The Revised Hasegawa’s Dementia Scale (HDS-R) as a Screening Tool for Delirium

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Objectives: The objective of this study was to examine the feasibility of the Revised Hasegawa’s Dementia Scale (HDS-R) in screening delirium for consultant psychiatrists at their first encounter with the patients in clinical medical/surgical settings. The authors also intended to present the sensitivity, specificity, and the cut-off scores of HDS-R scores in detecting delirium. Methods: We recruited 69 patients who have been referred to psychiatric consultation liaison (C-L) service at a medical center in northern Taiwan. HDS-R and Mini Mental State Examination (MMSE) were applied and the diagnoses were made according to DSM-IV criteria. Results: We found that Cronbach’s coefficient α HDS-R was 0.894, showing significant correlation with MMSE (r = 0.972, p < 0.001). The HDS-R scores in the delirium group were ranged from 0 to 23, with an average of 5.8 (standard deviation = 6.5). The HDS-R scores in the non-delirium group were ranged from 4 to 30, with an average of 22.9 (S. D. = 7.5, unequal variance t test, t = -9.659, degree of freedom = 45.978, p < 0.001). Area under receiver operating characteristic (ROC) curve was 0.946 (95% confident interval 0.875-0.997). The best cut-off point of HDS-R score for screening delirium was 16/17. Conclusion: HDS-R may serve as a screening tool of delirium for consultant psychiatrists who encounter the patients for the first time in the clinical medical/surgical settings.

Key words: Mini Mental Status Examination (MMSE), the receiver operating characteristic (ROC) curve, sensitivity, specificity

of delirium challenging and often causing under-detected cases [5, 6]. Owing to the highly perplexing clinical picture of delirium [7, 8], delirium becomes one of the leading reasons for psychiatric consultation requests in general hospitals.

Although many associated symptoms of delirium have been reported in literature, the core symptoms of delirium mostly centered on the disturbances of consciousness and cognition. But “consciousness disturbance” can sometimes be subtle and escaped the notice of physicians who are not familiar with the diagnosis of delirium. As a matter of fact, the rôle of “clouding of consciousness” in diagnosing delirium has been progressively de-emphasized in The Diagnostic and Statistical Manual of Mental Disorders (DSM) system since the publication of DSM-III in 1980, mostly owing to the failure to reach a consensus on its operational definition [9]. On the other hand, the acutely developed disturbances in attention and cognitive function have been stressed as the cardinal features of delirium over time, as is true in the change in delirium diagnostic criteria in the newly released DSM-5 [10]. Although cognitive deficit is not the single symptom to manifest in delirious patients, studies have suggested that the use of alternate forms of standardized Cognitive Test for Delirium (CTD) may prompt an early identification of delirium in intensive care units and timely management [11]. In this study, we also intended to examine whether a previously established cognitive function test—one that is both sensitive and easy to administer—may also help consultant psychiatrists screen the potentially delirious patients at their first encounter.

The Hasegawa’s Dementia Scale (HDS), a brief cognitive scale, was developed by Hasegawa in 1974. It is a scale initially set for the purpose of screening dementia that has been widely accepted both for clinical use and epidemiological surveys in Japan. The Revised Hasegawa Dementia Scale (HDS-R) was later reconstructed after reconsidering the feasibility for worldwide use [12]. HDS-R is to examine main areas of cognitive functions including orientation, attention, language, and memory. Studies have shown that HDS-R has high sensitivity in distinguishing the cognitively impaired from normal controls. Moreover, it is known to be not time-consuming when administered, and the tasks of HDS-R do not require reading and drawing abilities to complete [13]. All these advantages potentiate its use in illiterate or physically disabled patients that consultant psychiatrists often encounter in day-to-day practice.

We therefore hypothesized that HDS-R might serve as a feasible delirium screening tool that could be used by consultant psychiatrists in general hospitals. The main objectives of this study were to examine the validity of HDS-R as a candidate screening tool for patients with delirium, and to present the sensitivity, specificity, and the cut-off scores of HDS-R scores in detecting delirium. We also intended to examine the correlation of patients’ HDS-R and MMSE scores.

