

# Delirium in Children: Identification, Prevention, and Management

Amanda Bettencourt, RN, MSN, CNS, CCRN, ACCNS-P

Jodi E. Mullen, RN-BC, MS, CCRN, CCNS, ACCNS-P

Delirium in children is an often underrecognized but serious complication of hospitalization. Delirium in this age group has been described as behaviors such as refractory agitation and restlessness, visual or auditory hallucinations, children being “not themselves,” and a lethargic state. Often, children with delirium are at risk for harming themselves by dislodging tubes, falling, or refusing care. Pediatric nurses must recognize and intervene to prevent and treat delirium in hospitalized children because the delirium may be an indicator of worsening clinical status and is associated with high mortality and morbidity in children of all ages and with posttraumatic stress disorder. Pediatric nurses are uniquely positioned to design care interventions to both reduce risk for delirium and treat active delirium. Many treatment recommendations are nonpharmacological and are part of excellent nursing care. (*Critical Care Nurse*. 2017; 37[3]:e9-e18)

**D**elirium is defined as a syndrome characterized by the acute onset of cerebral dysfunction with a change or fluctuation in baseline mental status, inattention, and either disorganized thinking or an altered level of consciousness.<sup>1</sup> Delirium has a high prevalence; it affects an estimated 10% to 44% of hospitalized patients and up to 30% of patients in the pediatric intensive care unit (PICU). In adults, delirium has been associated with cognitive decline, loss of independence, and increased mortality in the year after discharge from the hospital.<sup>2</sup> Despite the known adverse clinical outcomes of adult patients with delirium, few studies have been done on delirium in infants and children. Increasingly, evidence suggests a positive association between illness severity and delirium; critical illness is the most common cause of delirium in children.<sup>2</sup> In a recent study<sup>3</sup> of children 6 months to 5 years old, the prevalence of delirium was as

## CE 1.0 hour, CERP A

This article has been designated for CE contact hour(s). The evaluation tests your knowledge of the following objectives:

1. Identify risk factors for the development of delirium in infants and children
2. Differentiate pediatric delirium screening tools
3. Implement interventions to prevent and manage delirium in children

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**Table 1** Process to evaluate modifiable factors that may contribute to development of delirium in children<sup>a</sup>

<b>B</b>	<b>B</b> ring oxygen: treat hypoxia, improve cardiac output, treat anemia
<b>R</b>	<b>R</b> emove or <b>R</b> educe drugs that can contribute to delirium, such as anticholinergics and benzodiazepines
<b>A</b>	<b>A</b> tmosphere: foreign environment and room, bright lights, loud noises, physical restraints, no family present, frequent change in caregivers, no consistent schedule
<b>I</b>	<b>I</b> nfection, <b>I</b> mmobilization, <b>I</b> nflammation
<b>N</b>	<b>N</b> ew organ dysfunction
<b>M</b>	<b>M</b> etabolic disturbances: hyponatremia/hypermnatremia, hypokalemia/hyperkalemia, hypoglycemia, hypocalcemia, alkalosis, acidosis
<b>A</b>	<b>A</b> wake: lack of a bedtime routine, disturbances of the sleep-wake cycle
<b>P</b>	<b>P</b> ain: too much pain and not enough medication, or pain being treated and now too much medication
<b>S</b>	<b>S</b> edation: assess the need for sedation and set an appropriate target

<sup>a</sup> Based on information from Smith et al.<sup>7</sup>

high as 56% in children less than 2 years old and 35% in children 2 to 5 years old. Compared with a diagnosis of no delirium, the diagnosis of delirium in children has been associated with longer hospitalization, higher costs, increased morbidity, and increased mortality even in children with low severity of illness.<sup>4</sup> Additionally, post-traumatic stress disorder is diagnosed within 3 months after hospital discharge in approximately 30% of children who survive an ICU stay, a finding that may be associated with delirium during the hospitalization.<sup>5</sup> On the basis of this evidence, pediatric critical care nurses must be able to recognize and intervene to detect and manage delirium in hospitalized infants and children.

The pathophysiology of delirium is complex and most likely is due to alterations in neurotransmitter function, reduced cerebral blood flow, increased energy metabolism, and disordered cellular homeostasis.<sup>6</sup> The underlying disease process, side effects of treatment, and the foreign critical care environment all contribute to the development of delirium in hospitalized children.<sup>6</sup> Disruptions in the normal balance of synthesis, release, and

inactivation of neurotransmitters that control cognitive function, mood, and behavior create the visible indications of delirium, because brain cells cannot preserve a balance of stimulating and inhibiting neurotransmitters.<sup>4</sup> BRAIN MAPS is a mnemonic for possible causes of delirium in the ICU<sup>4</sup> (Table 1). Of note, delirium is not a constellation of signs and symptoms, rather it is an actual diagnosis. Although not an indication of untreated pain, oversedation, sleep deprivation, or withdrawal, delirium is a syndrome and can be exacerbated by many factors.<sup>6</sup> Acute delirium can occur as a result of illness, hospitalization, or trauma and should be recognized and treated by interprofessional teams who care for PICU patients.

