



# Insulin pump initiation: Effects at Children's of Alabama

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## Background

We aimed to better understand the effects of our current system by evaluating continuous subcutaneous insulin infusion (CSII, also known as insulin pump) initiation after attending a "Pre-pump class" at Children's of Alabama. Class attendance is required prior to coverage of an insulin pump for patients insured by Alabama Medicaid but is optional for those with non-Medicaid insurance.

## Methods

### Objective

Our primary aim was to evaluate the patients who attended a pre-pump class and explore factors that are associated with CSII initiation. The secondary objective was to evaluate the features of CSII selected and evaluate differences in those selecting AID compared to non-AID models.

### Data source

The patient cohort was identified from pre-pump class attendance records kept by the pump nursing team. Demographic information, clinical, and diabetes-technology information were retrieved from the electronic health record via individual chart review.

### Participants

This retrospective study included patients seen from January 2022 through December 2023. Patients below 21 years of age attending pre-pump class from January 2022 through June 2023 were included in the analysis. Patients who had documented CSII use by December 2023 were defined as "CSII-starters." Patients without documented CSII use by December 2023 were described as "CSII-non-starters." The six-month phase from July 2023 through December 2023 was included to allow for time for those attending pre-pump class in June 2023 to have adequate time to decide upon CSII therapy, navigate the complex process, and start their CSII.

Patients above 21 years of age and those who attended a pre-pump class outside the observation period from January 2022 through December 2023 were excluded from the patient cohort. Type of diabetes was not an exclusion criterion. Demographic and medical data were compared.

## Results

**Table 1:** Demographic information and diabetes-specific data.

|                                                     | Total (n=283)  | CSII Starters (n=187) | CSII non-starters (n=96) | P-Value       |
|-----------------------------------------------------|----------------|-----------------------|--------------------------|---------------|
| <b>Sex:</b>                                         | 148 (52.3)     | 99 (52.9)             | 49 (51.0)                | 0.8           |
| Female (%)                                          |                |                       |                          |               |
| <b>Race:</b>                                        |                |                       |                          | <b>0.0385</b> |
| NHW                                                 | 208 (73.5)     | 147 (78.6)            | 61 (63.5)                |               |
| NHB                                                 | 58 (20.5)      | 32 (17.1)             | 26 (27.1)                |               |
| Hispanic                                            | 9 (3.2)        | 5 (2.7)               | 4 (4.2)                  |               |
| Other                                               | 8 (2.8)        | 3 (1.6)               | 5 (5.2)                  |               |
| <b>Language</b>                                     | 6 (2.1)        | 3 (1.6)               | 3 (3.1)                  | 0.4           |
| Non-English (%)                                     |                |                       |                          |               |
| <b>Insurance:</b>                                   | 138 (48.8)     | 108 (57.8)            | 30 (31.3)                | <b>0.0001</b> |
| Private (%)                                         |                |                       |                          |               |
| <b>Age at Pre-pump class</b>                        | 11.4 (4.1)     | 11.0 (4.0)            | 12.2 (4.1)               | <b>0.015</b>  |
| <b>Age at diabetes diagnosis</b>                    | 8.8 (4.1)      | 8.7 (4.0)             | 9.0 (4.2)                | 0.6           |
|                                                     | (n=280)        | (n=185)               | (n=95)                   |               |
| <b>Duration of Diabetes at pre-pump<sup>1</sup></b> | 1.13 (0.4-3.7) | 0.75 (0.42-2.5)       | 2.0 (0.75-5.0)           | <b>0.0001</b> |
|                                                     | n=280          | n=185                 | n=95                     |               |
| <b>Pre-pump HbA1c (%)</b>                           | 8.1 (7.1-9.6)  | 8.0 (6.9-9.1)         | 8.6 (7.5-10.4)           | <b>0.0020</b> |

HbA1c: glycated hemoglobin A1c; NHW: non-Hispanic White; NHB: non-Hispanic Black  
Variables are mean (standard deviation) and n (%) unless otherwise indicated  
<sup>1</sup>Median and interquartile range shown for skewed variable

