

## CONTINUING EDUCATION

# Low-Dose Ketamine for Postoperative Pain Management

Cheryl A. Allen, BSN, RN-BC, Julius R. Ivester Jr., MD

*Ketamine, an anesthetic agent, is gaining attention as an analgesic for the management of acute and chronic pain conditions. Perianesthesia nurses may expect to see ketamine's use increase as more anecdotal and evidence-based experience is gained with its use for pain management. Unlike opioids, ketamine supports respirations while supporting hemodynamic function; moreover, the agent has potential for decreasing opioid-induced hyperalgesia. Ongoing clinical evidence continues to support ketamine's use for analgesia, thus it may be argued that the current Food and Drug Administration classification for ketamine as an anesthetic agent is outdated, and patients would be better served by a reclassification of this medication to include its use for analgesic purposes. This continuing education article provides an overview of ketamine, its side effects, and the possible adverse reactions so perianesthesia nurses may be prepared to care for postsurgical patients who receive ketamine for analgesic purposes.*

**Keywords:** ketamine, pain, postsurgical pain, hyperalgesia.

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**OBJECTIVES**—1. Discuss common side effects of ketamine; 2. Describe appropriate nursing measures for the patient receiving low-dose ketamine infusions; and 3. Describe how ketamine is different from opioids for pain control.

## Background

Originally developed as an anesthetic agent over 40 years ago, today ketamine is finding new use in lower doses as an analgesic in both acute and chronic pain conditions. Soon after ketamine

arrived in the clinical arena, Coppel et al<sup>1</sup> discussed the positive aspects of analgesia without compromising cardiac function when using ketamine—although the authors were clear that for ketamine to be acceptable for clinical use, the negative side effects of emergent reactions and hallucinations would need to be addressed; therefore, they suggested diazepam as a solution.<sup>1</sup> (This was in 1973, so the choices for anxiolytics were slim.) It is interesting that even then, practitioners appreciated that the incidence of negative side effects with ketamine was dependent on the dose and type of premedication, although, at that time, practitioners were using ketamine primarily as an anesthetic agent. Today when using it for analgesic purposes, we recognize the same dose and reaction phenomena. Forty years later, Green and Krauss<sup>2</sup> revisited the topic of ketamine and its bad boy reputation. The authors noted that the addition of a benzodiazepine such as midazolam was beneficial with adults, although noted each clinical situation should be approached from an individualized perspective because it appeared that females were more prone to the

Cheryl A. Allen, BSN, RN-BC, Medical University of South Carolina, and Roper Hospital Ambulatory Surgery & Pain Management, James Island, Charleston, SC; and Julius R. Ivester Jr., MD, Anesthesia Associates of Charleston, SC.

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Address correspondence to Cheryl A. Allen, 6 Blackburn Circle, Charleston, SC 29407; e-mail address: [alleca@musc.edu](mailto:alleca@musc.edu).

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psychomimetic reactions of ketamine; Green and Krauss<sup>2</sup> also noted that practitioners should be aware of previous psychological trauma and/or personality disorders that may affect how the patient would react when ketamine was given.

### **Ketamine as an Analgesic**

As reported by other researchers and summarized by the authors (unpublished data, 2017) the negative patient outcomes for inadequately treated pain include poor patient satisfaction, increased hospital stays, and/or increased cost of care.<sup>3-5</sup> Ketamine, an *N*-methyl-D-aspartate (NMDA) receptor antagonist, is a surgical dis-dissociative anesthetic agent currently being used off label for acute and chronic pain conditions. The NMDA receptor antagonist is showing promise in preventing the transition of acute pain into a chronic pain state.<sup>6-12</sup> Ketamine's potential for decreasing opioid requirements and reducing opioid-induced hyperalgesia, coupled with its ability in supporting hemodynamic function and respiratory drive, makes it appealing for use as an analgesic agent.<sup>6-8,12,13</sup> The commonly reported side effects of headache, nausea, vomiting, sedation, increased heart rate, hypertension, and/or changes in perception of surroundings may be diminished by pretreatment planning that includes development of suitable patient selection criteria, pretreating patients with anxiolytics and antiemetics, use of antihypertensives during infusion, and by controlling the patient's immediate environment to decrease stimuli.

### **Purpose**

The purpose of this continuing education article is to provide an overview of ketamine, its most common side effects, and potential adverse reactions when using it as an analgesic, so that the perianesthesia nurse may be prepared to deliver appropriate care when recovering the surgical patient who is receiving ketamine. Patients with a chronic pain condition may also become surgical patients, and they may experience an acute on chronic pain event. Therefore, this literature review includes information concerning ketamine use for acute postoperative pain and ketamine for chronic pain conditions.

### **Literature Review**

Jouguelet-Lacoste et al<sup>6</sup> in their review of 39 studies on ketamine use concluded that ketamine might safely be given in the postoperative setting. The studies they reviewed included infusions and bolus dosing with postoperative infusion rates varying between 0.6 mg/kg/hour and 1.2 mg/kg/hour. Pain scores were reduced with the use of ketamine; yet the effect of this reduction was unclear. Although a 40% decrease in postoperative opioid consumption was identified by the researchers, they were unable to demonstrate a well-defined relationship between ketamine infusions and decreased opioid use. The researchers further acknowledged that a multimodal approach targeting different pain drivers is the recommended approach for treating acute pain conditions.<sup>6</sup>

In an older article on the efficacy of ketamine for acute postoperative pain, Schmid et al<sup>14</sup> made the distinction between the large doses of ketamine used for anesthesia and low doses of ketamine used for analgesia or hyperalgesia. The authors noted that in large doses ketamine's tendency to produce emergent delirium and increased sympathetic tone limited its clinical utility.<sup>14</sup> The authors acknowledged that in much lower doses ketamine proved effective for postoperative analgesia, particularly when used as an adjunct to other medications such as opioids and local anesthetics.<sup>12</sup> This article was significant as it recognized the (then) recent discovery of the NMDA receptor, which contributed to a reexamination of ketamine.<sup>14</sup>

In a systematic review using intravenous (IV) ketamine for postoperative pain, Laskowski et al<sup>15</sup> reviewed 70 randomized placebo-controlled studies and determined that the surgical site was significant with regard to how well ketamine performed for decreasing opioid consumption after surgery. Abdominal, thoracic, and major orthopaedic procedures demonstrated the highest level of opioid reduction when ketamine was used; however, the authors noted that analgesia requirements for head and neck surgeries were least likely to be influenced with the use of ketamine.<sup>15</sup> The authors' analysis suggested that IV ketamine might delay the time to first opioid analgesia dose, whereas decreasing the total amount of opioids required.<sup>15</sup> Laskowski et al<sup>15</sup> then proceeded

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