### Identifying Delirium

Despite growing evidence of the morbidity and mortality associated with delirium in children, the results of a survey<sup>8</sup> published in 2011 of pediatric critical care nurses and physicians indicated that screening for delirium was not done in 71% of PICUs, and only 2% of the respondents reported performing a delirium screening at least twice a day. One reason delirium screening is not performed routinely in PICU environments is the difficulty of differentiating delirium in children from other possible diagnoses, especially in the context of critical illness. The gold standard for identifying delirium is diagnosis by a child and adolescent psychiatrist on the basis of criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition). Currently, highly valid and reliable delirium screening tools are available for use by nurses to detect delirium in PICU patients on the basis of these criteria. The ability to monitor for delirium may

### Authors

*Amanda Bettencourt is a pediatric clinical nurse specialist at UF Health Shands Children's Hospital, Gainesville, Florida.*

*Jodi E. Mullen is a clinical leader, pediatric intensive care unit, UF Health Shands Children's Hospital.*

*Corresponding author: Jodi E. Mullen, RN-BC, MS, CCRN, CCNS, ACCNS-P, Clinical Leader, Pediatric Intensive Care Unit, UF Health Shands Children's Hospital, 1600 SW Archer Rd, PO Box 100335, Gainesville, FL 32610 (email: muljod@shands.ufl.edu).*

*To purchase electronic or print reprints, contact the American Association of Critical-Care Nurses, 101 Columbia, Aliso Viejo, CA 92656. Phone, (800) 899-1712 or (949) 362-2050 (ext 532); fax, (949) 362-2049; email, reprints@aacn.org.*

**Table 2** Types of delirium

Type	Signs	Patient example
Hypoactive	Child looks apathetic and seems uninterested <sup>2</sup>	Toddler who lies quietly in the bed and does not make eye contact or reach for toys or family members
Hyperactive	Child is irritable despite adequate pain medication and may be thrashing <sup>2</sup>	School-aged child receiving mechanical ventilation who is constantly moving around in bed despite adequate pain medication Patient is difficult to sedate
Mixed	Child fluctuates between a hypoactive and a hyperactive state <sup>2</sup>	Teenager who vacillates between yelling at staff and thrashing in the bed to being calm and staring off into the distance with no interactions with staff at different times of the day

lead to more efficient initiation of management strategies and collaboration with psychiatric personnel.

### Types of Delirium

Delirium in hospitalized children is characterized as hypoactive, hyperactive, or mixed<sup>4</sup> (Table 2). Signs of delirium can be difficult to detect and categorize in a critically ill child for many reasons, including the child's developmental level and the overlapping of the indications of delirium with signs and symptoms associated with pain, sedation, and opioid withdrawal. Delirium occurs in infants as young as 3 months old and may not have any upper or lower age limitations.<sup>2</sup> In some instances, parents may describe their child's behavior as "this is not my child" and should be taken seriously, because this change in behavior may be an additional indication of delirium.<sup>2</sup>

### Assessment Tools

Because differentiating delirium in children can be difficult, several valid and reliable tools have been developed to help nurses screen for and identify delirium in infants and children (Table 3). All of the screening tools have greater than 83% sensitivity and more than 79% specificity for detecting delirium in children<sup>2</sup> and have well-established feasibility.<sup>15</sup> Delirium is a fluctuating condition, so serial assessments are of great value, because the timing of the assessment may play a crucial role in detecting the presence of delirium.<sup>16</sup> The frequency with which delirium screening should be performed has not been established.

### Pain, Agitation, and Delirium

In 2013, the Society of Critical Care Medicine published a clinical practice guideline<sup>1</sup> outlining the latest

evidence-based practice in managing pain, agitation, and delirium in adult critical care patients. For adult patients, the concept that pain, agitation, and delirium are interrelated has been well established,<sup>1</sup> but practice guidelines and research in this area for pediatric critical care patients are not available. Despite this deficiency, pediatric critical care nurses must understand the differences between pain, agitation, and delirium and how these 3 conditions are related in order to effectively detect delirium and advocate for treatment interventions (Table 4). Diagnosis of delirium must be made with awareness of the results of pain and sedation assessments

**When possible, remove causative factors for delirium, such as hypoxia, hypotension, and metabolic disturbances.**

and in concert with the results of a delirium screening tool and discussion among members of the interprofessional team caring for the patient.<sup>4</sup> The goal of delirium screening is to remove as many risk factors for delirium as possible. If a cause can be identified, then the team should take action to remove the biggest causative factors, such as hypoxia, hypotension, and metabolic disturbances.<sup>4</sup> Analgesia and anxiolysis are important in the management of critically ill children, but treatment of pain and anxiety must be performed with the knowledge that both conditions could contribute to increased risk for delirium.<sup>4</sup>

### Strategies to Prevent and Manage Delirium in Children

Little information is available on the management of delirium in children.<sup>17</sup> Therefore, practices may be based on expert opinion or extrapolated from literature

