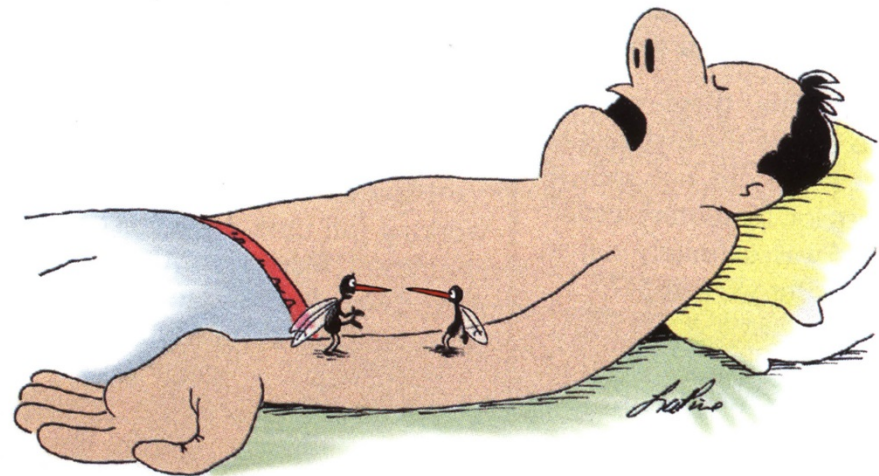


Když nejde zajistit žílu.... Up to date 2017

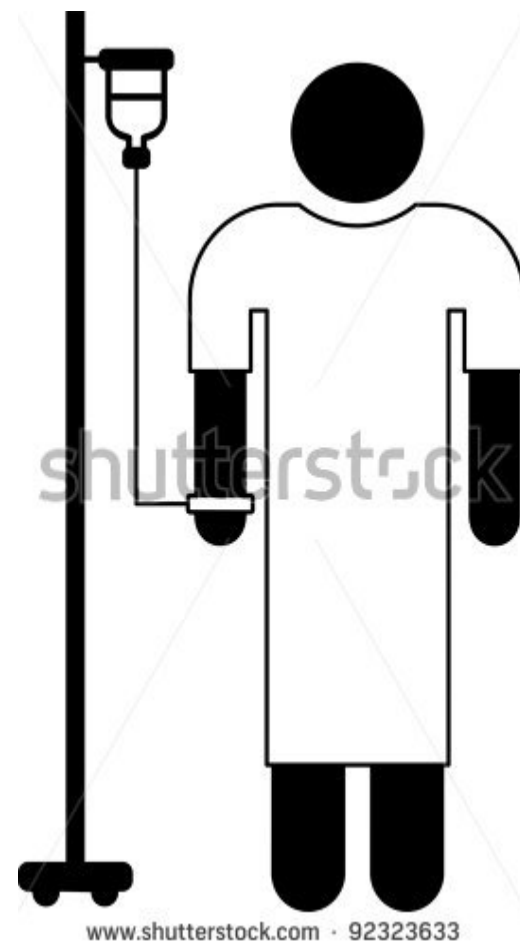
Jana Kubalová
ZZS Jihomoravského kraje
Colours of Sepsis 2017



"Sometimes I can't find a vein,
even when my life depends on it"

Obsah

- Proč i. os?
- Máme se bát komplikací?
- Čím?
- Správné provedení
- Místa zavedení
- i. os. při vědomí
- Novinky



Indikace k i. os. zavedení

Děti i dospělí, v jakékoliv situaci, kdy je nutné co nejrychleji zajistit žilní vstup a selhaly pokusy o punkci periferní žíly

KPR GL:

- Dospělí: 1. alternativa při selhání PIV, 2x pokus
- Děti: pokud se nezdaří PIV do 1 min => IO (GL 2010)
- **Děti zástava oběhu nebo dekomp. šok (adrenalin, tekutiny): i. os = 1. volba!!!**
- Podávání léků ET: nepředvídatelná plazmatická koncentrace, neznámá optimální dávka řady léků pro ET podání
- Od CV vstupu je odrazováno – nutí

Nolan, J.P. et al/ Resuscitation 81 (2010) 1219-1276
C.D. Deakin et al./ Resuscitation 81 (2010) 1305 – 1352
D.Biarent et al./ Resuscitation 81 (2010) 1364 – 1388



European Resuscitation Council Guidelines for Resuscitation 2015
Section 6. Paediatric life support

Ian K. Maconochie^{a,*}, Robert Bingham^b, Christoph Eich^c, Jesús López-Herce^d,
Antonio Rodríguez-Núñez^e, Thomas Rajka^f, Patrick Van de Voorde^g, David A. Zideman^h,
Dominique Biarentⁱ, on behalf of the Paediatric life support section Collaborators¹



IO vs. CVK

Patient Safety in Surgery

Research

Is the intraosseous access route fast and efficacious compared to conventional central venous catheterization in adult emergency resuscitation in the emergency department? An observational pilot study

Bernd A Leidel^{*1,3}, Chlodwig Kirchhoff², Viktoria Bognor², Wolf Mutschler², Karl-Georg Kanz² and Volker Braunstein¹

Address: ¹Department of Emergency Medicine, Charité - University Medicine Berlin, Campus Benjamin Franklin, Germany, ²Department of Trauma, University Medical Centre of Munich, Downtown, Nussbaumstr. 47, 80336 Munich, Germany, ³Helicopter Emergency Medical Service Christoph 31, ADAC Luftrettung air rescue services, Charité - University Medicine Berlin, Hindenburgdamm 30, 12203 Berlin, Germany

Results: Ten consecutive adult patients under resuscitation, each receiving IO access and CVC, were analyzed. IO access was performed with 10 tibial or humeral insertions, CVC in 10 internal jugular or subclavian veins. The success rate on first attempt was 90% for IO insertion versus 60% for CVC. Mean procedure time was significantly lower for IO cannulation ($2.3 \text{ min} \pm 0.8$) compared to CVC ($9.9 \text{ min} \pm 3.7$) ($p < 0.001$). As for complications, failure of IO access was observed in one patient, while two complications, like

Conclusion: Preliminary data demonstrate that IO access is a reliable bridging method to gain vascular access for in-hospital adult emergency patients under trauma or medical resuscitation with impossible peripheral IV access. Furthermore, IO cannulation requires significantly less time to enable administration of drugs or infusion solutions compared to CVC. Because CVC was slower and less efficacious, IO access may improve the safety of adult patients under resuscitation in the emergency department.

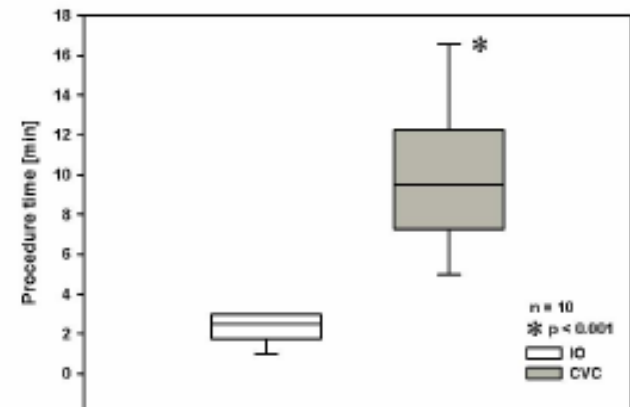


Figure 3
Procedure time of Intraosseous (IO) cannulation was significantly shorter than central venous catheterization (CVC) for vascular access to enable drug and fluid administration in adult emergency patients under resuscitation.

