

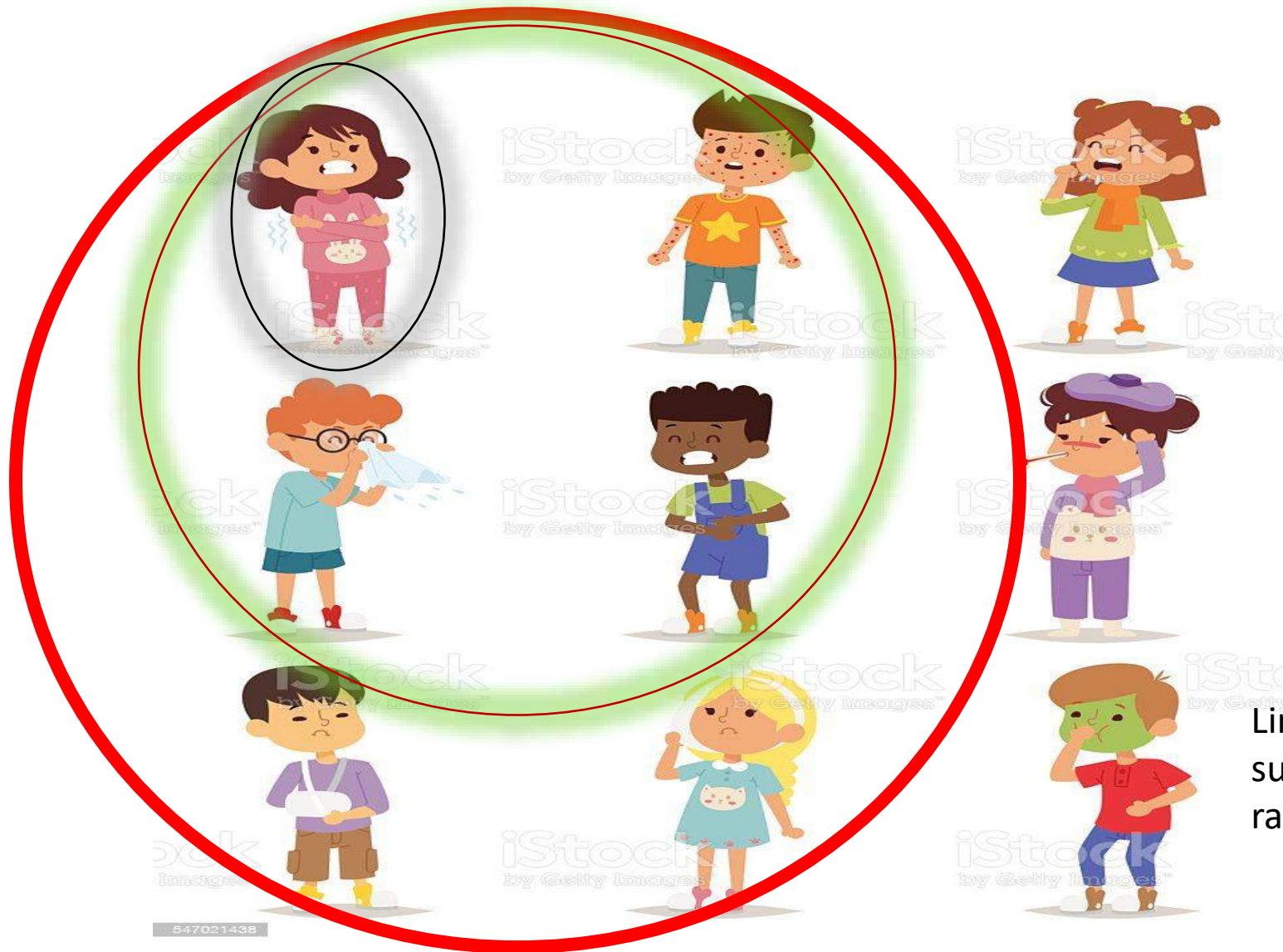


Ultrasound-guided insertion of long peripheral cannula in children with DIVA

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Intravenous catheter insertion - Success rate



More than 50 % of PIV are inserted on the more than 1-st attempt, and more than 9 % are inserted on more than 4-th attempt

Linger R. Pediatric peripheral I.V. insertion success rates. *Pediatr Nurs.* 2003; 29:351-4.

Pediatric DIVA - difficult intravascular access

- Children that require more than 2 attempts to secure IV access
- There is a need for other than a standard technique for IV access securing (US, NIR, transillumination ...)



Rauch et al., 2009

Predisposing factors for DIVA

- *Patient – f.e. age, nutrition, prematurity, non-cooperation, previous cannulations*
- *The severity of illness or injury – f.e. dehydration, burn, sepsis*
- *Inserting doctor, nurse - personal experience with PIV insertion, individual skills, experience with others than landmark techniques (US, NIR, transillumination)*



Do we have a scoring system for DIVA in children?