**Table 3** Bedside delirium screening tools

Tool	Validated age of use	Method of use	Advantages and disadvantages
Pediatric Anesthesia Emergence Delirium Scale (PAED) <sup>9</sup>	>1 year old	Clinician rates patient by indexing (1) eye contact, (2) goal-directed outcomes, (3) awareness of surroundings, (4) restlessness, and (5) whether the child is consolable Clinician selects response on a scale of 1 (not at all) to 5 (extremely)	Valid and easy-to-use tool at the bedside to detect emergence or hyperactive delirium Based on patient's behavior Good interrater reliability plus favorable sensitivity and specificity for detecting hyperactive delirium Cannot be used to detect hypoactive delirium, which is often present in children
Cornell Assessment of Pediatric Delirium (CAPD) <sup>10-12</sup>	Children of all ages	Caregiver completes all 8 components of the CAPD scale Caregiver asks screening questions and scores each item from 0 (not at all) to 4 (extremely) Scores $\geq 9$ indicate delirium	Adapted from the PAED to better identify hypoactive and hyperactive delirium by using a behavioral scale Validated in all critically ill children Screening completed by bedside caregiver and includes multiple observations during a period of time Can be used to pick up on subtle behaviors over time Does not require patient's participation, making it well-tolerated and feasible for bedside nurses to complete once per shift
Pediatric and Preschool Confusion Assessment Method-Intensive Care Unit (pCAM-ICU, psCAM-ICU) <sup>3,4,13,14</sup>	pCAM-ICU: >5 years old psCAM-ICU: 6 months to 5 years old	Based on 4 key features of delirium noted in <i>DSM-IV-TR</i> criteria, including Acute change or fluctuation in mental status Inattention Altered level of consciousness Disorganized thinking Cardinal features of delirium, features 1 and 2, are ruled out first If neither feature 1 nor feature 2 is present, the screening is negative for delirium If features 1 and 2 are present, plus either feature 3 or feature 4, the screening is positive for delirium	Both tools validated and reliable for detecting delirium Both tools are efficient, interactive, and objective bedside assessments Both can be used on children who are receiving mechanical ventilation and on children who are not Delirium assessment with this tool is a 2-step process; arousal is assessed by using a sedation scale, and then delirium is assessed by using this tool if the patient is at least arousable to voice

Abbreviation: *DSM-IV-TR*, *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition, Text Revision).

**Table 4** Differentiating pain, agitation, and delirium in children

Parameter	Definition	Assessment
Pain	An unpleasant sensory and emotional experience associated with actual or potential tissue damage Always subjective in intensity, meaning, and description for each individual patient <sup>4</sup>	Must rely on nonverbal, behavioral, and physiological indicators of pain to determine its presence Several different pain scales have been validated for use in this age group and cohort of patients Imperative to recognize changes from baseline Should correlate with a painful stimulus
Agitation	Often referred to as "sedation" in the critical care environment; encompasses anxiolysis, amnesia, analgesia, and facilitation of care <sup>4</sup> May mask or potentiate indications of delirium	The State Behavioral Scale has been validated for use in all ages of children to measure level of sedation Has been successfully used to monitor level of consciousness, assess for key features of delirium, and target levels of sedation for weaning from mechanical ventilation in critically ill children <sup>4</sup>
Delirium	Characterized by an alteration in attention and awareness Typically accompanied by a fluctuating mental status Involves an alteration in cognition	Can be screened for using bedside delirium assessment tools Delirium should be considered in hospitalized children when pain and sedation medications are not working Parents often are the first to notice that their children have delirium Is a diagnosis of exclusion, and collaboration with the care team to rule out potential iatrogenic causes should be performed before medication therapy is initiated

on delirium in adults.<sup>17,18</sup> Prevention and management of delirium in children may benefit from a holistic, inter-professional approach that first focuses on identifying, modifying, and, when possible, correcting a patient's underlying medical conditions that may be contributing to the delirium.<sup>7,19-21</sup> Because of the complexity of a critically ill child's condition and the required management, completely modifying or correcting the underlying condition is not always possible, so equal attention must be paid to minimizing the risk for the development of delirium and modifying the PICU environment to better support a delirious patient.<sup>4,7,19-22</sup> Finally, providing psychosocial support to a delirious child and the child's family is essential.

Management of a child with delirium begins with identifying and modifying factors that contribute to the development of delirium in children, including hypoxia, medications such as anticholinergics and benzodiazepines, metabolic disturbances, pain, and anxiety.<sup>2,7,21,23</sup> Many mnemonics are available to guide this assessment, including BRAIN MAPS, which is described in Table 1. Treatment of the underlying disorder may result in a rapid reduction in the signs of delirium or in complete resolution.<sup>21</sup> Children with underlying developmental conditions, such as autism spectrum disorder or a history of brain trauma, may require different strategies for simultaneously managing the signs of delirium and the underlying comorbid behavioral disorder.<sup>7</sup>

Consistently assessing and effectively treating pain in a critically ill child may decrease the risk for and severity of delirium.<sup>4,7</sup> Compared with other children, a child who is calm and pain-free and has a clear sensorium will be less anxious or fearful of the ICU environment and may respond in a positive manner to comforting and distraction by familiar staff and family members.<sup>4,7</sup>

The target level of sedation should be the level at which the child is alert and calm, unless existing factors require more sedation, such as when the patient's actions could disrupt the integrity of essential medical devices, such as an endotracheal tube.<sup>4,7</sup> The need for and target level of sedation should be reevaluated on a regular basis, with the risks for complications due to sedation, such as delirium, balanced with the goals of care. In particular, benzodiazepines are a risk factor for delirium, particularly with prolonged administration.<sup>23-26</sup> These drugs should be titrated or discontinued when no longer necessary for treatment.<sup>7</sup> Guidelines for the management of delirium in adult ICU patients recommend continuous intravenous

**Table 5** Intensive care environmental modifications to manage delirium

Provide a calm, reassuring environment that is consistent and predictable<sup>7,16,17,21,27</sup>

Consider room location and modify as tolerated:

- Room in a quieter part of the pediatric intensive care unit, away from unit traffic and activity for child with hyperactive or mixed delirium<sup>2,17</sup>
- Room near more active area of the unit, with age-appropriate interactions with surroundings, for child with hypoactive delirium<sup>2,17</sup>

Decorate room with familiar pictures of home, family, friends, and favorite pets<sup>7,24,25</sup>

Have on hand favorite toys, blankets, music, and personal items<sup>11,17,23,28</sup>

