

# Pain Management in the ICU

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# How to manage sedation analgesia for patient-centred care in the ICU

Managing sedation analgesia for patient-centred care in the ICU



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**P**ain management and sedation are closely linked in the intensive care unit. In the past, clinicians were using sedative agents too liberally, often with benzodiazepines. And several issues were observed in the ICU, including the problems of delirium, weakness and prolonged ICU course.

In recent years, attempts have been made to decrease the intensity of sedation whenever possible and to put analgesia before sedation because pain control is of paramount importance. Once pain is controlled through effective analgesia, the patient can then be put on minimal or even no sedation according to the clinical team. Everybody in the critical care team must be involved and must be concerned about this.

The following is an overview of a discussion on how to manage sedation analgesia for patient-centred care in the ICU. The primary goal of this discussion is to talk about the important connection between sedation and analgesia and to find out how a balance can be achieved while ensuring deliverability of patient-centred care and humanising the patient experience in the ICU. The discussion will include input from Prof. Gerald Chanques, Intensive Care Unit, Saint Eloi University Hospital, Montpellier, France and Prof. Xavier Capdevila, Lapeyronie University Hospital, Montpellier, France. ■

# Sedation and Analgesia

How to manage sedation analgesia for patient-centred care in the ICU

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In the concept of patient-centered care, sedation and analgesia have high importance. Intensive care is sometimes invasive and very painful. Patients in the ICU are seriously ill and often suffer from anxiety, agitation, and pain. There is sometimes a need to use deep and prolonged sedation, but that can cause other issues which need to be addressed.

When deep sedation is used, the patient becomes immobile. This can lead to ICU acquired weakness as well as delirium due to the immobilisation of the brain function. Deep and prolonged sedation is associated with worse outcomes, longer duration of mechanical ventilation (MV), longer length of stay (LOS) in the ICU and the hospital, and higher rates of complications such as infections and sometimes even death. It is thus very important to limit the use of deep and prolonged sedation and to understand the use of sedation and pain targets.

Thanks to adequate control of the pain, the level of sedation can be reduced. On the other hand, if the pain is not controlled properly, there is a risk of increased agitation. It is thus very important to use valid and robust tools to assess for agitation such as the Richmond Agitation Sedation Scale (RASS). The RASS score is used to measure the agitation or sedation level and to describe a patient's level of alertness or agitation. It is mostly used in mechanically ventilated patients to avoid over and under-sedation, but it can also be used after in non-intubated patients to assess agitation and delirium as well as side effects of opioids and psychoactive drugs (coma) throughout the ICU stay.

The RASS score is the first step when administering the Confusion Assessment Method in the ICU (CAM-ICU), an effective tool to detect

delirium in ICU patients. Clinicians in the ICU should be targeting a RASS score of zero or +1. Anything over +1 can become dangerous for the patient. The RASS target shall be discussed and agreed by the critical care team including nurses and physicians.

Along with defining and determining sedation targets, it is also important for the critical care team to focus on pain control. Working with a defined target and a continuous assessment of pain leads to more success in decreasing pain prevalence, pain intensity,

and agitation. It enables proper and effective use of analgesics. Then sedatives can be reduced leading to a decrease in the duration of mechanical ventilation, ICU LOS, complications, and infections.

