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The utility of nursing instruments for daily screening for delirium: Delirium causes substantial functional impairment

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Abstract

Objective. Nursing assessments have been recommended for the daily screening for delirium; however, the utility of individual items have not yet been tested. In a first step in establishing the potential of the electronic Patient Assessment-Acute Care (ePA-AC) as such, the impact of delirium on the functional domains was assessed.

Method. In this prospective observational cohort study, 277 patients were assessed and 118 patients were delirious. The impact of delirium on functional domains of the ePA-AC related to self-initiated activity, nutrition, and elimination was determined with simple logistic regressions.

Results. Patients with delirium were older, sicker, were more commonly sedated during the assessment, stayed longer in the intensive care unit (ICU) and floors, and less commonly discharged home. A general pattern was the loss of abilities and full functioning equivalent to global impairment. For self-initiated mobility, in and out of the bed sizable limitations were noted and substantial inability to transfer caused friction and shearing. Similarly, any exhaustion and fatigue were associated with delirium. For self-initiated grooming and dressing, the impairment was greater in the upper body. Within the nutritional domain, delirium affected self-initiated eating and drinking, the amount of food and fluids, energy and nutrient, as well as parenteral nutrition requirement. In delirious patients, the fluid demand was rather increased than decreased, tube feeding more often required and dysphagia occurred. For the elimination domain, urination was not affected — of note, most patients were catheterized, whereas abilities to initiate or control defecation were affected.

Significance of results. Delirium was associated with sizable impairment in the level of functioning. These impairments could guide supportive interventions for delirious patients and perspectively implement nursing instruments for delirium screening.

Introduction

Delirium is a neuropsychiatric syndrome characterized by disturbances in consciousness and cognition, an abrupt onset and fluctuating course commonly caused by underlying etiologies (American Psychiatric Association, 2013). Delirium is common across healthcare settings (Bucht et al., 1999; Inouye et al., 2014). Delirium occurs in up to 70% in inpatients undergoing cardiac surgery procedures (Norkiene et al., 2007; Gottesman et al., 2010) and in 80% in mechanically ventilated intensive care patients (Pun and Ely, 2007). Delirium is associated with significant adverse short-term (Rosen et al., 2002; Santos et al., 2004) and long-term outcomes for patients and increased healthcare costs (Koster et al., 2009). Important patient outcomes include prolonged length of stay in the ICU and hospital (Ely et al., 2004; Ouimet et al., 2007), prolonged mechanical ventilation or more frequent ventilation (Heymann et al., 2010), increased morbidity, as evidenced in nosocomial infections, pneumonia, or respiratory complications increased mortality rates (Balas et al., 2009; Heymann et al., 2010), and in the longer-term decline in functionality and cognitive abilities (Bickel et al., 2008), with increased rates of institutionalization (Ouimet et al., 2007).

Nursing assessments have been proposed as screening tools for delirium. One major advantage is their daily clinical implementation and a wide range of documented parameters. A nursing study identified areas of care in patients with delirium as follows: Dyspnea, problems with nutrition and elimination, self-care and mobility, communication, relationships, and physical

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safety (Sola-Miravete et al., 2018). Further, lacking regular activity has been identified as a potential risk factor for delirium (Yang et al., 2008). For patients with delirium superimposed on dementia, both impaired mobility and balance helped identify delirium (Gual et al., 2019). In addition, nutritional status and nutrients have been hypothesized to contribute to delirium (Sanford and Flaherty, 2014).

The electronic Patient Assessment-Acute Care (ePA-AC) (Hunstein, 2012) includes various domains assessing activity, mobility, grooming, nutrition, elimination, cognition and consciousness, communication and interaction, sleep, breathing, pain, and wounds. Since these domains are likely to be altered by delirium, they may carry potential in assessing delirium. Further, this instrument attempts to signal an increased risk for confusion, delirium, or dementia. However, this risk assessment has been arbitrarily defined based on items reflecting cognition, behavior and sleep–wake cycle, although this construct has never been validated.