Use physical restraints as a last resort; their use may increase agitation and create additional problems, such as loss of mobility and prolonged confusion<sup>20,23,28-30</sup>

Children who need glasses or hearing aids should wear them when possible<sup>2,11</sup>

infusions of dexmedetomidine rather than benzodiazepine for sedation, and this strategy may also be appropriate for PICU patients.<sup>1,4</sup>

## Nonpharmacological Management of Delirium

### Environmental Modifications

During their stay in the PICU, critically ill children are assaulted with unfamiliar sights, sounds, and smells. They also experience excessive noise, bright lights, and ongoing activities that make maintaining a normal sleep-wake cycle difficult.<sup>16</sup> This sensory overstimulation, coupled with sleep interruptions, may further exacerbate a delirious child's thought misperceptions, disorientation, and inattention.<sup>4,7,16</sup> Nurses are in a prime position to modify and manage this environment in the best interest of a delirious child. Table 5 describes specific modifications that can be made to the PICU environment to further support a child with delirium.

### Promotion of Sleep

Normal sleep-wake homeostasis is important in immunity, in thermoregulation, and for preventing a catabolic state, all of which are important for recovering from critical illness.<sup>8,29,30</sup> Inadequate sleep quality and duration, often experienced by patients in the ICU, are associated with the development of delirium.<sup>30,31</sup> However, in a survey<sup>8</sup> of 341 pediatric nurse and physician members of the World Federation of Pediatric Intensive and



# Ella's Daily Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7:30	Wake-up	Wake-up	Wake-up	Wake-up	Wake-up	Wake-up	Wake-up
8:00	Assess/Meds/Nursing	Assess/Meds/Nursing	Assess/Meds/Nursing	Assess/Meds/Nursing	Assess/Meds/Nursing	Assess/Meds/Nursing	Assess/Meds/Nursing
9:00	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
10:00	PT/OT/Out of Bed	PT/OT/Out of Bed	PT/OT/Out of Bed	PT/OT/Out of Bed	PT/OT/Out of Bed	PT/OT/Out of Bed	PT/OT/Out of Bed
11:00	Rest	Rest or Shower and dressing change	Rest	Rest or Shower and dressing change	Rest	Rest or Shower and dressing change	Rest
12:00	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch
13:00	Rest	Rest or Shower and dressing change	Rest	Rest or Shower and dressing change	Rest	Rest or Shower and dressing change	Church
14:00	Choice of activity	Teacher	Choice of activity	Teacher	Choice of activity	Choice of activity	Choice of activity
15:00	Choice of activity	Teacher	Choice of activity	Teacher	Choice of activity	Choice of activity	Choice of activity
16:00	Choice of activity	Teacher	Choice of activity	Teacher	Choice of activity	Choice of activity	Choice of activity
17:00	Rest or family time	Rest or family time	Rest or family time	Rest or family time	Rest or family time	Rest or family time	Rest or family time
18:00	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner
19:00	Family/friend time	Family/friend time	Family/friend time	Family/friend time	Family/friend time	Family/friend time	Family/friend time
20:00	Get ready for bed	Get ready for bed	Get ready for bed	Get ready for bed	Get ready for bed	Get ready for bed	Get ready for bed
21:00	Bedtime	Bedtime	Bedtime	Bedtime	Bedtime	Bedtime	Bedtime



**Figure** Example of a daily schedule.

Abbreviations: OT, occupational therapy; PT, physical therapy.

Critical Care Societies, few respondents reported having unit protocols to optimize noise (16%) and light exposure (9%) to promote sleep. Therefore, opportunities exist for nurses to implement noninvasive strategies to promote sleep-wake cycles in critically ill patients. However, little empirical evidence supports specific interventions to improve sleep, particularly in PICU patients.<sup>32</sup>

Children with delirium are anecdotally described as “having their days and nights mixed up,” and the physical signs of delirium often worsen at night. Structure and continuity are important for children with delirium, and even though the perception may be that a child is “too sick” for a routine schedule, the sicker the patient, the more important is a stable environment and day-night routine.<sup>4,32-35</sup> An individualized schedule should be posted in the patient’s room so all members of the health care team and visitors are aware of the plan. The Figure is an example of a daily schedule that can be modified to

include the preferences of a patient and the patient’s family. Sleep during the daytime, except for scheduled naps or quiet rest times, should be discouraged.<sup>36</sup> Even if the child has been awake much of the night, keeping to the daytime awake schedule most likely will result in better sleep the next night. Table 6 lists additional strategies to promote sleep and day-night orientation for children with delirium.

## Family Involvement

Helping a patient’s family members manage their own anxiety is an essential element of delirium management. Parents worry that the changes they see in their child may be permanent, and they need frequent reassurance and anticipatory guidance about their child’s behavior, delirium management, and the expected course of the condition.<sup>2,16,17</sup> Observing their child’s dramatic and frequent changes in mental state is frightening for

