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# Delirium documentation in hospitalized pediatric patients with cancer

Kelly Lastrapes, M.D.[1,*], Malisa Dang, B.S.[2,*], J. Brian Cassel, PH.D.[2], Tamara Orr, PH.D[2], Tracye Proffitt, M.S., R.N.[3] and Egidio Del Fabbro, M.D.[2]

[1]Pediatric Hematology, Oncology and Palliative Care, Department of Pediatrics, Division of Pediatric Hematology/Oncology, Virginia Commonwealth University, Richmond, VA, USA; [2]Department of Internal Medicine, Division of Hematology, Oncology, and Palliative Care, Virginia Commonwealth University, Richmond, VA, USA and [3]Department of Adult Health and Nursing Systems, Virginia Commonwealth University, Richmond, VA, USA

## Abstract

**Objective.** Screening tools for delirium are being used more consistently in pediatric critical care. However, screening is not universal, and delirium may be underdiagnosed, misdiagnosed, or undocumented in hospitalized patients. We evaluated the identification and documentation of delirium in pediatric oncology and bone marrow transplant patients.

**Method.** A retrospective chart review on all hospitalized pediatric oncology and bone marrow transplant patients admitted to an Academic Cancer center between 2013 and 2016. Patients aged less than 21 years of age with active cancer were included. Patients with major psychiatric conditions, developmental delays, or autism were excluded. Data were collected to characterize documentation concerning the identification and diagnosis of delirium.

**Results.** Of 201 hospitalization records, 54 (26.9%) admissions from 109 unique patients had documentation of delirium. The overall documented incidence of delirium was 3.2% of hospitalizations or 8.2% of unique patients. Patients prescribed opioids and benzodiazepines were more likely to have documentation of delirium. ICD coding under-reported delirium while physician documentation was inaccurate in 26% (53/201) when compared with the chart review.

**Significance of results.** Delirium was frequently undocumented or miscoded. Implementing a validated, universal screening tool for delirium may improve identification and clinical outcomes.

## Original Article

*These authors contributed equally to this work.

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**Author for correspondence:**
Egidio Del Fabbro, Department of Internal Medicine, Division of Hematology, Oncology, and Palliative Care, Virginia Commonwealth University, Richmond, VA, USA.
E-mail: egidio.delfabbro@vcuhealth.org

## Introduction

Delirium is characterized by fluctuating consciousness, cognitive dysfunction, with reduced ability to focus, sustain, or shift attention (American Psychiatric Association, 2013). A combination of a systemic illness, effects of treatment, and the abnormal hospital environment contribute to developing delirium (Traube et al., 2017a). In adults, delirium is associated with increased morbidity and mortality, increased length of hospitalization, higher health care costs, and higher levels of distress in patients and families (Breitbart and Alici, 2012). More recently, recognition of delirium in the pediatric population and its impact on clinical outcomes has increased research, mostly in the area of pediatric critical care. The development of validated screening tools has allowed for universal screening in pediatric intensive care units, yielding prevalence rates of 13–28% (Daoud et al., 2014). In a large study of over almost 1,600 critically ill pediatric patients, delirium was diagnosed in 17% of patients. Identified risk factors for developing delirium in this study included age ≤2 years, developmental delay, severity of illness, prior coma, mechanical ventilation, and benzodiazepine/anticholinergic use. Delirium increased hospital length of stay in these children and was an independent predictor of mortality (Traube et al., 2017b).

Despite the medical complexity of pediatric cancer patients, less is known about delirium in this population than adults (Combs et al., 2014; Traube et al., 2014b, 2017a; Winsnes et al., 2019). A retrospective study of admissions over a 3-month period to the pediatric cancer service found a delirium incidence of 18.8%. Age ≤5 years old, primary diagnosis of brain tumor, postoperative status and benzodiazepines were independently associated with the development of delirium (Traube et al., 2017a). A 1-year prospective study in pediatric hematology, oncology, and bone marrow transplant patients found a delirium prevalence of only 5% and significant associations with increased length of stay, admission to the bone marrow transplant service, patient location [Pediatric Intensive Care Unit (PICU) vs. Pediatric Hematology/Oncology (PHO) unit], benzodiazepine, opioid, and anticholinergic administration (Winsnes et al., 2019).