Methods

Study subjects

We recruited patients who had been referred for psychiatric consultation liaison service during a three-month interval from a 2,500 beds medical center in northern Taiwan to participate in this study. Excluded were patients with a previously attained diagnosis of “dementia” in their medical records. We included 69 subjects who finally entered this study. They were evenly distributed in males \( (n = 34) \) and females \( (n = 35) \), and aged from 18 to 87 years. The requests for psychiatric consultations were issued from medical intensive care units (ICU) \( (n = 7) \), surgical ICU \( (n = 11) \),
burn center (n = 5), and general medical wards (n = 46). This study protocol was approved by the institutional review board of Chang Gung Memorial Hospital without the need of obtaining the signed consent forms from the study subjects.

**Study procedures**

Our consultant psychiatrists visit the patients within 24 hours after the consultations were requested. Each study patient in this study, despite the reasons leading to his or her consultation, was instructed to complete HDS-R and MMSE by a senior psychiatry resident. A formal diagnostic interview with both the patient and the source of collateral information (i.e., close family members, caregivers, or primary medical staff) was then conducted by a board certificated attending psychiatrist to reach the final diagnosis according to the DSM-IV criteria. The results were later examined and approved in the consultation-liaison service’s team meeting held by the director, a senior C-L psychiatry specialist every day.

**Study tools**

**The Revised Hasegawa’s Dementia Scale (HDS-R)**

HDS-R consists of 9 simple questions with a maximum score of 30. Questions of HDS-R include age (1 point), orientation to time (4 points) and place (2 points), repeating of 3 words (3 points), serial subtractions of 7s (2 points), digits backward (2 points), recalling of 3 words (6 points), confrontation naming and immediate recall of 5 objects (5 points), and category fluency test (5 points).

In our study, the test was delivered to the patient verbally. The individual response to each question was then documented on a preprinted sheet from which total score could be obtained.

**Mini Mental Status Examination (MMSE)**

The MMSE consists of various questions that can be grouped into 7 categories with a maximum score of 30. Each question represents a different cognitive domain or functioning: orientation to time (5 points), orientation to place (5 points), registration of 3 words (3 points), attention and calculation (5 points), recall of 3 words (3 points), language (8 points) and visual construction (1 point) [14].

**Statistics**

Internal consistency of the HDS-R was calculated using Cronbach’s coefficient. The correlation between HDS-R and MMSE was evaluated by Pearson’s correlation test (two-tailed). We obtained the receiver operating characteristic (ROC) curve for HDS-R for each observed value of the attribute, and estimated the areas under the ROC curves. We then determined the optimal cut-off point of HDS-R scores for delirium screening. The data was analyzed using Statistical Package and Social Science software version 10 (SPSS, Inc., Chicago, Illinois, USA).

**Results**

A total of 69 patients were included in our study. Excluded were 7 patients due to their inability of responding to verbal questioning, or performing the writing/reading/drawing task of MMSE. Among the rest 62 patients who completed the assessment, the final diagnoses based on DSM-IV include delirium (n = 39), psychosis (n = 7), depression (n = 9), substance abuse (n = 3), and anxiety disorders (n = 4).

HDS-R showed a good internal consistency (Cronbach’s coefficient α = 0.894). The HDS-R and MMSE scores in the delirium group were from 0 to 23 and 0 to 22 respectively, with an av-
average of 5.8 (S.D. = 6.5) in HDS-R and 6.5 (S.D. = 6.9) in MMSE. The HDS-R and MMSE scores in the non-delirium group were from 4 to 30 and 6 to 30 respectively, with an average of 22.9 (S.D. = 7.5) in HDS-R and 25.3 (S.D. = 6.5) in MMSE. HDS-R not only shows high correlation with MMSE \( r = 0.972, p < 0.001 \). The difference of HDS-R scores in the two groups was also significant (unequal variance \( t \) test, \( t = -9.659, \text{d.f.} = 45.978, p < 0.001 \)).

The estimated cut-off point of HDS-R score and that of MMSE for screening delirium were 16/17 and 17/18, respectively. The sensitivity and specificity of HDS-R and MMSE were 0.95 and 0.92, respectively. As shown in Figure 1, the area under the ROC curve was 0.946, with a 95% confident interval ranging from 0.875 to 0.997.

