

# Multimodalna analgezija

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Project number: 585927-EPP-1-2017-1-RS-EPPKA2-CBHE-JP (2017 – 3109 / 001 – 001)

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# Bol - definicija

- Bol predstavlja individualno, subjektivno iskustvo povezano sa aktuelnim ili potencijalnim oštećenjem tkiva, čija je manifestacija rezultat složene interreakcije fizioloških i neurohemijskih efekata sa psihosocijalnim faktorima.

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# Akutni bol

- Akutni bol - bol u prvih 7 dana od operacije
- Hronični bol – bol koji traje duže od 3 meseca
  
- Akutni postoperativni bol – bol usled hirurške intervencije, kao i proceduralni bol (drenovi, sonde, kateteri).

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# Patofiziologija postoperativnog bola

- bolna senzacija sa mesta hirurške incizije se razlikuje od drugih bolnih senzacija
  - (neuropatski bol, bol kao posledica inflamacije)
- hiperalgezija na mestu hirurške incizije: posredovana  $A\delta$  i C vlaknima
- $\alpha$ -amino-3-hydroxy-5-methyl-4-isoxazole-propionate
- (AMPA)/kainate
- $\downarrow$ pH  $\uparrow$ [laktata] – ishemijski mehanizam može da utiče na nastanak bola

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# Prediktori postoperativnog bola

- Preoperativni bol
- Mlađe životno doba
- Anksioznost
- Gojaznost
- Strah od intervencije
- Tip operacije (abdominalne, torakalne, ortopedske, dugog trajanja)

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# Posebne subpopulacije bolesnika kod kojih bol može biti neadekvatno tretiran:

- pedijatrijski bolesnici
- gerijatrijski bolesnici
- kritično oboleli
- bolesnici sa oštećenim kognitivnim funkcijama

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# Akutni bol

- Akutni bol nije samo neprijatno iskustvo
- Bol pokreće stresni odgovor na hiruršku traumu:
- 
- Povećanje simpatičke aktivnosti
- Oslobađanje stres hormona
- Oštećenje imune funkcije
- Povećanje koagulabilnosti

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# Akutni bol

- Povećanje simpatičke aktivnosti:
  - Tahikardija
  - Hipertenzija - povećana potrošnja kiseonika -- IM
  - ↑ SVR - smanjuje regionalni krvni protok u koži i potkoži – remeti zarastanje rana i pogoduje razvoju infekcije na mestu hirurškog rada
- Imobilizacija zbog bola + hiperkoagulabilnost:
  - venski tromboembolizam
  - plućna embolija

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# Akutni bol

## Bol (abdomen, grudni koš) remeti:

Duboko disanje

Kašalj

Iskašljavanje



Atelektaza, hipoksemija, pneumonija

## Bol pojačava katabolizam:

Stimuliše razgradnju proteina

Podiže nivo glikemije



Remeti zarastanje operativne rane

## Psihološke posledice:

Remećenje sna

Psihomotorna agitacija

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# Akutni postoperativni bol

- tretman izuzetno značajan u postoperativnom lečenju bolesnika
- samo 1 od 4 hirurška bolesnika dobija adekvatnu postoperativnu analgetsku terapiju
- Holandija, 1420 bolesnika i pored protokola za postop. Terapiju bola 41% bolesnika imalo na dan operacije epizodu srednjeg do jakog bola
- USA, 250 bolesnika – 80% srednji do jak bol na dan operacije
  - - 86% jak bol po otpustu iz bolnice
- Deca – nakon tonzilektomije i adenoidektomije: 86% značajan bol na dan I dan nakon operacije

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# Gde je problem ?

- Nejasno
- Multifaktorijelni problem
- Bol se tretira samo na zahtev
- Slaba komunikacija sa bolesnikom
- Ne procenjuje se intenzitet bola
- Ne pridržavanje protokola
- Ne korišćenje regionalnih tehnika analgezije (epidural, nervni blokovi...)

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# Procena intenziteta bola

- **Ne proporučuje** se korišćenje vitalnih znakova ( $\uparrow$ Fr,  $\uparrow$ TA) kao **samostalnih** pokazatelja pristutva bola, već samo kao znak-upozorenje da treba bol proceniti primenom neke od navedenih skala.
- **Skale:** Behavioral pain scale (BPS) i Critical-Care Pain Observation Tool (CCPOT) su najverodostojnije i najpouzdanije skale za procenu bola kod ne-verbalnih bolesnika, odnosno numerička skala za verbalne bolesnike.

