

Diagnosis and Prevention of Delirium

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Delirium is a common syndrome in hospitalized older patients that is frequently undiagnosed by health care professionals. This is particularly troubling because delirium is associated with poor outcomes such as increased nursing home placement, nosocomial infections and increased mortality. Criteria for the diagnosis of delirium are validated, reliable and can readily be applied to patients by health care professionals. Solid evidence exists that delirium can be prevented with educated prescribing of medications, practical in-hospital interventions and geriatric consultation.

Key words: delirium, differential diagnosis, prevention, Confusion Assessment Method.

Delirium is a common, morbid and costly syndrome that occurs preferentially in older patients. On a general medical ward, the prevalence of delirium among older patients is 10–15% on hospital admission^{1,2} and the incidence is 15–25% after admission,^{2,3} yielding a total prevalence of 25–40% in this population.^{3,4} Delirium is associated with as high as a 10-fold increase in in-hospital mortality.² Additionally, delirious patients have increased lengths of stay,⁵ greater staff time requirements⁶ (e.g., from physicians, registered nurses, licensed practical nurses) and higher rates of nursing home placement,^{5,7} all of which represent significant costs to the health care system.⁷ Despite these factors, between 32% and 67% of delirium cases are unrecognized by physicians,^{2,8,9} and there is good evidence that delirium can be prevented.

Delirium is a syndrome with many names. At times, mental status symptoms may be recognized but not appropriately evaluated because of this lack of standardized nomenclature. Table 1 provides a partial list of the names used in the medical literature to describe delirium. The correct nomenclature is important for standardizing the diagnosis of delirium within regions and recognizing the true cost of delirium both to the health care system and the patient.

Differential Diagnosis

Many disorders can have clinical features of delirium. Dementia and depression share diagnostic features with delirium (Table 2). It is important to note that these disorders may coexist, making history-taking from the family or caregiver crucial in the differential diagnosis.

Another challenge in the diagnosis of delirium has been a lack of standardized diagnostic criteria. Despite being described over 2,000 years ago by Aurelius, only recently have criteria for the diagnosis of delirium been established. Based on the criteria set forth in the Diagnostic and Statistical Manual of Mental Disorders, version IIR,¹⁰ a diagnostic algorithm called the Confusion Assessment Method (CAM) has been validated for the clinical diagnosis of delirium.¹¹ In combination with mental status testing, the CAM has become the “gold standard” for the diagnosis of delirium.¹² The CAM algorithm is shown in Figure 1, and its individual criteria are described in detail here.

Acute Onset and Fluctuating Course

Patients with delirium are often mistakenly diagnosed with dementia or depression. The acute onset of delirium highlights an important distinction from dementia or depression. In delirium, the

mental change develops over hours to days, compared to a course of months to years for dementia or depression (Table 2). The family, caregiver or nurse are important sources of information in determining the timing of a change in cognition.

Delirious patients will have fluctuating periods of relative lucidity and confusion within a day. The fluctuating course in delirium represents another diagnostic challenge; physicians are not constantly present with patients and so cannot detect the fluctuating mental status throughout the course of a day. Again, this history is better obtained from family, caregivers or nurses.

Inattention

Another distinguishing feature between delirium and dementia is that attention is spared in early and moderate dementia, whereas it is impaired in delirium. Assessing attention can be accomplished by asking the patient to recite the months of the year or days of the week backwards. A summary of tests of attention can be found in Table 3. Serial 7's (subtracting from 100 by groups of seven) requires more calculation skill than attention and is not recommended. Beyond these formal tests of attention, one needs to use clinical

Table 1

Names for Delirium Published in the Medical Literature

Acute mental status change
Altered mental status
Acute confusional state
Reversible dementia
Toxic/metabolic encephalopathy
Organic brain syndrome
Dysergastic reaction

Table 2

Comparison of CAM* Criteria for Delirium, Dementia and Depression

CAM Criteria	Delirium	Dementia	Depression
Acute onset and fluctuating course	Hours to days; within a day	Months to years; decline not fluctuation	Weeks to months; day to day fluctuation possible
Inattention	Present	Present in late stages	Possibly present
Disorganized thinking	Present	Memory impairment	Present in severe cases
Altered level of consciousness	Present	Not present	Not present

*CAM: Confusion Assessment Method

acumen to detect attentional disturbances, such as distractibility or failure to keep track of what was said during the encounter.