Thus, the present study aimed to assess the utility of the ePA-AC for profiling patients at risk for delirium in the intensive care setting, a highly vulnerable population, in addition to further explore the potential of this instrument for the daily determination of delirium in addition to established instruments

Methods

Patients and procedures

All patients in this prospective, descriptive cohort study were recruited at the University Hospital Zurich, a tertiary care center managing 39,000 admissions yearly. The study was conducted on a 12-bed, intensive care unit serving primarily cardiovascular–surgical patients admitted between May 1, 2013 and April 30, 2015. Inclusion criteria were a minimum age of 18 years and intensive care management for more than 18 h. Exclusion criteria were drug, alcohol, or medication use disorders in an effort to exclude delirium caused by withdrawal. In this study, 277 patients were included, of which 118 were delirious and 159 non-delirious patients.

As part of the inclusion process, patients were informed about the study rationale and procedures and an initial attempt to obtain written informed consent was made. In those patients who were unable to provide written consent at that time, either due to severe delirium, critical medical conditions, sedation, or frailty, proxy assent from the next of kin or a responsible caregiver was obtained. After stabilization — in accordance with the ethical standards of the Declaration of Helsinki — retrospective consent was obtained from these patients. Patients were excluded when they refused to participate or consent at the initial attempt or after they had clinically improved. The study was approved by the ethics committee of the Canton Zurich, Switzerland (KEK-ZH-Nr: 2012-0263).

The baseline assessment included an interview, the determination of delirium according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) criteria (American Psychiatric Association, 2000) by psychiatrists, the acquisition of the ePA-AC (Hunstein, 2012) on the same day, and completion of socio-demographic, medical, and psychiatric variables. Assessments were based upon all available sources of information, including collateral information from nursing, medical–surgical staff, the electronic medical record system (Klinikinformationssystem, KISIM, CisTec AG, Zurich), and family/caregivers.

Measurements

Diagnostic and Statistical Manual IV: Text Revision

Representing the gold standard, delirium was diagnosed with DSM-IV-TR (American Psychiatric Association, 2000) by psychiatrists. Criteria represent: (A) a disturbance of consciousness, with reduced ability to focus, sustain, or shift attention; (B) altered cognition (memory, orientation, and language disturbance) or the development of a perceptual disturbance (delusion or hallucination or illusion) that is not better accounted for by pre-existing dementia; (C) the disturbance develops over hours or days and tends to fluctuate during the course of the day; and (D) there is evidence of an etiological cause.

Electronic Patient Assessment-Acute Care

The ePA-AC (Hunstein, 2012) is a nursing instrument administered in the daily clinical routine summarizing 11 domains and 56 items (Table 2). The first domain aims to provide 1: risk assessments for (a) self-care, (b) decubital ulcers, (c) falls, and (d) pneumonia, confusion/delirium/dementia, nutrition, and malnutrition. Further domains describe 2: activity, 3: grooming and dressing, 4: nutrition, 5: elimination, 6: cognition and consciousness, 7: communication and interaction, 8: sleep, 9: respiration, 10: pain, and 11: wounds. Items are rated on scales from either 0 — absent to 1 — present, or from 1 to 4, most commonly representing 1 — no ability, 2 — substantial impairment, 3 — mild impairment, and 4 — full ability; or for consciousness 1 — comatose, 2 — soporose, 3 — somnolent, and 4 — awake and alert; or for orientation, 1 — no quality, 2 — single quality, 3 — two qualities, and 4 — fully oriented. For most items, the inability to assess is coded as 9.

Statistical methods

All statistical procedures were conducted using the Statistical Package for Social Sciences (SPSS) version 25. Description of the sample in terms of socio-demographic and clinical variables was by means and standard deviations or medians and interquartile ranges, depending on parametric properties, and percentages for categorical variables. The data were tested with Shapiro–Wilk's for distribution of normality, and the respective tests were chosen. Intergroup comparisons were calculated for patients with delirium vs. those without. Mann–Whitney U test was computed for interval or ordinal variables, for categorical variables, Pearson's χ^2 or Fisher's exact test were chosen depending on sample sizes, and simple logistic regressions were performed to determine the effect sizes expressed as the respective odds ratio (OR) with 95% confidence interval (CI). All tests were two-tailed, and the significance level was set at 0.05.

