Symptom profile as assessed on delirium rating scale-revised-98 of delirium in respiratory intensive care unit: A study from India

Akhilesh Sharma, Savita Malhotra, Sandeep Grover, SK Jindal

Departments of Psychiatry and Pulmonary Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh, India

ABSTRACT

Aim: This study aimed to evaluate the phenomenology of delirium in patients admitted in a Respiratory Intensive Care Unit (RICU). Methods: Consecutive patients admitted to RICU were screened for delirium using Richmond Agitation-Sedation Scale (RASS), Confusion Assessment Method for ICU (CAM-ICU) assessment tool and those found positive for delirium were evaluated by a psychiatrist to confirm the diagnosis. Those with a diagnosis of delirium as per the psychiatrist were evaluated on Delirium Rating Scale-Revised-98 (DRS-R-98) to study phenomenology. Results: All the 75 patients fulfilled the criteria of “acute onset of symptoms” and “presence of an underlying physical disorder” as per the DRS-R-98. Commonly seen symptoms of delirium included disturbances in attention (100%), thought process abnormality (97.33%) disturbance in, sleep-wake cycle, language disturbance (94.7%), disorientation (81.33%), and short-term memory impairments (73.33%). No patient had delusions and very few (5.3%) reported perceptual disturbances. According to RASS subtyping, hypoactive delirium was the most common subtype (n = 34; 45.33%), followed by hyperactive subtype (n = 28; 37.33%) and a few patients had mixed subtype of delirium (n = 13; 17.33%). Factor structure of DRS-R-98 symptoms yielded 3 factors (Factor-1: cognitive factor; Factor-2: motoric factor; Factor-3: thought, language, and fluctuation factor). Conclusion: The phenomenology of delirium in ICU patients is similar to non-ICU patients, but hypoactive delirium is the most common subtype.

KEY WORDS: Delirium, Intensive Care Unit, motoric subtypes, phenomenology

INTRODUCTION

Delirium is a neuropsychiatric condition, which is quite frequently seen in patients admitted to Intensive Care Unit (ICU). Studies have reported prevalence rates varying between 20% and 83.3% with higher rates in the mechanically ventilated elderly patients.\(^1\)\(^{-}\)\(^4\)

The central features of delirium include disturbances of consciousness, attention, cognition, thought, and language. However, in general, the clinical presentation is considered highly variable with a wide range of associated noncognitive symptoms that reflect the influence of particular etiologies, comorbidities, medical treatments, or individual vulnerabilities.\(^5\)\(^{-}\)\(^6\)

Many studies have evaluated the symptom profile of delirium and have used factor analysis to clarify phenomenology of delirium; most of these studies have been limited to patients admitted to non-ICU set-ups.\(^7\)\(^{-}\)\(^20\)

How to cite this article: Sharma A, Malhotra S, Grover S, Jindal SK. Symptom profile as assessed on delirium rating scale-revised-98 of delirium in respiratory intensive care unit: A study from India. Lung India 2017;34:434-40.
Although many studies have evaluated the incidence, prevalence, and risk factors of delirium in ICU set-up, very few studies have attempted to study the symptom profile of delirium in this scenario. One study attempted to evaluate the symptom profile of delirium using Memorial Delirium Assessment Scale (MDAS). Factor analysis revealed a 2-factor structure, namely, cognitive disturbances, and behavioral abnormalities. Another study attempted to use Delirium Rating Scale-Revised-98 (DRS-R-98) to study the phenomenology of delirium in pediatric ICU set-up. Authors reported difficulty in using the DRS-R-98 scale in the pediatric population, especially for assessment of cognitive functions. From the above, it is clear that there is a lack of data in terms of symptom profile of delirium in ICU set-up.

In this background, the aim of this study is to evaluate the phenomenology of delirium in critically ill patients admitted to a respiratory ICU (RICU) of a tertiary care teaching hospital using the DRS-R-98.

**METHODS**

This study was carried out in a tertiary care multi-specialty teaching hospital in North India. The RICU is an eight-bedded set-up managed by the pulmonary and critical care specialists.