IO vs. CVK

Dolister M et al, Intraosseous vascular access is safe, effective and costs less than central venous catheters for patients in the hospital setting, J Vasc Access 2013; 14(3): 216 – 224

„Results:

- 105 cases, six centers
- 94% of placements were successful on the first attempt
- mean time to IO access was 103.6±96.2 seconds
- one serious complication – a lower extremity compartment syndrome
- IO access costs \$100/patient.

Conclusions:

- IO catheter placement than reported for CVCs, few complications and high user satisfaction
- if 20% of the 3.5 million CVCs placed annually were replaced with IO catheters, cost savings could approach \$650 million/year“

Průtok kanylou

- Hagen-Poiseuilleův zákon: $Q = \pi r^4 \cdot \Delta P / 8 \mu l$

- Q = průtok
- r = poloměr kanyly
- ΔP = tlakový gradient mezi začátkem a koncem
- M = viskozita podávaného roztoku
- l = délka kanyly

⇒ průtok závisí přímo úměrně na čtvrté mocnině poloměru

⇒ průtok krátkou kanylou zavedenou do PŽ ($l=4,5\text{cm}$) bude min. 3x↑ než průtok katétrem téhož kalibru zavedeném do CŽ ($l=15 - 20\text{cm}$)

⇒ video



MC-001297 Proximal Humerus Subclavian Vein Dissected and Flush (Cadaveri....mov)

Hot topic on Colours of sepsis



10:45 - 11:45 Panelová diskuze - Těžká sepe

V panelové diskuzi jsme se věnovali problematickým kapitolám léčby sepse. Dozvěděli jsme se, že kapilární návrat, jedno z nejjednodušších klinických vyšetření, má stále své místo jako ukazatel stavu perfúze. Živě se diskutovalo též nad zajištěním vstupu. V podstatě se shodli s mezinárodními GL, které tvrdí, že v případě, kdy nelze zajistit periferní žílu do 2 minut, máme preferovat intraosseální přístup.

Komplikace

Závažné komplikace IO:
osteomyelitis, fraktura, infekce,
extravazace, kompartment
syndrom a poranění růstové
ploténky

Studie:

- **Dospělí – (2004-2009) < 0,004%**
- **Děti – osteomyelitis < 0,6% (4200 pacientů, komplikace = bakteriémie v době vpichu, prodloužená doba inserce)**
- **Na histopat. změny ve dřeni po IO inf. nemá vliv ani rychlost ani osmolalita (u prasat)**
- **Pozor na inf. > 2 hod (chemoter., cytotox., hyperosmol. léky)**



Manufacture's database, VidaCare Corporation

Davidoff J, Fowler R, Gordon D, et al. Clinical evaluation of a novel intraosseous device for adults. JEMS 2005; suppl: 20-23

Rossetti, VA, Thompson, BM, Miller, J et al. Intraosseus infusion: an alternative route of pediatric access. Ann Emerg Med 1985; 14:885-8

Brickman KR, Rega P, Schoolfield L, Harkins K, Weisbrode SE, Reynolds G: Investigation of bone developmental and histopathologic changes from intraosseous infusion. Ann Emerg Med October 1996;28:430-435

Complication with Intraosseous Access: Scandinavian Users' Experience

Peter Hallas, MD,* [Mikkel Brabrand](#), MD,[†] and [Lars Folkestad](#), MD[‡]

Complication with Intraosseous Access

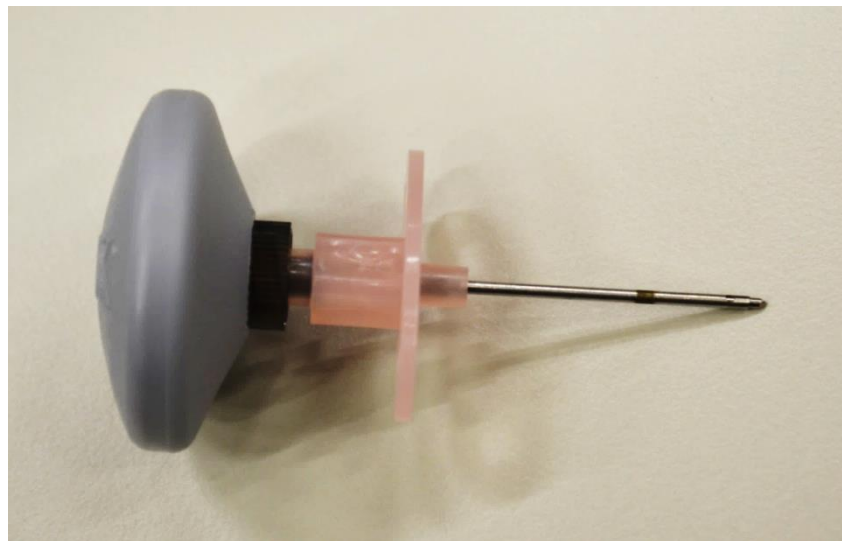
Hallas et al

Table. Complication rate with intraosseous access (IO) reported by Scandinavian users - listed by device.

IO-equipment used	All	%	EZ-IO	B.I.G	Cook	Others	p-value*
Cases reported	1,802	100.0	861	255	418	268	
Start complications							
Equipment difficult to assemble	36	2.0	4	21	5	6	< 0.0001
Difficult to identify correct anatomical site	57	3.2	28	17	5	7	0.0013
Bended or broken needle	72	4.0	11	17	20	24	< 0.0001
Patient discomfort / pain	128	7.1	73	13	20	22	0.0663
Difficult to penetrate the periosteum	186	10.3	18	56	51	61	< 0.0001
Difficult to aspirate bone marrow	221	12.3	92	51	38	40	< 0.0001
Complications in use							
Difficult to inject fluid and drugs	133	7.4	59	33	27	14	0.0026
Slow infusion despite use of pressure bag	159	8.8	77	32	34	16	0.0610
Displacement after insertion	153	8.5	47	50	38	18	< 0.0001
Extravasation	66	3.7	25	12	17	12	0.4089
Late complications							
Compartment syndrome	10	0.6	6	1	1	2	0.796
Osteomyelitis	7	0.4	4	1	1	1	1.000
Skin infection	6	0.3	4	1	1	0	0.829

Manuální

- Více typů, Dieckmann™ (Cook Critical Care)



- Nutný nácvik a zkušenosti
- Obtížné užití, nutná síla k zavedení
- Často opomínány při užití pro psychologickou bariéru personálu
- Bezpečné, dostupné řadu let, lze řídit hloubku zavedení během výkonu
- Většinou využívány v pediatrii (měkkí kost)

Semi-automatické

B.I.G.™ 15G, 18G - WeisMed Ltd.

NIO™ – PerSys Medical

- Jednoduchá aplikace, do 17s vč. přípravy a inserce
- Nutné pečlivé vyhledání místa inserce a stabilizace končetiny
- Hloubka inserce se musí přednastavit předem dle věku a místa vpichu, po vystřelení již nelze upravit



Semi-automatické Arrow EZ-IO™ - EZ (Easy) IO (IntraOsseal) access



- Snadné použití a kontrola hloubky zavedení
- Příprava místa a zavedení 6 – 10 s
- Vysoké procento úspěšnosti 97% a minimální riziko komplikací

Efficacy and safety of the EZ-IO™ intraosseous device: Out-of-hospital implementation of a management algorithm for difficult vascular access^{☆,☆☆}

Nicolas Gazin^a, Harold Auger^a, Patricia Jabre^{a,b,c}, Christine Jaulin^a, Eric Lecarpentier^a, Catherine Bertrand^a, Alain Margenet^a, Xavier Combes^{a,*}

Co si vybrat?



