

Supportive and adjuvant drugs

| Indication | Drug/ Brand example | Dose | Application- mode | Drug/ Brand example | Dose | Indications |
|---------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Constipation | Lactulose | <3 years 3x2-5ml >3 years 3x5-10ml | po | S-Ketamine (S-Ketanest®) | 0,5-3 mg/kg/d iv | - Neuropathic pain - painful procedures (higher dose) - Terminale sedation (combine with midazolame) |
| | Macrogol (Movicol®) | 0,8 g/kg/d | po | | | |
| | Natriumpicosulfate (Laxoberal®) | >4 years 4-8 drops in 24 h >12 years 10-max. 18 drops in 24 h | po | | | |
| Nausea/ Vomiting | Dimenhydrinate (Vomex®) | 1-2mg/kg every 6-8 h | iv | Gabapentine (Neurontin®) | Titrate in 3-7 d mg/kg/d po in 3 doses Max.: 60 mg/kg/d. Max. daily dose adults.: 3600 mg | - Neuropathic pain, shooting |
| | | 5mg/kg every 6-8 h | po supp | | | |
| | max. daily dose po/supp 2-6 years 75mg 6-12 years 150mg | | | | | |
| | Domperidone (Motilium®) | 0,3 mg = 1 dr/kg, max. 33 dr/dose every 6-8 h | po | | | |
| | Ondansetron (Zofran®) | 0,17 mg/kg every 12 h, max. dose 8 mg | iv/po | | | |
| | Promethazine (Atosil®) | 0,2-0,5 mg/kg po or iv every 6 h | | | - Nausea, vomiting dyspnoe - Acute agitation | |
| | Lorazepam (Tavor®/Expidet) | Start 2 x 0,5 mg/d po. Max. dose 0,05 mg/kg | | | - Sleep disturbance, cerebral convulsions anxiety, dyspnoe | |
| | Amitriptyline (Saroten®) | Start with 0,2 mg/kg/d po. at night; increase over 2-3 weeks (every 2-3 d by 25%) up to 1 mg/kg/d or to minimal effective dose | | | - Neuropathic pain, burning - Phantome pain - Sleep disturbance due to pain | |

"These faces show how much something can hurt. This face [point to left-most face] shows no pain. The faces show more and more pain [point to each from left to right] up to this one [point to right-most face] - it shows very much pain. Point to the face that shows how much you hurt [right now]."

Score the chosen face 0, 2, 4, 6, 8, or 10, counting left to right, so '0' = 'no pain' and '10' = 'very much pain'. Do not use words like 'happy' and 'sad'. This scale is intended to measure how children feel inside, not how their face looks.



In the following instructions, say "hurt" or "pain", whichever seems right for a particular child.

Faces Pain Scale Revised (Hicks et al. Pain 2001; 93: 173-83) (<http://www.painresourcebook.ca>)



DGSS Deutsche Gesellschaft zum Studium des Schmerzes e.V.



DGP Deutsche Gesellschaft für Palliativmedizin e.V.



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Help for children with pain or life-limiting diseases e.v.

Pain management in children B. Zernikow, Ch. Schiessl, Ch. Wamsler et al.

Pain assessment FLACC (Merkel SI Pediatr Nurs 1997; 23:293-7) and FLACC-revised (Malviya S, Ped Anaesth 2006; 16:258-65)

Revisions in brackets; unrevised: assessment of postoperative pain (0-4 Years); revised: assessment of pain in cognitively impaired children