**Table 6** Strategies to promote sleep and orientation to day and night

- Create an individualized schedule of daytime activities and nighttime sleep
- Have consistent daily routines for hygiene, mobility, range-of-motion exercises, therapies, interventions, and play
- Wake the child at the same time each morning
- Have the child out of bed when awake as much as tolerated
- Place bed in a chairlike position when child tolerates
- Discourage sleep during the daytime, except for scheduled naps or quiet rest times<sup>36</sup>
- Use a dim nightlight to reduce the child's misperceptions and fearfulness at night<sup>2,16,17</sup>
- Use eye masks to block light during sleep<sup>36</sup>
- Use earplugs or background white noise from a fan or quiet music<sup>36,37</sup>
- Cluster care to minimize disruptions and noise during rest periods
- Avoid overstimulation, particularly before a scheduled sleep or rest time
- Use a room with windows with an outside view to cue time of day<sup>11,34,36</sup>
- Have a calendar and clock for date and time identification<sup>23</sup>
- Alternate a picture of the sun during the day and the moon at night<sup>19,38</sup>
- Post a picture identifying what meal is coming next<sup>21,39</sup>
- Have parents, visitors, and staff actively reorient child to person, place, time, and reason for being in the hospital<sup>14,31,32</sup>

parents, especially as they become hopeful during periods of lucidity and then concerned again when the child experiences a reoccurrence of disorientation and unusual behavior and they are unable to console the child.<sup>5,17</sup> Giving parents information in writing, such as a pamphlet describing delirium, may be helpful.<sup>2</sup>

When possible, a delirious child will benefit from the continued presence of a parent or loved one and from consistency in the nursing staff assigned to care for the child.<sup>17,22,23</sup> Those present and caring for the child should provide frequent reorientation and calm reassurances or explanations.<sup>16,17,21,34,39,40</sup> Nurses and other care providers may need to repeatedly let the patient know, in an age-appropriate manner, who the staff member is, the member's role in caring for the child, what the staff member will be doing and why.<sup>2,39</sup> Table 7 further describes some communication strategies that can be used when engaging with a delirious child. Children with delirium also benefit from the expertise of child life specialists and

**Table 7** Strategies for communicating with a delirious child<sup>a</sup>

- Speak calmly and slowly.
- Use clear, short sentences.
- Explain where the child is and why he or she is there.
- Tell the child who you are.
- Describe what you will be doing.
- Remind the child what time of day it is.
- Provide a calm, quiet presence, which may be more helpful than continued attempts to engage the child in dialogue.
- Do not argue with the child about visual or auditory hallucinations. Explain that your perception differs from the child's.
- When possible, speak to the child about real people and actual events. Focus on things that make the child happy.

<sup>a</sup> Based on information from Schieveld et al.<sup>2</sup>

hospital teachers, because these care providers help maximize the child's resiliency to stress and anxiety and the ability to cope with the current situation.<sup>4,7</sup>

## Pharmacological Management of Delirium

No medications have been approved by the Food and Drug Administration for use in the prevention and treatment of delirium in children, and little empiric research is available to guide practice.<sup>2,19-21,27,41</sup> Pharmacological intervention may be necessary when a child's psychomotor symptoms interfere with the child's safety, especially when the medical condition causing or contributing to the delirium cannot be immediately remedied.<sup>2,16,17,19,21,23,27,28</sup> In these situations, medications to help manage the signs of delirium may be appropriate to enhance the child's safety and to support brain function.<sup>7,17,21</sup> Additional reasons for administering medications to manage or decrease the behavioral expression of delirium include limiting the time the patient is in a delirious state, decreasing any associated physical or emotional trauma and distress, and reducing the hospital length of stay.<sup>17,22</sup> Antipsychotics target neurotransmitter dysregulation, and their use does not imply that the child has a psychiatric disorder or that only patients who are psychotic benefit from these medications. Generally, the lowest dose is started and then modified on the basis of the child's response.<sup>2</sup>

Haloperidol may be beneficial for children who cannot tolerate oral medications and whose agitation has not changed in response to the nonpharmacological interventions previously described.<sup>4,16,19</sup> Haloperidol

blocks dopamine receptors in the brain, countering overstimulation of higher cortical pathways; it can alleviate hallucinations and unstructured thoughts, provide anxiolysis or sedation, and restore attention.<sup>4,21,27</sup> Because of this effect on dopamine receptors, haloperidol may be useful in hyperactive delirium.<sup>4,22,23,41</sup> Haloperidol can be administered intravenously, a characteristic that makes it particularly useful when rapid control of severe agitation is needed, as often occurs in critical illness.<sup>4,7,21</sup>

Atypical antipsychotics, such as risperidone, olanzapine, quetiapine, and ziprasidone, among others, can be equally useful in the treatment of the physical signs of delirium in children.<sup>4,7,16,19,23,27,42-45</sup> In studies in adults,<sup>4,19,46-48</sup> these medications have had efficacy similar to that of haloperidol, but with fewer side effects. These agents also have an effect on dopamine activity, along with more extensive effects on acetylcholine, serotonin, and norepinephrine receptors.<sup>22,42,48</sup> The wider effects of the atypical antipsychotics on various receptors may make these medications more useful in treatment of mixed or hypoactive delirium, although their use in patients with these types of delirium remains controversial.<sup>4,7,22,41</sup> In several studies<sup>16,19,23</sup> on delirium in children, risperidone was used most often, possibly because it is available in tablet, oral disintegrating, and liquid oral forms. Olanzapine is also available as an oral disintegrating tablet, a form that makes its administration easier in children.<sup>49</sup> In a 2-year retrospective review<sup>44</sup> of atypical

**The complexity of managing delirium requires collaboration and coordination among multiple health care professionals.**

antipsychotic medications used to control signs of delirium in children, olanzapine was used most often. Among patients 1 to 18 years old, 78 received olanzapine, 19 received quetiapine, and 13 received risperidone. For 75 patients who had delirium screening scores available before and after administration of medication, mean scores decreased significantly with use of antipsychotics, although the improvement in signs may also have been due to treatment of the underlying cause and additional nonpharmacological interventions.

