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Delirium in the intensive care setting and the Richmond Agitation and Sedation Scale (RASS): Drowsiness increases the risk and is subthreshold for delirium

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ABSTRACT

Introduction: Sedation is a core concept in the intensive care setting, however, the impact of sedation on delirium has not yet been studied to date.

Methods: In this prospective cohort study, 225 patients with Richmond Agitation and Sedation (RASS) scores of − 1 – drowsiness and 0 – alert- and calmness were assessed with the Delirium Rating Scale-Revised 1998 (DRS-R-98) and DSM-IV-TR-determined diagnosis of delirium assessing drowsiness versus alertness.

Results: By itself, drowsiness increased the odds for developing delirium eightfold (OR 7.88 $p < 0.001$) and rates of delirium were 68.2 and 21.4%, respectively. Further, in the drowsy patient, delirium was more severe. In the presence of drowsiness, delirium was characterized by sleep-wake cycle disturbances and language abnormalities. These two features, in addition to psychomotor retardation, allowed the correct classification of delirium at RASS-1. The same features, in addition to thought abnormalities and the impairment in the cognitive domain, orientation, attention, short- and long-term memory representing the core domains of delirium, or the temporal onset were very sensitive towards delirium, however lacked specificity. Conversely, delusions, perceptual abnormalities and lability of affect representing the non-core domain were very specific for delirium in the drowsy, however, not very sensitive. In the absence of delirium, drowsiness caused attentional impairment and language abnormalities.

Conclusion: Drowsiness increased the odds for developing delirium eightfold and caused more severe delirium, which was characterized by sleep-wake cycle and language abnormalities. Further, drowsiness by itself caused attentional impairment and language abnormalities, thus, with its disturbance in consciousness was subthreshold for delirium.

1. Introduction

Delirium is the most common neuropsychiatric syndrome across the healthcare settings [1,2]. It is defined and characterized by an abrupt onset and fluctuating course, disturbances in consciousness and cognition, which are caused by an underlying etiology. Further non-cognitive domains including motor behavior, emotionality and sleep-wake cycle are affected [3,4].

After surgery or in the intensive care setting the prevalence rates vary at substantial rates. Up to 70% of patients are affected by delirium after cardiac surgery procedures [5,6] and this rate even reaches 80% in the mechanically-ventilated [7]. Further, short-term [8,9] and long-term adversities for both patients and the health care system have been recognized [10]. Among these are the prolonged length of stay on the Intensive Care Unit (ICU) [11,12], increased rates of and prolonged mechanical ventilation [13] and increases in morbidity and mortality [13,14]. In the longer term, a decline in functionality and cognitive abilities has been described [15] and increased rates of institutionalisation documented [12].

Several instruments have been developed to improve the screening and diagnosis of delirium. Across all hospital settings, one of the most commonly used instrument is the Delirium Rating Scale, revised 98

(DRS-R-98) [16]. The total score - consisting of the severity and diagnostic set - distinguishes delirium from dementia, schizophrenia, depression, and other medical illnesses during blind rating, with sensitivity ranging from 91% to 100%, depending on the cut-off score chosen [16]. The original English version has high sensitivity and specificity, inter-rater reliability, and concurrent validity to its predecessor, the DRS [17].

This instrument, however, has been rarely used in the intensive care setting, although providing a very detailed characterization of delirium. One study focusing on the incidence, prevalence, risk factors and outcome of delirium documented an incidence and prevalence of 24.4 and 53.6%, respectively. The mean DRS-R-98 diagnostic score was 11.3, the total score was 16.2. No further details about the individual DRS-R-98 items were provided [18,19]. Another study provided more detailed DRS-R-98 information, and commonly documented symptoms of delirium were sleep-wake cycle disturbances, lability of affect, thought abnormalities, inattention and disorientation, as well as short- and long-term memory impairment. Delusions were rarely recorded [18,19].

The Richmond Agitation Sedation Scale (RASS) [20] has been developed to assess the level of sedation, alertness and agitation in the intensive care setting and is commonly used to achieve the appropriate level of sedation, avoiding under- or over-sedation. Obtaining the RASS score is the first step in the algorithm for assessing delirium with the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) [21].

To date, there are few studies describing delirium in the intensive care setting with the DRS-R-98 and no studies assessing delirium dependent on the level of sedation. A better characterization of delirium on the ICU could benefit the understanding of this syndrome in an environment with the highest rates of delirium. Thus, in this study, the phenomenological characteristics in delirious and non-delirious patients at RASS levels of being drowsy, representing − 1 or alert and calm, representing 0 were evaluated.