This study was approved by the Ethics Committee of the Institute. Patients were recruited after obtaining proxy written informed consent from the family members. All the cases diagnosed with delirium were reported to the treating team for appropriate management.

A prospective cohort design was followed. Patients were recruited during two separate phases (October 18, 2008 to January 17, 2009 and March 25, 2009 to June 24, 2009), each lasting for a continuous period of 3 months. To be recruited in the study patients were required to be aged more than 18 years. Those patients who were deaf or unable to speak or understand Hindi, English or Punjabi or whose caregivers refused consent were excluded from the study. The data with regards to the incidence, prevalence, and outcome of delirium have already being published.

Following instruments were used:

**Richmond Agitation-Sedation Scale**

It is an instrument to assess sedation and agitation of adult ICU patients and is simple to use. It is a ten-point scale with four levels of anxiety or agitation (+1 to +4), one level to denote a calm and alert state (0) and five levels to assess the level of sedation (−1 to −5). A score of −4 indicates that the patient is unresponsive to verbal stimulation and a score of −5 indicates unarousable states. It has good inter-rater reliability and validity.

**Confusion Assessment Method for Intensive Care Unit assessment tool**

It is an instrument specifically designed for use in nonverbal (i.e., mechanically ventilated) patients. Importantly, the CAM-ICU can only be administered to a patient who is arousable to voice without the need for physical stimulation. In the hands of trained health care professional, completion of Confusion Assessment Method for ICU (CAM-ICU) takes only 1–2 min. It has a minimum of 75.5% sensitivity and 95.8% specificity for detecting delirium in comparison to full Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) assessment.

**Delirium Rating Scale-Revised-98**

It is a scale used for the assessment of phenomenology and severity of delirium. It has 13-items to assess the severity and three diagnostic items, pertinent to the preceding 24 h. The severity ratings range from 0 to 3 indicating no impairment to severe impairment and higher scores indicating the higher severity of delirium. It is a well-validated instrument with high inter-rater reliability, sensitivity, and specificity.

**Procedure**

Each patient meeting the selection criteria was first evaluated on the Richmond Agitation-Sedation Scale (RASS) within 24 h of admission to RICU. Those patients, who were rated −3 through +4 (i.e., arousable on verbal stimulation) on RASS, were screened for delirium on CAM-ICU once a day at a fixed time of the day (between 7 and 9 pm) by a psychiatrist. Those screened positive on CAM-ICU were evaluated on DSM-IV criteria to confirm the diagnosis of delirium. The diagnosis of delirium was based on the information provided by the patient, caregivers, treating physician, and nurses. Any patient, rated as unresponsive at the first assessment, was reassessed on the next day and every subsequent day throughout the RICU stay, to ascertain his level of sedation and agitation using RASS. If at any stage he was found to be arousable, then he was screened on CAM-ICU for delirium. All the patients found to have delirium as per the assessment of psychiatrist by using DSM-IV criteria were assessed on DRS-R-98 by the psychiatrist for phenomenology throughout their stay in RICU. For studying phenomenology, all DRS-R-98 ratings were taken into consideration. If a patient was found to have a symptom in one of the assessments, it was considered present and for severity, highest severity rating during the study was taken into account.

**Statistical analysis**

Data were analyzed using the Statistical Package for Social Scientists-14 (SPSS for Windows, Version 14.0. Chicago, SPSS Inc.). Mean and standard deviation with range were calculated for continuous sociodemographic variables (age at assessment) and clinical variables (duration of delirium-time from the first onset of symptoms to the assessment). Frequency and percentages were calculated for categorical sociodemographic variables (gender) and...
clinical variables (etiology, medications, etc.). Chi-square test, Fisher’s exact test, and t-test were used to compare various variables of different groups and subgroups. Factor analysis of DRS-R-98 was carried out using a principal components analysis. Significance was fixed at \( P < 0.05 \). Factor analysis of symptom items was carried out using a principal components analysis.

RESULTS

During the study, 178 patients were eligible, of which 140 were evaluated for delirium. Of the 38 patients not included in the study, 19 had very short stay and were transferred out, discharged or expired before assessment for delirium, eight patients did not meet the selection criteria (the caregivers refused consent for six patients, and two had sensory impairments) and 11 patients remained comatose throughout their RICU stay and could not be assessed.