Results

Characteristics of the patient sample

The delirious patients were older, stayed longer on the ICU and in the hospital, were more severely ill as indicated by the simplified acute physiology scores (SAPS), were more commonly under intermittent and continuous sedation during the assessment (OR 1.54 and 3.72, respectively). Conversely, non-delirious patients were less commonly under any sedation during assessment (OR 0.26) and discharged home more often. Neither gender distribution, discharge from the ICU, final discharge to institutions, nor mortality was different (Table 1).

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Table 1. Socio-demographic and medical variables of the patient sample

	Delirious patients – D ($N = 118$)	Non-delirious patients – ND ($N = 159$)	OR, CI – P
Age (years)	70.4 (67.4–73.4, 14.3)	64.4 (61.8–67.0, 15.2)	0.001[a]
Gender (%)			
Female	32.2	22.6	0.099[b]
Male	67.8	77.4	0.099[b]
ICU length of stay (days)	9.3 (6.9–11.7, 11.3)	5.6 (4.2–6.3, 6.4)	<0.001[a]
ICU discharge to (%)			
Floor	46.8	59.4	0.062[b]
Intermediate care	47.9	37.0	0.105[b]
ICU	4.3	2.9	0.718[b]
Deceased	1.1	0.7	1[b]
Hospital length of stay (days)	25.4 (21–30, 20.8)	18.1 (15.1–21.1, 17.7)	<0.001[a]
Final discharge to (%)			
Home	9.6	21.7	0.38, 0.17–0.85[b] – 0.019
Rehabilation	72.3	65.1	0.315[b]
Other hospital	14.9	9.4	0.217[b]
Deceased	3.2	3.6	1[b]
Simplified acute physiology score (SAPS)	42.5 (39.57–45.51, 14.3)	32.85 (30.45–35.16, 13.8)	<0.001[a]
Sedation during the assessment (%)			
None	53.3	81.7	0.26, 0.14–0.47[b] – <0.001
Intermittent	33.3	14.3	3, 1.54–5.83[b] – 0.001
Continuous	13.3	4.0	3.72, 1.26–10.98[b] – 0.019

ICU, intensive care unit; OR, odds ratio; CI, confidence interval; SD, standard deviation.
[a]Mann–Whitney U test.
[b]Pearson's χ^2 test.

Impact of delirium on the functional domains: self-initiated mobility, nutrition, and elimination

Self-initiated activity/mobility

This domain describes self-initiated behavior including activity and mobility, gait, balance and falls, as well as exhaustion and self-initiated grooming and dressing. Generally, delirium caused functional impairment as evidenced by the loss of abilities (Table 2).

Whereas the lack of ability for self-initiated activity or full inactivity was not affected by delirium, at the lower levels of activity impairment — substantial and more (substantial+), as well as mild and more (mild+), or conversely full activity, effects were noted. Delirium was associated with a loss of activity (substantial+ OR 3 and mild+ OR 7) and substantially lower ability for full activity (OR 0.14). With respect to mobility within the bed or change of position, delirium was associated with substantial+ impairment and no activity (OR 3.61 and 3.22). Substantial impairment in the ability to transfer was associated with friction and shearing (OR 3.69).

Further, both abnormal gait and impaired balance were seen more commonly in the delirious (OR 2.07 and 2.04), whereas falls — either recent or prior — were not. In particular, exhaustion or fatigue was documented at any level of activity in the delirious (OR 3.42–5.39), and conversely, full activity appeared to be protective of delirium (OR 0.26).

Delirium affected the abilities of grooming and dressing, and the impairment seen was greater in the upper rather than lower body. For the grooming and dressing of the upper body, any impairment was more common in the delirious (grooming OR 3.63–4.39 and dressing 3–11.2, respectively), whereas full activity was associated with the non-delirious (dressing OR 0.09). For the lower body, no ability was more commonly seen within the delirious (grooming OR 3.93 and dressing 3.33).

