P1-179

Longitudinal metabolic control after initiation of insulin pump in 5,040 pediatric type-1-diabetes subjects – heterogeneous HbA1c trajectories over three years from the DPV registry

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Conclusions:

There are **different trajectories of HbA1c change after start of continuous subcutaneous insulin infusion** (CSII) in pediatric type-1-diabetes patients. Further analyses are needed to characterize the subgroups in order to predict which patients may be most successful in improving HbA1c with insulin pumps.

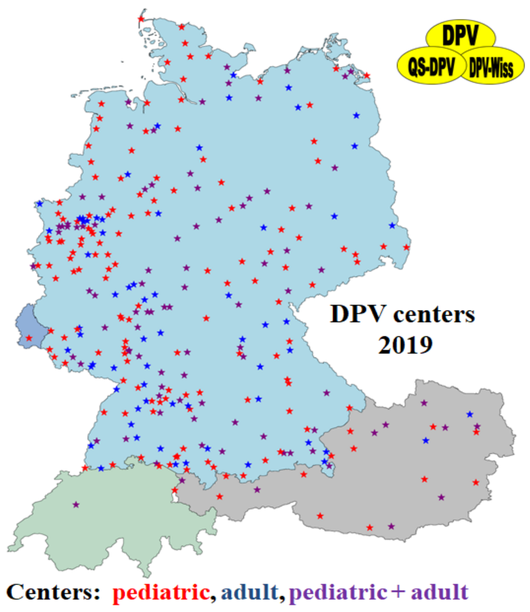
Objectives:

CSII has been associated with lower HbA1c. To explore whether CSII initiation leads to HbA1c improvement in each individual with type-1 diabetes (T1D) and to identify co-variates which might influence change in HbA1c.

Methods:

- Multicenter, standardized diabetes patient follow-up registry (DPV; **Fig. 1**)
- **5,040 T1D** subjects (≤20 y) with **diabetes duration ≥3 years at CSII initiation** and **continuously documented pump therapy over three years**
- **Group-based modeling** to identify heterogeneous subgroups of HbA1c change after CSII initiation (SAS: PROC TRAJ)
- HbA1c values aggregated quarterly; patients with <7 aggregated values were excluded
- **HbA1c change (Δ)** defined as HbA1c at the respective time-point (HbA1c [i]) minus baseline value

Fig. 1: DPV registry



Results:

- Demographics of study cohort are summarized in **table 1**.

Table 1: Demographics of study cohort (median [IQR], %)

	Pediatric T1D
N	5,040
Age at diabetes onset, years	5.9 [3.5–8.4]
Age at CSII initiation, years	12.5 [10.3–14.5]
Males, %	49
Baseline HbA1c, %	7.7 [7.0–8.4]

- Using group-based modeling, **four different trajectories of HbA1c change** were identified (**Fig. 2**):
  - Group 1: ***HbA1c reduction*** (~Δ -2%)
  - Group 2: ***Slight*** HbA1c ***reduction*** (~Δ -0.25%)
  - Group 3: ***Slight*** HbA1c ***increase*** (~Δ +0.8%)
  - Group 4: ***Dramatic*** HbA1c ***increase*** (~Δ +2.5%)

