Pediatric Sedation: Using Secondary Data to Describe Registered Nurse Practice in Radiology

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ABSTRACT: **Children often require sedation for procedures because of their developmental level and difficulty complying with positioning. There are few studies that describe nurse sedation practices or adverse events. Studies of pediatric sedation care have small sample sizes that are inadequate to detect adverse events. This study reports practices and outcomes of sedation delivered to children from infancy up to 14 years of age, who were monitored only by registered nurses during diagnostic radiology procedures drawn from a sample of 12,584 cases from the Pediatric Sedation Research Consortium database. There were 727 adverse events (5.78%). However, no deaths, cardiac arrests, intubations, or aspirations were reported in this sample. The most common adverse event was inadequate sedation/agitation/delirium 196 (155.8/10,000) and desaturation below baseline for more than 30 s 173 (138/10,000). Further research comparing sedation practices and outcomes by type of providers, including nurses, is necessary to improve practice. (J Radiol Nurs 2014;33:166-180.)**

KEYWORDS: **Sedation; Pediatrics; Nurse sedation; Radiology nursing; Adverse events; Pediatric sedation research consortium.**

INTRODUCTION

The growing demand for diagnostic procedures such as magnetic resonance imaging (MRI) and computerized tomography (CT) scans for children of all ages has led to an increased demand for procedural sedation services (Havidich & Cravero, 2012). Procedural sedation is "a technique of administering sedative or dissociative agents with or without analgesics to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function. Procedural sedation and analgesia is intended to result in a depressed level of consciousness that allows the patient to maintain oxygenation and airway control independently" (Godwin et al., 2005, p. 178). To meet the need for sedation services in this population, numerous specialties such as radiologists and registered nurses (RNs) with varying education and experience provide sedation (Havidich, & Cravero, 2012).

SEDATION IN PEDIATRICS

The goals of sedation in children are to maintain safety, minimize discomfort, decrease anxiety, minimize psychological trauma, increase cooperation with exam requirements such as immobilization to complete the procedure, and return the child to their preprocedural physical and cognitive states (Coté & Wilson, 2006). Children aged less than 6 years often require deep levels of sedation to gain the cooperation necessary to complete diagnostic procedures (Coté & Wilson, 2006). Sedated children are at risk for serious adverse events, such as apnea, airway obstruction, and hypotension (Coté & Wilson, 2006). Adverse responses to sedation

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cannot be eliminated but can be mitigated by assuring that appropriate screening, medications, equipment, monitoring, and personnel are in place to provide sedation (Coté & Wilson, 2006).

Sedation Outside the Operating Room

Until the 1980s, the practice of sedation was completed in the operating room by anesthesiologists (Krauss & Green, 2008). In the last 20 years, the demand for sedation outside the operating room, in locations such as radiology, has led to the expansion of sedation services by many nonanesthesia provider specialists such as staff RNs, advanced practice nurses, and physician specialists such as intensivists and radiologists (Krauss & Green, 2008). This study focused only on staff RN sedation providers; advanced practice nurses such as nurse practitioners and Certified Registered Nurse Anesthetists (CRNAs) were excluded. Although RNs often provide sedation care directly to patients, institutional oversight of sedation generally remains with physician specialists, such as anesthesiologists, who provide expertise in the development of sedation protocols and assuring sedation quality (Krauss & Green, 2008). The current model of varying institution level sedation practice and administrative responsibility means that sedation systems differ depending on location. This inherent variation in sedation care has made research difficult. Many studies about sedation analyze practices and outcomes of physician sedation providers, but research on RN sedation providers is limited (Couloures, Beach, Cravero, Monroe, & Hertzog, 2011).

Studies of RN pediatric sedation care are similarly limited and involve small sample sizes, describe implementation of RN sedation services, only include data on 1 location, or compare sedative medication regimes (Beebe et al., 2000; Bluemke & Breiter, 2000; Gozal & Gozal, 2008; Lavoie, Vezina, Paul-Savoie, Cyr, & Lafrenaye, 2012; Shah et al., 2011; Srinivasan, Turmelle, Depalma, Mao, & Carlson, 2012; Sterni, Beck, Cole, Carlson, & Turmelle, 2008; Sury, Hatch, Deeley, Dicks-Mireaux, & Chong 1999; Woodthorpe, Trigg, Gurney, & Sury, 2007). This study was undertaken to describe practices and outcomes of pediatric sedation by RNs in radiology to determine the patient characteristics, medications delivered, monitoring practices, and outcomes of sedation by RNs in children during diagnostic MRI, CT scan, and ultrasound procedures.

PEDIATRIC SEDATION GUIDELINES

In 2006, the American Academy of Pediatrics (AAP) updated guidelines for the monitoring and management of pediatric patients during and after procedural sedation (Coté & Wilson, 2006). The updated document was modified to incorporate similar language, definitions of sedation, and monitoring guidelines found in sedation regulations such as the Joint Commission sedation standards (Joint Commission International, 2011). The AAP does not include any information regarding the RN role in providing or assisting with sedation or data regarding RN sedation practice (Coté & Wilson, 2006). The AAP guidelines also use the American Society of Anesthesiologists (American Society of Anesthesiologists [ASA], 2002) guidance document for Sedation and Analgesia by Non-Anesthesiologists in describing safe pediatric sedation practice.

American Society of Anesthesiologists

The ASA has published several advisories, statements, and guidelines concerning sedation by nonanesthesiologists, which have set the standard for sedation care in the United States. There are 4 levels of sedation described by the ASA, ranging from minimal to general anesthesia, occurring on a continuum (Table 1). In the pediatric population, a deep level of sedation is often required to complete diagnostic procedures (Coté & Wilson, 2006; Gozal & Gozal, 2008). The ASA also established standards for the care of the sedated patient and an anesthesia risk score called the ASA score (Table 2). Several studies on pediatric sedation have demonstrated that children, especially those aged 6 years or younger, are at risk of unintentionally moving from the intended level of sedation to a deeper than intended level of sedation (Coté & Wilson, 2006). Therefore, sedation providers are required to have the skills necessary to rescue patients from a deep level of sedation during the procedure (Coté & Wilson, 2006).

The most recent ASA statements on granting privileges for moderate sedation defines nonanesthesiologist sedation practitioners as "licensed physicians, dentists, or podiatrists who have not completed postgraduate training in anesthesiology but are specifically trained to personally administer or supervise the administration of moderate sedation" and supervised sedation practitioners as "a licensed RN, advanced practice nurse or physician's assistant who is trained to administer medications and monitor patients during moderate sedation under the direct supervision of a nonanesthesiologist sedation practitioner or an anesthesiologist" (American Society of Anesthesiologists [ASA], 2010, p. 3). In the latest ASA advisory statement on granting privileges for deep sedation, only nonanesthesiologist sedation practitioners and anesthesia professionals such as anesthesiologists and CRNAs are qualified to administer deep sedation (ASA, 2010). The ASA advisory statements do not provide any information on current RN sedation practice,