Yes, we do!

DIVA scale system by Yen et al.

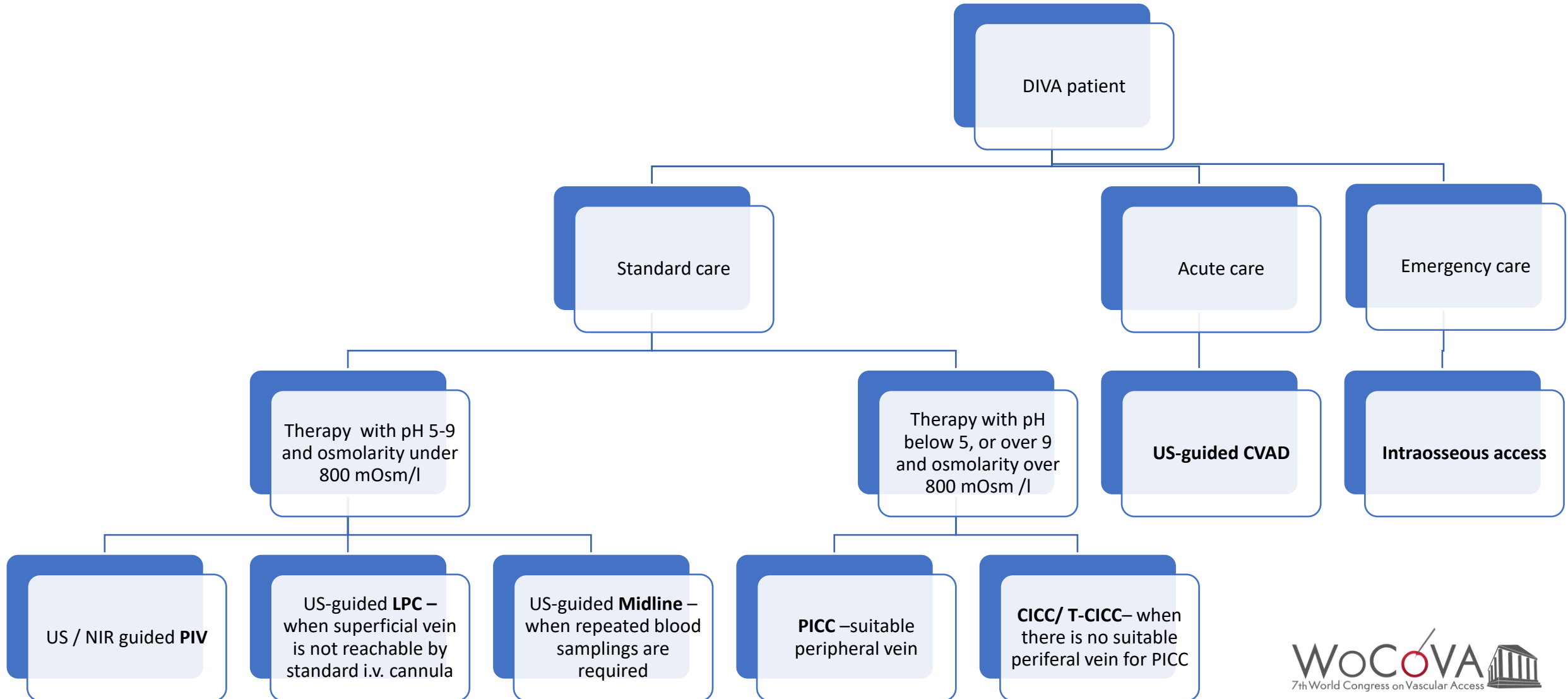
vein not visible		2 pp
vein not palpable		2 pp
Age	prematurity	3 pp
	younger than 1 year	3 pp
	1-2 years	1 p

DIVA score of **4** or more is more than 50 % likely to be failed intravenous placement on the first attempt.



Yen K, Riegert A, Gorelick MH. Derivation of the DIVA score: a clinical prediction rule for the identification of children with difficult intravenous access. *Pediatr Emerg Care*. 2008 Mar;24(3):143-7. doi: 10.1097/PEC.0b013e3181666f32. PMID: 18347490.

What we can do ?



