

Research Article

A Pilot Study on the Use of a Customized Clinical Tool for Detection and Initial Management of Delirium in General Medical Inpatients

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Abstract

Objectives: Delirium often presents with atypical or subtle features that makes its diagnosis among junior doctors a challenge. We conducted a pilot cross sectional study to determine the prevalence, incidence and etiology of delirium in general medical inpatients, and explored the use of a customized clinical tool to improve the detection rate of delirium and optimize management among junior doctors.

Methods: An evidence-based, user-friendly delirium clinical tool was created and applied for patients in the study team who had a change in mental status or function to help junior doctors confirm the diagnosis, screen for and manage common precipitating causes of delirium. Prevalence and etiologies for delirium were gathered from the clinical tool. Delirium detection rate in the study team was compared against that in non-study teams where the clinical tool was not being used.

Results: 282 and 2822 patients were admitted to the study and non-study teams respectively over two months. The occurrence rate of delirium in the non-study teams was 1.4%, and increased to 5.3% in the study team. Delirium was more common in elderly patients. Hypoactive delirium accounted for the major phenotype, and infection was the most common cause.

Conclusion: This pilot study has shed some light on the prevalence and etiology of delirium among medical inpatients for which there is scarce local data. The use of the clinical tool by junior doctors resulted in a higher rate of delirium detection and has the potential to help in the early identification and patient centered management of delirium.

Keywords: Delirium; Medical; Screening; Management; Tool

Introduction

Delirium is a common, potentially life-threatening clinical syndrome which requires early diagnosis and prompt management. The clinical diagnosis of delirium is based on observation of key features such as disturbance in attention, change in cognition, acute onset, fluctuating course and external causation[1].

The cause of delirium is typically multifactorial, especially in elderly patients[2]. It is the result of a complex interplay between predisposing factors in a vulnerable patient, and exposure to precipitating factors[3]. Leading predisposing factors for delirium include age 70 years or older, dementia or cognitive impairment, vision impairment and multiple coexisting conditions[4]; while

common precipitating factors include polypharmacy, use of drugs such as narcotics, intercurrent illnesses such as infections, metabolic derangements and pain[3].

Delirium is associated with serious adverse outcomes including cognitive and functional decline, longer length of hospitalization, increased likelihood of institutionalization and death, with inpatient mortality rates of 22-76%[5], and one-year mortality rate of 35-40%[3]. Despite its clinical significance, delirium remains frequently undetected and misdiagnosed. It has been shown in previous studies that clinicians miss the diagnosis of delirium in up to two thirds of cases, and nurses only identified delirium in 31% of patients compared with researchers[6].

The lack of recognition and detection of delirium can be attributed to multiple factors such as the heterogeneity and subtlety

of presentations associated with different delirium subtypes, lack of awareness of diagnostic criteria, the fleeting and fluctuating nature of delirium which makes detection difficult when clinicians only have brief patient contact[7,8], and its tendency to overlap or comorbidly exist with depression and dementia[9]. System-based practice limitations include time constraints, failure to integrate the assessment of symptoms of delirium within the care delivery process, and failure to incorporate a screening tool[9].

While many studies have been published abroad and locally[10-13] examining delirium in geriatric patient populations, there have been few studies examining the epidemiology of delirium in general medical inpatient wards wherein the age profile of patients admitted ranges from the young adult (21yrs and above) to the middle aged and elderly. A systematic review published in 2006 showed that 35 out of 40 eligible studies were carried out in exclusively older populations aged more than 60 to 75 years old[7]. There is therefore a knowledge gap in the epidemiology of delirium in the unselected medical inpatient population.