Nutrition

The nutritional domain included self-initiated eating and drinking, energy requirement, the amount of food, fluid, fluid addition, and fluid demand, as well as tube feeding, dysphagia, and nausea. Generally, greater impairment was noted in the delirious (Table 3).

Any impairment in self-initiated eating and drinking was associated with delirium (eating OR 4.85–5.12 and drinking 3.49–5.47), and conversely, the delirious patients were less commonly able to attend to these activities (OR 0.21–0.23). With respect to the amount of food and fluid intake, a similar pattern emerged. Any reduction in the amount of food was characteristic for the delirious (OR 2.83–3.41), whereas regular portions were rarely noted (OR 0.35). For the amount of fluid intake, any reduction from 1 to 1500 cm^3 was also characteristic for the delirious. Generally, the fluid was rather increased in the delirious (OR

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Table 2. ePA-AC items of the mobility domain

	D	ND	OR, CI – P^a		D	ND	OR, CI – P^a
Self-initiated mobility				Self-initiated grooming and dressing			
Self-initiated activity/mobility				Grooming upper body			
None	20.3	16.4	0.431	None	46.2	16.4	4.39, 2.52–7.64 – <0.001
None*substantial	83.9	63.5	3, 1.7–5.4 – <0.001	None*substantial	86.3	63.5	3.63, 1.95–6.73 – <0.001
None*substantial*mild	99.2	94.3	7, 0.88–59.2 – 0.048	None*substantial*mild	100	93.7	0.006
Full	0.8	5.7	0.14–1.14 – 0.048	Full	–	6.3	0.006
Self-initiated mobility/change of position				Grooming lower body			
None	19.5	6.3	3.61, 1.644–7.92 – 0.001	None	76.9	45.9	3.93, 2.31–6.68 – <0.001
None*substantial	73.7	46.5	3.22, 1.93–5.4 – <0.001	None*substantial	92.3	84.3	0.063
None*substantial*mild	95.8	93.1	0.439	None*substantial*mild	99.1	96.2	0.245
Full	4.2	6.9	0.439	Full	0.9	3.8	0.245
Friction, shearing, ability to transfer				Dressing upper body			
Subst	55.6	25.3	3.69, 2.21–6.15 – <0.001	None	60.7	32.1	3.27, 1.99–5.38 – <0.001
Substantial*mild	94.9	91.8	0.348	None*substantial	88	71.1	3, 1.56–5.77 – 0.001
None	5.1	8.2	0.348	None*substantial*mild	99.1	91.2	11.2, 1.45–86.42 – 0.003
Abnormal gait	59.6	41.6	2.07, 1.01–4.52 – 0.050	Full	0.9	8.8	0.09, 0.12–0.69 – 0.003
Balance	35	20.9	2.04, 1.02–4.09 – 0.047	Dressing lower body			
Fall within the last 2 months	9	4.8	0.271	None	78.6	52.5	3.33, 1.94–5.7 – <0.001
Fall recent	2.5	1.9	0.702	None*substantial	91.5	86.1	0.188
Exhaustion/fatigue				None*substantial*mild	99.1	97.5	0.398
No activity	27.8	10.1	3.42, 1.77–6.61 – <0.001	Full	0.9	2.5	0.398
No*minor activity	84.3	50	5.39, 2.98–9.74 – <0.001				
No*minor*major activity	96.5	88	3.79, 1.25–11.47 – 0.014				
Full activity	3.5	12	0.26, 0.09–0.8 – 0.014				

D, delirious patients; ND, non-delirious patients; OR, odds ratio; CI, confidence interval.
[a]Pearson's $\chi 2$ test.

2.43) than decreased (OR 0.5); however, the requirement for intravenous fluid addition was similar.

For nutritional requirements, a mild to substantial increase in energy and nutrient requirement was noted in patients with delirium (OR 1.88–2.11), whereas on the contrary the lack of additional energy and nutrients was less common (OR 0.53). Similarly, with respect to parenteral nutrition and additional calories, the delirious were substantially more often in the build-up phase (OR 9.42) or reached their requirement (OR 3.17). Conversely, the lack of requirement for parenteral nutrition was rarely seen (OR 0.15).