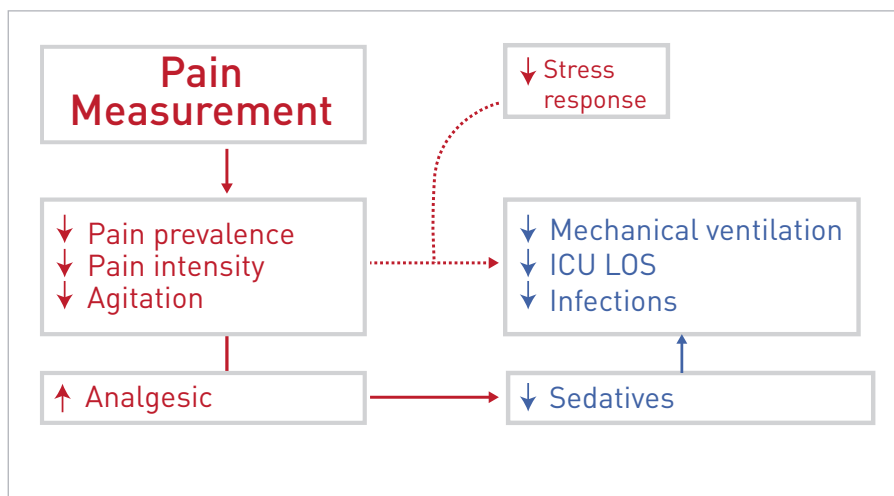
Overall, there is significant evidence showing that pain measurement is associated with better outcomes. Better pain management leads to a possible decrease in the stress response. This has been shown by many sequential controlled trials and large multicentre database studies (Figure 1).

**the important thing is to measure the level of pain; that's the only way pain can be managed, and sedation can be levelled out**

## Analgo-sedation

There are two types of analgo-sedation. One is “analgesia-based sedation” which refers to the use of an analgesic instead of a sedative to reach the sedative goal. The other is “analgesia-first sedation” which refers to the use of an analgesic before a sedative to reach the sedative goal (Figure 2).

There is no defined recommendation on



**Figure 1.** Impact of pain management in the ICU.  
 Source: Chanques et al. 2006; Robinson et al. 2008; Skrobik et al. 2010; Faust et al. 2016.

the use of opioids but generally speaking, if there is a patient who is agitated and suffering from pain, an opioid should be used instead of a sedative. By doing so, the need to use sedation will be reduced.

### Measuring and managing pain

Different strategies can be used to measure pain depending on the patients. A self-reporting pain scale is generally used in patients who are able to rate their pain using a numeric rating scale (NRS) from 0 (no pain) to 10 (maximum pain) (Chanques et al. 2010). The Behavioural Pain Scales (BPS) and the Critical Pain Observational Tool (CPOOT) are used on sedated patients or delirious who are unable to self-report pain scales. These two pain tools are the most validated pain tools in the world.

A study was published a few years ago that compared the use of CPOOT and BPS in Critical Care (Chanques et al. 2014). Both of these tools showed the same properties. It is easy to determine whether a non-communicant patient is in pain based on their behaviour.

When the patients suffer from paralysis or are deeply sedated, the most effective way to measure pain is through electrophysiological tools, such as the Analgesia Nociception Index (ANI). This tool analyses heart rate variability. A scale of 0 to 100 is used where 100 is a perfect restful state without pain. When the ANI decreases around the 40s, it is very likely that the patient is in pain.

Pain is experienced by both surgical and medical patients. Studies show that both groups demonstrate pain prevalence and pain intensity during their ICU stay (Kress et al. 2000; Chanques et al. 2017). Surgical patients commonly report pain at the site of the surgery while medical patients often complain of back pain and pain in the limbs. Pain is thus a common occurrence in the ICU and needs to be properly managed so that sedation can be levelled out.