In the Department of Internal Medicine (DIM) at Singapore General Hospital (SGH), there is a large inpatient load with management administered by multiple medical teams. In this setting, the challenges of diagnosing and managing delirium are significant. In addition, it had been observed that junior doctors, who form the vanguard of medical teams, often encountered difficulties in diagnosing delirium and providing initial individualized management that was appropriate for each patient. Prior to the present study, there was also no practical resource or tool which was readily available for the junior doctors to access and utilize. Recognizing this need, a customized clinical tool for the detection and management of delirium (see Appendix 1) was created by three consultants from the Departments of Internal Medicine and Geriatric Medicine based on extensive literature search[3,8,14,15-21] and consolidation of clinical experience. Established clinical methods of detecting delirium criteria at the bedside (using the Confusion Assessment Method), common precipitating factors of delirium, non-pharmacological and pharmacological methods in the initial management of delirium were the main clinical considerations in constructing and writing out the tool. In terms of implementation, as one of the logistical considerations was ease of use by the junior doctor, the clinical tool was created to be simple, concise and in the format of a checklist. Thereafter, a pilot study was embarked upon to assess the utility of this tool as well as to gather empirical data on the prevalence and incidence of delirium within DIM.

Appendix 1. The customized delirium clinical tool.

Assessor and Date: _____ Patient Sticker: _____ Serial No.: _____

Delirium Clinical Tool (for SGH DIM & GRM)

Primary Dx (after evaluation by inpatient team) _____
Baseline cognitive function (tick all boxes if information is available)
 1. Any known cognitive disorder: eg Dementia, PH delirium, intellectual impairment, Depression, mental disorders, alcoholism, drug abuse,
 2. Short term memory (intact / impaired)
 3. Long term memory (intact / impaired)
 4. Duration of cognitive decline: Acute / Chronic / Acute on chronic

Assessment
 According to CAM (confusion assessment method), delirium is diagnosed if pt fulfills criteria 1 and 2 plus 3 or 4

- 1. Inattention (repeat 5 digits forward)
- 2. Acute onset and fluctuating course
- 3. Disorganized thinking **OR**
- 4. Altered level of consciousness

- hyperalert=vigilant
- drowsy, easily aroused=lethargic
- drowsy, difficult to arouse=stupor
- unarousable=coma

Investigations (tick if indicated)

- Drugs/Dehydration** – screen for drugs that can contribute or cause delirium (eg anticholinergic including antihistamines, ophthalmidrine (found in Anareg®) and tricyclic antidepressant, benzodiazepine, antibiotics, diuretics and alcohol withdrawal, digoxin and inotropes, corticosteroids). Assess for **Dehydration**
- Electrolyte imbalance**
- Lots of pain
- Infection/Inflammation** (post-surgery)
- Respiratory failure** (hypoxia, hypercapnia)
- Impaction of stool**
- Urine retention/IDC**
- Metabolic disorder** (liver/renal failure), hyper or hypoglycemia/Myocardial infarction

References:
 1. Delirium: diagnosis, prevention and management. NICE guideline 2010.
 2. Inouye SK. Delirium in elder persons. *NEJM* 2006; 354:1157-1165

Assessor and Date: _____ Patient Sticker: _____ Serial No.: _____

Assessor and Date: _____ Patient Sticker: _____ Serial No.: _____

Interventions (tick if you have done)

- 1. Identify and treat precipitating causes of delirium

Possible causes:

- 2. Identify and remove offending drugs

- 3. Communication and reorientation: (1) Reassure patient (2) Adopt appropriate tone and approach to patient (3) Orientate the patient through verbal reminder and refer OT for orientation chart

- 4. Sensory impairment: visual and hearing aids (if necessary)

- 5. Environment: (1) Quiet and conducive environment (2) Avoid sleep disruption at night

- 6. Early mobilization when safe

- 7. Pharmacological interventions:

(A) Considerations: To be considered only after non-pharmacological measures have been implemented and is considered necessary when (i) it is required for an important investigation or treatment to proceed whilst patient is delirious, (ii) patient's delirious behaviour is a liability and danger to doctors, healthcare personnel, other patients and relatives, (iii) when the patient is in severe distress/agitation

(B) Type of pharmacotherapy for acute delirium (Table 1): (1) haloperidol (2) lorazepam. Avoid atypical anti-psychotics unless one has good experience in using them.