Disorganized Thinking

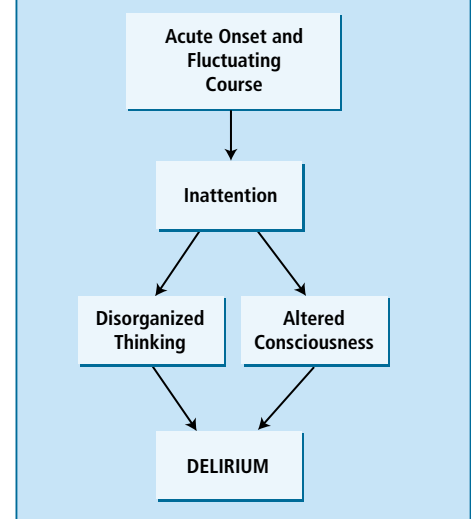
Disorganization is often recognized by the clinician but dismissed as baseline personality traits, dementia or sleep deprivation—physicians are often unsure what to do with the information. The patient with illogical flow of ideas or rambling, irrelevant conversation satisfies the criteria for disorganized thinking, as does the patient with delusions, illusions or hallucinations. Disorganized thought can be both verbose and illogical or scant and perseverative. These patients are the classic “poor historians”, which further emphasizes the need to get the history from someone else. It is important not to dismiss these symptoms, particularly in the older hospitalized patient.

Altered Level of Consciousness

There are three subtypes of delirium: hyperactive (25% of delirious patients), hypoactive (50%) and a mixed hyperactive and hypoactive disorder (25%).¹³ Due to the disruption to the hospital routine, the patients with a hyperactive delirium are recognized more frequently than those with the hypoactive subtype, who have a slowed motor response and little spontaneous speech.

Level of consciousness can be detected by holding a short conversation with the patient, and assessing whether the patient is alert, vigilant, lethargic or stuporous. Any level of consciousness other than alert is considered abnormal. Regardless of sleep deprivation or medication administration, it is not normal for a patient to repeatedly fall asleep during the clinical interview.

Figure 1: Confusion Assessment Method (CAM) Criteria for Delirium



Other Delirium Assessment Measures

The CAM is considered the “gold standard” for diagnosis of delirium, but reliable diagnosis also requires a test of general mental status, such as the Mini-Mental State Exam (MMSE), and supplemental attention testing. Other measures have been developed to assess the symptoms and severity of delirium. The Delirium Symptom Interview (DSI) is a validated interview for eliciting eight key symptoms of delirium.¹⁴ The Delirium Rating Scale, Delirium Index and the Memorial Delirium Assessment Scale (MDAS) are validated severity scales for delirium.¹⁵⁻¹⁷ The combination of all these measures can be done in 10–15 minutes

Table 3

Clinical Tests of Attention

Days of week backwards
Months of year backwards
Digit span (forward and backward)
Spell “world” backwards
Trailmaking test A

Table 4

Predisposing and Precipitating Factors of Delirium

Predisposing Factors	Precipitating Factors
Age	> 6 medications; > 3 new inpatient medications
Impaired cognition	Psychotropic medication use
Impaired Activities of Daily Living	Acute medical illness
Medical comorbidities	Dehydration
	Decreased sensory input
	Environmental change