There are some patients in the ICU that still require sedation including those

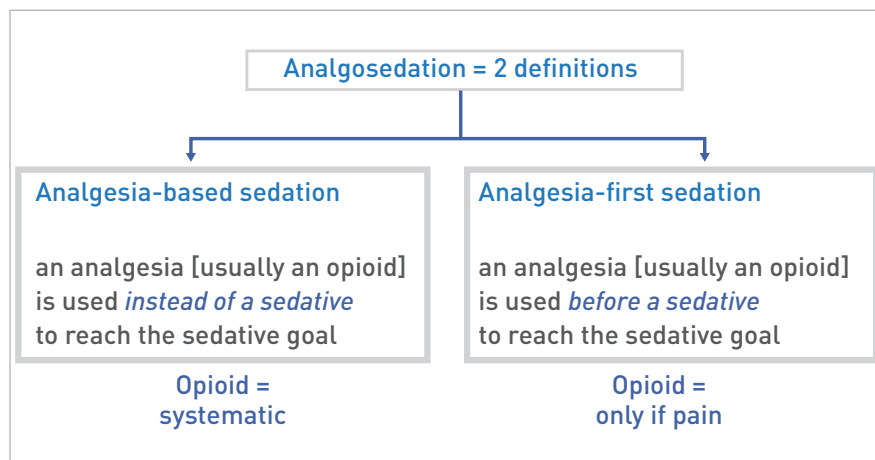


Figure 2. Types of Analgesedation.

Source: Devlin et al. 2018

**the use of multimodal analgesia should be promoted so that opioids are not overused and the pain management effort is more effective**

with severe ARDS as well as patients with severe brain injury. However, with proper management, treatment strategies, and the effective use of modern drugs, sedation levels can be minimised in most patients.

### Which drugs to use?

A paper published in Critical Care (Klaus et al. 2018) showed a catastrophic impact of remifentanyl supply shortage on mechanical ventilation. Findings showed a very high duration of MV in patients who experienced the period of remifentanyl shortage and were forced to use another drug instead (Figure 3). This indicates the impact that the chosen drug can have on a patient's condition and outcome.

Guidelines recommend that benzodiazepines should probably be avoided for

sedation. Propofol and dexmedetomidine should be given preference. For analgesics, morphine should be avoided whenever possible as there is a risk of overdosing in patients with acute renal failure. The use of multimodal analgesia should probably be promoted so that opioids are not overused and the overall pain management effort is more effective (Devlin et al. 2018).

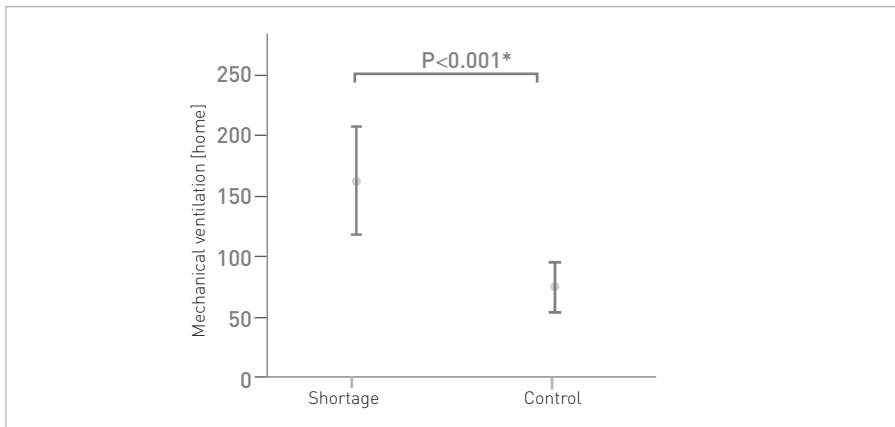
### Using the bundled approach (ABCDEF)

The ABCDEF bundled approach to pain management is an evidence-based guide for clinicians in the ICU to enable them to optimise patient recovery and outcomes (Pandharipande et al. 2010). The ABCDEF bundle includes:

- Assess, Prevent, and Manage Pain;
- Both Spontaneous Awakening Trials (SAT) and Spontaneous Breathing Trials (SBT);
- Choice of analgesia and sedation drugs;
- Delirium: Assess, prevent, and manage;
- Early mobility and exercise;
- Family engagement and empowerment.

Some of the key benefits of the ABCDEF bundle include:

- Empowerment of clinicians and families
- Well-rounded patient care
- Optimal resource utilisation



**Figure 3.** Impact of remifentanyl shortage. Primary outcome parameter. Dot and whiskers indicate mean with 95% confidence interval. Asterisk indicates significance.