Table 1 (Adapted and modified from Inouye²)

Drug	Dose	Adverse Effects	Comments
Haloperidol (First Line)	PO 0.5-1.0mg BD, with additional doses Q6H as needed (peak effect in 4-6 hours) (M) 0.5-1.0mg, observe after 30-60 mins and repeat if needed (peak effect in 20-40mins)	Extrapyramidal symptoms esp if >3mg/day. Prolonged QTc Avoid in patients with withdrawal syndrome, hepatic insufficiency, neuroleptic malignant syndrome	Usually agent of choice. Effectiveness demonstrated in RCTs. Avoid IV use due to short duration of action. To be given for 2-3 days, maximum daily dose of 5mg. Stop once acute delirium resolves.
Lorazepam (Second Line)	PO 0.5-1.0mg with additional doses Q6H as needed.	Paradoxical excitation, respiratory depression, oversedation	Second line agent. Associated with prolongation and worsening of delirium symptoms in some clinical trials. Reserve for use in patients undergoing sedative and alcohol withdrawal, Parkinson's disease, and neuroleptic malignant syndrome

- 8. If necessary, to refer psychiatrist (for psychosis/psychiatric disorders) or geriatrician for further input and management

Outcome

Recovery of Delirium upon discharge

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 3. Easton TMA, Radolich B. Chapter 12: Delirium. *Hospitalist's Guide To The Care of Older Patients*, Wiley Blackwell 2013. (with modifications)
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Aims

Primary aim of the pilot study:

To study the prevalence, incidence and etiologies of delirium in the general medical inpatient population admitted into DIM (SGH).

Secondary aims of the study:

1. To compare the detection rate of delirium with and without the use of the delirium clinical tool.
2. To assess the utility of the customized delirium clinical tool in improving the detection rate of delirium by gathering verbal feedback through focus group discussions with junior team doctors.

Methods

The pilot cross-sectional cohort study was carried out in SGH, a multidisciplinary tertiary acute hospital in Singapore. Patients were admitted to each of the 14 teams in the DIM on a rotational basis if they were deemed to have non-surgical conditions that do not require high-level subspecialty care eg. thrombolysis, percutaneous coronary intervention. Each team is made up of one consultant, one registrar, two to four medical officers and two to four house officers with a daily patient list ranging between 20-30 patients. Team members were rotated on a monthly basis.

The study population consisted of all patients admitted to one specified DIM team (ie. the study team) over two months, from 1 March 2014 to 30 April 2014. Two of the authors of this paper took turns to head the study team during this period. The control population consisted of patients admitted to the other 13 DIM teams headed by Internal Medicine consultants over the same period. Patients were excluded if they were below 21 years old, and were followed up till the date of discharge or demise.

In the study team, the delirium clinical tool was initiated for patients deemed by any of the team members to have a change in mental status, function or behaviour through history taking or physical examination. If the patient fulfilled the diagnostic criteria for delirium as stated on the form, the junior doctor will then be required to complete the other sections of the clinical tool. Baseline cognitive function was assessed by reviewing the patient's past medical history for known diagnoses of dementia or cognitive impairment, and by interviewing the patient's caregivers. Long term memory loss was suggested by the patient forgetting significant past events such as employment, not recognizing family members and getting lost; while short term memory loss was suggested by the patient forgetting recent personal and family events such as appointments, losing items around the home and repetitive questioning. The junior doctor will also be directed to screen for common precipitating causes of delirium and to check off appropriate multi-component delirium interventions to be implemented. For patients

who do not fulfil the diagnostic criteria for delirium, it was not mandatory to complete the rest of the clinical tool.

Patients in the study team were reviewed daily by either the team consultant or registrar, and further management tailored according to the results of initial investigations and clinical progress. The delirium clinical tool was used once for each separate episode of delirium, and was collected back on the patient's discharge for analysis.

At the end of each month, a focus group discussion was held with junior members of the study team to obtain verbal feedback on the implementation and utility of the clinical tool.