Olaussen A, Williams B., Intraosseous access in the prehospital setting: literature review. Prehosp Disaster Med. 2012 Oct;27(5):468-72. doi: 10.1017/S1049023X12001124. Epub 2012 Aug 9. (2100 => 20)

- „**IO**...a safe and simple method for gaining access to the patients' vascular system
-**semiautomatic devices** offers better and faster intraosseous access compared with the use of manual devices and also were associated with fewer complications
-**semiautomatic devices** can reduce insertion times and the number of insertion attempts when contrasted with the use of manual insertion techniques“.

Weiser G et al, Current advances in intraosseous infusion - a systematic review, Resuscitation, 2012 Jan;83(1):20-6. doi: 10.1016/j.resuscitation.2011.07.020. Epub 2011 Aug 24. (179 => 10)

- „**CONCLUSIONS:** studies suggested a superiority of the battery-powered IO driver over manual needles, and other semi-autonomous IO devices“

RESUSCITATION

OFFICIAL JOURNAL OF THE
EUROPEAN RESUSCITATION COUNCIL



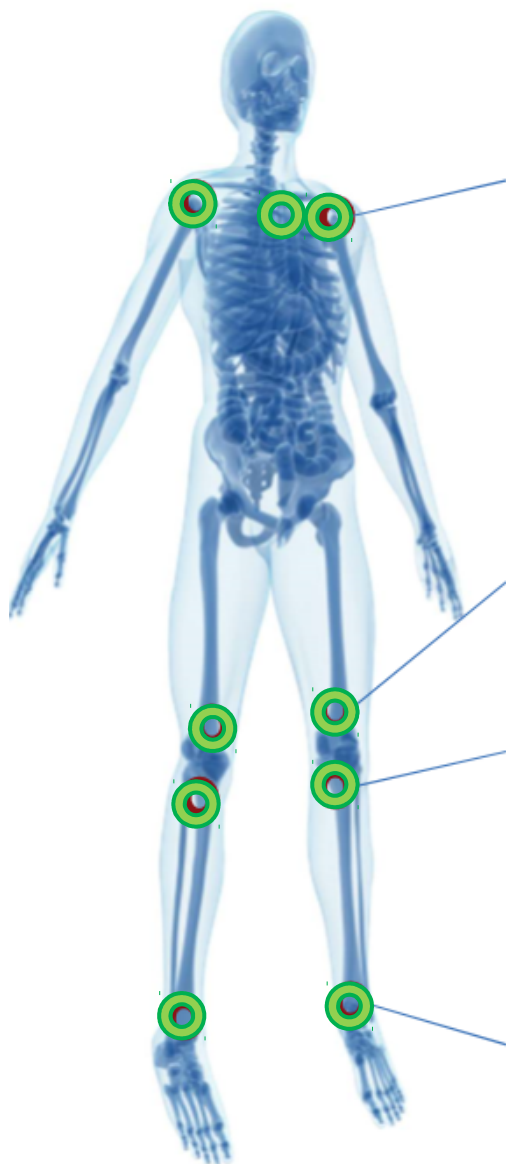
Správné provedení



1. VYHLEDAT MÍSTO VPICHU



- Dle situace
- Dle věku
- Dle dostupného zařízení
- EZ-IO zvolit správnou délku jehly



4 Sites, 8 Targets

Proximal Humerus

Preferred site for adults
Optimal site for high flow and quick drug uptake
Awake, responsive patients
Less painful

Distal Femur

Best under 12 years

Proximal Tibia

Unresponsive
Unfamiliarity with other sites
Unable to landmark other sites

Distal Tibia

Larger patient
Unable to access other sites

Místa zavedení

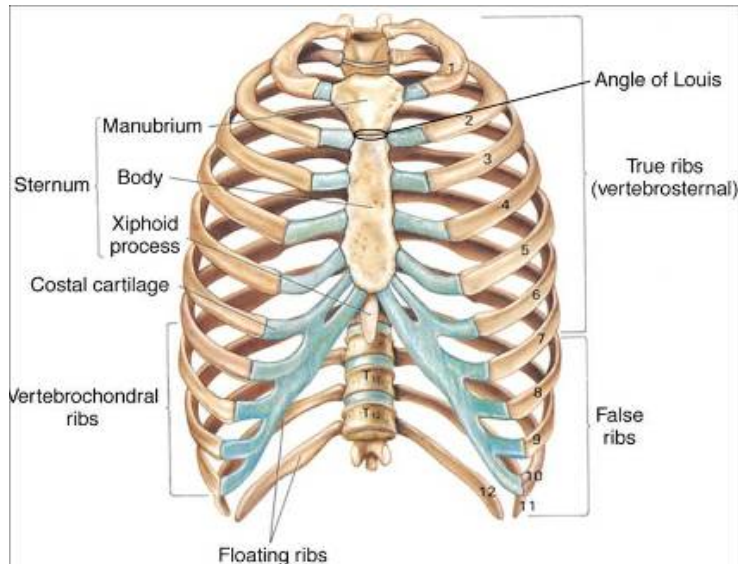
Site selection

Dependent upon:

- No previous IO in 48 hours
- Absence of contraindications
- Accessibility
- Ability to secure & monitor

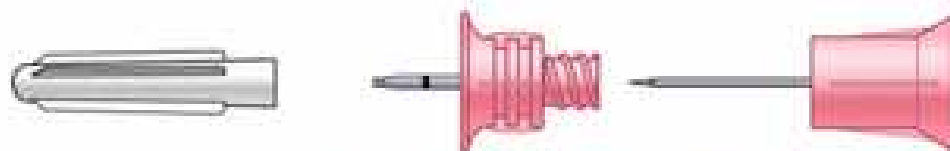
FAST 1™- Pyng Medical First Access for Shock and Trauma

Sternum?



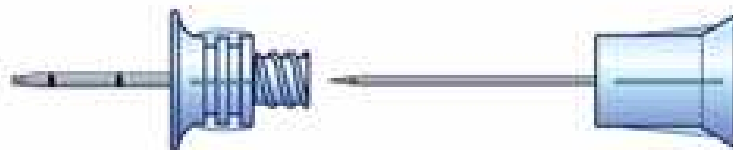
FAST Responder - Pyng Medical
<https://www.youtube.com/watch?v=FG6aO1sj3Ow>

EZ-IO - použití v jakémkoliv věku a konstituci pacienta, podmínka: možnost najít místo vpichu