Of the 140 patients screened for delirium, 75 (53.57\%) developed delirium during their RICU stay.

As shown in Table 1, the mean age of the patients who developed delirium was significantly higher; this was guided by significantly higher percentage of the elderly patients in the delirious group. Those who developed delirium and who did not develop delirium did not differ with respect to gender, education level and past psychiatric illness. Significantly, higher percentage of patients who were on mechanical ventilation developed delirium.

**Phenomenology of delirium**

All patients fulfilled the criteria of “acute onset of symptoms” and “presence of an underlying physical disorder” as per the DRS-R-98. No patient had delusions, and very few (5.3\%) reported perceptual disturbances.

The mean DRS-R-98 severity score was 11.34 ± 4.10 (range 5–21) and mean DRS-R-98 total score was 16.24 ± 4.56 (range 7–25). The severity score in 53 patients ranged 5–14 and in 22 patients it was 15 or more. The total DRS-R-98 score in 44 patients ranged from 7 to 17 and in 31 patients it was more than equal to 18.

**Phenomenology in elderly (n = 23) versus nonelderly patients (n = 52)**

In terms of frequency of symptoms, a significant difference was seen only on the item of the lability of affect (present in 34 out of 52 nonelderly patients vs. 21 out of 23 elderly cases, \( \chi^2 = 4.23^*, P = 0.04 \)). No significant difference emerged in terms of severity of symptoms on any of the items, total DRS-R-98 severity scores and total DRS-R-98 scores.

**Table 1: Sociodemographic and clinical profile of patients with and without delirium**

| Variable                                | Delirious (n=75) | Nondelirious (n=65) | \( \chi^2/t\)-test |
|------------------------------------------|-----------------|---------------------|--------------------|
| Age (years)                              | 49.53±19.27 (range: 18-92) | 37.43±13.94 (range: 18-67) | \( t = −4.200^*** (P<0.001) \) |
| Elderly patients (≥65 years)             | 23 (30.66)      | 1 (1.53)            | Chi-square with Yate’s correction=19.12*** (P<0.001) |
| Sex                                      | Male 43 (57.3)  | 29 (44.6)           | \( \chi^2=2.25 \) |
| Education (years)                        | 10.91±5.63 (range: 0-21) | 12.09±4.13 (range: 4-25) | \( t = −1.74 \) |
| Past psychiatric illness                 | 6 (8)           | 3 (1.5)             | Fisher exact test (P=0.50) |
| Mechanically ventilated                  | 60 (80.0)       | 34 (52.3)           | \( \chi^2=12.104^*** (P<0.001) \) |

SD: Standard deviation; \( P<0.05^*** \)

**Table 2: Frequency and severity of various symptoms as assessed on Delirium Rating Scale–Revised-98**

| Symptom frequency, n (%) | Moderate/severe frequency of symptoms, n (%) | Mean score±SD (range) |
|--------------------------|---------------------------------------------|-----------------------|
| Sleep-wake cycle disturbances | 71 (94.7) | 24 (32) | 1.26±0.55 (0-2) |
| Perceptual disturbance | 4 (5.3) | 0 | 0.05±0.22 (0-1) |
| Delusions | 0 | 0 | 0 |
| Lability of affect | 55 (73.33) | 1 (1.33) | 0.74±0.46 (0-2) |
| Language | 68 (90.66) | 0 | 0.90±0.29 (0-1) |
| Thought process abnormality | 75 (100) | 5 | 1.06±0.25 (1-2) |
| Motor agitation | 35 (46.66) | 23 (30.66) | 0.77±0.89 (0-2) |
| Motor retardation | 40 (53.33) | 23 (30.66) | 0.96±1.07 (0-3) |
| Orientation | 61 (81.33) | 40 (53.33) | 1.36±0.79 (0-3) |
| Attention | 75 (100) | 35 (46.66) | 1.57±0.75 (0-3) |
| Short-term memory | 55 (73.33) | 22 (29.33) | 1.02±0.75 (0-2) |
| Long-term memory | 43 (57.33) | 43 (57.33) | 0.90±0.87 (0-2) |
| Visuospatial ability | 44 (58.66) | 44 (58.66) | 0.65±0.60 (0-2) |
| Temporal onset of symptoms | 75 (100) | 59 (78.66) | 2.01±0.70 (0-3) |
| Fluctuation | 73 (97.33) | 20 (26.66) | 1.24±0.48 (0-2) |
| Physical disorder | 75 (100) | 49 (65.33) | 1.65±0.47 (1-2) |
| Mean DRS-R98 severity score | 11.34±4.10 (5-21) | 11.34±4.10 (5-21) |
| Total DRS-R98 score | 16.24±4.56 (7-25) | 16.24±4.56 (7-25) |