Given preliminary evidence that delirium occurs frequently within pediatric oncology population with serious consequences of increased length of hospital stay and mortality, we wanted to add to the emerging body of the literature by evaluating delirium identification and documentation in hospitalized pediatric cancer and bone marrow transplant patients at



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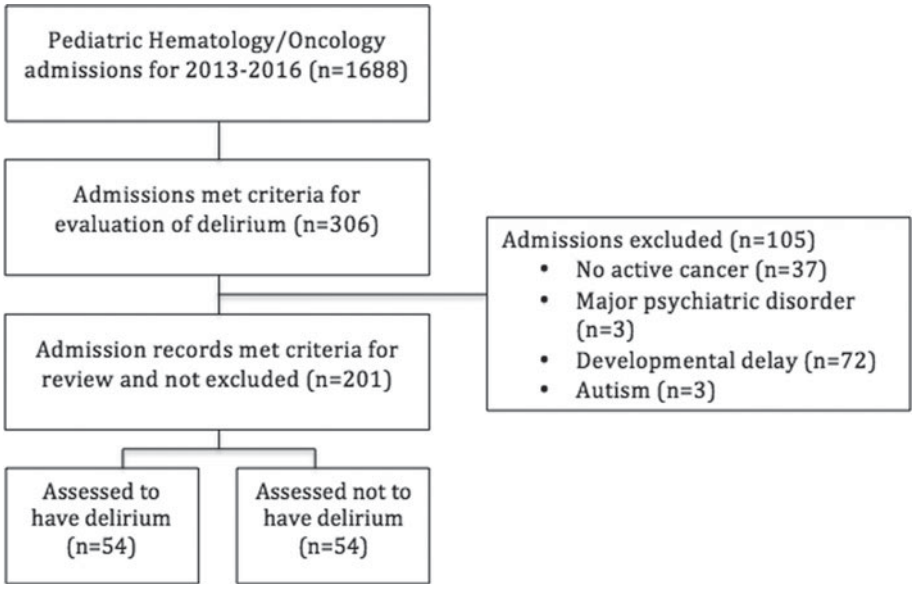


**Fig. 1.** Diagram of medical records identified and reviewed.

our institution. We hypothesized that delirium is poorly recognized and documented within this population.

## Methods

A retrospective, observational study conducted at a National Cancer Institute (NCI)-designated cancer center. The Cancer Informatics Core at Massey Cancer Center conducted a search of the Massey Data Analysis System (MDAS) and Clinical Trials Eligibility Database (CTED) for hospitalized pediatric oncology patients aged less than 21 years of age with active cancer from January 2013 to March 2016. Billing administrative data was searched for the following ICD codes: 780.09, 780.97, 293.0, 293.1, 293.89, 292.81, 300.11, R40.41, F05, F44.89, F06.1, F44.4, F44.6, F53, R40.0, R40.1, R41.82 (see Appendix). Administrative data yielded specific medications used during hospitalization (Lorazepam, Midazolam, Alprazolam, Morphine, Hydromorphone, Fentanyl, Oxycodone, Haloperidol, Quetiapine, Risperidone, Diazepam, and Olanzapine) and for the presence of a psychiatry consult. A term search of the medical record used the following key words: delirium, confusion, encephalopathy, agitation, inattentive/inattentiveness/inattention, altered mental status, ICU psychosis, and delirious. Patients with developmental delay, autism, or co-morbid psychiatric conditions (i.e., schizophrenia, bipolar disorder) were all excluded given the difficulty of retrospectively diagnosing delirium in these populations.