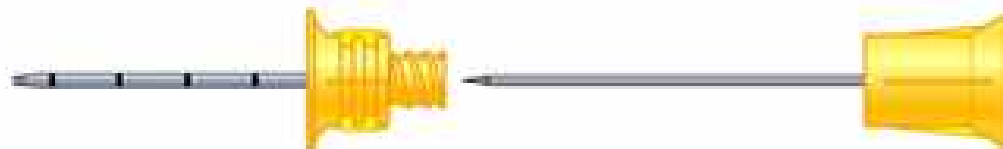
EZ-IO PD 15 mm Needle Set

Krátká 1,5 cm,
převážně děti,
orient. do 39kg



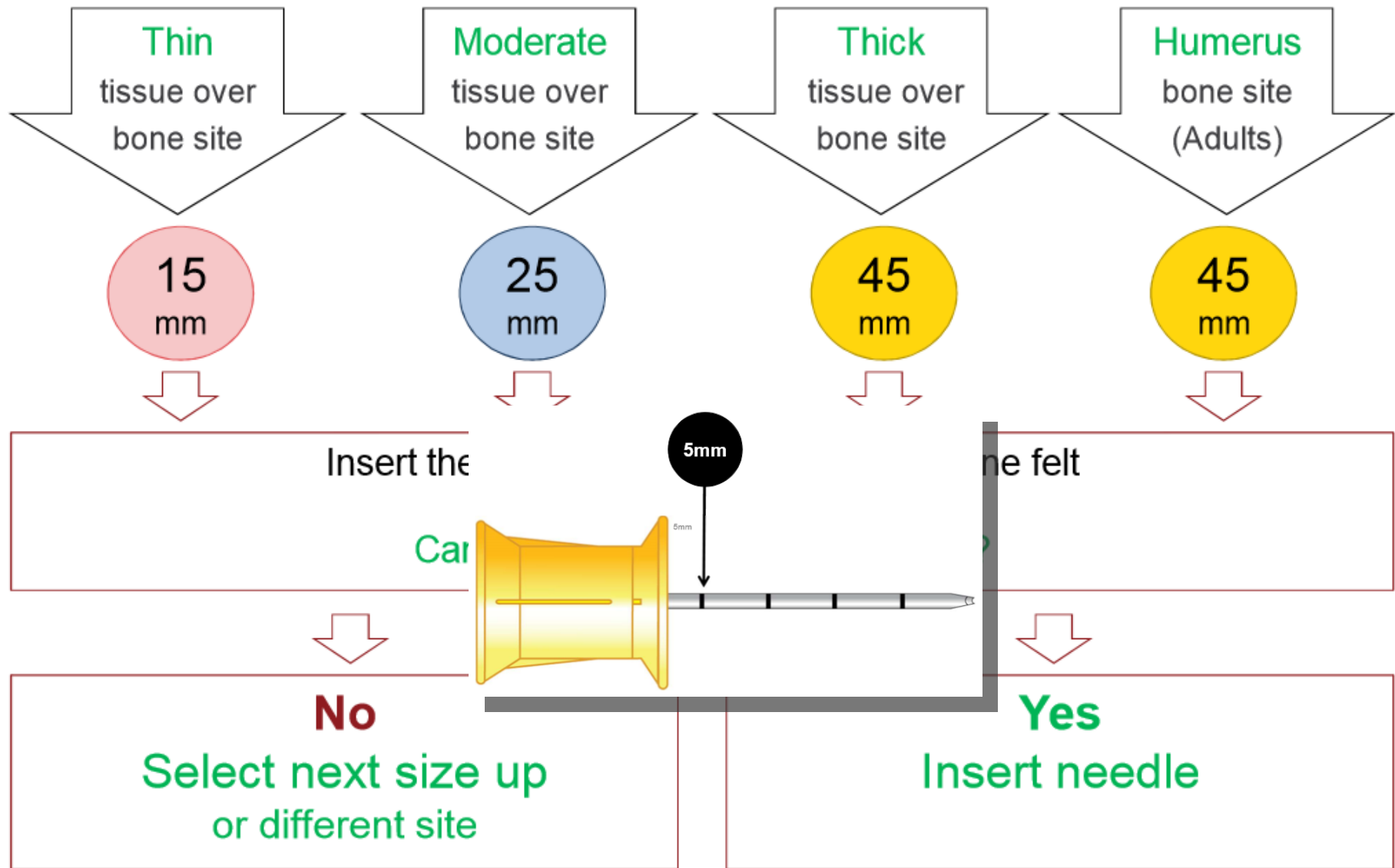
EZ-IO AD 25 mm Needle Set

Střední – 2,5 cm,
nad 3 kg



EZ-IO LD 45 mm Needle Set

Dlouhá – 4,5 cm,
obézní pacienti,
humerus



2. PŘÍPRAVA MÍSTA VPICHU

- Dezinfekce
- Asepsa





3. PROPÍCHNOUT KŮŽI



4. VRTAT (frézovat)...





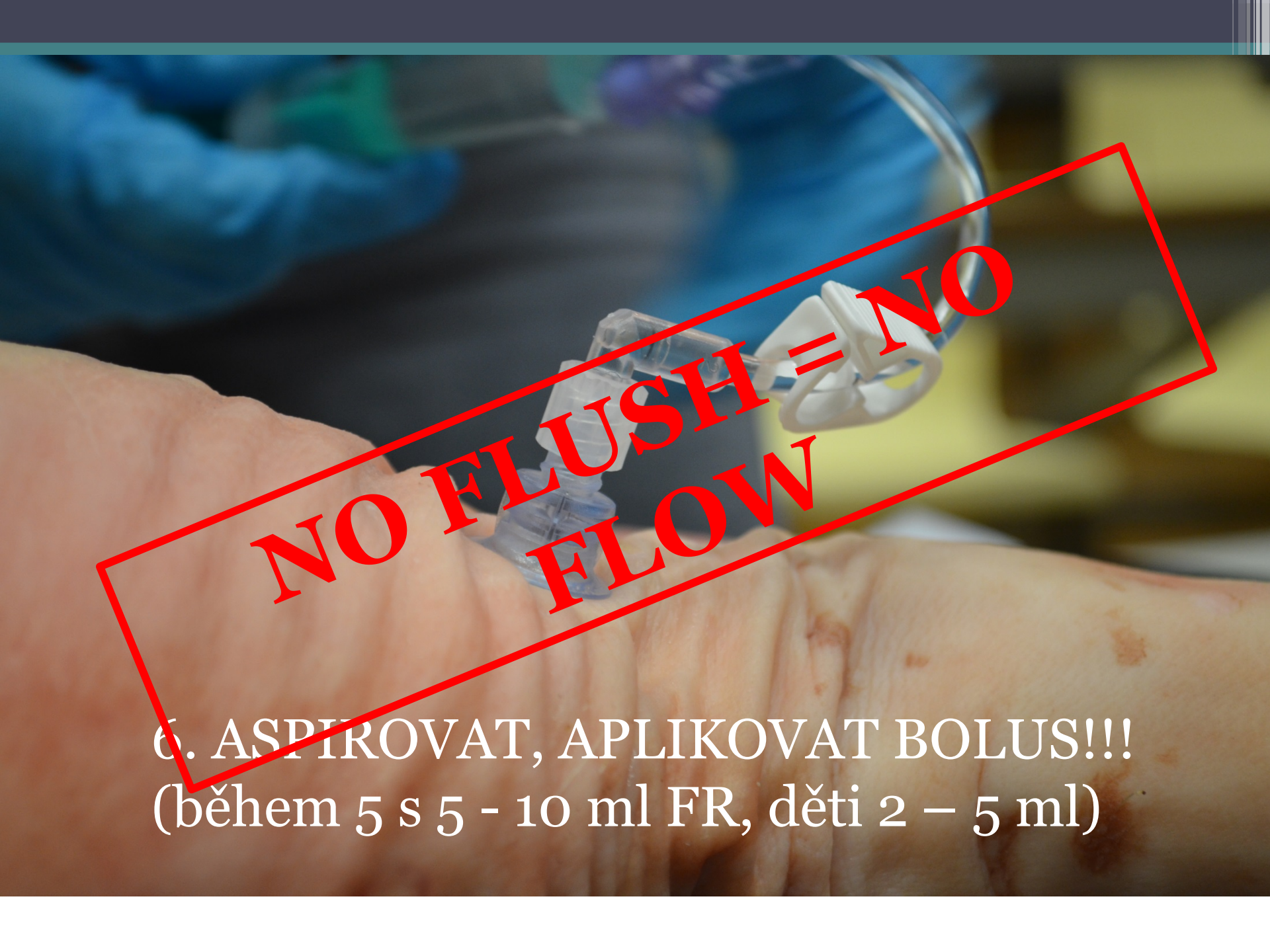
..... DO ZTRÁTY ODPORU



5. ROZŠROUBOVAT



6. VYTÁHNOUT ZAVÁDĚCÍ JEHLU



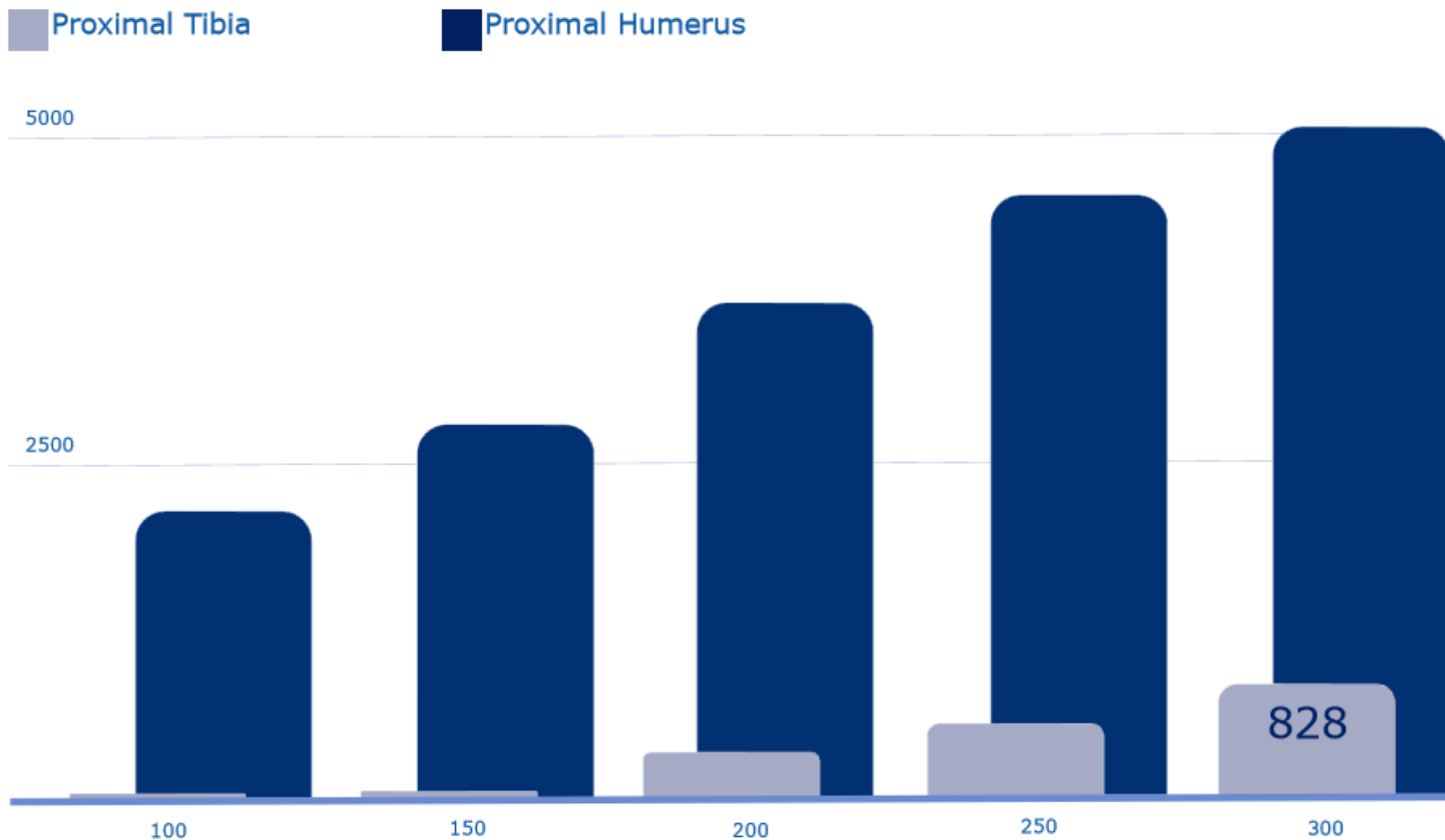
**NO FLUSH = NO
FLOW**

6. ASPIROVAT, APLIKOVAT BOLUS!!!
(během 5 s 5 - 10 ml FR, děti 2 – 5 ml)



7. FIXOVAT, APLIKOVAT INFÚZI