DRS-R-98: Delirium Rating Scale–Revised-98, SD: Standard deviation
Phenomenology in mechanically ventilated \((n = 60)\) versus nonmechanically ventilated patients \((n = 15)\)

A significant difference was seen in the frequency of symptoms only on the item of language disturbances (present in all 60 mechanically ventilated patients vs. 8 of 15 nonmechanically-ventilated cases, \(\chi^2 = 25.61, P < 0.001\)). No significant difference emerged in terms of severity of symptoms on any of the items, total DRS-R-98 severity scores and total DRS-R-98 scores. In terms of severity score, mechanically ventilated cases had a higher score on items of language \((t = 3.26)\), thought process abnormality \((t = 5.4)\) and temporal onset of symptoms \((t = 3.37)\).

Factor analysis of DRS-R-98

As none of the patient had delusions, this item was removed from the factor analysis. Multiple factor analyses were carried out using the other 15 items of DRS-R-98 and using the 12 severity items of DRS-R-98. The Kaiser-Meyer-Olkin measure of sampling adequacy value was 0.677 and Bartlett’s test of sphericity was significant \((\chi^2 = 529.90, df = 105; P < 0.001)\) when the 15 items of DRS-R-98 were entered into the factor analysis. The initial principal component analysis yielded five factors with an Eigenvalue of more than one, explaining 69.89% of the total variance. The Kaiser-Meyer-Olkin measure of sampling adequacy value was 0.693 and Bartlett’s test of sphericity was significant \((\chi^2 = 473.10, df = 66; P < 0.001)\) when the only 12 severity items were entered into the factor analysis. The initial principal component analysis, yielded four factors with an Eigenvalue of more than one, explaining 71.77% of the total variance. While running the multiple factor analyses, scree plots also consistently showed tailing at three factors. It is suggested that results of the exploratory analysis are more accurate when each common factor is represented by at least three variables and variance explained by each factor is more than 10% each.\[26\]

When the 15 items of DRS-R-98 were entered into factor analysis, the three-factor model explained 54.61% of the total variance and 2-factor model explained 44.72% of the total variance and both the models retained the 12 items in common. Whereas when the 12 items of DRS-R-98 were entered into factor analysis, the 3-factor model explained 63.04% of the total variance and 2-factor model explained 51.79% of the total variance. Considering that the 3-factor models retained more number of items (11 out of 12 compared to 9 out of 12 items in 2-factor model of 12 items; and 13 out of 15 compared to 11 out of 15 items in 2-factor model of 15 items) a 3-factor models were considered further. Perceptual abnormalities did not load on any of the 3-factor models [Table 3]. When the 15 items were entered into factor analysis, the item–“presence of physical disorder” item did not load onto any of the 3-factors and the other two diagnostic items loaded onto Factor-3. Further, in terms of number of items on each factor, the 3-factor model of 15 items had at least three items on each of the three factors, in contrast to only two items on the 3-factor model of 12 items [Table 3]. Hence, the 3-factor model of 15 items was accepted as the best model. The Factor-1 was named as cognitive factor, Factor-2 was named as motoric factor and Factor-3 was named as thought, language and fluctuation factor.