Haloperidol and the atypical antipsychotics do have important side effects,<sup>2,4,19,22,27,34,42,50-52</sup> (Table 8). In addition to monitoring for drug interactions and the response to therapy, children with delirium should have

**Table 8** Important adverse effects of medications used to treat delirium

Tachycardia
Prolonged QTc, which can result in torsade de pointes and ultimately sudden death
Hypotension
Laryngeal spasm
Sedation
Anticholinergic effects
Extrapyramidal movement disorders, including dystonic reactions (dysarthry, torticollis, swallowing problems), and akathisia
Tardive dyskinesia (rare)
Neuroleptic malignant syndrome
Malignant hyperthermia
Cholestasis with elevated levels of liver enzymes
Glucose dysregulation
Weight gain (with long-term use)

QTc assessment at baseline and then at least daily, especially when intravenous haloperidol is used for treatment, which should be avoided in patients at high risk for arrhythmia.<sup>2,7,22,27,34,50</sup> Ziprasidone should also be avoided in seriously ill children because of a risk for arrhythmia.<sup>51</sup> Diphenhydramine can be used to treat dystonic reactions, and generally all side effects improve once the medication causing the reactions is stopped.<sup>22</sup> Antipsychotic medications are sedating, particularly quetiapine, so administering these medications at bedtime may promote sleep.<sup>19,34</sup> Pharmacological treatment of delirium requires reassessment and ongoing drug titration once the child's clinical status improves.<sup>4,19</sup> The unfavorable and potentially permanent side effects of antipsychotic medications can be mitigated with dose progression of the drugs, administration of anticholinergic medications, and careful monitoring by bedside nurses.

Other adjunct medications to improve the manifestations of delirium have been considered, but again, knowledge of the effectiveness of the drugs in children is sparse. Because circadian rhythms can be disrupted by delirium, resulting in disordered sleep, administration of melatonin may be considered.<sup>19</sup> Melatonin generally has minimal side effects and may decrease emergence delirium in children postoperatively.<sup>53</sup> Agents such as dexmedetomidine and clonidine may help with agitation.<sup>7,27</sup> In critically ill children, a continuous infusion



of dexmedetomidine may decrease the need for benzodiazepines, which have been associated with the development of delirium.<sup>19,25,54</sup> Clonidine can be administered via a transdermal patch when continued or longer term effects are desired.<sup>19</sup>

## Interprofessional Collaboration and Education

Caring for a child who is experiencing delirium can be challenging, and because of its complexity, management of delirium in children requires collaboration and coordination among multiple health care professionals, including pharmacists, psychologists and psychiatrists, and ancillary personnel.<sup>7</sup> Health care staff should recognize that rapid and dramatic fluctuations in mental state can occur and should adjust interventions as needed.<sup>16,17</sup> Additional interprofessional strategies include educating members of the health care team about delirium in children, having multidisciplinary rounds focused specifically on delirium monitoring and treatment (eg, brain rounds, pediatric road map), order sets, protocols and practice guidelines for delirium management, and quality ICU rounds checklists to facilitate the consistent assessment and management of pain, sedation, and delirium.<sup>1,4,23,39</sup>

Because delirium in infants and children is often unrecognized, education related to the nature and management of delirium is important for the entire pediatric health care team.<sup>2,17,39,55,56</sup> In a study<sup>56</sup> of nurses in one PICU, 11.4% incorrectly identified the Glasgow Coma Scale as the correct screening tool for delirium in children, 38.1% incorrectly indicated that benzodiazepines are helpful in treating delirium, and a majority (62%) incorrectly thought that children generally do not remember the experience of being delirious. Among the members of the World Federation of Pediatric Intensive and Critical Care Societies who responded about their ICU practices, only 2% reported that delirium screening is performed on every child at least once per shift, and 71% do not perform any routine delirium screening at all.<sup>8</sup> Results of these studies highlight the education gap that most likely exists for all members of the health care team about identification and management of delirium in children.

## Summary

Nurses are in a prime position to recognize delirium in children and to engage the medical team in developing

a strategy to manage pain, anxiety, and delirium in critically ill children. Several validated delirium screening tools are available to guide nurses and clinicians in detecting delirium, because detection can be difficult in some patients. Despite the availability of screening tools, many hospitalized children experience delirium because a comprehensive delirium assessment and prevention program has not been implemented. Simple strategies that can be performed by pediatric nurses to promote a healthy brain environment include advocating for interventions that promote sleep and for early removal of catheters, tubes, and restraints. Psychosocial support of patients and their family members by bedside nurses is vital. Education of the interprofessional health care team about delirium and appropriate interventions to prevent and manage the manifestations of delirium are imperative, so that an interprofessional plan of care can be developed to manage delirium. Once delirium has been detected, a multiprofessional approach incorporating evidence-based recommendations for care may improve the morbidity and mortality associated with delirium in children, and ultimately improve outcomes after discharge. Research is needed to determine the optimal nursing interventions for children at risk for and experiencing delirium. **CCN**

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## See also

To learn more about delirium in the critical care setting, read "Feasibility and Effectiveness of a Delirium Prevention Bundle in Critically Ill Patients" by Smith and Grami in the *American Journal of Critical Care*, January 2017;26:19-27. Available at [www.ajconline.org](http://www.ajconline.org).