Source: Klaus et al. 2018

- Better pain control
- Improved physical recovery
- Improved mental health

### The concept of eCASH

The eCASH concept is based on the premise of delivering patient-centred care without excessive sedation. The strategy can be regarded as an evolution of the Pain, Agitation and Delirium guidelines, hence the mnemonic

eCASH – **Early Comfort** using **Analgesia** with a minimum of **Sedatives** and a maximum of **Humanity**. Providing effective pain relief to patients in the ICU is the first priority when implementing eCASH. This pain relief can be achieved through the use of multimodal analgesia. Sedation should be secondary to pain relief and whenever possible, should be based on drugs that can be titrated to prespecified sedation targets (Vincent et al. 2016). ■

### Key Points

- Deep sedation can lead to ICU acquired weakness as well as delirium due to the immobilisation of the brain function
- Prolonged sedation is also associated with worse outcomes, longer duration of mechanical ventilation (MV), longer length of stay (LOS) and higher rates of complications
- The use of analgesedation can help manage pain as well as reduce the need for sedation
- Fixing sedation targets and measuring pain is important for more effective patient management
- The Richmond Agitation Sedation Scale (RASS) is used to measure the agitation or sedation level and to describe a patient's level of alertness or agitation
- The ABCDEF bundled approach is the key to effective pain management and improved patient outcomes

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# Pain management through multimodal analgesia in the ICU

Overview and focus on regional anaesthesia

Opioid dependency is a serious problem in the ICU. Opioids are effective at providing pain relief because they reduce the perception of the pain signal. At the same time, opioids are associated with respiratory depression, cough suppression, confusion, and drowsiness. In addition, there is a risk of abuse and dependence with opioid drugs.

Despite these risks and associated side-effects, the number of opioid prescriptions continues to increase. Different formulations of opioids are now available, further increasing the risk of abuse and overdose.

The number of deaths involving opioids is consistently increasing (National Center for Health Statistics). The use of opioids in the ICU and in the post-operative period is very common. Most patients receive opioids even after simple surgeries. Opioid-related deaths are a problem in the U.S. and the opioid epidemic continues to plague the rest of the world as well (Figure 1).

Pain management is not just a strategy to improve patient comfort and patient outcomes, but it is also a means to reduce sedation. However, the type of drugs that are used to manage pain can make a big difference in the

level of pain control that is achieved and the quality of patient outcomes that result from the usage of those drugs.

It is important to highlight some key issues that are related to drugs which are used to manage pain. For example, many patients receive opioids (such as morphine, fentanyl, sufentanil, remifentanyl) in the post-operative period, even after a simple and classic surgery like total knee arthroplasty. In such patients, the use of a non-opioid drug could be a better option and could protect these patients from opioid-related side-effects.

The practice of analgo-sedation in the ICU, i.e. using analgesia first instead of sedation is becoming increasingly common. Results of a study published three years ago demonstrated that patients who received more fentanyl and fewer benzodiazepines, and much more dexmedetomidine, but less propofol required lower sedation (Faust et al. 2016). Thus, moving from using total sedation and some analgesics to using more analgesics accompanied by sedatives has proven to be a more effective strategy for reducing sedation. This significant change in the ICU environment is showing results in the form of reduced MV duration and reduced ICU LOS (Faust et al. 2016).