**DISCUSSION**

This study used DRS-R-98 in the ICU setting to assess the phenomenology of delirium in adults, although it has been used in pediatric ICU setting in a recent study.\[30\]

DRS-R-98 is considered a comprehensive instrument as it assesses the cognitive, behavioral and diagnostic symptoms separately and gives a broader picture of the phenomenology. The symptoms which were seen in more than 70% of the patients included disturbances in attention, thought process abnormality, fluctuation of symptoms, sleep-wake cycle, language, orientation, and short-term memory impairments. No patient had delusions and very few reported perceptual disturbances. When the findings of this study are compared with the studies which have described the phenomenology using DRS-R-98 in the non-ICU picture\[16,20,36,37\] certain similarities and

| Table 3: Factor model depicting the distribution of various items |
|---------------------------------------------------------------|
| **3-factor model of 15 items of DRS-R-98** | **3-factor model of 12 items of DRS-R-98** |
| **Factor-1** | **Factor-2** | **Factor-3** | **Factor-1** | **Factor-2** | **Factor-3** |
| Sleep-wake cycle disturbances | 0.455 | | 0.473 | |
| Perceptual disturbance | | 0.618 | 0.615 | |
| Lability of affect | 0.618 | | | 0.674 |
| Language | 0.495 | | 0.850 | |
| Thought process abnormality | | −0.689 | 0.907 | |
| Motor agitation | 0.869 | | | |
| Motor retardation | | −0.826 | | −0.860 |
| Orientation | 0.735 | | 0.743 | |
| Attention | 0.878 | | 0.874 | |
| Short-term memory | 0.923 | | 0.923 | |
| Long-term memory | 0.813 | | 0.836 | |
| Visuospatial ability | 0.801 | | 0.800 | |
| Temporal onset of symptoms | | 0.700 | | |
| Fluctuation | 0.531 | | | |
| Physical disorder | | | | | |

DRS-R-98: Delirium Rating Scale–Revised-98

Lung India • Volume 34 • Issue 5 • September - October 2017
differences emerge. The similarity includes the presence of sleep-wake cycle disturbances, lability of affect, disorientation, attention deficits, short-term and long-term memory deficits and disturbance in the visuospatial ability in more than half of the patients across the studies. All the earlier studies have reported the presence of delusions in few patients (less than one-third of the patients), although no patient in the present study had this symptom. In the present study, language and thought process abnormalities were seen in almost all patients, in contrast to the earlier studies which have reported these to be present in 57%–90% (for language abnormalities) and 54%–92% (for thought process abnormalities). However, motor agitation was found to be present in only 46.66% in the present study compared to the some of the earlier studies done in referred consultation-liaison patients, which have reported it be present in more than 90% of the patients.

Accordingly, these studies report less prevalence of motor retardation. However, studies done in palliative care have reported a profile similar to that seen in the present study.

However, when the mean scores of various items of DRS-R-98, DRS-R-98 severity score and DRS-R-98 total score are compared with the existing literature, the mean scores in the present study are much lower for all the severity items. This was further highlighted by the fact that only 54 out of the 75 patients in the present study did not meet the cut-off severity score of 15 and 44 out of 75 patients did not meet the cut-off of 18 for the total score to be considered to have delirium.

There can be various reasons for these findings. First, DRS-R-98 has not been validated in the ICU population. Because all the patients diagnosed as having delirium in the present study were assessed for delirium by a psychiatrist after being screened for the same on CAM-ICU and confirming the diagnosis by DSM-IV criteria, it can be said that the cut-off described in the literature may not be an application to the ICU population. A recent study which also attempted to study delirium in pediatric ICU using DRS-R-98 reported difficulty in using the same in ICU-set up considering the number of items for assessment of cognition in DRS-R-98 which may be difficult in children. In the present study also difficulty in rating on DRS-R-98 was observed with respect to evaluation of severity of some of the cognitive symptoms, language and thought process abnormalities, because many patients were on mechanical ventilation, so the answers were obtained in the form of “yes” or “no” from the patients or relatives and members of the treating team and were considered present or absent, but the severity could not be assessed properly. Hence, it can be said that although the present study suggests that it is feasible to use DRS-R-98 in the ICU population, but the cut-off required to be compatible with the diagnosis of delirium needs to be revised. Hence, there is a need to validate this instrument in ICU population.