**Table 2:** Automated insulin delivery system compared to non-automated insulin delivery system.

|                                                           | CSII Starters (n = 187) | CSII used as AID (n = 116) | CSII used without AID (n = 71) | p-value       |
|-----------------------------------------------------------|-------------------------|----------------------------|--------------------------------|---------------|
| <b>Age at diabetes diagnosis</b>                          | 8.7 (4.0)               | 9.3 (3.9)                  | 7.8 (4.1)                      | <b>0.0151</b> |
|                                                           | (n=185)                 | n=115                      | N=70                           |               |
| <b>Duration of diabetes at pre-pump class<sup>1</sup></b> | 0.75 (0.42-2.5)         | 0.67 (0.33-2.75)           | 0.96 (0.50-2.33)               | 0.2           |
|                                                           | n=185                   | n=115                      | n=70                           |               |
| <b>Age at CSII start</b>                                  | 11.4 (4.0)              | 12.0 (3.8)                 | 10.4 (4.3)                     | <b>0.0123</b> |
| <b>Pre-pump HbA1c (%)</b>                                 | 8.3 (+/- 1.9)           | 8.0 (6.9-9.1)              | 8.1 (7.3-9.0)                  | 0.1           |
| <b>Days to CSII initiation<sup>1</sup></b>                | 108 (76-154)            | 110 (78-162)               | 102 (71-153)                   | 0.1           |
| <b>Insurance</b>                                          | 108 (57.8)              | 62 (53.5)                  | 46 (64.8)                      | 0.1           |
| Private (%)                                               |                         |                            |                                |               |
| <b>Sex</b>                                                | 99 (52.9)               | 56 (48.3)                  | 43 (60.6)                      | 0.1           |
| Female (%)                                                |                         |                            |                                |               |
| <b>Race:</b>                                              |                         |                            |                                | 0.6           |
| NHW                                                       | 147 (78.6)              | 88 (75.9)                  | 59 (83.1)                      |               |
| NHB                                                       | 32 (17.1)               | 23 (19.8)                  | 9 (12.7)                       |               |
| Hispanic                                                  | 5 (2.7)                 | 3 (2.6)                    | 2 (2.8)                        |               |
| <b>Other</b>                                              | 3 (1.6)                 | 2 (1.7)                    | 1 (1.4)                        |               |
| <b>Language</b>                                           | 3 (1.6)                 | 3 (2.6)                    | 0                              | 0.2           |
| Non-English (%)                                           |                         |                            |                                |               |

CSII: continuous subcutaneous insulin infusion; AID: Automated insulin delivery system; HbA1c: glycated hemoglobin A1c; NHW: non-Hispanic White; NHB: non-Hispanic Black  
Variables are mean (standard deviation) and n (%) unless otherwise indicated  
<sup>1</sup>Median and interquartile range shown for skewed variable

## Results (cont.)

**Table 3:** Continuous subcutaneous insulin infusion (CSII) models.

| CSII Models (n = 187)         |            |
|-------------------------------|------------|
| <b>Models</b>                 |            |
| OmniPod® UST400               | 22 (11.8)  |
| OmniPod® DASH                 | 37 (19.8)  |
| OmniPod® 5                    | 72 (38.5)  |
| Tandem Basal IQ®              | 3 (1.6)    |
| Tandem Control IQ®            | 52 (27.8)  |
| Medtronic 770 G™              | 1 (0.5)    |
| <b>CSII type:</b>             |            |
| Tubed CSII                    | 56 (30.0)  |
| Tubeless CSII                 | 131 (70.0) |
| <b>CSII with AID capacity</b> |            |
| Yes                           | 128 (68.4) |
| Used in AID mode              | 116 (90.6) |
| Used in non-AID mode          | 12 (9.4)   |
| No                            | 59 (31.6)  |

CSII: continuous subcutaneous insulin infusion; AID: Automated insulin delivery system

A total of 283 patients aged 1-19 attended pre-pump class during the period of study. Of these, 187 patients (66%) started a CSII. The median duration from pre-pump attendance to CSII initiation was 108 days (interquartile range 76-154). CSII-starters and CSII-non-starters differed in race, age, insurance, duration of diabetes, and pre-pump glycated hemoglobin A1c. CSII-starters preferred tubeless systems, with 131 (70.0%) selecting a tubeless pump. Most CSII-starters used an automatic insulin delivery (AID) system (n=116, 62% of PS). Insurance and race were not associated with selecting an AID over non-AID CSII systems (p=0.13 and 0.65).

## Conclusion

While race and insurance are not associated with the selection of an AID system compared to a traditional CSII system, they are associated with CSII-starters versus non-starters after attending pre-pump class. Future work will aim to reduce these disparities and increase access for all interested in diabetes technology.

## Acknowledgment

The authors thank and acknowledge the contributions of the pump nurse team of the Children's of Alabama who help to improve the outcomes of patient with diabetes mellitus.