## References

1. Barr J, Fraser GL, Puntillo K, et al; American College of Critical Care Medicine. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Crit Care Med*. 2013;41(1):263-306.
2. Schievel J, Ista E, Knoester H, Molag M. Pediatric delirium: a practical approach. In: Rey J, ed. *IACAPAP e-Textbook of Child and Adolescent Mental Health*. Geneva, Switzerland: International Association for Child and Adolescent Psychiatry and Allied Professions; 2015:chap1.5:1-17. <http://iacapap.org/wp-content/uploads/I.5-DELIRIUM-2015.pdf>. Accessed February 16, 2017.
3. Smith HA, Gangopadhyay M, Goben CM, et al. The Preschool Confusion Assessment Method for the ICU: valid and reliable delirium monitoring for critically ill infants and children. *Crit Care Med*. 2016;44(3):592-600.
4. Smith HA, Berutti T, Brink E, et al. Pediatric critical care perceptions on analgesia, sedation, and delirium. *Semin Respir Crit Care Med*. 2013;34(2):244-261.

5. Schievelld JN, Janssen NJ. Delirium in the pediatric patient: on the growing awareness of its clinical interdisciplinary importance. *JAMA Pediatr.* 2014;168(7):595-596.
6. Silver G, Traube C, Gerber LM, et al. Pediatric delirium and associated risk factors: a single-center prospective observational study. *Pediatr Crit Care Med.* 2015;16(4):303-309.
7. Smith HA, Brink E, Fuchs DC, Ely EW, Pandharipande PP. Pediatric delirium: monitoring and management in the pediatric intensive care unit. *Pediatr Clin North Am.* 2013;60(3):741-760.
8. Kudchadkar SR, Yaster M, Punjabi NM. Sedation, sleep promotion, and delirium screening practices in the care of mechanically ventilated children: a wake-up call for the pediatric critical care community. *Crit Care Med.* 2014;42(7):1592-1600.
9. Janssen NJ, Tan EY, Staal M, 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(8):1331-1337.
10. Silver G, Traube C, Kearney J, et al. Detecting pediatric delirium: development of a rapid observational assessment tool. *Intensive Care Med.* 2012;38(6):1025-1031.
11. Traube C, Silver G, Kearney J, et al. Cornell Assessment of Pediatric Delirium: a valid, rapid, observational tool for screening delirium in the PICU. *Crit Care Med.* 2014;42(3):656-663.
12. Silver G, Kearney J, Traube C, Hertzog M. Delirium screening anchored in child development: the Cornell Assessment for Pediatric Delirium. *Palliat Support Care.* 2015;13(4):1005-1011.
13. Smith HA, Fuchs DC, Pandharipande PP, Barr FE, Ely EW. Delirium: an emerging frontier in the management of critically ill children. *Anesthesiol Clin.* 2011;29(4):729-750.
14. Smith HA, Boyd J, Fuchs DC, et al. Diagnosing delirium in critically ill children: validity and reliability of the Pediatric Confusion Assessment Method for the Intensive Care Unit. *Crit Care Med.* 2011;39(1):150-157.
15. Daoud A, Duff JP, Joffe AR; Alberta Sepsis Network. Diagnostic accuracy of delirium diagnosis in pediatric intensive care: a systematic review. *Crit Care.* 2014;18(5):489.
16. Hatherill S, Flisher AJ, Nassen R. The diagnosis and treatment of delirium in children. *J Child Adolesc Ment Health.* 2009;21(2):157-165.
17. Hatherill S, Flisher AJ. Delirium in children and adolescents: a systematic review of the literature. *J Psychosom Res.* 2010;68(4):337-344.
18. Creten C, Van Der Zwaan S, Blankespoor RJ, Leroy PL, Schievelld JN. Pediatric delirium in the pediatric intensive care unit: a systematic review and an update on key issues and research questions. *Minerva Anesthesiol.* 2011;77(11):1099-1107.
19. Turkel SB, Hanft A. The pharmacologic management of delirium in children and adolescents. *Paediatr Drugs.* 2014;16(4):267-274.
20. Turkel SB, Tavaré CJ. Delirium in children and adolescents. *J Neuropsychiatry Clin Neurosci.* 2003;15(4):431-435.
21. Van Tuijl SG, Van Cauteren YJ, Pikhart T, Engel M, Schievelld JN. Management of pediatric delirium in critical illness: a practical update. *Minerva Anesthesiol.* 2015;81(3):333-341.
22. Silver GH, Kearney JA, Kutko MC, Bartell AS. Infant delirium in pediatric critical care settings. *Am J Psychiatry.* 2010;167(10):1172-1177.
23. Schievelld JN, Leroy PL, van Os J, Nicolai J, Vos GD, Leentjens AF. Pediatric delirium in critical illness: phenomenology, clinical correlates and treatment response in 40 cases in the pediatric intensive care unit. *Intensive Care Med.* 2007;33(6):1033-1040.
24. Aydogan MS, Korkmaz MF, Ozgul U, et al. Pain, fentanyl consumption, and delirium in adolescents after scoliosis surgery: dexmedetomidine vs midazolam. *Paediatr Anaesth.* 2013;23(5):446-452.
25. Pandharipande P, Ely EW. Sedative and analgesic medications: risk factors for delirium and sleep disturbances in the critically ill. *Crit Care Clin.* 2006;22(2):313-27, vii.
26. Pandharipande P, Shintani A, Peterson J, et al. Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. *Anesthesiology.* 2006;104(1):21-26.