Other reason for the lower scores on the DRS-R-98 in the present study compared to the previous studies which have used the same in consultation-liaison population could be that the present study involved screening of all patients hence patients would have been picked up delirium earlier in the course before the full severity of various symptoms manifest. Third, most of the studies done in the consultation-liaison population have included only referred patients. Due to that, it is quite possible that many patients of hypoactive delirium, which are less problematic for the primary medical-surgical team or not evaluated, which was the predominant subtype in the present study.

One argument can be that the present study involved screening of all the patients and the lower scores on many of items of DRS-R-98 compared to that seen in consultation-liaison population can be due to picking up of delirium cases in the prodromal or subsyndromal phase. This is also compatible with the lower frequency and lower scores on some of the items of DRS-R-98 in the incidence cases compared to nonincidence cases. However, in the present study, the diagnosis of delirium was compatible with DSM-IV criteria. Hence, this argument may not hold completely true.

Previous studies including those from our center have used factor analysis to study the phenomenology of delirium. However, all of these studies have been done in non-ICU setup and some have been limited to the elderly population only and only one study has carried out factor analysis of Memorial Delirium Assessment Scale (MDAS) in ICU set up. However, this study included only nonventilated patients. The existing factor-analytic studies which have carried out factor analysis of DRS/DRS-R98 have also yielded two or three factors, which explain 44%–64% of the variance. The two factor structure of MDAS presented in the earlier ICU set up study explained nearly 63% of the variance.

In this study, the 3-factor model obtained explained 54.61% of variance and is in the range reported in the previous studies. The three factors, namely, “cognitive” factor, “motoric” factor and “thought, language and fluctuation factor” are in line with the existing literature. All the previous studies, although based on different assessment scales have consistently reported a cognitive factor. With regards to other symptoms, depending on the assessment tools used the other symptoms have been presented as a single composite factor or two separate factors.

The cognitive factor obtained in the present study is also very similar to the cognitive factor reported in the previous study based on MDAS in ICU patients and is also similar to the cognitive factor reported in our earlier studies on non-ICU patients. Among the various behavioral symptoms, the items of motor agitation and inverse of motor retardation have also consistently been shown to load on to the same factor across the studies. However, there is an inconsistency with respect to the loading of other items. Overall based on the above comparisons, it can
be said that the factor structure of DRS-R-98 is consistent across the various treatment setting with the cognitive and behavioral factors. The cognitive factor in the present study is similar to that reported in the distribution of items. However, in the previous study other symptoms loaded onto a single factor in contrast to two separate factors in the present study. These differences can possibly be understood in the background of difference in the study population (inclusion of mechanically ventilated patients in the present study) and assessment instrument used.

CONCLUSION

This study suggests that the phenomenology of delirium is more or less similar to non-ICU patients. However, it is important to note that compared to the consultation-liaison population, hypoaffective delirium is the most common subtype. Further, the factor structure of DRS-R-98 in ICU patients is also similar to patients seen in the consultation-liaison population. These findings suggest that the core symptoms of delirium are seen across various treatment settings, and it is the frequency of noncore symptoms which vary across the various treatment settings.

One need to note that in this study patients were evaluated by psychiatrists well versed with evaluation of patients with delirium in various treatment settings. Hence, it is possible that evaluation of patients on DRS-R-98 could have been influenced by their level of experience in assessing these patients.