PŘETLAKEM (300 mmHg)

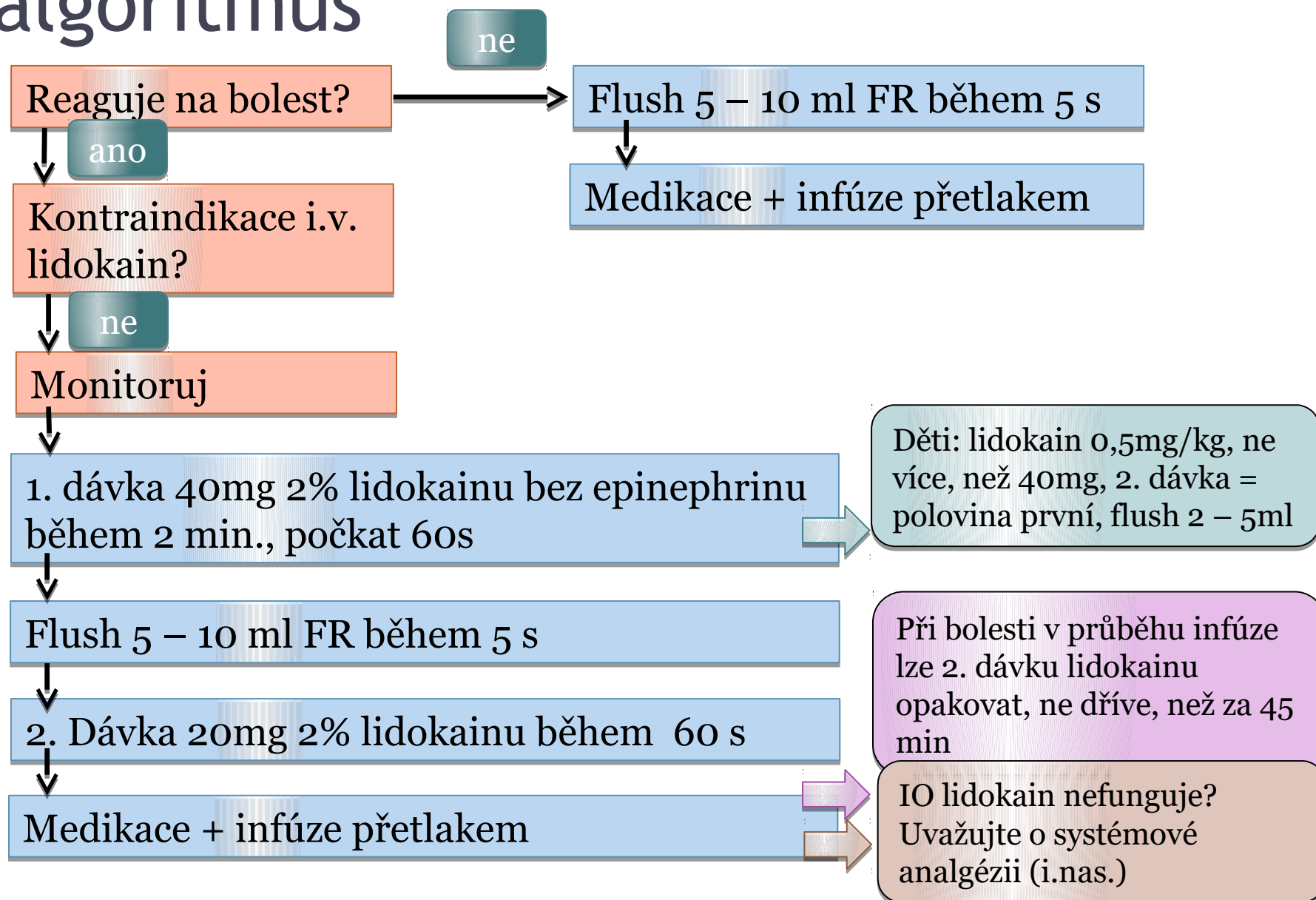
Průtok v závislosti na přetlaku



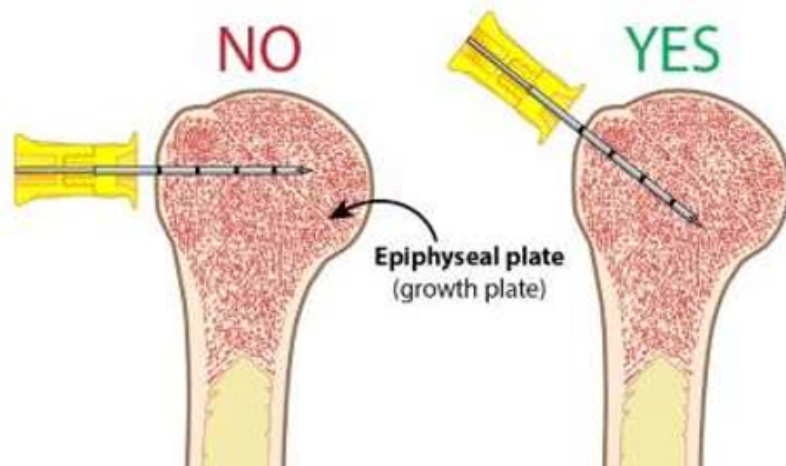
Pacient při vědomí

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study Weaknesses
Philbeck et al, 2009, USA	10 volunteers, Proximal humerus , 20 mg lidocaine, 10 ml saline flush followed by further 40 mg lidocaine	Open-label trial	Pain on IO insertion Pain during infusion	Mean 3.9 (± 1.5) Mean 2.0 (± 1.2) after 20 mg initial bolus; no pain after 40 mg initial bolus	Conference abstract only; small numbers; healthy volunteers; sponsored by device manufacturer
Philbeck et al, 2010 USA	1. 10 healthy volunteers left prox. tibia , 40 mg => flush => 20 mg 2% lidocaine. 2. right prox. tibia 80 mg => flush => 20 mg 2% lidocaine. 3. 6 volunteers proximal right humerus 40 mg => flush => 20 mg 2% lidocaine.	Open-label trial	Mean pain during IO insertion Mean pain score during initial flush Peak pain during infusion	Tibia left: 4.4 (± 2.6) Tibia right 3.6 (± 2.3) Humerus: 3.0 (± 1.5) Tibia left: 6.8 (± 2.9) Tibia right 7.9 (± 2.8) Humerus: 4.6 (± 2.9) Tibia: 2.9 Humerus: 1.4	Healthy volunteers; 5 took part in both parts, so may have become 'habituated' to IO access. 1 new volunteer to part 2 withdrew after IO insertion because of excess pain; sponsored by manufacturer

