



Opioid rotation in pediatrics: A conversion chart for children older than 1 year

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What was done

To simplify the process of opioid rotation in pediatrics, an opioid conversion chart with easily memorable conversion factors was generated.

Why it was done

In some patients, it is necessary to change the opioid during therapy, due to tolerance development or due to side effects. Although conversion tables for adults are well established, they are not readily available for pediatric use.

How it was done

1. A literature search was performed to collect conversion factors and equivalent doses of opioids with different application routes. We searched specifically for conversion factors in pediatrics. [a-n]
2. For all conversion factors experts confirmed their adequacy for clinical use in pediatrics.
3. The conversion factors were rounded up to whole numbers, which was considered reasonable based on long-term experience in pediatric pain management.

Why older than 1 year

- Immature metabolism in children under 1 year makes the opioid action often unpredictable. Therefore specialists in pain management should be consulted.
- The use of the chart is for children older than 1 year.

What is next

- Analysis of a possible reduction in critical incidences due to mistakes in calculation
- Survey with (junior) doctors on the use of the table and its benefits and possible ways to improve it for daily use.

What was achieved

- Opioid equivalence factors for children were determined according to literature and clinical experience.
- The equivalence factors are easily memorable and a help for (junior) doctors in clinical decision making.
- Internal guidelines about opioid dosing for children were created (available on www.pediatric-dosage.ch → HCP information).
- Starting doses were set according to www.pediatric-dosages.ch and based on clinical experience.

Ausgangssubstanz ↓	mg/die	Zielsubstanz ↓																Kispi Startdosis bei opioidnaiven Patienten*		
		Fentanyl i.v.	Fentanyl nasal	Fentanyl TTS	Hydromorphon i.v.	Hydromorphon p.o.	Methadon i.v. (Racemat)	Methadon p.o. (Racemat)	Morphin i.v.	Morphin s.c.	Morphin p.o.	Nalbuphin i.v.	Nalbuphin s.c.	Oxycodon i.v.	Oxycodon s.c.	Oxycodon p.o.	Remifentanyl i.v.		Sufentanyl i.v.	Tramadol p.o.
Fentanyl i.v.	mg/die			1 _a				x100 _d	x100 _d	x300								±10		0.5-1.0 mcg/kg/h _a
Fentanyl nasal	mg/die							x60 _c												1-2 mcg/kg/dosis _{c,d}
Fentanyl TTS	mg/die	1 _a						x100 _d	x100 _d	x300 _e										0.5-1.0 mcg/kg/h _a
Hydromorphon** i.v.	mg/die					x3 _a		x5 _d	x5 _d	x20 _b										0.002-0.01 mg/kg/h _c
Hydromorphon** p.o.	mg/die				±3 _a			x1.5 _d	x1.5 _d	x4 _b					x2.5 _b				x13 _b	0.2 mg/kg/die _c (0.03 mg/kg alle 4 h _{d,e})
Methadon [†] i.v. (Racemat)	mg/die						x1.2 _m	X												0.05-0.1 mg/kg alle 8-12 h _b
Methadon [†] p.o. (Racemat)	mg/die						±1.2 _m													0.1 mg/kg alle 4-12 h _n
Morphin [‡] i.v.	mg/die	±100 _d	±60 _c	±100 _d	±5 _d	±1.5 _d	X		1 _{a,e}	x5 _d	x2 _g	x2 _g	1 _i	1 _c	x3 _h	±200 _c	±1000 _e	x10 _a		0.01-0.05 mg/kg/h _b (0.04-0.2 mg/kg al
Morphin s.c.	mg/die	±100 _d		±100 _d	±5 _d	±1.5 _d		1 _{a,e}		x3 _a	x2 _g	x2 _g						x10 _a		0.01-0.05 mg/kg/dosis _c
Morphin p.o.	mg/die	±300		±300 _d	±20 _b	±4 _b		±3 _a	±3 _a		±1.5 _d	±1.5 _d				±1.5 _b		x3 _b		1 mg/kg/die _c
Nalbuphin i.v.	mg/die							±2 _g	±2 _g	x1.5 _d		1 _i								0.02-0.1 mg/kg/h _{a,c}
Nalbuphin s.c.	mg/die							±2 _g	±2 _g	x1.5 _d	1 _i									0.02-0.1 mg/kg/h _{a,c}
Oxycodon i.v.	mg/die							1 _i						1 _e	x2 _i					0.02 mg/kg/h _e 0.05-0.2 mg/kg alle 4-6
Oxycodon s.c.	mg/die							1 _c						1 _e	x2 _i					0.02 mg/kg/h _e 0.05-0.2 mg/kg alle 4-6
Oxycodon ⁺ p.o.	mg/die					±2.5 _b		±3 _h		x1.5 _b			±2 _i	±2 _i				x5 _b		0.5 mg/kg/die _c (0.1 mg/kg/dosis alle 4
Remifentanyl ⁺⁺ i.v.	mg/die							x200 _c												0.1-0.75 mcg/kg/min _{a,c}
Sufentanyl ⁺⁺⁺ i.v.	mg/die	x10 _i						x1000 _e												0.1-2 mcg/kg/min _a
Tramadol p.o.	mg/die					±13 _b		±10 _a	±10 _a	±3 _b										0.5-1 mg/kg alle 4 h _{c,e}

How the chart works

1. Calculate the daily dose of the current opioid [mg/day]
2. Look for the starting substance in the left column
3. Look for the target substance
4. Take the factor below the target substance
5. Multiply/divide the daily dose with the corresponding factor
6. Divide the daily dose into suitable dosing intervals and single doses
7. Further procedure according to internal guidelines

Ausgangssubstanz ↓	mg/die	Methadon i.v. (Racemat)	Morphin i.v. <33 mg/die	Morphin i.v. 33-100 mg/die	Morphin i.v. >100 mg/die
Methadon i.v. (Racemat)	mg/die		x4 _m	x8 _m	x12 _m
Morphin i.v. <33 mg/die		±4 _m			
Morphin i.v. 33-100 mg/die		±8 _m			
Morphin i.v. >100 mg/die		±12 _m			

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Literature

- [a] www.kinderdosierungen.ch
 [b] uptodate: Opioid analgesics for use in children
 [c] Erfahrungswert Kinderspital Zürich
 [d] McGrath et al. Oxford Textbook of Paediatric Pain, 1. Edition, Oxford University Press, Oxford
 [e] Zernikow, Hassan: Schmerztherapie bei lebensbedrohlichen und lebenslimitierenden Erkrankungen. pp 439-479 5. Auflage. Springer, Heidelberg.
 [f] uptodate: Nalbuphine: Pediatric drug information
 [g] Schultz-Machata et al. Nalbuphin in der Kinderanästhesie. S.135-142, Anaesthesist, 2014
 [h] Pereira et al. Equianalgesic Dose Ratios for Opioids: A Critical Review and Proposals for long-term Dosing, Journal of Pain and Symptom Management, Vol 22. Nr. 2 (2001)
 [i] Fachinformation Oxynorm Inject, September 2016
 [k] Heck, Fresenius: Repetitorium Anaesthesiologie, Vorbereitung auf die anästhesiologische Facharztprüfung und das Europäische Diplom für Anästhesiologie, 2001, Springer Verlag
 [l] Fachinformation Sufenta - forte, Juli 2014
 [m] Merkblatt "Opioidrotation auf Methadon", Anästhesieabteilung Kinderspital Zürich, 2017
 [n] uptodate: Methadone: Pediatric drug information