We are aware of the limitations of this study, which include small size and restriction of assessment to a single ICU setup. More studies in surgical and other critical care areas are required to get a complete picture of symptom profile of delirium in ICU. We did not assess the prevalence of dementia in the patients before development of delirium, although some of the studies suggest that there is no difference in the phenomenology of delirium in those with and without dementia. We also did not administer DRS-R-98 to patients who did not develop delirium, hence could not establish the appropriate cut-off for ICU patients. Future studies addressing the above limitations would be useful.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Ely EW, Inouye SK, Bernard GR, Gordon S, Francis J, May L, et al. Delirium in mechanically ventilated patients: Validity and reliability of the confusion assessment method for the Intensive Care Unit (CAM-ICU). JAMA 2001;286:2703-10.
2. Bergeron N, Dubois MJ, Dumont M, Dial S, Skrobik Y. Intensive care delirium screening checklist: Evaluation of a new screening tool. Intensive Care Med 2001;27:859-64.
3. Pandharipande P, Cotton BA, Shintani A, Thompson J, Pun BT, Morris JA Jr., et al. Prevalence and risk factors for development of delirium in surgical and trauma Intensive Care Unit patients. J Trauma 2008;65:34-41.
4. Lat I, McMillian W, Taylor S, Janzen JM, Papadopoulos S, Korth L, et al. The impact of delirium on clinical outcomes in mechanically ventilated surgical and trauma patients. Crit Care Med 2009;37:1898-905.
5. Burns A, Gallaghe A, Byrne J. Delirium. J Neurol Neurosurg Psychiatry 2004;75:362-7.
6. Gupta N, de Jonghe J, Schieveld J, Leonard M, Meagher D. Delirium phenomenology: What can we learn from the symptoms of delirium? J Psychosom Res 2008;65:215-22.
7. Camus V, Burtin B, Simeone I, Schwed P, Gontier R, Dubos G. Factor analysis supports the evidence of existing hyperactive and hypoactive subtypes of delirium. Int J Geriatr Psychiatry 2000;15:313-6.
8. Saravay SM, Kaplowitz M, Kerek J, Zeman D, Pollack S, Novik S, et al. How do delirium and dementia increase length of stay of elderly general medical inpatients? Psychosomatics 2004;45:235-42.
9. de Jonghe JF, Kalisvaart KJ, Timmers JF, Kat MG, Jackson JC. Delirium-O-Meter: A nurses’ rating scale for monitoring delirium severity in geriatric patients. Int J Geriatr Psychiatry 2005;20:1158-66.
10. Shyamsundar G, Raghuthaman G, Rajkumar AP, Jacob KS. Validation of Memorial Delirium Assessment Scale. J Crit Care 2009;24:530-4.
11. Lawlor PG, Nekolaichuk C, Gagnon B, Manclini I, Perera J, Bruera ED. Clinical utility, factor analysis, and further validation of the Memorial Delirium Assessment Scale in patients with advanced cancer: Assessing delirium in advanced cancer. Cancer 2000;88:2859-67.
12. Trzepacz PT, Dew MA. Further analyses of the Delirium Rating Scale. Gen Hosp Psychiatry 1995;17:75-9.
13. Trzepacz PT, Mulssant BH, Dew MA, Pasternak R, Sweet RA, Zubenko GS. Is delirium different when it occurs in dementia? A study using the Delirium Rating Scale. J Neuropsychiatry Clin Neurosci 1999;10:199-204.
14. Grassi L, Caraceni A, Beltrami E, Borrani C, Caramazza M, Maltoni M, et al. Assessing delirium in cancer patients: The Italian versions of the Delirium Rating Scale and the Memorial Delirium Assessment Scale. J Pain Symptom Manage 2001;21:59-68.
15. Fann JR, Allano CM, Burington BE, Roth-Roemer S, Katon WJ, Syrjala KL. Clinical presentation of delirium in patients undergoing hematopoietic stem cell transplantation. Cancer 2005;103:810-20.
16. Franco JG, Trzepacz PT, Mejia MA, Ochoa SB. Factor analysis of the Colombian translation of the Delirium Rating Scale (DRS), revised-98. Psychosomatics 2009;50:255-62.
17. Grover S, Chakrabarti S, Shah R, Kumar V. A factor analytic study of the Delirium Rating Scale-revised-98 in untreated patients with delirium. J Psychosom Res 2011;70:473-8.
18. Grover S, Kate N, Agarwal M, Mattoo SK, Avasthi A, Malhotra S, et al. Delirium in elderly people: A study of a psychiatric liaison service in North India. Int Psychogeriatr 2012;24:117-27.
19. Jain G, Chakrabarti S, Kulhara P. Symptoms of delirium: An exploratory factor analytic study among referred patients. Gen Hosp Psychiatry 2011;33:377-85.
20. Mattoo SK, Grover S, Chakravarti K, Trzepacz PT, Meagher DJ, Gupta N. Symptom profile and etiology of delirium in a referral population in Northern India: Factor analysis of the DRS-R98. J Neuropsychiatry Clin Neurosci 2012;24:95-101.
21. McNicol J, Pisani MA, Zhang Y, Ely EW, Siegel MD, Inouye SK. Delirium in the Intensive Care Unit: Occurrence and clinical course in older patients. J Am Geriatr Soc 2003;51:591-8.
22. Pandharipande P, Shintani A, Peterson J, Pun BT, Wilkinson GR, Dittus RS, et al. Lorazepam is an independent risk factor for transitioning to delirium in Intensive Care Unit patients. Anesthesiology 2006;104:21-6.
23. Dubois MJ, Bergeron N, Dumont M, Dial S, Skrobik Y. Delirium in an Intensive Care Unit: A study of risk factors. Intensive Care Med 2001;27:1297-304.
24. Aldemir M, Ozen S, Kara IH, Sir A, Baç B. Predisposing factors for delirium in the surgical Intensive Care Unit. Crit Care 2001;5:263-70.
25. Oumet S, Riker R, Bergeron N, Cossette M, Kavanagh B, Skrobik Y. Subsyndromal delirium in the ICU: Evidence for a disease spectrum. Intensive Care Med 2007;33:1007-13.
26. Girard TD, Pandharipande PP, Ely EW. Delirium in the Intensive Care...
27. Van Rompaey B, Schuurmans MJ, Shortridge-Baggett LM, Truijen S, Bossaert L. Risk factors for intensive care delirium: A systematic review. Intensive Care Nurs 2008;24:98-107.