algoritmus



Proximální humerus

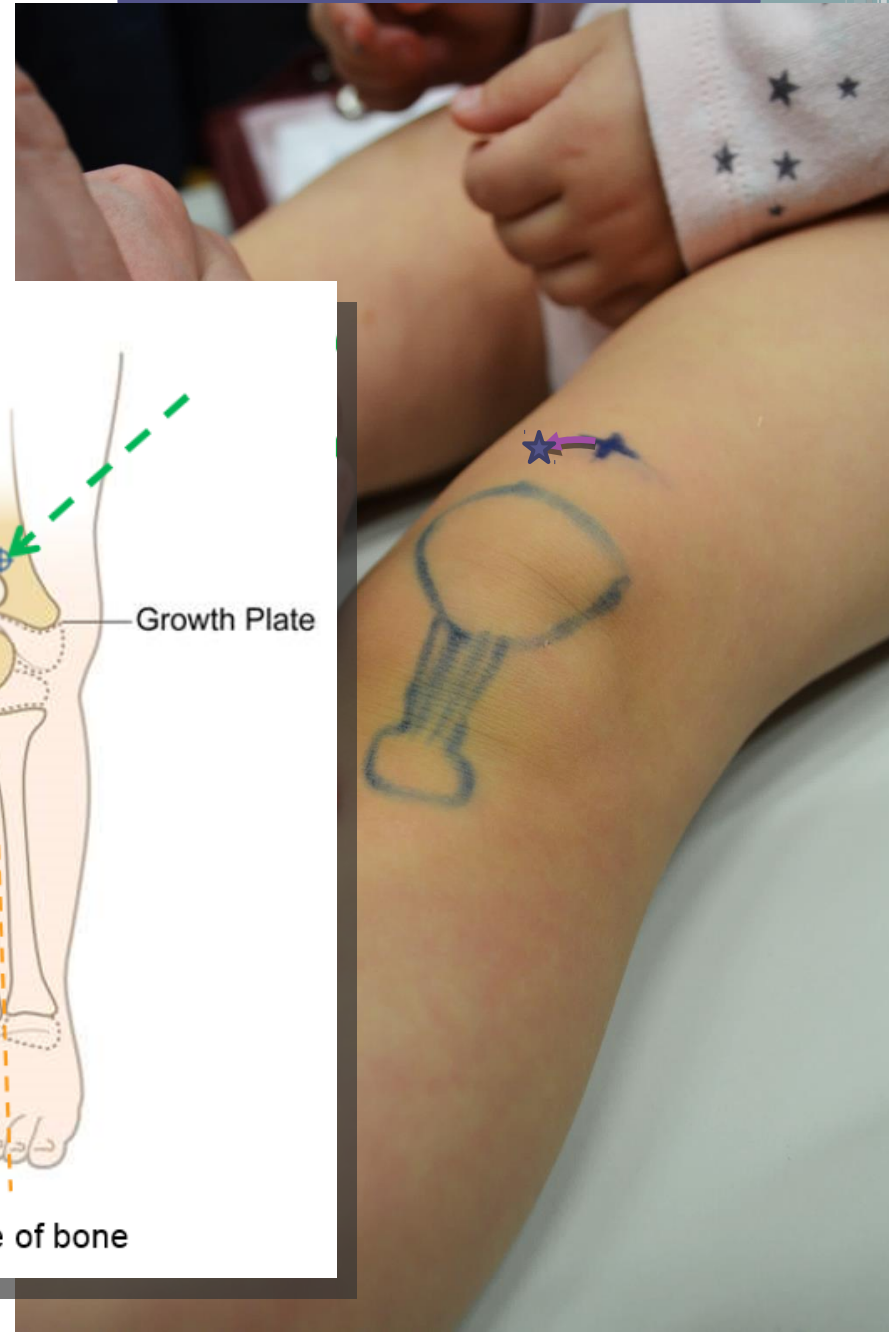
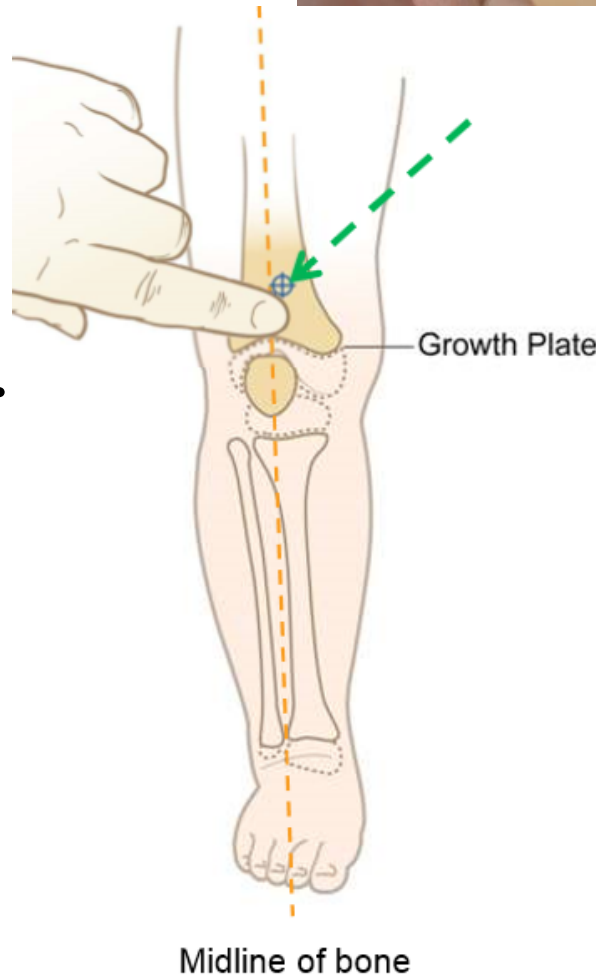


- Stabilizovat jehlu
- Stabilizovat končetinu

EZ-IO[®]

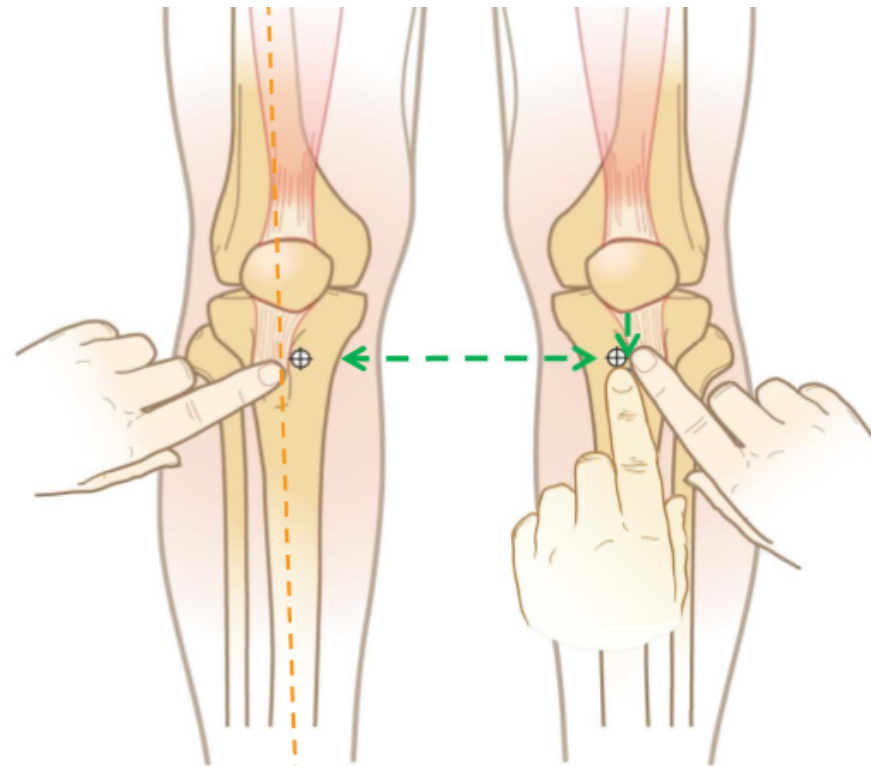
Distální femur

- Do 12 let věku
- Jeden prst nad koleno, vycentrovat med. ne přes šlachu
- Jehla 2,5 cm