Elimination

The domain of elimination describes urination, defecation, elimination urge, urinary catheterization, colonic stoma, and skin humidity, and overall, it was less affected by delirium except for defecation (Table 4).

Neither the abilities for self-initiated urination nor for control urination were affected by delirium; however, most patients — delirious and not — were catheterized. Contrarily, any impairment in self-initiated defecation (OR 2.26–5.29) or ability to control defecation (OR 4.64–6.02) was associated with delirium, whereas full control of these abilities was less common (OR 0.44 and 0.22, respectively). Elimination urge and colonic somatization were rare and not different, as was an increase in skin humidity.

Discussion

Summary of main findings

The patient population in this study was characteristic of a delirious sample: patients were older, more severely ill, stayed longer on the ICU and in the hospital, and returned less frequently home at discharge. The nutritional domain was the most affected by delirium followed by activity and mobility, and last, elimination. The general pattern was a loss of functioning. For the nutritional domain, both self-initiated eating and drinking were impaired, as well as the amount of food and fluid intake. The energy and nutrient requirement, as well as the requirement for parenteral nutrition and additional calories, were increased. Although there was no need for additional fluids, generally, the fluid demand was rather increased. Patients with delirium had more dysphagia and required tube feeding.

For self-initiated mobility, exhaustion and fatigue were the most prominent in the delirious. Mobility was reduced both out of bed and in bed. Furthermore, outside bed an abnormal gait and balance

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Table 3. ePA-AC items of the nutritional domain

	D	ND	OR, CI – P^a		D	ND	OR, CI – P^a
Nutrition							
Self-initiated eating				Self-initiated drinking			
None	33.1	8.9	5.08, 2.6–9.92 – <0.001	None	23.7	8.2	3.49, 1.72–7.1 – <0.001
None*substantial	61	23.4	5.12, 3.04–8.63 – <0.001	None*substantial	48.3	16.4	5.47, 3.15–9.53 – <0.001
None*substantial*mild	89.8	64.6	4.85, 2.46–9.57 – <0.001	None*substantial*mild	82.2	50.9	4.45, 2.53–7.83 – <0.001
Full	10.2	35.4	0.21, 0.1–0.41 – <0.001	Full	17.8	49.1	0.23, 0.13–0.4 – <0.001
Amount of food				Amount of fluid to ml			
Very little	62.4	32.7	3.41, 2.07–5.63 – <0.001	0	18.6	10.1	0.052
Very little*little	84.6	66	2.83, 1.55–5.15 – 0.001	1–500	60.2	26.4	4.21, 2.53–7.01 – <0.001
Very little*little*sufficient	95.7	88.7	2.86, 1.03–7.94 – 0.046	1–1000	83.9	64.8	2.83, 1.57–5.11 – <0.001
Good	4.3	11.3	0.35, 0.13–0.97 – 0.046	1–1500	96.6	87.4	4.1, 1.36–12.34 – 0.009
Energy and nutrient requirement				1500+	5.8	15	0.067
Substantial increased	3.4	0.6	0.167	Fluid addition			
Substantial*moderate increased	35.6	20.8	2.11, 1.23–3.61 – 0.009	0	23.7	19.5	0.458
Substantial*moderate*mild increased	74.6	61	1.88, 1.11–3.16 – 0.020	1–500	53.4	42.8	0.089
Not increased	25.4	39	0.53, 0.32–0.9 – 0.020	1–1000	83.9	77.4	0.223
Parenteral nutrition, additional calories				1–1500	94.9	95	1
Build-up	19.7	2.5	9.42, 3.16–28.08 – <0.001	1500+	7.2	6.6	1
Reached	11.1	3.8	3.17, 1.17–8.6 – 0.028	Fluid demand			
N/A	69.2	93.7	0.15, 0.07–0 – <0.001	Increased	28.2	3.8	0.758
Tube feeding	28.2	3.8	10.02, 4.03–24.88 – <0.001	Decreased	20.4	3.2	2.43, 1.36–4.37 – 0.003
Dysphagia	20.4	3.2	7.73, 2.81–21.27 – <0.001	Normal	14.5	23.9	0.5, 0.3–0.8 – 0.005
Nausea	24	18.2	1				

OR, odds ratio; CI, confidence interval.
[a]Pearson's χ^2 test.

occurred, while in bed substantial impairment in ability to transfer caused friction and shearing. For self-initiated grooming and dressing, the impairment was greater in the upper body. For the elimination domain, urination was not problematic for the delirious, whereas defecation, either self-initiated or ability to control, was.

