Chapter 19
Sedation and Analgesia

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ABSTRACT

Patients in the cardiothoracic intensive care unit (CTICU) are subject to numerous physical and mental stresses. While most of these cannot be completely eliminated, intensivists have many tools in their armamentarium to alleviate patients' pain and suffering. This chapter will consider the importance of analgesia and sedation in the CTICU and the relevant consequences of over- or under-treatment. We will examine the tools available for monitoring and titrating analgesia and sedation in critically ill patients. The major classes of medications available will be reviewed, with particular attention to their clinical effects, metabolism and excretion, and hemodynamic characteristics. Lastly, experimental evidence will be assessed regarding the best strategies for treatment of pain and agitation in the CTICU, including use of non-pharmacologic adjuvants.

INTRODUCTION AND BACKGROUND

The experience of being in the intensive care unit (ICU) can present many stresses, both physical and psychological. Up to 77% of patients in the ICU suffer pain (Van Gulik et al., 2010) and 15% may go on to develop posttraumatic stress disorder (PTSD) (Girard et al., 2007). Many of the daily necessities of critical care, such as endotracheal intubation, mechanical ventilation, placement and maintenance of lines, and use of restraints, cause pain and distress, to say nothing of the discomfort that can come from surgical wounds and interventions. Through the use of judicious analgesia and sedation, intensivists are able to attenuate these stresses.

Inadequate sedation and analgesia have been associated with elevated catabolism, immunosuppression, hypercoagulability, and sympathetic overactivity (Consales, Chelazzi, Rinaldi, & De Gaudio, 2006). These effects are deleterious for patients in the perioperative period, even more so for those with cardiovascular disease, in whom they may precipitate arrhythmias and myocardial ischemia. Conversely, heavy sedation can lead to more time spent undergoing mechanical ventilation, longer ICU stays, and increased needs for imaging and other studies to evaluate patients' neurologic status, all of which put patients at risk for complications (Kress, Pohlman, O'Connor, & Hall, 2000).

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As a result, it is critical to maintain a balance between providing adequate analgesia and sedation and limiting side effects. Several principles seem to logically follow from this:

1) Selection of medications should be tailored to the individual patient and situation.
2) There is growing evidence that the medications used in the ICU may impact long-term outcomes, so current best evidence and guidelines should be followed.
3) Titration of medications should be based on reproducible, validated measurements, and frequent reassessment is mandatory.
4) Use of non-pharmacologic measures should be optimized to reduce the need for medication.

While analgesics and sedatives can produce adverse effects, they have the potential to relieve suffering and improve patients' outcomes and quality of life. This is as true in the cardiothoracic population as in any other group of critically ill individuals. The goals of this chapter will be to discuss the assessment of pain and mental state in the cardiothoracic ICU (CTICU), review various options for providing analgesia and sedation, and provide a framework for evaluating the evidence and selecting the most appropriate agents and strategies for individual patients.

ASSESSMENT OF LEVEL OF ANALGESIA/SEDATION

Regardless of the sedative used, it is critical to monitor level of analgesia and sedation closely so as to avoid over- or under-dosing. For pain intensity, the gold standard is the patient's subjective report; when this is not available, clinicians are forced to estimate pain levels via observation of behavior. One simple and well-validated tool for measuring self-reported pain intensity is the Visual Analog Scale (VAS), which plots relative pain intensity along a line. An alternative is the Numerical Reporting Scale (NRS), which adds numerical increments to the VAS (Hawker, Mian, Kendzerska, & French, 2011).

When patients cannot report their pain intensity due to altered mental status or inability to communicate, an observational scale may be used, such as the Behavioral Pain Scale (BPS). The BPS relies on visual indicators of discomfort, assessed by a healthcare practitioner, and ranks pain intensity on a scale of 3 to 12 (see Table 1). This scale has been shown to have good reliability and validity in a broad population of critically ill patients (Cade, 2008). However, the BPS relies partially on increases in patient movement to indicate greater pain intensity, and some studies suggest that increased pain intensity is correlated with *decreased* movement, calling its results into question (Blenkham, Faughnan, & Morgan,

Table 1. The behavioral pain scale

Item	1 Point	2 Points	3 Points	4 Points
Facial Expression	Relaxed	Partially tightened	Fully tightened	Grimacing
Upper Limb Movements	No movement	Partially bent	Fully bent with finger extension	Permanently retracted
Compliance with Mechanical Ventilation	Tolerating movement	Coughing but tolerating ventilation for most of time	Fighting ventilator	Unable to control ventilation

(Adapted from Payen et al., 2001)