| Observation | Description | Score | |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Face | No particular expression or smile | 0 | For each observation select only one description. Observe the child over a period of 15 seconds and document the scores according to the given descriptions. Sum the scores of the five observation areas (minimal 0; maximum 10). Assess the child as often as possible to get reliable pain scores. Postoperatively the cut off total pain score for an analgesic therapy is 4. Higher scores show that pain therapy is necessary more urgently. |
| | Occasional grimace/frown; withdrawn or desinterested (appears sad or worried) | 1 | |
| | Consistent grimace or frown; frequent/constant quivering chin; clenched jaw (distressed looking face; expression of fright or panic) | 2 | |
| Legs | Normal position or relaxed (usual tone and motion to limbs) | 0 | |
| | Uneasy, restless, tense (occasional tremors) | 1 | |
| | Kicking, or legs drawn up (marked increase in spasticity; constant tremors or jerking) | 2 | |
| Activity | Lying quietly, normal positions, moves easily (regular, rhythmic respiration) | 0 | |
| | Squirming, shifting back and forth (tense or guarded movements; mildly agitated (e.g. head back and forth, aggression), shallow, splinting respirations, intermitted sights) | 1 | |
| | Arched, rigid or jerkins (severe agitation, head banging; shivering (not rigors); breath holding, gasping or sharp intake of breath, severe splinting) | 2 | |
| Cry | No cry/verbalization | 0 | |
| | Moans or whimpers; occasional complaint (occasional verbal outbursts, constant grunting) | 1 | |
| | Crying steadily, screams or sobs, frequent complaints (repeated outbursts, constant grunting) | 2 | |
| Consolability | Content and relaxed | 0 | |
| | Reassured by occasional touching, hugging or being talked to. Distractible | 1 | |
| | Difficult to console or comfort (pushing away caregiver, resisting care or comfort measure) | 2 | |
| | | Sum: | |

Pain therapy

Non-opioid analgesics

- Post-OP, in case of mucositis, burn pain, cancer pain: give pain medication "by the clock" and "as needed" for breakthrough pain.
- Select analgesic according to pain pathophysiology (inflammation => Ibuprofen, Diclofenac; visceral/abdominal pain => Dipyrrone etc.) and contraindications (high bleeding risc => Acetamenophen/Paracetamol).

| Analgesic | Application mode | Single dose | Dose-interval | Maximum daily dose (< 50 bw)/dose | Maximum daily (adults) | Brand names (e.g.) |
|-----------------------------|--------------------------------------------|-----------------------------------|---------------|--------------------------------------------|------------------------|--------------------------------------------------------------------------------|
| Diclofenac | po, supp | 1 mg/kg | (6h to) 8h | 3 mg/kg/d | 150 mg/d | Voltaren®tablets 12.5; 25; 50 mg, slow rel. tabl. 100 mg, supp 125 mg and more |
| Ibuprofen | po, supp | 10 mg/kg | 6h (to 8h) | 40 mg/kg/d | 2400 mg/d | Nurofen® liquid (5 ml = 100 mg), Supp 60 mg and more |
| Dipyrrone | po, supp iv short-infusion over 15 min. | 15 mg/kg | (4h to) 6h | 75 mg/kg/d | 5000 mg/d | Novalgin® drops (1 drop = 25 mg) supp 300 and 1000 mg |
| Paracetamol (Acetaminophen) | po, supp | 15 mg/kg loading dose 30 mg/kg | (4h to) 6h | <2 years 60 mg/kg/d >2 years 90 mg/kg/d | 4000 mg/d | Ben-u-ron® liquid (5 ml = 200 mg), supp 75 mg and more |
| | iv short-infusion over 15 min. | 15 mg/kg no loading dose | 6 h | ≤ 1 year 30 mg/kg/d > 1 year 60 mg/kg/d | 4000 mg/d | Perfalgan® 10 mg/ml (bottle à 500 or 1000 mg) |

Opioids - starting doses plus accordingly application mode

Usual starting dose for opioid-naive children with body weight > 10 kg and age > 6 months. Max = maximal starting dose (see below)
Postoperatively combine with non-opioids. Good experiences with continous infusion (CI) (Tramadol plus Dipyrrone or Morphine plus Dipyrrone in a single syringe)