## The new paradigm of pain management

It is time to focus on a new paradigm of pain management and to understand the impact of regional anaesthesia and the benefits of multimodal analgesia. Multimodal analgesia refers to a pain management strategy that combines different analgesics with different mechanisms such as opioids, NSAIDs, local

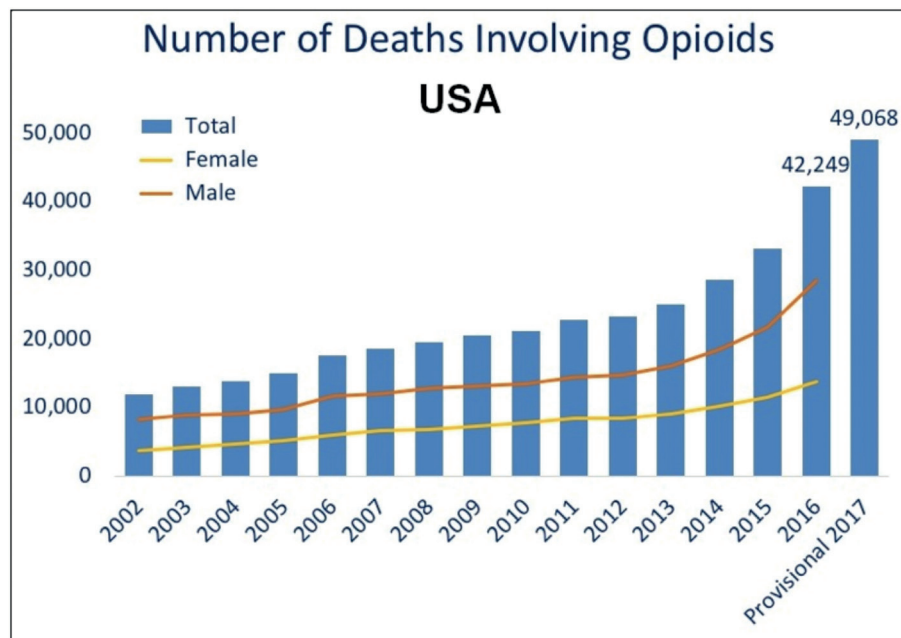


Figure 1. Opioid deaths in the US.

Source: National Center for Health Statistics, CDC Wonder



	Opioid only (n - 302)	Multimodal analgesia (n - 172)	P
Sedation assessment, n(%)	247 (82)	106 (62)	<.01
Sedation scale, n (%)			.11
Ramsay	98 (40)	57 (54)	
SAS	33 (13)	12 (11)	
RASS	53 (21)	17 (16)	
Other	63 (26)	20 (19)	
Deep sedation state*, n/N (%)	133/183 (73)	39/86 (45)	<.01
Sedative use, n (%)	267 (88)	103 (60)	<.01
Type of sedative, n (%)			<.01
Propofol	41 (15)	32 (31)	
Midazolam	219 (82)	70 (68)	
Other	7 (3)	1 (1)	
Daily Dose of sedative, median (IQR)			
Propofol (mg kg <sup>-1</sup> 24 h <sup>-1</sup> )	28 (10-42)	23 (7-40)	.47
Midazolam (mg kg <sup>-1</sup> 24 h <sup>-1</sup> )	1.2 (0.8-2.1)	0.6 (0.4-1.3)	<.01
High dosages of sedatives <sup>b</sup> , n/N (%)	19/260 (7)	3/100 (3)	.13

**Figure 2.** Sedation management and sedation assessment in ICU patients according to modality of analgesia  
Source: Payen et al. 2013. Image Copyright © 2013 Elsevier Inc. Reprinted with permission from Elsevier.

anaesthetics, etc. The combined use of these analgesics produces synergistic analgesia and enables clinicians to use lower total doses. This, in turn, reduces the number of side effects. Multimodal analgesia is a more rational approach to pain management and can effectively reduce postoperative pain as well as the use of opioids and sedatives (Jin and Chung 2001).

The new guidelines published in Critical Care Medicine (Devlin et al. 2018) make three primary recommendations for managing pain and balancing sedation:

1. Using multimodal analgesia in the ICU. This means that clinicians should use some opiates, and should also use adjunctive therapies such as acetaminophen or nefopam whenever possible. This can help in reducing the number of opioids.
2. Using an opiate before the sedatives, and trying to use the lowest effective dose to limit the risk of opioid addiction and

## use of multimodal analgesia with non-opioid drugs and regional anaesthesia can have a positive impact on the long-term mortality in patients

dependency in patients.