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# BEHAVIORAL PAIN SCALE (BPS)

Parametar	Bodovi (1-4)
Ekspresija lica	Relaksiran – 1 Delimično stegnut ( nabrano čelo) – 2 Izrazito namršten (žmuri) -3 Grimase - 4
Pokreti gornjih ekstremiteta	Bez pokreta – 1 Delimično savijen -2 Kompl. savijen sa fleksijom prstiju – 3 Permanentna retrakcija - 4
Usklađenost sa mehaničkim ventilatorom	Toleriše – 1 Kašlje, ali uglavnom toleriše vent. – 2 Bori se sa ventilatorom -3 Ne može se kontrolisati ventilacija -4
Zbir: 3 – nema bola 12- maksimalni bol	

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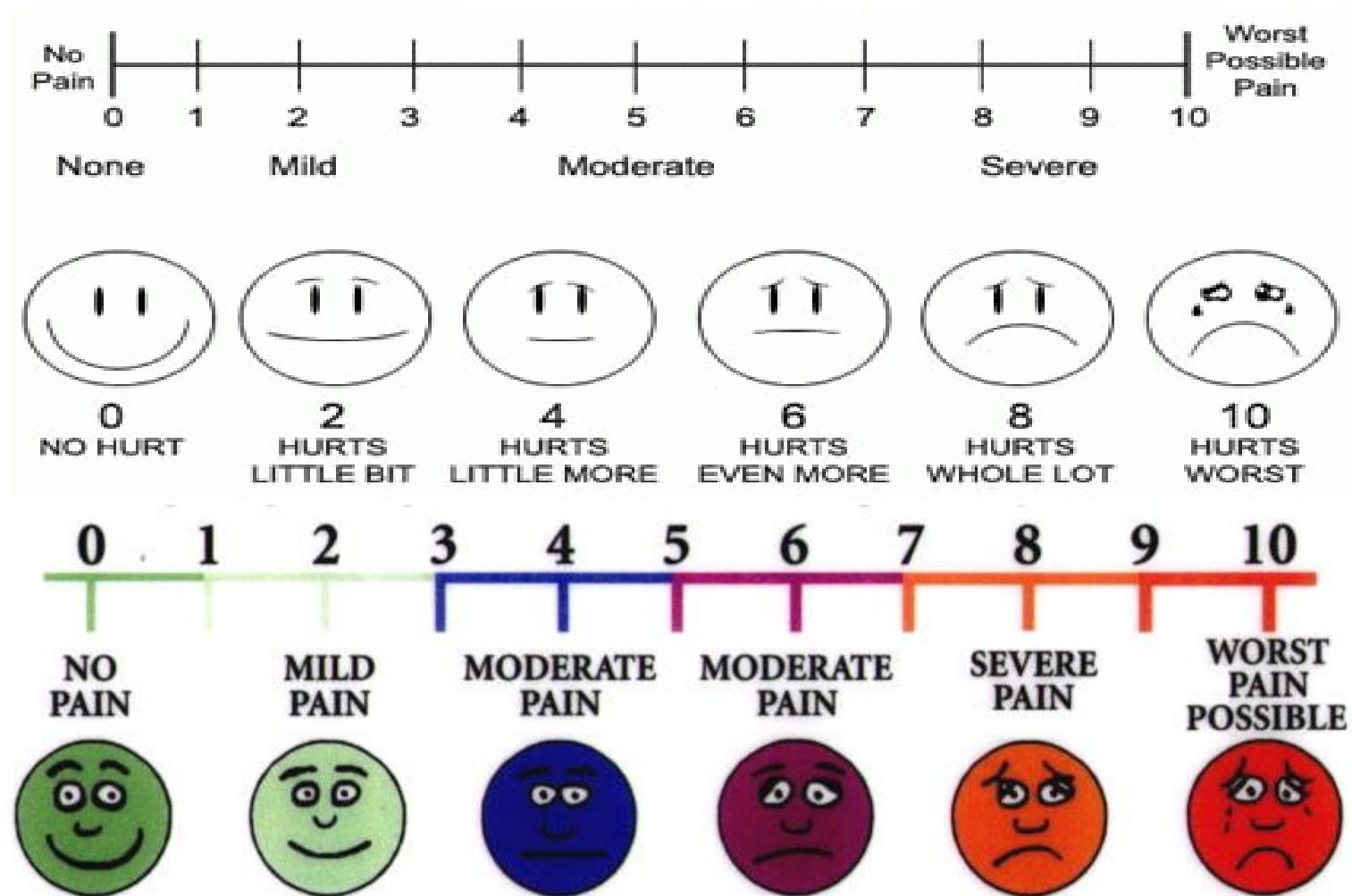
## Critical-Care Pain Observation Tool (CCPOT)