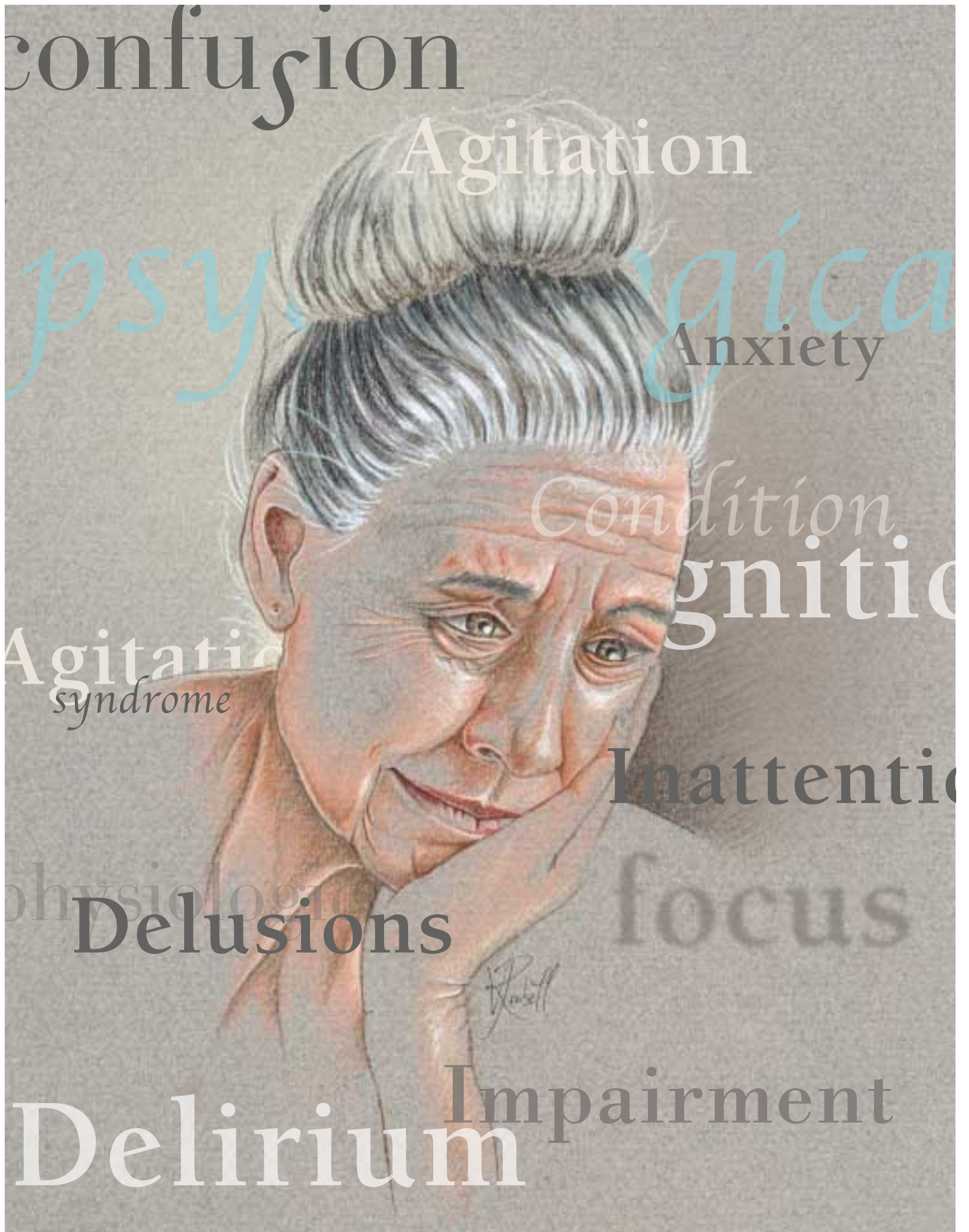


Table 5

Examples of Medications Associated with Delirium

Benzodiazepines (diazepam, flurazepam, chlordiazepoxide)
Opioids (meperidine, morphine, codeine)
Anticholinergics
Antidepressants (amitriptyline, imipramine)
Antihistamines (diphenhydramine, hydroxyzine, ranitidine)
Antipsychotics (haloperidol, thioridazine)
Antispasmodics (oxybutynin, cyclobenzaprine, belladonna)
Cardiac (digoxin, amiodarone, methyl dopa, procainamide)
Drugs with actions in the CNS (levodopa, lithium, phenytoin, divalproex, indomethacin)

and has been shown to be sensitive, specific and reliable ($k=0.95$)¹⁸ when administered by trained non-physicians (e.g., registered nurses and research assistants).