LPC – long periferal cannula

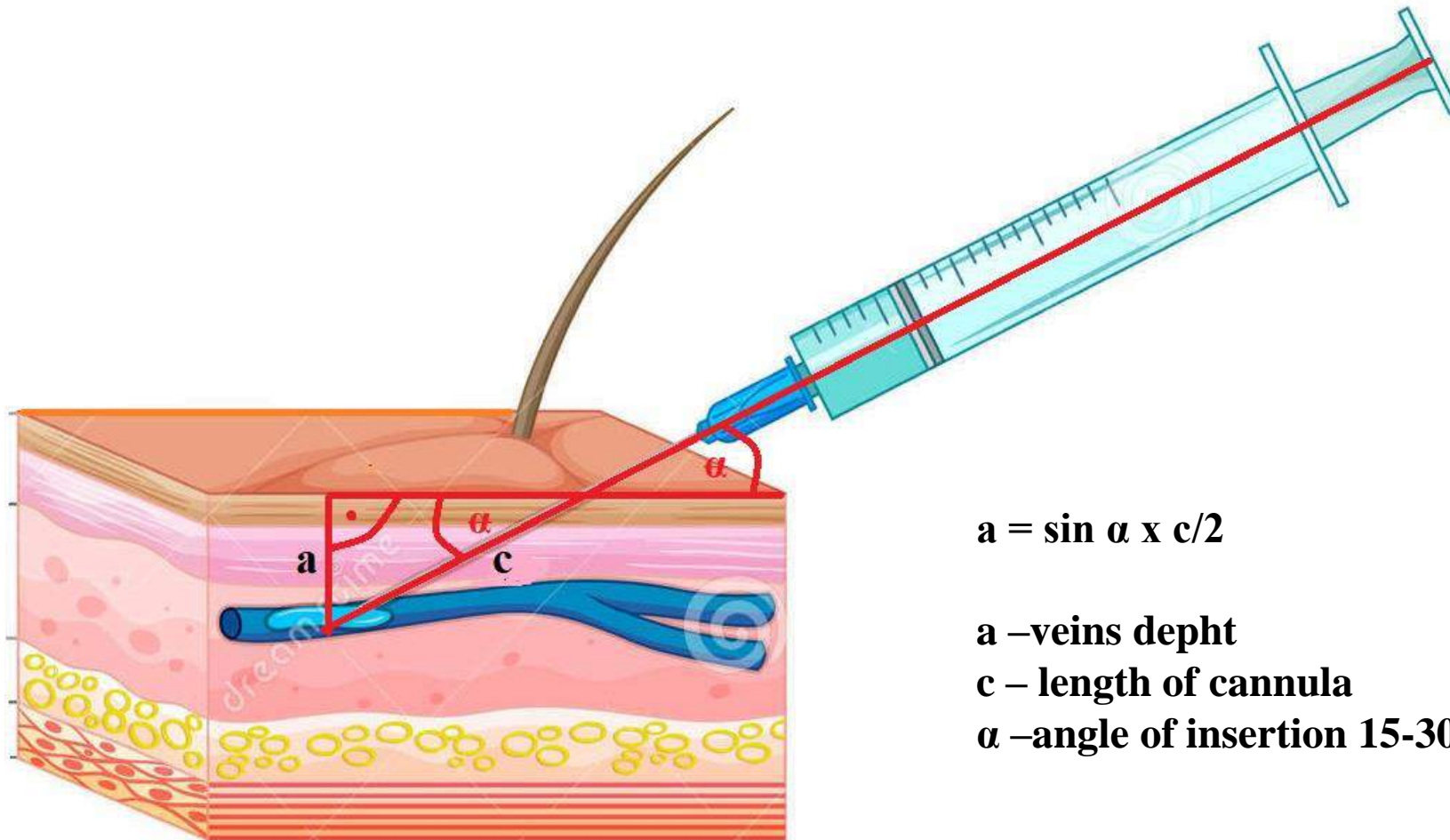


LPC for pediatric DIVA

- 3,2 to 15 cm long cannula, mostly polyurethane
- Designed as a standard peripheral cannula – when it's inserted, we can't differentiate if it is SPC or LPC (body and hub look the same)
- The therapy options are the same as a standard peripheral cannula - "**Good peripheral approach**".
- We can insert it by the landmark techniques, but US-guided insertion is recommended (significantly increases the success of insertion) alternative - near infrared technique
- It can be in place within 4 weeks
- veins of the forearm and the deep venous system of the arm are cannulated, less often we use the peripheral veins of the lower limb



Dependence of PIV insertion angle and veins depth



$$a = \sin \alpha \times c/2$$

a –veins depth

c – length of cannula

α –angle of insertion 15-30°

Dependence of PIV insertion angle and veins depth with SPC

Cannula size	26 G	24 G	22 G	20 G	18 G	16 G
Max depth of vein on insertion angle 15 ° in mm	2,5	2,5	3,2	4,1	5,8	6,4
Max depth of vein on insertion angle 30° in mm	4,7	4,7	6,25	8	11,2	12,5

$$a = \sin \alpha \times c/2$$

a – veins depth

α - angle of insertion

c – cannula length

V.cephalica a V.basilica in a toddler



What is the advantage of using LPC in pediatric DIVA ?