Indikator	Bodovi (0, 1, 2)
Ekspresija lica	Relaksiran – 0 Napet -1 Grimase -2
Pokreti tela	Bez pokreta – 0 Protektivni pokreti (dodiruje bolno mesto) -1 Nemiran, čupa tubus -2
Mišićna tenzija	Relaksiran – 0 Otpor na pasivne pokrete -1 Izrazita rezistencija na pokret -2
Usklađenost sa ventilatorom / vokalizacija	Toleriše (alarmi se ne uključuju) -0 Kašlje, ali toleriše -1 Bori se sa ventilatorom -2 Govori normalno -0 Uzdiše, stenje -1 Viče, jeca -2
Zbir 0 - 8	

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# Procena intenziteta bola



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# Procena intenziteta bola

Choice of assessment tool

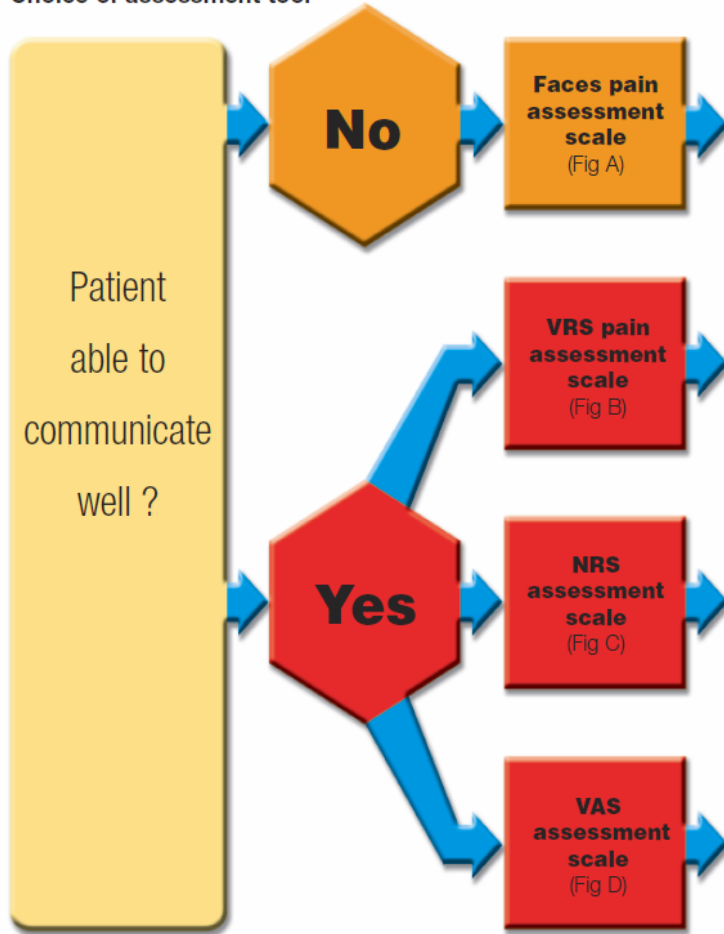


Fig A. Wong-Baker Faces Pain Rating Scale<sup>1</sup>

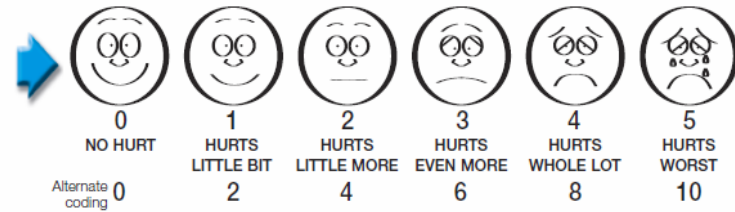


Fig B. VRS<sup>2</sup>

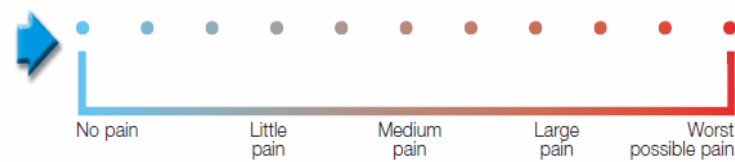


Fig C. NRS<sup>2</sup>

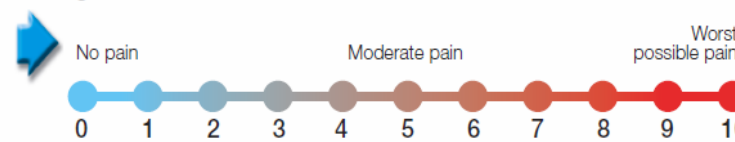
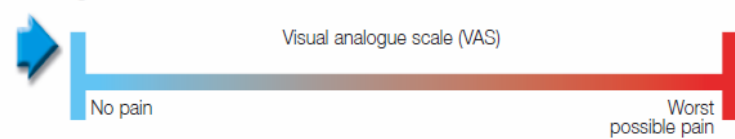


Fig D. VAS<sup>2</sup>



<sup>1</sup> With permission from Elsevier.

<sup>2</sup> Adapted from McCaffery M, Pasero C. Pain: Clinical Manual 1999 with permission from Elsevier.

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SPECIAL ARTICLES

**Practice Guidelines for Acute Pain Management in the Perioperative Setting**

*An Updated Report by the American Society of Anesthesiologists Task Force on Acute Pain Management*

**P**RACTICE Guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints and are not intended to replace local institutional policies. In addition, Practice Guidelines developed by the American Society of Anesthesiologists (ASA) are not intended as standards or absolute requirements, and their use cannot guarantee any specific outcome. Practice Guidelines are subject to revision as warranted by the evolution of medical knowledge, technology, and practice. They provide basic recommendations that are supported by a synthesis and analysis of

- What other guideline statements are available on this topic?
  - These Practice Guidelines update the "Practice Guidelines for Acute Pain Management in the Perioperative Setting" adopted by the ASA in 2003 and published in 2004.\*
- Why was this guideline developed?
  - In October 2010, the Committee on Standards and Practice Parameters elected to collect new evidence to determine whether recommendations in the existing Practice Guidelines were supported by current evidence.