Prevention of Delirium

Over half the cases of delirium on an inpatient ward develop after the patient has been admitted, suggesting that there is an iatrogenic cause of delirium.⁶ There are predisposing patient characteristics that put patients at risk for delirium and there are precipitating factors within the hospital environment that are associated with the development of delirium (Table 4). Prevention strategies are aimed at minimizing the precipitating factors in susceptible patients.

New medications are an independent risk factor for development of delirium after adjustment for age and cognitive status. Particularly offensive drugs are those with high anticholinergic activity or cognitive side effects; Table 5 includes a partial list of agents. Meperidine has been independently associated with a greater risk of delirium compared to other narcotics (odds ratio [OR]=2.7).¹⁹ The long half-life, active metabolites, anticholinergic properties and cognitive effects of meperidine render it dangerous to the older patient. High anticholinergic activity and increased risk for delirium also are associated with medications used for sleep, such as diphenhydramine (OR=1.7)²⁰ and neuroleptic medications (OR=4.5).²¹ Benzodiazepines also are

independently associated with delirium, especially those with a long half-life (OR=3.0).¹⁹ Prescription of medication should be consistent with the geriatrician's adage "start low and go slow". Avoidance of medications with known

cognitive effects is the backbone of delirium prevention.

A landmark study of delirium prevention was conducted by Inouye, *et al.*²² The study employed teams of "Elder Life Specialists" who were employed to perform six delirium prevention interventions on patients on a medical floor (Table 6). The program was successful in reducing the incidence of delirium from 15.0% on a usual care floor to 9.9% in the intervention group (adjusted OR=0.60). The intervention with the greatest impact was the non-pharmacologic sleep protocol. For this bedtime protocol, sedative-hypnotics were delayed while the protocol was implemented. Fluorescent lights were turned off and an incandescent nightlight was turned on. Patients were given warm milk or herbal tea, relaxation tapes were played and patients were given a short back massage. With this intervention, many

Table 6

Prevention Interventions and Outcomes²²

Intervention Protocol	Actions	Outcome	p value
Reorientation	– orientation board – clock, calendar	Improved orientation	0.04
Non-pharmacologic sleep	– lights out – warm milk/herbal tea – relaxation tape – back massage	Sleep without sedatives	0.001
Immobility	– ambulation or active range of motion exercised t.i.d. – limit bed tethers (e.g., restraints, bladder catheters)	Increased ambulation	0.06
Vision	– put on glasses – adaptive equipment (e.g., large print books, large telephones)	Increased vision	0.27
Hearing	– earwax disimpaction – portable amplifying devices	Increased hearing	0.10
Dehydration	– early recognition of dehydration – oral repletion – I.V. repletion if oral was unsuccessful	BUN/Cr < 18	0.04

patients fell asleep spontaneously and the use of medication for sleep declined significantly.

In another study of hip fracture patients, perioperative geriatric consultation was used as an intervention to prevent postoperative delirium.²³ The geriatric consultants saw the patient prior to surgery or within 24 hours after surgery. The consultants made recommendations in 10 module areas, including: adequate oxygen delivery, fluid/electrolyte balance, pain management, regulation of bowel/bladder function, nutritional intake, early mobilization and rehabilitation, prevention and early management of postoperative complications, improving sensory input and treatment of delirium. The patients who received geriatric consultation were less likely to develop delirium compared to usual care (32% vs. 50%; $p=0.04$) and were even less likely to develop severe delirium (12% vs. 29%; $p=0.02$). There was no difference in length of stay or prevalent delirium at hospital discharge.

Summary

Delirium is an important cause of loss of independence, institutionalization and mortality in the older population. The CAM is considered the “gold standard” for diagnosis and can be obtained during a patient exam and supplemented by history from family or staff. Prevention of delirium is obtainable with low risk interventions and appropriate medication prescribing. The recognition of delirium as a preventable and treatable medical condition is paramount to limiting the devastating effects on patients’ lives. ◆

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