Opioids for moderate to severe pain WHO III

| | | | Equianalgesic dose | Drug brand names (e.g.) |
|------------------------------|-----------------------------------------|------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Buprenorphine | | | | |
| intravenous | Bolus | 0.003 mg/kg (max. 0.15 mg) | 0.2 mg | Temgesic® amp. 0.3 mg = 1 ml |
| | PCA bolus | 0.001 mg/kg (max. 0.06 mg) | | |
| | CI | 0.0005 mg/kg/h (max. 0.03 mg/h) | | |
| sublingual | 0,004 mg/kg (max. 0.2 mg) every 8 hours | 0.3 mg | Temgesic® sublingual 0.2 mg; sublingual forte 0.4 mg | |
| Hydromorphone | | | | |
| intravenous | Bolus | 0.01 mg/kg (max. 0.5 mg) every 3 h | 1.5 mg | Palladone® inject. 2mg = 1 ml; 10 mg = 1 ml; 100 mg = 10 ml |
| | PCA bolus | 0.004 mg/kg (max. 0.2 mg) | | |
| | CI | 0.005 mg/kg/h (max. 0.02 mg/h) | | |
| oral | immediate release | 0.03 mg/kg (max. 1.3 mg) every 4 h | 4.5 mg | Palladone® 1,3 mg, 2.6 mg, 4 mg, 8 mg, 16 mg, 24 mg |
| | slow release | 0.06 mg/kg (max. 4 mg) every 8 h | | |
| Morphine § | | | | |
| intravenous/ subcutaneous | Bolus | 0.05 mg/kg (max. 3 mg) every 3 h | 10 mg | MSI® 10 mg = 1ml; 20 mg = 1ml; 100 mg = 5 ml; 200 mg = 10 ml |
| | PCA bolus | 0.02 mg/kg (max. 2 mg) | | |
| | CI | 0.02 mg/kg/h (max. 0.5 mg/h) | | |
| oral | immediate release | 0.2 mg/kg (max. 5 mg) every 4 h | 30 mg | Morphine-Merck® drops 0.5% = 16 dr = 1 ml = 5mg; 2% = 16 dr = 1 ml = 20 mg; MST® pellets s.r. 20 mg, 30 mg, 60 mg, 100 mg, 200 mg |
| | slow release | 0.4 mg/kg (max. 10 mg) every 8 h | | |
| Oxycodone | | | | |
| intravenous/ subcutaneous | Bolus | 0.04 mg/kg (max. 2 mg) every 4 h | 8 mg | Oxygesic® inject. 10 mg = 1 ml; 20 mg = 2 ml |
| | PCA bolus | 0.02 mg/kg (max. 1.3 mg) | | |
| | CI | 0.02 mg/kg/h (max. 0.5 mg/h) | | |
| oral | immediate release | 0.1 mg/kg (max. 5 mg) every 4 h | 15 mg | Oxygesic® acute 5 mg, 10 mg, 20 mg Oxygesic® 5mg, 10 mg, 20 mg, 40 mg, 80 mg Targin® tabl. s.r. 10/5 respect. 20/10 (10 respect. 20 mg oxycodone / 5 mg respect. 10 mg naloxone) |
| | slow release | 0.2 mg/kg (max. 10 mg) every 8 h | | |

Opioids for mild to moderate pain (do not exceed the dose of 10 mg/kg/d or 600 mg/d)

| | | | | |
|------------------------------|-------------------|---------------------------------|--------|---------------------------------------------------------------------------------------------------|
| Tramadol | | | | |
| intravenous/ subcutaneous | Bolus | 1 mg/kg (max. 5= mg) every 4 h | 100 mg | Tramal® 1 ml = 50 mg; 2 ml = 100 mg |
| | PCA bolus | 0.3 mg/kg (max. 10 mg) | | |
| | CI | 3 mg/kg/h (max. 10 mg/h) | | |
| oral | immediate release | 1 mg/kg (max. 50 mg) every 4 h | 150 mg | Tramal® drops, 1 dr. = 2.5 mg; Caps. up to 50 mg Tramal® long 50 mg; 100 mg; 200 mg tabl. s.r. |
| | slow release | 2 mg/kg (max. 100 mg) every 8 h | | |
| Tilidine/Naloxone | | | | |
| oral | immediate release | 1 mg/kg (max. 50 mg) every 4 h | 150 mg | ValoronN® drops; 1 dr. = 2.5 mg Valoron N® s.r. 50/4 mg; 100/8 mg, 150/12 mg, 200/16 mg |
| | slow release | 2 mg/kg (max. 100 mg) every 8 h | | |