- How does this statement differ from existing guidelines?
  - New evidence presented includes an updated evaluation of scientific literature and findings from surveys of experts and randomly selected ASA members. The new findings did not necessitate a change in recommendations.
- Why does this statement differ from existing guidelines?
  - The ASA guidelines differ from the existing guidelines because they provide new evidence obtained from recent scientific literature as well as findings from new surveys of expert consultants and randomly selected ASA members.

Updated by the American Society of Anesthesiologists (ASA) Committee on Standards and Practice Parameters; Jeffrey L. Apfelbaum, M.D. (Committee Chair), Chicago, Illinois; Michael A. Ashburn, M.D., M.P.H. (Task Force Chair), Philadelphia, Pennsylvania; Richard T. Connis, Ph.D., Woodinville, Washington; Tong J. Gan, M.D., Durham, North Carolina; and David G. Nickinovich, Ph.D., Bellevue, Washington. The previous update was developed by the ASA Task Force on Acute Pain Management: Michael A. Ashburn, M.D., M.P.H. (Chair), Salt Lake City, Utah; Robert A. Caplan, M.D., Seattle, Washington; Daniel B. Carr, M.D., Boston, Massachusetts; Richard T. Connis, Ph.D., Woodinville, Washington; Brian Ginsberg, M.D., Durham, North Carolina; Carmen R. Green, M.D., Ann Arbor, Michigan; Mark J. Lema, M.D., Ph.D., Buffalo, New York; David G. Nickinovich, Ph.D., Bellevue, Washington; and Linda Jo Rice, M.D., St. Petersburg, Florida.

Received from the American Society of Anesthesiologists, Park Ridge, Illinois. Submitted for publication October 20, 2011. Accepted for publication October 20, 2011. Supported by the American Society of Anesthesiologists and developed under the direction of the Committee on Standards and Practice Parameters, Jeffrey L. Apfelbaum, M.D. (Chair). Approved by the ASA House of Delegates on October 19, 2011. A complete list of references used to develop these updated Guidelines, arranged alphabetically by author, is available as Supplemental Digital Content 1, <http://links.lww.com/ALN/A780>.

Address correspondence to the American Society of Anesthesiologists: 520 North Northwest Highway, Park Ridge, Illinois 60068-2573. These Practice Guidelines, as well as all published ASA Practice Parameters, may be obtained at no cost through the Journal Web site, [www.anesthesiology.org](http://www.anesthesiology.org).

