatrician to the emergency room staff (although the diagnosis of delirium by the geriatrician was not assessed in the study), increased the rate of diagnosis of delirium.[29] For now, a section on delirium has been added to the continuing medical education (CME) program for family doctors, geriatricians, and the medical school curriculum in the framework of the Russian National Institute for Geriatrics and Gerontology.

Strengths and limitations

The current study has several strengths. 1) It is a prospective study that is one of only a very few studies that have addressed the issue of delirium in Russia. 2) The study shows that a short training program for doctors brought about a dramatic change in the daily work practice in the wards and led to the identification of delirium in a considerable number of cases.

The current study also has many weaknesses. The first weakness is that, the evaluation was conducted on doctors who underwent a short training program and was not validated in a group of doctors with experience in this field. Thus, even though the structured CAM-ICU instrument, which has high specificity and sensitivity rates, was used,[19,30,31] it is reasonable to assume that the false-positive and false-negative rates were high. Another potentially significant problem with the study is the relative low response rate. Only 260 of the 589 patients (44.1%) who were hospitalized during the study period in the relevant wards underwent a preliminary evaluation before enrollment in the study, and only 181 of them (30.7%) were assessed using the study instruments. Since nine of the 13 patients diagnosed with delirium had the hypoactive type, it is likely that patient restlessness did not determine the selection of study participants. Furthermore, because of data collection difficulties that could not be overcome, we do not have data on the exact reasons that 77 of the 260 patients who were surveyed did not fulfill the inclusion criteria and were not enrolled in the study. Another weakness is that the assessment was conducted only once during the

course of hospitalization, so we do not know how long the delirium persisted among the patients who were diagnosed with delirium, for example, we do not know how many of them were discharged to their home with active delirium. Another study limitation is the lack of consistency in the timing of the assessment, with a range of 1 day to >1 month after admission to the hospital. For this reason, the rate of patients who were admitted with delirium is not clear, nor do we know the rate of patients who developed delirium during the course of hospitalization.

Another limitation of the study is that although one of the study aims was to follow patients with delirium after discharge from the hospital, for reasons beyond our control this could not be performed, so we do not know what happened to these 13 patients after they were discharged.

There are two possible explanations as to why delirium was not cited in the discharge letter of any of the 13 patients. 1) They did not have delirium at the time of discharge, which we believe is the more likely explanation. 2) Delirium was not perceived as a significant problem, from which we can conclude that these patients were not followed after discharge from the hospital.

Conclusion

In the current study, we showed that a short training program for ward doctors can increase the rate of diagnosis of delirium among patients. Training in the recognition of delirium in patients aged ≥65 years should be introduced into various education and training programs for medical students and doctors. Regulatory changes and changes to clinical guidelines should be made in Russia requiring doctors to carry out activities even if not supported by evidence-based medicine, such as daily psychiatric consultations.

We hope that the current study will help to bring about the necessary changes in both training programs and regulatory issues, and we will be pleased to report on such changes in the future.

Author contributions

Designed the study and wrote the article: Olga N Tkacheva. Designed the study and assisted with writing the article: Nadezda K Runikhina. Supervised the data collection: Arkadiy L Vertkin. Collected the data and assisted with writing the article: Irina V Voronina. Collected the data and assisted with writing the article: Natalia V Sharashkina. Assisted with writing the article: Elen A Mkhitaryan. Collected the data and assisted with writing the article: Valentina S Ostapenko. Supervised the data collection: Elena A Prokhorovich. Performed statistical design of the study and carried out the statistical analysis: Tamar Freud. Designed the study and wrote the article: Yan Press. All authors contributed toward data analysis, drafting and critically revising the paper and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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