Comparison to the existing literature

Surprisingly, the literature on functional status in the delirious is rare and studied regular floors rather than the intensive care setting. As summarized in the Introduction, there is vague evidence for activity (Yang et al., 2008), mobility and balance in delirium superimposed on dementia (Gual et al., 2019), and nutritional status and nutrients in delirium contribution (Sanford and Flaherty, 2014).

The most comprehensive study to date assessed nursing tools for delirium identification and showed the following domains relevant to this study: Problems with nutrition and elimination, as well as self-care and mobility (Sola-Miravete et al., 2018). This study was performed on elderly patients on regular surgical and medical floors. Although regular floors and intensive care units represent different settings, this study showed similar results. For the nutritional domain, delirious patients required more frequently fluid therapy; for the mobility domain, more frequently rested in bed, as well as the level of self-care and dependence; for the elimination domain, more frequently urinary, fecal incontinence and the use of urinary catheters.

From the univariate model, in that study, delirious patients had more comorbidities (OR 1.88), whereas our intensive care patients were more severely ill as documented by the SAPS. In the self-care domain, regular inpatients featured a medium to high dependency (OR 4.62) or inability of care (OR 8.54), as well as resting in bed, inability to get up (OR 1.5). For the elimination domain, urinary and fecal incontinence were more common (OR 13.5 and 17.1), as well as an increased use of urinary catheters was (OR 2.6). From the more specific multivariate model, the inability to get out of bed (OR 2.51), urinary incontinence (OR 4.25), and the use of urinary catheters (OR 3.9) emerged. Although settings vary and mobility is generally more restricted in the intensive care setting, the level of dependency and mobility were comparable, while on regular floors the inability to care for themselves was greater (OR 8.54 vs. ORs between 2 and 4 on average) and rather met the odds of the multivariate model. In the intensive care setting, most patients were catheterized; thus, urinary incontinence was not relevant, and with respect to fecal incontinence, intensive care patients were less affected by delirium (OR 17.1 vs. OR 4–6). A novelty in this study was the documentation of the decline of full abilities, which reached 50–90%.

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Table 4. ePA-AC items of the elimination domain

	D	ND	OR, CI – P^a		D	ND	OR, CI – P^a
Elimination				Ability to control defecation			
Self-initiated urination				None	46.6	12.7	6.02, 3.33–10.89 – <0.001
None	90.7	86.8	0.348	None*substantial	55.1	15.2	6.85, 3.89–12.06 – <0.001
None*substantial	91.5	91.2	1	None*substantial*mild	66.9	30.4	4.64, 2.78–7.75 – <0.001
None*substantial*mild	92.4	95	0.45	Full	33.1	69.6	0.22, 0.13–0.36 – <0.001
Full	7.6	5	0.45	Elimination urge	10.2	6.3	0.266
Ability to control urination				Urinary catheterization	91.5	91.2	1
None	89.8	89.9	1	Colonic stoma	5.1	1.9	0.177
None*substantial	90.7	91.2	1	Skin humidity			
None*substantial*mild	91.5	92.5	0.824	Continuous	2.5	–	0.076
Full	8.5	7.5	0.824	Continuous*often	12.7	10.7	0.704
Self-initiated defecation				Continuous*often*sometimes	72.9	65.4	0.193
None	50.8	16.4	5.29, 3–9.21 – <0.001	Rarely	27.1	34.6	0.193
None*substantial	71.2	40.3	3.67, 2.2–6.1 – <0.001				
None*substantial*mild	78.8	62.3	2.26, 1.31–3.89 – 0.004				
Full	37.7	21.2	0.44, 0.26–0.77 – 0.004				

OR, odds ratio; CI, confidence interval.
[a]Pearson's χ^2 test.