For patient encounters identified by any one of the above mechanisms, the electronic medical record was reviewed to confirm the diagnosis of delirium using Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria. For patient encounters determined to have documentation of delirium, the reviewers collected the following data: age, race/ethnicity, underlying diagnoses (including primary cancer diagnosis) reason for admission, medication use, length of stay, and discharge plan. As a quality control measure, every tenth patient encounter was reviewed by a clinical psychologist with expertise in delirium to ensure the diagnosis was assigned appropriately by the chart reviewers.

Data were collected and managed from using Research Electronic Data Capture (REDCap), a secure web-based application. The Institutional Review Board (IRB) at Virginia Commonwealth University approved this study.

## Results

We identified 1,688 admissions of hospitalized pediatric oncology patients from January 2013 to March 2016. After screening patients, and excluding those with developmental delay, autism or psychiatric disorder, 201 admissions remained for the evaluation of delirium. Excluded patients are listed in Figure 1.

Of 201 admissions reviewed, 54 (26.9%) were assessed to have documentation of delirium, from 109 unique patients. Their demographic characteristics are shown in Table 1. Of note, the overall incidence of documented delirium was 3.2% (54 of the total 1,688 admissions) or 8.2% of unique patients (43 of the total 525 hospitalized pediatric oncology patients).

Patients prescribed opioids and benzodiazepines were more likely to have documentation of delirium during a hospitalization than those who did not receive these medications (Table 2). Over half of the patients with documentation of delirium were prescribed both opioids and benzodiazepines within 7 days before or after delirium was documented. Only five patients with documentation of delirium were not prescribed either opioid or benzodiazepines.

The accuracy of diagnoses codes in billing was compared with charts manually assessed for delirium (Table 3). Of the hospitalizations that had a hospital code and/or physician billing code for delirium, 44.8% were assessed to have no delirium through chart review (false positives). Of the hospitalizations assessed to have delirium, 70.3% had no codes for delirium on either the hospital or physician billing.

## Discussion

In this retrospective study of pediatric cancer and bone marrow transplant admissions, delirium was documented in at least 8.2% of unique patients. This is lower than previously reported in the pediatric critical care literature (17%) or in hospitalized children with cancer (13–18.8%), likely due to the retrospective nature of our study and the lack of routine delirium screening (Traube et al., 2017a, 2017b; Winsnes et al., 2019).

Similar to other studies done in both pediatric critical care and oncology patients, we found a significant association between opioid and benzodiazepine use and delirium (Traube et al., 2017a,

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**Table 1.** Demographic characteristics of unique patient records reviewed and evaluated for delirium

| Characteristics | Frequency ($n = 109$) |
|---|---|
| Race and Ethnicity | |
| White — not Hispanic or Latino | 68 (62%) |
| Black or African American | 29 (27%) |
| Asian | 3 (3%) |
| Hispanic or Latino | 7 (6%) |
| Other | 3 (3%) |
| Gender | |
| Male | 49 (45%) |
| Female | 60 (55%) |
| Age | |
| Mean | 10.5 (SD = 6.2) |
| Median | 10 |
| Cancer Site | |
| Brain and Nervous System | 25 (23%) |
| Liver | 2 (2%) |
| Genitourinary | 6 (6%) |
| Blood | 39 (36%) |
| Head and Neck | 2 (2%) |
| Respiratory/Thoracic | 2 (2%) |
| Endocrine and Neuroendocrine | 13 (12%) |
| Musculoskeletal | 14 (13%) |

**Table 3.** Accuracy of billing codes vs. chart review for delirium

| | Chart review for delirium | | | | |
|---|---|---|---|---|---|
| | No | Yes | Total | False negative | False positive |
| Hospital diagnosis code | | | | | |
| No | 144 | 46 | 190 | 85.2% | 27.3% |
| Yes | 3 | 8 | 11 | | |
| Total | 147 | 54 | 201 | | |
| Physician Diagnosis Code | | | | | |
| No | 135 | 41 | 176 | 75.9% | 48% |
| Yes | 12 | 13 | 25 | | |
| Total | 147 | 54 | 201 | | |
| Physician or Hospital Codes | | | | | |
| No | 134 | 38 | 172 | 70.3% | 44.8% |
| Yes | 13 | 16 | 29 | | |
| Total | 147 | 54 | 201 | | |