**Discussion**

Delirium is often under-recognized in clinical practice among patients with dementia because early detection poses a great challenge for clinicians who are unfamiliar with the diagnosis. The fluctuating and perplexing nature of delirium might also mask itself to the eyes of untrained medical staff who may issue the psychiatric consultation under the description such as “psychosis,” “agitation,” “irritability,” or “insomnia.”

In this study, we demonstrated that HDS-R could serve as a tool in screening delirium. At a cut-off point of 16/17, HDS-R readily separated delirious patients from those who received other major psychiatric diagnoses including psychosis, depression, anxiety, and substance use disorders.
In this study, the patients with these disorders showed less marked deficit in cognitive function when compared to delirious ones. Based on the result of this study, we suggest that a score lower than 16/17 may raise the suspicion of delirium regardless of the variable manifestations that prompt the consultation in the first place when HDS-R is applied routinely by consultant psychiatrists.

Many previously studied delirium-screening instruments, such as Clinical Assessment of Confusion (CAC-A), Confusion Assessment Method (CAM), and Delirium Rating Scale (DRS), have been designed primarily for non-psychiatric medical or nursing staff [15]. Most of these instruments also require information regarding DSM-5 sleep-wake cycle disorders [10]. But consultant psychiatrist may not have the access to at their first encounter with the patients, especially when a reliable source of collateral information available at bedside. To our knowledge, no known studies exist to examine the feasibility of these instruments in screening delirium for consultant psychiatrists in C-L services. Also, several instruments’ validity and reliability were have only been established in selected patient groups [16, 17] rather than the non-selected patient groups with a wide age range and heterogeneous medical backgrounds that consultant psychiatrists encounter in every day practice.

Researchers have studied the use of HDS-R to assess cognitive changes throughout the perioperative period [18]. Also, preoperative HDS-R score has been linked to the assessment of postoperative delirium [19]. Kaneko et al. suggest that the patients with postoperative delirium often have preoperative cognitive impairment. The finding in this study further suggests that a marked deficit in HDS-R scores at a single time point within the initial 24 hours after psychiatric consultation being requested is sufficient to raise the clinical suspicion for delirium. What is also found in our study is that HDS-R had good correlation with MMSE in demonstrating cognition deficit. HDS-R not only excels its counterparts in the free application to those who do not have reading, writing, or drawing abilities, but also is less influenced by patients’ demographic backgrounds [20]. Based on the finding of our study, we suggest that HDS-R may enable consultant psychiatrists to screen for delirium even when reliable sources of collateral information is not yet available at bedside, as many patients in general hospital nowadays are taken care of by short-term hired caregivers who have little, if not at all, knowledge about the patients’ baseline cognitive function level.

**Limitations of the study**

The readers are cautioned against over-interpreting the study results because this study has three limitations.

- The timing of applying HDS-R in the present study design reflects real-world psychiatric C-L practice. Therefore, the classical fluctuation of deficits in cognition of delirium may therefore escape detection and thus bias the study results.
- Patients with previously documented dementia are excluded in our study, because HDS-R is originally set for detecting dementia and false positive findings can be expected with this patient group. Chang et al. reported that the Chinese version of HDS-R has been validated to be a good screening instrument for dementia in Taiwanese population at a cut-off score of 17/18 [21], which is very close to what we found in our study in the screening for delirium (cut-off score at 16/17).
- Delirium and cognitive impairment due to other reasons may be difficult to separate [22].
Although HDS-R is good at recognizing cognitive impairment from normal controls, it is unable to tell since when and how the cognitive decline has taken place. When being administered alone, HDS-R might not be able to differentiate delirium from diseases that also may manifest significant cognitive impairment.

**Summary**

As previously reviewed, cognition deficits alone do not satisfy the diagnosis of delirium. Nevertheless, the detection of cognition deficits with standardized cognitive function test may help raise the clinical awareness. The preliminary results of this study suggest that HDS-R might be a feasible delirium screening tool, rather than a diagnostic measure, for consultant psychiatrists who encounter their patients for the first time. A significant cognitive deficit as shown by low HDS-R scores should necessitate comprehensive survey in discriminating the underlying causes. Further validation of its clinical utility is warranted.

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**References**