Proximální tibie > 40 kg

2 cm medial to
Tuberosity



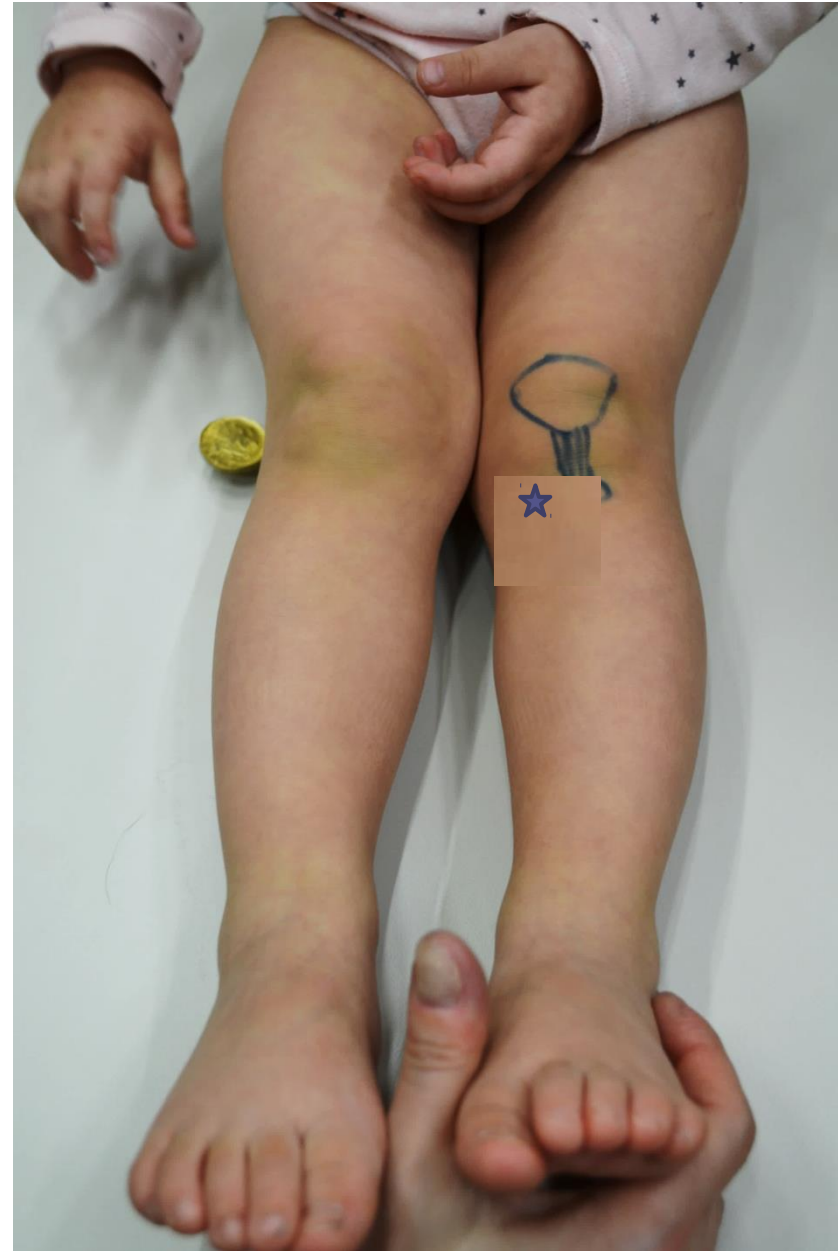
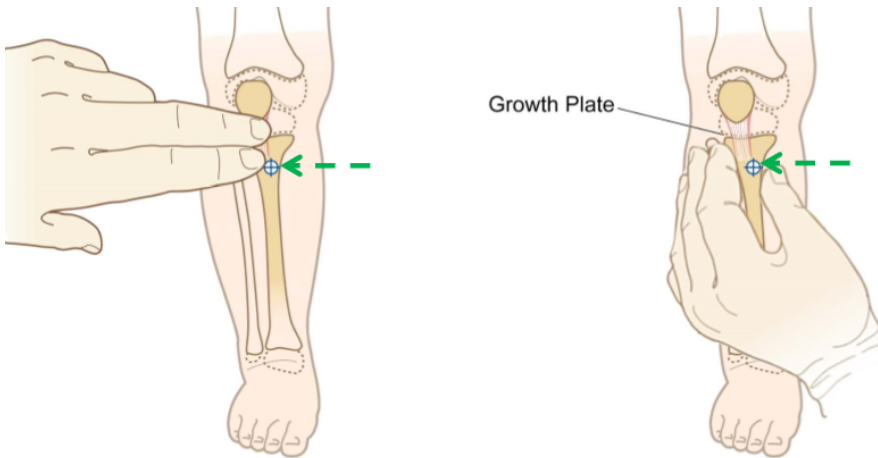
3 cm from
base of patella

Actual insertion
sites located

Anterior (front) view
(Fingers on tibial tuberosities)

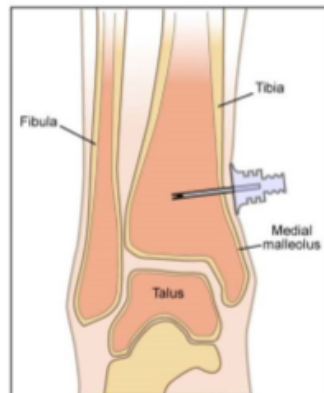
Proximální tibie

- Děti < 39 kg
- Vyhmatat tuberositas tibie + 1 cm mediálně
- 2 prsty pod patelu + 1 cm mediálně
- Vhodné vyhmatat mediální hranu tibie



Distální tibie

DOSPĚLÍ:



3 cm proximal to the most prominent aspect of the medial malleolus

Midline of the bone

DĚTI:



1-2 cm proximal to the most prominent aspect of the medial malleolus

IO v praxi - statistika ZZS JmK

- Růžová:
 - 2014: 17
 - 2015: 17
 - 2016: 15
- Modrá:
 - 2014: 101
 - 2015: 85
 - 2016: 69
- Žlutá:
 - 2014: 38
 - 2015: 37
 - 2016: 39



Vychytávky



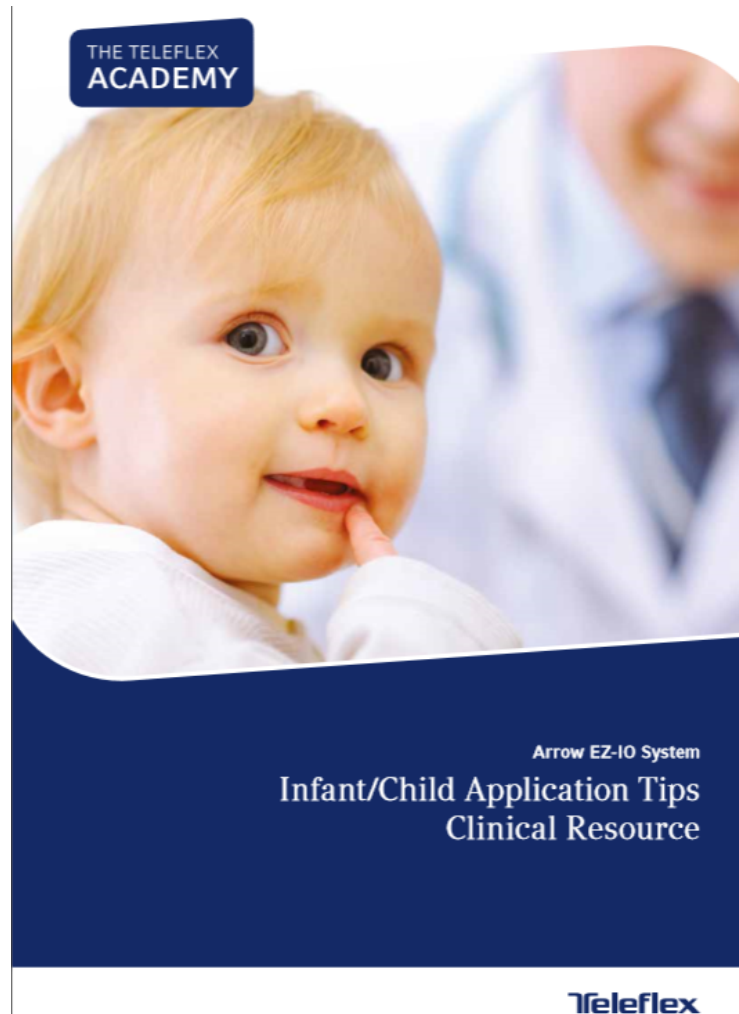
Arrow EZ-IO®

By Ideawire, inc.

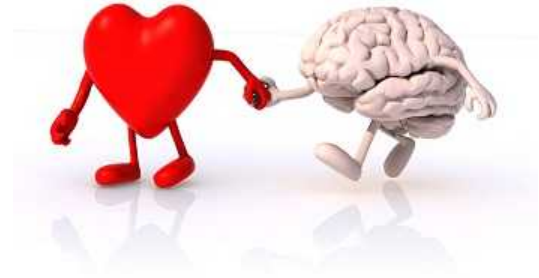
Open iTunes to buy and download



[View in iTunes](#)



Děkuji za pozornost



Těšíme se na vás v praktické části....