The aim of this study was to assess the impact of the level of sedation on the phenomenology of delirium as measured by the DRS-R-98 and DSM-IV-TR-determined diagnosis of delirium.

2. Methods

2.1. Patients

All patients in this prospective, descriptive cohort study were recruited at the University Hospital Zurich, a level 1 Trauma center with 39,000 admissions yearly. The patients stayed on a 12-bed cardiovascular-surgical intensive care unit between May 2013 and April 2015. Inclusion criteria were adulthood, ability to consent and ICU length of stay for > 18 h. Exclusion criteria were inability to consent or a history of substance use disorder.

2.2. Procedures

All patients in this study were informed of the rationale and procedures of this study and an initial attempt to obtain written informed consent was made. In those patients unable to provide written consent at that time, either due to delirium severity, sedation, or frailty, proxy assent from the next of kin or a responsible caregiver was obtained instead. After medical stabilization, consent was obtained, or those refusing participation and consent were excluded.

The assessment of delirium was performed by four psychiatrists specifically trained in the use of the DRS- R-98 and DSM-IV-TR. Most patients (n = 197) were assessed by one of these psychiatrists and a subset (n = 28) were assessed by all psychiatrists in order to achieve inter-rater reliability.

The baseline assessment included several steps. The patients were assessed at the earliest time. Every morning, all patients on the ICU

were screened for potential inclusion and once able were examined according to the following process: At first, the patient was interviewed, second, the presence or absence of delirium was determined according to the DSM-IV-TR criteria and third, the DRS-R-98 was completed. The DRS-R-98 was performed on all patients – delirious and non-delirious. Patients were assessed only once representing a cross-sectional design.

If required, the assessment was completed by obtaining collateral information from nursing, medical-surgical staff, the electronic medical record system (Klinikinformationssystem, KISIM, CisTec AG, Zurich) and family or caregivers.

This study was approved by the Ethics Commission of the Canton Zurich, Switzerland (PB_2016-01264).

2.3. Measurements

2.3.1. Diagnostic and Statistical Manual (DSM) - IV- TR

The diagnosis of delirium was determined by DSM IV-TR [3] including four criteria: A - disturbance of consciousness, B - a change in cognition or perceptual disturbances not better accounted for by a dementia, C - the disturbance develops over a short period of time and tends to fluctuate during the course of the day, and D - (i) the disturbance is caused by the direct physiological consequences of a general medical condition, (ii) the symptoms developed during substance intoxication or a withdrawal syndrome, or (iii) the delirium is multifactorial.

2.3.2. Richmond Agitation and Sedation Scale (RASS)

The RASS is a medical scale developed to measure the level of sedation, alertness and agitation [20]. This scale can be used in all hospitalized patients, however, is mostly used in ventilated patients in order to avoid over- and under-sedation. The RASS includes 10 points ranging from − 5 to 4 and provides a detailed description for each score. The score of 0 represents the alert and calm patient, spontaneously paying attention to the caregiver. Negative scores describe the level of sedation with − 1 representing drowsiness, characterized by not being fully alert, sustained awakening as defined by more than ten seconds, with eye contact to voice. Levels of − 2 to − 5 describe light, moderate and deep sedation, as well as being unarousable. Positive scores describe the level of agitation, ranging from + 1 to + 4, representing restlessness, agitation, pronounced agitation and combativeness [20].

2.3.3. Delirium Rating Scale-Revised-98 (DRS-R-98)

The DRS-R-98 is a 16-item scale with 13 items describing severity, in addition to three diagnostic items, with four points – absent (0), mild (1), moderate (2) or severe (3) impairment [16]. The rating of severity is clearly specified in the description of the scale. The diagnosis of delirium requires scores of > 15 points on the severity scale or 18 points on the severity and diagnostic scale. The severity and diagnostic items are listed in Table 3.

Motor activity is rated with items 7 – increased and 8 – decreased motor behaviors. The hyperactive subtype requires a score of 1 and more on item 7, increased motor behavior, in the absence of hypoactivity, the hypoactive subtype a score of 1 and more than on item 8, decreased motor behavior, in the absence of hyperactivity, the mixed subtype both hypo- and hyperactivity, and last, the no-motor-subtype the absence of hyper- or hypoactivity as evidenced by the corresponding items. The rating applies to the preceding 24 h.

2.3.4. Statistical methods

All statistical procedures were conducted using the Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics were implemented for the characterization of the sample such as sociodemographic, clinical variables and delirium variables, in particular, the DRS-R-98 items and total scores. In a first step, the excluded patients were compared with those that were included, in a second step,