\* American Society of Anesthesiologists Task Force on Acute Pain Management: Practice guidelines for acute pain management in the perioperative setting: An updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *ANESTHESIOLOGY* 2004; 100:1573–81.

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the current literature, expert and practitioner opinion, open forum commentary, and clinical feasibility data.

This document updates the "Practice Guidelines for Acute Pain Management in the Perioperative Setting: An Updated Report by the American Society of Anesthesiologists Task Force on Acute Pain Management," adopted by the ASA in 2003 and published in 2004.\*

**Methodology**

**A. Definition of Acute Pain Management in the Perioperative Setting**

For these Guidelines, acute pain is defined as pain that is present in a surgical patient after a procedure. Such pain may be the result of trauma from the procedure or procedure-related complications. Pain management in the perioperative setting refers to actions before, during, and after a procedure

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**Preoperativni pristup:**

- Nastavljanje preop. terapije
- Tretman za redukciju preop. bola
- Premedikacija i anksioliza
- Edukacija bolesnika i porodice

**Perioperativni pristup:**

- centralna neuroaxijalna analgezija
- PCA – intravenska/epiduralna
- periferna regionalna analgezija

**ASA preporuke:**

- opioidi i.v., PCA, neuroaxialno
- ne i.m. na zahtev bolesnika

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# Postoperative Pain Management – Good Clinical Practice



General recommendations  
and principles for  
successful pain management



Produced in consultation with the  
European Society of Regional Anaesthesia  
and Pain Therapy

## Balansirana – multimodalna analgezija

A2-CBHE-JP (2017 – 3109 / 001 – 001)

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# Multimodalne tehnike za postoperativnu analgeziju

## Multimodalna tehnika:

korišćenje dva ili više analgetika sa različitim mehanizmom analgetskog dejstva.

- analgetici mogu biti primenjeni istim putem ili različitim

## ASA preporuke:

- kad god je moguće koristiti multimodalnu tehniku
- razmotriti primenu centralnih neuroblokova/lokalni anestetici

+

NSAIDs, COXIBs ili acetaminofen

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# Analgetici

## Pharmacological options of pain management

Non-opioid analgesics	Paracetamol NSAIDs, including COX-2 inhibitors* Gabapentin, pregabalin <sup>2</sup>
Weak opioids	Codeine Tramadol Paracetamol combined with codeine or tramadol
Strong opioids	Morphine Diamorphine Pethidine Piritramide Oxycodone
Adjuvants**	Ketamine Clonidine

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# Multimodalne tehnike za postoperativnu analgeziju

**Neuroaxialno:** morfin + LA  
sufentanil + LA

**Sistemska:** opioidi (Mo, fentanil, sufentanil, tramadol)

+

NSAIDs  
COX NSAIDs  
Pregabalin  
Gabapentin

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# Treatment options in relation to magnitude of postoperative pain expected following different types of surgery<sup>1</sup>



## Mild intensity pain

*For example:*  
Inguinal hernia  
Varices  
Laparoscopy

## Moderate intensity pain

*For example:*  
Hip replacement  
Hysterectomy  
Jaw surgery

## Severe intensity pain

*For example:*  
Thoracotomy  
Upper abdominal surgery  
Aortic surgery  
Knee replacement

- (i) Paracetamol and wound infiltration with local anaesthetic
- (ii) NSAIDs (unless contraindicated) and
- (iii) Epidural local analgesia or major peripheral nerve or plexus block or opioid injection (IV PCA)

- (i) Paracetamol and wound infiltration with local anaesthetic
- (ii) NSAIDs (unless contraindicated) and
- (iii) Peripheral nerve block (single shot or continuous infusion) or opioid injection (IV PCA)

- (i) Paracetamol and wound infiltration with local anaesthetic
- (ii) NSAIDs (unless contraindicated) and
- (iii) Regional block analgesia  
Add weak opioid or rescue analgesia with small increments of intravenous strong opioid if necessary

# Morfijum

Morphine	
Administration	(i) Intravenous. (ii) Subcutaneous by continuous infusion or intermittent boluses via indwelling cannula. (iii) Intramuscular (not recommended due to incidence of pain. 5-10 mg 3-4 hourly).
Dosage: IV PCA  Subcutaneous	Bolus: 1-2 mg, lockout: 5-15 min (usually 7-8 min), no background infusion. 0.1-0.15 mg/kg 4-6 hourly, adapted in relation to pain score, sedation and respiratory rate.
Monitoring	Pain score, sedation, respiratory rate, side effects.
Comments	Side effects such as nausea, vomiting, sedation and apnoea. No other opioid or sedative drug should be administered.