28. Bruno JJ, Warren ML. Intensive Care Unit delirium. Crit Care Nurs Clin North Am 2010;22:161-78.

29. Shehabi Y, Riker RR, Bokesch PM, Wiseman-W, Shintani A, Ely EW; SEDCOM (Safety and Efficacy of Dexmedetomidine Compared With Midazolam) Study Group. Delirium duration and mortality in lightly sedated, mechanically ventilated intensive care patients. Crit Care Med 2010;38:2311-8.

30. Janssen NJ, Tan EY, Staal M, Janssen EP, Leroy PL, Lousberg R, et al. On the utility of diagnostic instruments for pediatric delirium in critical illness: An evaluation of the Pediatric Anesthesia Emergence Delirium Scale, the Delirium Rating Scale 88, and the Delirium Rating Scale-revised R-98. Intensive Care Med 2011;37:1331-7.

31. Sharma A, Malhotra S, Grover S, Jindal SK. Incidence, prevalence, risk factor and outcome of delirium in Intensive Care Unit: A study from India. Gen Hosp Psychiatry 2012;34:639-46.

32. Ely EW, Truman B, Shintani A, Thomason JW, Wheeler AP, Gordon S, et al. Monitoring sedation status over time in ICU patients: Reliability and validity of the Richmond Agitation-Sedation Scale (RASS). JAMA 2003;289:2983-91.

33. Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O’Neal PV, Keane KA, et al. The Richmond Agitation-Sedation Scale: Validity and reliability in adult Intensive Care Unit patients. Am J Respir Crit Care Med 2002;166:1338-44.

34. Neto AS, Nassar AP Jr., Cardoso SO, Manetta JA, Pereira VG, Espósito DC, et al. Delirium screening in critically ill patients: A systematic review and meta-analysis. Crit Care Med 2012;40:1946-51.

35. Trzepacz PT, Mittal D, Torres R, Kanary K, Norton J, Jimerson N. Validation of the Delirium Rating Scale-revised-98: Comparison with the Delirium Rating Scale and the cognitive test for delirium. J Neuropsychiatry Clin Neurosci 2001;13:229-42.

36. Meagher DJ, Moran M, Raju B, Gibbons D, Donnelly S, Saunders J, et al. Phenomenology of delirium. Assessment of 100 adult cases using standardised measures. Br J Psychiatry 2007;190:135-41.

37. Meagher DJ, O’Hanlon D, O’Mahony E, Casey PR, Trzepacz PT. Relationship between symptoms and motoric subtype of delirium. J Neuropsychiatry Clin Neurosci 2000;12:51-6.