Diagnosis and management of delirium in the non-study teams was in accordance with the usual clinical practice of the team doctors.

The study was approved by the Singhealth Centralized Institutional Review Board. Informed consent was waived as the clinical tool and subsequent proposed investigations and management constitute part of the routine workup in the management of delirium.

Patients in the study team were diagnosed as having delirium if they fulfilled the criteria set out in the clinical tool, which followed the Confusion Assessment Method (CAM), the most widely used instrument for identification of delirium validated in high quality studies including over 1000 patients with sensitivity of 94%, specificity of 89%, and high inter-rater reliability[4,6,22]. The etiology of delirium was derived from the ticked checkboxes under the "Investigations" section on the clinical tool.

Patients in the other 13 teams were considered to have been diagnosed with delirium if they had delirium related diagnoses (such as "delirium", "altered mental status", "encephalopathy" and their aliases) listed as their primary or secondary discharge diagnoses. Etiology of delirium was not captured for these patients.

Statistical Analysis

The data from study team were converted to an Excel file and descriptive analysis was applied. The data from control teams (the other 13 teams) were generated using International Statistical Classification of Disease and Related Healthcare Problems, Version 10 (ICD-10) coding system through the computerized medical record system.

Results

The study was conducted over the period of 1 March 2014 to 30 April 2014. There were 3104 DIM admissions in total over two months, of which 282 patients (9.1%) were admitted to the study team. 68% of the patients were over 60 years old (Table 1), and 43% were males. All patients were of Asian descent. No patients were excluded as they were all 21 years old and above.

Age range	Patients admitted to study team	Patients admitted to the other 13 teams
21 - 30 years	16	190
31 - 40 years	11	135
41 - 50 years	13	258
51 - 60 years	50	411
61 - 70 years	54	508
71 - 80 years	66	684
81 - 90 years	63	506
91 - 100 years	9	129
> 100 years	0	1
Total	282	2822

Table 1: Age range of patients admitted to the internal medicine teams.

Of these 282 patients, 15 were diagnosed with delirium using the Confusion Assessment Method (CAM), giving an estimated occurrence rate of 5.3%. Apart from two patients who presented with delirium upon admission, 13 patients developed delirium during their hospital stay, giving a prevalence rate (on admission) of 0.7% and incidence rate of 4.6%. These patients were aged between 59 to 91 years old, and seven of them (47%) were males.

Delirium was diagnosed in one patient aged below 60 in the study team. As delirium prevalence was usually derived from elderly patients in previous literature, we calculated that the delirium detection rate in the study team was 7.3% (14/192) among patients aged 60 and above after excluding this single patient. All 15 patients had only one episode of delirium throughout their admission, and hence were screened using the clinical tool only once. Thirteen patients (87%) had hypoactive delirium, accounting for the major phenotype of delirium. Contributing factors for delirium are illustrated in Figure 1. Infection was the most common cause of delirium and was present in 87% of patients. This was followed by metabolic disorders such as renal impairment and acidosis (47%), and then electrolyte disturbances (40%). 87% of patients had more than one factor identified as the precipitating cause of delirium. Baseline cognitive function is shown in Figure 2: six (40%) patients had underlying dementia or cognitive impairment, of whom three had already been formally diagnosed with cognitive impairment or dementia prior to admission, and the remaining three were scheduled for outpatient evaluation after they have recovered from delirium. One (6%) had childhood epilepsy with intellectual impairment, four (27%) had normal baseline cognition, while information on baseline cognition was not available in four (27%) patients.