Fig. 2: Four different trajectories of HbA1c change after CSII initiation

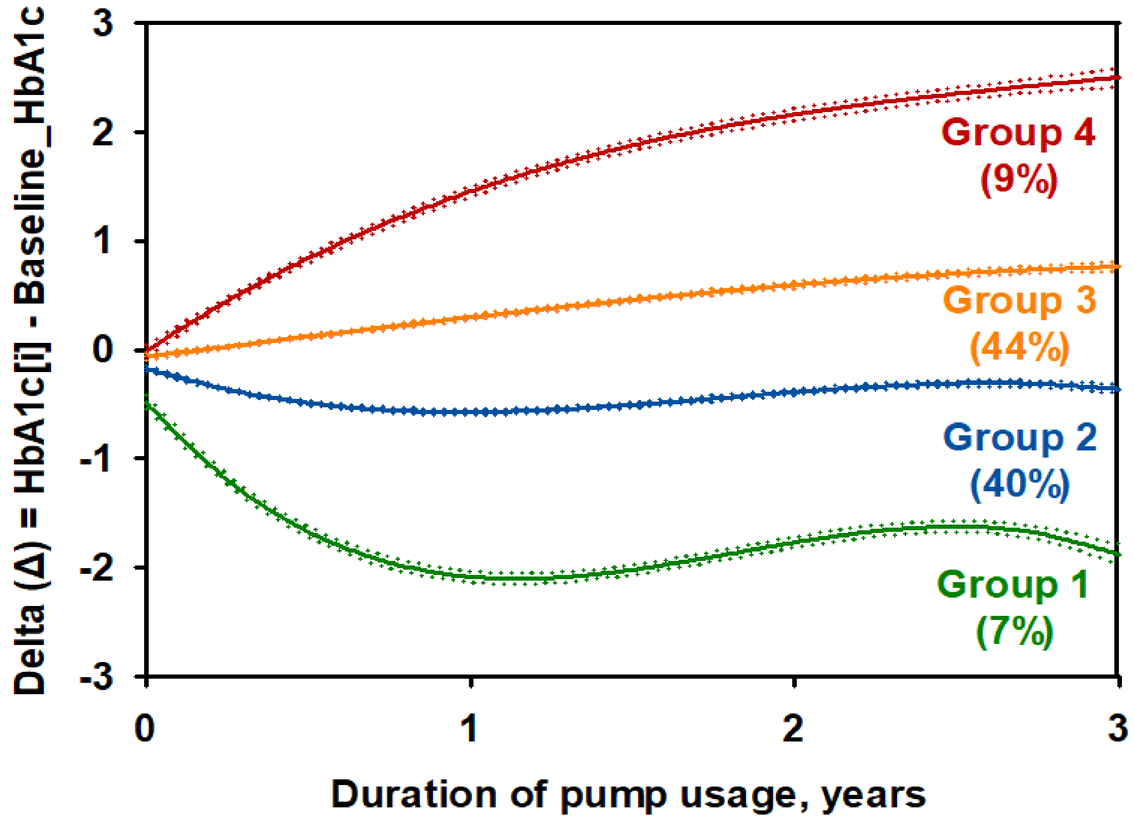


Table 2: Group-specific characteristics of the four different ΔHbA1c trajectories (median [IQR])

	Group 1 (Δ -2%)	Group 2 (Δ -0.25%)	Group 3 (Δ +0.8%)	Group 4 (Δ +2.5%)
N	346 (7%)	1,950 (40%)	2,296 (44%)	448 (9%)
Age at diabetes onset, years	6.7 [3.7; 9.9]	5.7 [3.4; 8.3]	5.9 [3.5; 8.3]	6.6 [4.0; 8.8]
Age at CSII initiation, years	14.2 [12.0; 15.6]	12.4 [10.1; 14.4]	12.2 [10.2; 14.2]	13.1 [11.5; 14.6]
HbA1c at CSII initiation, %	9.7 [9.0; 10.7]	7.9 [7.3; 8.5]	7.3 [6.7; 7.9]	7.4 [6.7; 8.2]
Insulin dose after CSII initiation, IU/kg*d				
1 year	0.85 [0.72; 1.01]	0.78 [0.66; 0.94]	0.78 [0.65; 0.93]	0.82 [0.69; 0.98]
2 years	0.87 [0.72; 1.01]	0.79 [0.66; 0.94]	0.80 [0.67; 0.96]	0.87 [0.71; 1.05]

- **Table 2**: **Age at diabetes onset**, **age and HbA1c at CSII initiation**, and **insulin dose** were all related to *group membership* (each p<0.001) .
  At CSII initiation: **group 1** had the **highest HbA1c** and was **oldest**. Further, they were **oldest at diabetes onset** and had **highest insulin requirements**.
- *Analyzing boys and girls separately*: the same number of trajectory groups were revealed, although gender ratio differed. **In girls**, the **largest group** (47%) had a **slight HbA1c increase**, whereas in **boys** (43%) the **largest trajectory** revealed a **slight decrease**.

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58ESPE P1-179

Diabetes and insulin

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