27. Smith HA, Fuchs DC, Pandharipande PP, Barr FE, Ely EW. Delirium: an emerging frontier in the management of critically ill children. *Crit Care Clin.* 2009;25(3):593-614.
28. Schievelld JN, Leentjens AF. Delirium in severely ill young children in the pediatric intensive care unit (PICU). *J Am Acad Child Adolesc Psychiatry.* 2005;44(4):392-394.
29. Kudchadkar SR, Sterni L, Yaster M, Easley RB. Sleep in the intensive care unit. *Contemp Crit Care.* 2009;7(1):1-12.
30. Kudchadkar SR, Aljohani OA, Punjabi NM. Sleep of critically ill children in the pediatric intensive care unit: a systematic review. *Sleep Med Rev.* 2014;18(2):103-110.
31. Schievelld JN, Brouwers AG, Schievelld BR. On the lack of standardized essential PICU guidelines. *Crit Care Med.* 2014;42(7):1724-1725.
32. Davidson JE, Winkelman C, Gelinac C, Dermenchyan A. Pain, agitation, and delirium guidelines: nurses' involvement in development and implementation. *Crit Care Nurse.* 2015;35(3):17-31.
33. Hatherill S, Flisher AJ, Nassen R. Delirium among children and adolescents in an urban sub-Saharan African setting. *J Psychosom Res.* 2010;69(2):187-192.
34. Madden K, Turkel S, Jacobson J, Epstein D, Moromiso DY. Recurrent delirium after surgery for congenital heart disease in an infant. *Pediatr Crit Care Med.* 2011;12(6):e413-e415.
35. Traube C, Augenstein J, Greenwald B, LaQuaglia M, Silver G. Neuroblastoma and pediatric delirium: a case series. *Pediatr Blood Cancer.* 2014;61(6):1121-1123.
36. Kamdar BB, Yang J, King LM, et al. Developing, implementing, and evaluating a multifaceted quality improvement intervention to promote sleep in an ICU. *Am J Med Qual.* 2014;29(6):546-554.
37. Van Rompaey B, Elseviers MM, Van Drom W, Fromont V, Jorens PG. The effect of earplugs during the night on the onset of delirium and sleep perception: a randomized controlled trial in intensive care patients. *Crit Care.* 2012;16(3):R73.
38. Eisendrath SJ, Shim JJ. Management of psychiatric problems in critically ill patients. *Am J Med.* 2006;119(1):22-29.
39. Rivosecchi RM, Smithburger PL, Svec S, Campbell S, Kane-Gill SL. Nonpharmacological interventions to prevent delirium: an evidence-based systematic review. *Crit Care Nurse.* 2015;35(1):39-50.
40. Turkel SB, Braslow K, Tavaré CJ, Trzepacz PT. The Delirium Rating Scale in children and adolescents. *Psychosomatics.* 2003;44(2):126-129.
41. Karnik NS, Joshi SV, Paterno C, Shaw R. Subtypes of pediatric delirium: a treatment algorithm. *Psychosomatics.* 2007;48(3):253-257.
42. Allen J, Alexander E. Prevention, recognition, and management of delirium in the intensive care unit. *AACN Adv Crit Care.* 2012;23(1):5-11.
43. Grover S, Kumar V, Chakrabarti S. Comparative efficacy study of haloperidol, olanzapine and risperidone in delirium. *J Psychosom Res.* 2011;71(4):277-281.
44. Turkel SB, Jacobson J, Munzig E, Tavaré CJ. Atypical antipsychotic medications to control symptoms of delirium in children and adolescents. *J Child Adolesc Psychopharmacol.* 2012;22(2):126-130.
45. Wang HR, Woo YS, Bahk WM. Atypical antipsychotics in the treatment of delirium. *Psychiatry Clin Neurosci.* 2013;67(5):323-331.
46. Hawkins SB, Bucklin M, Muzyk AJ. Quetiapine for the treatment of delirium. *J Hosp Med.* 2013;8(4):215-220.
47. Parelada E, Baeza I, de Pablo J, Martínez G. Risperidone in the treatment of patients with delirium. *J Clin Psychiatry.* 2004;65(3):348-353.
48. Skrobik YK, Bergeron N, Dumont M, Gottfried SB. Olanzapine vs haloperidol: treating delirium in a critical care setting. *Intensive Care Med.* 2004;30(3):444-449.
49. Turkel SB, Jacobson JR, Tavaré CJ. The diagnosis and management of delirium in infancy. *J Child Adolesc Psychopharmacol.* 2013;23(5):352-356.
50. Breitbart WS, Alici-Evicmen J. Why off-label antipsychotics remain first-choice drugs for delirium. *Curr Psychiatry.* 2007;6(10):49-63.
51. Ben Amor L. Antipsychotics in pediatric and adolescent patients: a review of comparative safety data. *J Affect Disord.* 2012;138(suppl):S22-S30.
52. Jacobson JR, Turkel SB. Elevated liver enzymes associated with fluphenazine used to manage delirium symptoms in infants. *J Child Adolesc Psychopharmacol.* 2013;23(7):513-514.
53. Kain ZN, MacLaren JE, Herrmann L, et al. Preoperative melatonin and its effects on induction and emergence in children undergoing anesthesia and surgery. *Anesthesiology.* 2009;111(1):44-49.
54. Schievelld JN, Staal M, Voogd L, Fincken J, Vos G, van Os J. Refractory agitation as a marker for pediatric delirium in very young infants at a pediatric intensive care unit. *Intensive Care Med.* 2010;36(11):1982-1983.
55. de Carvalho WB, Fonseca MC. Pediatric delirium: a new diagnostic challenge of which to be aware. *Crit Care Med.* 2008;36(6):1986-1987.
56. Flaigle MC, Ascenzi J, Kudchadkar SR. Identifying barriers to delirium screening and prevention in the pediatric ICU: evaluation of PICU staff knowledge. *J Pediatr Nurs.* 2016;31(1):81-84.