- Patients with **DIVA** admitted to the hospital often require **therapy suitable for** administration into a **peripheral vein** (ph 5-9, and osmolarity less than 800 mOsm/l)
- In many pediatric patients is also indicated **treatment for more than 7 days**, and because recommended maximal dwell time for LPC is up to 28 days, it would cover the need for vascular access **during the entire hospitalization**

What is the advantage of using LPC in pediatric DIVA ?

- Most common in obese patients, or in patients with veins that are not visible or palpable (Yen's DIVA score 4 or more)
- The LPC enables the cannulation of deeper veins compared to the standard cannula, when there is a rule that at least 50 % of the cannula length should be inserted into the vessel

Standard cannula	Possible depth of vein when the angle of insertion is between 15-30°	Long peripheral cannula	Possible depth of vein when angle of insertion is between 15-30°
Yellow 24 G	2,5 – 4,5 mm	Yellow 24 G	4 – 8 mm
Blue 22 G	3 - 6 mm	Blue 22 G	8 -16 mm
Pink 20 G	4 - 8 mm	Pink 20 G	8 -16 mm
Green 18 G	6 – 11 mm	Green 18 G	8 -16 mm

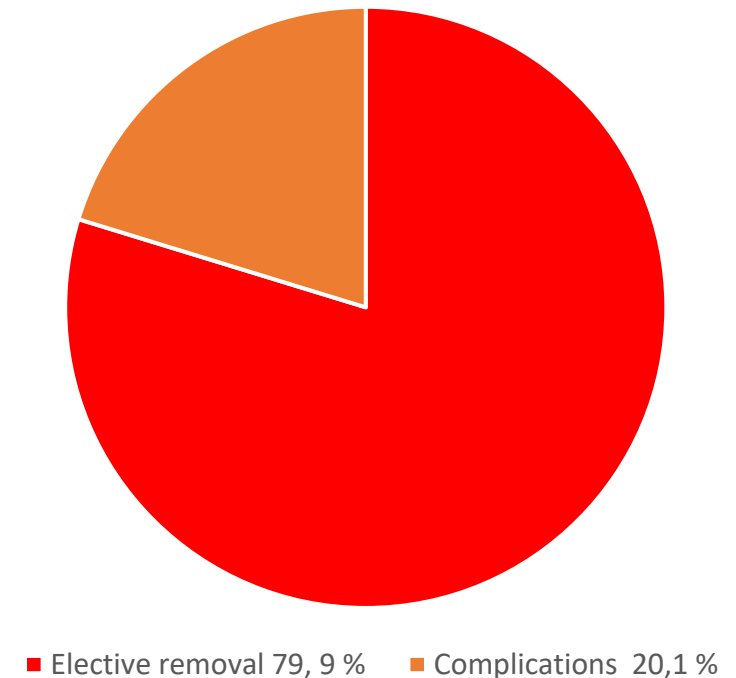
Our group

- September 2020 – september 2021 **43** patients
- Indications – more than 2 attempts to secure PIV, or previously known DIVA patient
- For all LPC insertion we used US-guided technique
- Most frequent diagnosis: Neurological disorders (CP, Epilepsy) 7 (16 %)
 - Surgical conditions (Acute abdomen) 6 (14 %)
 - Cystic fibrosis 5 (11 %)
- Age : 4 months – 18 years (average 6,3 years)
 - younger than 2 years - 15 children (35 %)
 - younger than 1 year - 8 children (18 %)

Our group - results

- Dwell time ranged between 1- 30 days (392 catheter days - average 9,11 days)
- Reason for extraction was in 34 cases **Elective removal** (79,9 % - 350 catheter days – average - 10,3 days)
- ***Complications*** (malfunction, dislodgement, catheter occlusion) occurring in 9 cases - 20,1 % (42 catheter days – average 4,2 day).

Long periferal cannulas- LPCs



Conclusion

- Our group confirms the frequent occurrence of patients with DIVA in infants and toddlers - 35%
- The average dwell time (9.1 days) confirms the right indication of LPC insertion in patients with a planned treatment for more than 7 days
- The incidence of complications in our group (22.9 per 1000 catheter days) is comparable with world data (40 per 1000 cath-days *)

* Pacilli M.(AU) - Long peripheral catheters: current evidence WoCoVa 2021

Take home message

- US-guided LPC is a good alternative for installing vascular access in children with DIVA
- It is connected with a low rate of complications and a high rate of successful insertion.
- It could be used in all children without age restriction with beneficial use in chubby toddlers and obese teenagers.

Thank you for your attention !