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# Tramadol

<b>Tramadol</b>	
Administration	(i) Intravenous: inject slowly (risk of high incidence of NV). (ii) Intramuscular. (iii) Oral administration as soon as possible.
Dosage	50-100 mg 6 hourly.
Monitoring	Pain score, sedation, respiratory rate, side effects.
Comments	Tramadol reduces serotonin and norepinephrine reuptake and is a weak opioid agonist. In analgesic efficiency, 100 mg tramadol is equivalent to 5-15 mg morphine. Sedative drugs can have an additive effect.

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# Paracetamol

## Paracetamol

### Administration

- (i) Intravenous: Start 30 min before the end of surgery.
- (ii) Oral administration as soon as possible.  
Duration: as long as required.

### Dosage

4 x 1 g paracetamol/day (2 g propacetamol/day).  
Dose to be reduced (e.g. 3 x 1 g/day) in case of hepatic insufficiency.

### Monitoring

Pain scores.

### Comments

Should be combined with NSAID and/or opioids or loco-regional analgesia for moderate to severe pain.

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# Nesteroidni antiinflamatorni lekovi

NSAIDs <sup>1</sup>	
Administration	(i) Intravenous: administration should start at least 30-60 min before end of surgery. (ii) Oral administration should start as soon as possible. Duration: 3-5 days.
Dosage examples	(i) <i>Conventional NSAIDs include:</i> ketorolac: 3 x 30-40 mg/day (only IV form) diclofenac: 2 x 75 mg/day ketoprofen: 4 x 50 mg/day (ii) <i>Selective NSAIDs include:</i> meloxicam 15 mg once daily COX-2 inhibitors are now licensed for postoperative pain management. They are as efficient as ketorolac but reduce GI side effects. Examples include: parecoxib: 40 mg followed by 1-2 x 40 mg/day (IV form) or celecoxib: 200 mg/day. However, there is some debate due to cardiovascular risks in patients with arteriosclerosis. *See note below Table 2, page 17
Monitoring	Pain scores. Renal function in patients with renal or cardiac disease, elderly patients, or patients with episodes of severe hypotension. Gastrointestinal side effects. Non-selective NSAIDs would be combined with proton inhibitors (i.e. omeprazol) in patients at risk of gastrointestinal side effects.
Comments	Can be added to the pre-medication. Can be used in association with paracetamol and/or opioids or local regional analgesia for moderate to severe pain.

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# Analgetici

Analgetik	Način primene	Doza	Vremenski interval
Morfin	i.v.	1-2 mg	
Petidin (Meperidin)	i.v., i.m.	0.5-1.5 mg/kg	na 4-6 h
Tramadol	i.v., i.m., s.c.	50-100 mg	na 6 h
Paracetamol	i.v.	1 g	na 6 h
<b>NSAIL-neselektivni COX inhibitori</b>			
Ketorolak	i.v.	30-40 mg	na 6 h
Diklofenak	i.v.	75 mg	na 12 h
Ketoprofen	i.v.	50 mg	na 6 h
<b>NSAIL-selektivni COX-2 inhibitori</b>			
Celecoxib	Per os	200 mg	jednom dnevno
Meloxicam	Per os	15 mg	jednom dnevno
Parecoxib	i.v.	40 mg	1-2 puta dnevno

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# PCA – i.v.

Koncentracija leka	Bolus	Sigurnosni interval	Kontinuirana infuzija
Morfin (1 mg/ml)	0.5-2.5 mg	5-10 minuta	0.01-0.03 mg/kg/h
Fentanil (0.01 mg/ml)	10-20 µg	5-10 minuta	0.05-0.1 µg/kg/h

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# PCEA

Lek	Potrebna doza	Sigurnosni interval	Kontinuirana infuzija
Morfin	100–200 µg	10–15 minuta	300–600 µg/h
Fentanil	10–15 µg	6 minuta	80–120 µg/h
Bupivacain 0.125% + fentanil 4µg /ml	2 ml	10 minuta	4 ml/h
Ropivacain 0.2% + fentanil 5 µg /ml	2 ml	20 minuta	5 ml/h

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# Zaključak

Procena bola

Dokumentovanje

Multimodalna analgezija

Protokol za analgeziju

Izbor i dozu analgetika prilagoditi bolesniku, operativnom zahvatu, prisustvu drugih oboljenja ili bolnih sindroma

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# HVALA NA PAŽNJI