3. Using light sedation in contrast to deep sedation in the critically ill, mechanically ventilated patients.

Findings from a French study (Payen et al. 2013) demonstrated that the use of multimodal analgesia in mechanically ventilated critically ill patients could decrease sedation and delirium and at the same time, avoid the use of opioids and opioid-related side effects (Figure 2). Patients given multimodal

analgesia were also more likely to have fewer organ failures and received fewer hypnotics compared to patients who received opioids alone. It is thus evident that the concept of multimodal analgesia must be promoted in the ICU.

Dexmedetomidine, an alpha 2 antagonist and a potent anxiolytic, is another important drug that should be considered within the multimodal approach to pain management (MIDEX and PRODEX) and has shown that it can limit the MV duration compared to Midazolam (Jakob et al. 2012). However, more studies are needed to prove its benefits versus its adverse events.

## Regional anaesthesia: impact on patient outcomes

A study published in JAMA Surgery a few years ago demonstrated that in patients with abdominal aortic aneurysm repair, the overall mortality was different between the group using epidural analgesia and the group using classical analgesia. Results showed that some of the complications were decreased in the epidural group. The addition of epidural analgesia to general anaesthesia was also associated with long-term survival benefit due to the reduced rates of post-operative complications (Bardia et al. 2016).

Clinical evidence shows that epidural analgesia has some effects on mortality, complications, and morbidity after surgery. The use of epidural analgesia can limit the infusion of opiates and opioid-related complications in ICU patients. The complex and mixed use of sedative agents, associated to analgesia with opiates and the use of regional anaesthesia can help improve patient rehabilitation in the

postoperative period. Regional anaesthesia is associated with a composite morbidity score of pneumonia, prolonged ventilator dependency, and postoperative unplanned intubation (Popping et al. 2014).

A study published in *Anesthesia and Analgesia* (Malekpour et al. 2017) compared no-procedure management, i.e. sedation and opiates versus procedural management with a paravertebral blockade in patients with rib fractures. Results clearly showed differences in

mortality and complications. In the patients who received regional analgesia effectively, the rehabilitation was optimised and the use of morphine decreased.

It is thus safe to conclude that the use of multimodal analgesia with non-opioid drugs and regional anaesthesia can have a positive impact on the long-term mortality in patients after big surgeries, as well as optimised pain management and decreased organ dysfunction in these patients. ■

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## Key Points

- While opioids are very effective at treating pain, they can also be addictive
- New guidelines make three recommendations for managing pain and balancing sedation: using multimodal analgesia; using an opiate before the sedatives; and using light sedation in contrast to deep sedation in the critically ill, mechanically ventilated patients
- Multimodal analgesia refers to a pain management strategy that combines different analgesics with different mechanisms such as opioids, NSAIDs, and local anaesthetics
- The use of regional anaesthesia can have a positive impact on the long-term mortality as well as optimised pain management in patients after big surgeries
- The addition of epidural analgesia to general anaesthesia was also associated with long-term survival benefit due to the reduced rates of post-operative complications

# Concluding Remarks

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**R**educing sedation and managing and treating pain are important objectives for clinicians. The primary goal should always be to promote the comfort of the patient and to minimise

pain through the proper use of multimodal analgesia. The use of opioid drugs should be avoided unless absolutely necessary; and focus should be placed on achieving pain control through combined pain management strategies. The use of the ABCDEF bundled approach, the implementation of the eCASH Concept and the effective use of epidural analgesia are all strategies that can be used to balance sedation and analgesia in the ICU.

The four take-home messages from this debate are:

- Minimise deep and prolonged sedation
- Promote comfort and analgesia
- Minimise opioids
- Promote multimodal analgesia

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