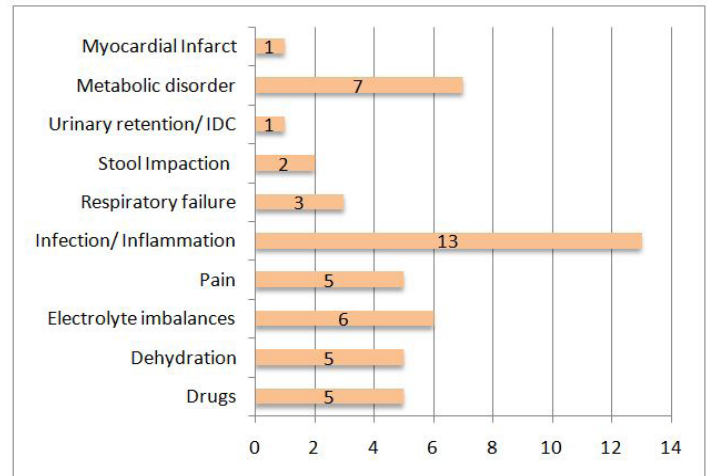


Figure 1: Factors contributing to delirium in patients in the study team. IDC: indwelling catheter

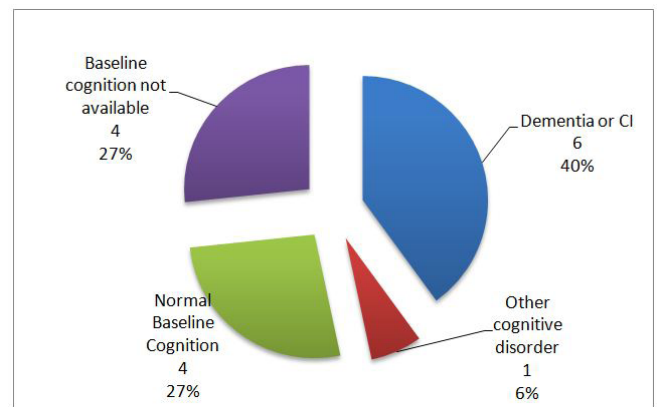


Figure 2: Baseline cognitive function of patients in the study team diagnosed with delirium.

CI: Cognitive Impairment (not specified)

General care interventions were implemented in all patients and included communication and reorientation, optimizing environment and early mobilization when safe to do so. Junior doctors were also guided by the clinical tool to screen for common precipitating factors of delirium such as pain, electrolyte disturbances, constipation, drugs and infection, and targeted interventions were implemented based on the causes identified. If non-pharmacological measures were unsuccessful, the clinical tool helped junior

doctors to determine when pharmacological measures were considered necessary and also provided guidance on the types, dosages and adverse effects of the different medications. Twelve patients (80%) recovered from delirium upon discharge, one patient passed away from multi-organ failure while two patients' recovery data were missing. During the same study period, 2822 patients were admitted to the other 13 non-study teams. 64.8% of the patients were over 60 years old (Table 1), and 45% were males. Forty patients were found to have delirium based on their discharge diagnoses, giving an occurrence rate of 1.4%. Data was not available to differentiate between patients who already had delirium on admission from those who developed delirium after admission.

Focus-group discussions were held with members of the study team after each month to gather verbal feedback. There was unanimous agreement among the junior doctors (medical and house officers) that the delirium clinical tool had increased their awareness of delirium and helped them to diagnose it more accurately. The clinical tool also increased their confidence when it came to ordering investigations and managing delirium, especially in patients who had multiple precipitating causes. In addition, many felt that quick screening of delirium should be incorporated into the daily ward round process, and that the delirium clinical tool should be used whenever delirium was detected.

Discussion

In our study, the occurrence rate (combined prevalence and incidence) of delirium in the study team using the clinical tool was 5.3%, while that in the non-study teams was 1.4%. Delirium was more common in elderly patients with no gender predisposition. At least 40% had underlying cognitive impairment. Hypoactive delirium accounted for the major phenotype of delirium in the study team (87%). Infection was the most common cause of delirium (87%), followed by metabolic disorders (47%); and 87% of patients had multiple precipitating causes for delirium.