For infants < 6 mo of age, infants < 10 kg or children with cerebral damage, the starting dose is one third of the proposed dose. The dose should be titrated against effect. CI - continous infusion (intravenously/ subcutaneously); max. = maximal single starting dose or maximal hourly starting dose in case of continous infusion.

Continous morphine infusion in a child with a body weight of 30 kg

1. Start with a i.v. bolus dose administered over 10 minutes: 30 kg x 0,05 mg. ORDER: "15 minute i.v. short infusion of 1.5 mg morphine"
2. Reassess in 20 minutes. If child is still in pain and not sedated: repeat starting dose every 20 minutes. If child is still in pain but somewhat sedated: give 50% of the starting dose (0.7 mg morphine)
3. After desired pain reduction, start continous morphine infusion: 30 kg x 0,02 mg x 24 h = 15 mg. ORDER: 15 mg morphine ad 48 ml NaCl 0.9%, rate 2ml/h". Order rescue doses for breakthrough pain (50-100% of the hourly infusion dose)
4. Think about non opioids and prophylactic antiemetics and laxatives
5. ORDER: "Assess pain reguarly with faces pain scale and monitor the child with a SaO2-monitor"
6. Order the naloxone dose for an emergency in the patient chart. ORDER: "In severe respiratory depression: stop morphine, give naloxone iv. 0.15 mg; repeat naloxone if necessary"
7. If repeated breakthrough pain occurs or if the child has still continal pain: give the starting dose again and thereafter increase infusion dose by 25%. Continue to provide rescue doses

Oral morphine therapy in a child with a body weight of 30 kg:

1. "By the clock" morphine. Morphine 0.5 mg/kg every 8 hours; MST®-slow release morphine suspension 20 mg dilute in 20 ml water, give 15 ml, drop the rest. ORDER: MST®-slow release morphine suspension 15 mg every 8 h"
2. Rescue morphine for breakthrough pain. 1/6 of the daily morphine dose. Order: "As needed give morphine drops 0.5%, 16 drops = 5 mg up to every 2 h"
3. Order prophylactic antiemetics and laxatives
4. Reevaluate after 24 h

Four strategies to react to side effects of opioid treatment

1. Reduce the opioid dose, if pain is well controlled
2. Add adjuvant drugs such as antiemetics
3. Change route of application
4. Rotate opioid

Conversion factors (empirical)

1. po Morphin 60 mg = Hydromorphone 8 mg; analgesic effectiveness: po Morphine to Hydromorphone = 1 zu 7,5
2. iv Morphin 10 mg = Hydromorphone 2 mg; analgesic effectiveness: iv Morphine to Hydromorphone = 1 zu 5
3. po Morphin 60 mg = Fentanyl TTS (Durogesic®SMAT) 25 µg/h = Buprenorphine TTS (Transtec pro®) 35 µg/h (Durogesic®SMAT available from 12,5 µg/h upwards)

Naloxone

- Naloxone (Narcanti®) 1 Amp. a 0,4 mg to 10 ml NaCl 0,9% => 1:10 => 0,04 mg/ml
- Dose: 0.001 to 0,01 mg/kg iv = 0,025 to 0,25 ml/kg iv
- Buprenorphine-Intoxikation: Naloxone 0,05 mg/kg iv, monitor carefully!
- CAVE:** Time of action Buprenorphine > Naloxone, as a rule; naloxone has to be repeated more than ones, consider continous infusion of naloxone.

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