2017b; Winsnes et al., 2019). Previous studies involving pediatric oncology patients reported frequent use of opioids (41.0–60.7% of admissions) and benzodiazepines (39.5–54.2%) and independent associations with increased risk of delirium (Traube et al., 2017a; Winsnes et al., 2019). Limiting benzodiazepine and opioid administration and optimizing opioid/benzodiazepine-sparing pharmacologic and non-pharmacologic interventions for pain, anxiety, and nausea may decrease delirium (Dupuis et al., 2013, 2014; Traube et al., 2017a).

Findings from our study also indicate a sizable discrepancy in ICD codes and charts manually assessed for delirium. One study evaluating diagnostic coding of delirium found in-hospital delirium incidence unreliable and under-reported (Casey et al., 2019); ICD codes as compared to a point of prevalence survey using validated tools were 30% lower. Of note, the study was conducted in adult patients in whom recognition may be more robust than the pediatric population. Our results affirm under-coding for delirium is prevalent in pediatric oncology but also reveal some concerns for over-diagnosing delirium (false positives). Education of healthcare professionals and a standardized assessment improves the identification of delirium in adults (Fadul et al., 2007). Similarly, familiarity and daily clinical use of CAP-D, a validated screening tool designed to also detect hypoactive delirium, may improve diagnosis in pediatric patients (Traube et al., 2014a).

Our study has several limitations including the retrospective nature and the relatively small sample size from a single NCI center. We also excluded patients with developmental delay, autism, or major psychiatric disorders, conditions previously identified as risk factors for delirium (Traube et al., 2017b). We excluded these patients because evaluating delirium in children with developmental delays or major psychiatric disorders often requires knowledge of child's baseline through comprehensive patient interaction. Documentation of this information may not be readily available through a hospital chart review (Traube et al., 2017b).

## Conclusion

Delirium is a known complication of a pediatric cancer diagnosis and treatment, documented in at least 3.2% of the total admissions or 8.2% of unique patients in our retrospective study. Despite increasing awareness, delirium remains a frequently undocumented or miscoded entity. Implementing a validated, universal screening tool for delirium may improve identification and clinical outcomes. Patients who received opioids and benzodiazepines were more likely to have documentation of delirium than those patients that did not receive these medications. Further prospective research is also necessary to determine the true incidence of delirium, associated risk factors and establish best practices for treatment and prevention of delirium within the pediatric cancer and bone marrow transplant population.

**Table 2.** Presence of delirium in relation to drugs prescribed

| Characteristics: Drugs prescribed | Number of admissions | Delirium present ($n = 54$) | No delirium present | Odds Ratio (95% CI) |
|---|---|---|---|---|
| Opioids | 122 | 41 (75.9%) | 81 (66.4%) | 2.57 (1.27–5.19, $p = 0.0085$) |
| Benzodiazepines | 109 | 40 (74.1%) | 69 (63.3%) | 3.23 (1.62–6.44, $p = 0.0009$) |

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**Conflict of interest.** There are no conflicts of interest.

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## Appendix

**ICD codes used to identify patients**

| Codes | Diagnosis |
|---|---|
| 292.81 | Drug-induced delirium |
| 293 | Transient mental disorder due to conditions classified elsewhere |
| 293.1 | Subacute delirium |
| 293.89 | Catatonic disorder in conditions classified elsewhere |
| 300.11 | Conversion disorder |
| 780.09 | Other alter consciousness |
| 780.97 | Altered mental status |
| F05 | Delirium due to known physiological condition |
| F06.1 | Catatonic disorder due to known physiological condition |
| F44.4 | Conversion disorder with motor symptom deficit |
| F44.6 | Conversion disorder with sensory symptom or deficit |
| F44.89 | Other dissociative and conversion disorder |
| F53 | Puerperal psychosis |
| R40.0 | Somnolence |
| R40.1 | Stupor |
| R40.4 | Transient alteration of awareness |
| R41.82 | Altered mental status, unspecified |

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