The occurrence rates of delirium in our study are lower than the 11-49% reported in studies conducted overseas [4,7] and the 50% reported in another local study[10]. This difference could be due to the underreporting of delirium in our study which will be elaborated upon later in the discussion of limitations. Another factor would be the age-mix of patients within the study and non-study teams. The majority of published studies were conducted exclusively in geriatric or surgical populations in which delirium is more prevalent, whereas about one-third of our patients did not fall into the geriatric age group: in the study team, 32% of patients were aged 60 years and below while this proportion was about 35% in the non-study team. The presence of the younger group of patients could therefore partly account for the lower prevalence and incidence of delirium in this study. In addition, junior doctors were the primary users of the clinical tool and their relative lack of clinical experience may have resulted in the lower detection rate

as well.

Apart from that, our results are largely consistent with that of previous studies showing that hypoactive delirium was more prevalent than the hyperactive variant[23-25] and that delirium was commonly superimposed on dementia[12,26]. Delirium is a common clinical syndrome associated with serious adverse outcomes, yet it is commonly missed due to the various reasons as mentioned earlier. In this study, a customized clinical tool was created to help junior doctors diagnose delirium, consider the various precipitating factors and initiate appropriate management. This tool has been found to be simple and quick to use. Other positive outcomes from using this tool included increased awareness and detection of delirium amongst the junior doctors based on verbal feedback.

However, our study has several limitations. Firstly, the clinical tool was only piloted in one medical team with a small sample size, thus limiting the significance and generalizability of the results. Secondly, there was selection bias in the study team, as the clinical tool was not applied for every patient, but used only when delirium was clinically suspected by the team doctors. Hence, some patients with delirium could have been missed by the study team. However, it was felt that applying CAM screening daily was also not practical and sustainable given the heterogeneous general medical patient population, high patient workload and limited manpower in the study team. Thirdly, delirium might be under-reported in the non-study teams as there could be inconsistency in listing delirium as one of the discharge diagnoses, especially if it had not been a presenting complaint, or had resolved on discharge. Fourthly, the criteria for diagnosis of delirium in the study and non-study teams were not standardized. Next, the etiologies of delirium were derived from the clinical tool based on assessment by a junior doctor who might limit its accuracy. Verification of diagnosis by senior doctors was not possible in every instance. We were also unable to obtain data on the etiologies, prevalence and incidence rates of delirium in the non-study teams. Finally, patients who had initially been admitted to DIM but subsequently had their care taken over by another subspecialty department may have developed delirium during their hospitalization which was not detected in the study.

Despite the limitations, teams using this tool had a higher rate of detection, 5.3% (prevalence and incidence combined) at the end of the pilot study period, compared to 1.4% for non-study teams. Nevertheless, the overall low occurrence rates of delirium found in our study as compared to previous studies emphasizes the reality that delirium remains mostly underreported and underdiagnosed in our cohort of general medical inpatients.

Moving forward, larger studies can be conducted by piloting the delirium clinical tool in more medical subspecialty departments. This may then provide a more accurate estimate of the prevalence and incidence of delirium within the medical inpatient population. The tool can be incorporated into the clerking sheet or

Sunrise Clinical Manager (ECLIPSYS®)[27] such that high-risk patients will be screened with the tool. Long term outcomes can also be studied by examining length of stay, functional status, discharge disposition, readmission and mortality rates.

Not unexpectedly, geriatric patients were the predominant group with delirium in this study. Due consideration can thus be given to the establishment of a dedicated delirium monitoring and management unit/ward for geriatric patients in SGH as local data has shown the utility and positive health care outcomes of such a unit/ward. These include non-use of restraints, lower pressure ulcer and nosocomial infection rates, improved caregiver satisfaction, and sustained benefits in terms of shortened delirium duration and hospital cost savings[12]. Such a unit/ward would also facilitate the study of long term outcome measures as mentioned above.

Conclusion

This pilot study has shed some light on the prevalence and etiology of delirium among general medical inpatients for which there is scarce local data. The use of the customized delirium clinical tool by junior doctors resulted in a higher rate of detection compared to non-use. The customized clinical tool has the potential to help junior doctors be more vigilant in the early identification of delirium, determine the multiple contributing factors and manage delirium in a more targeted and patient centered manner. Further refinement and implementation of the tool as part of a continuous quality improvement initiative should be considered.

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