Although evidence for activity (Yang et al., 2008), mobility and balance (Gual et al., 2019), as well as nutritional status and nutrients (Sanford and Flaherty, 2014) is vague on regular floors, this study confirmed gait and balance disturbances as well as nutritional aspects. Regarding the former, we have to assume that delirium caused gait and balance disturbances, and for latter, the energy and nutrient requirement, as well as parenteral nutrition and additional calories were increased. Another considerable aspect was the lack of discrimination of the level of attribution of the common underlying causes the severity of illness and delirium to the functional domains: nutrition, mobility, and elimination.

Implications of this study

Beyond confirming previous results of the impact of delirium on the level of functioning (Sola-Miravete et al., 2018), numerous new aspects of functional impairment have been elucidated in this study. This study helps to better understand delirium in the intensive care setting and could aid in profiling patients at risk for delirium and direct interventions.

Functional impairment regarding actions of daily living (grooming and dressing) might embody apraxia since motor planning and task performance require skills of high-order thinking, which are disturbed during delirium (Baranowski and Patten, 2000). Understanding functional impairment as the type of apraxia seems conclusive and implicates that screening for apraxia might warrant new possible diagnostics for delirium. Naturally, delirium and the severity of illness are inseparable (Voyer et al., 2007); however, the assumption has to be made that delirium superimposes functional impairment on dysfunction and addressing these impairments could aid the patient. For example, a common intervention, the early mobilization of patients, has been shown to reduce the incidence of delirium (Brummel and Girard, 2013). Similarly, risk reduction and management guidelines also outline early mobilization, maintaining optimal hydration and nutrition, as well as regulation of bowel and bladder function (Scottish Intercollegiate Guidelines Network (SIGN), 2019). Thus, known interventions attempt to target specific impairments shown in this study. Within the described remaining functional impairments, further modifiable factors could be identified as possible dimensional delirium symptom patterns across interdisciplinary settings.

Strengths and limitations

Although this study has numerous strengths including the comprehensive daily nursing assessment with the ePA-AC, delirium determined with the gold standard, at that time DSM-IV-TR, by psychiatrists and the inclusion of a sizable patient sample, few limitations have to be noted. Both delirium and severe illness cause functional impairment, and it was not possible to truly separate their effects. Although patients were daily screened for eligibility, enrollment was not consecutive, rather depended on the ability of patients to participate in the psychiatric assessment. Thus, a potential bias to those able to engage in the interview was created, excluding those with limited communication abilities, i.e., the more delirious, and over representing the less delirious and non-delirious.

The design did not allow for the assessment of premorbid cognitive impairment, which was only screened for by chart review. Mostly cardiovascular surgery patients notable for high delirium risk were included and the generalizability to other intensive care settings could be limited. Furthermore, the design was cross-sectional, so it is necessary to replicate these findings in a longitudinal study capturing the incidence and resolution of delirium.

This analysis only included the ePA-AC domains of activity, grooming and dressing, nutrition, and elimination. The remaining domains such as cognition and consciousness, communication and interaction, sleep, respiration, pain, and wounds still have to be evaluated.

Conclusion

Delirium was associated with substantial functional impairments in the nutritional, activity–mobility, and elimination domain. Characterizing these impairments allows a better understanding of their dimensional prevalence in delirium in the cardiovascular intensive care setting. Moreover, these findings will facilitate developing adapted risk and treatment profiles that target the underlying risk constellations in medical and nursing procedures in the future. Furthermore, these results can contribute to future studies investigating the co-occurrence and relatedness of possible dimensional delirium symptom patterns across a wider range of interdisciplinary settings. Since the ePA-AC is usually obtained via nurses, our findings strengthen the position of nursing in the process of delirium diagnosis and management. We suggest to pay attention if nursing is adequately integrated into the process of delirium diagnosis. By simplified identification of dimensional delirium symptoms, the disseminated application of the ePA-AC may eventually help clinicians and nurses to improve the quality of life in patients.

Conflicts of interest. There are no conflicts of interest.

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