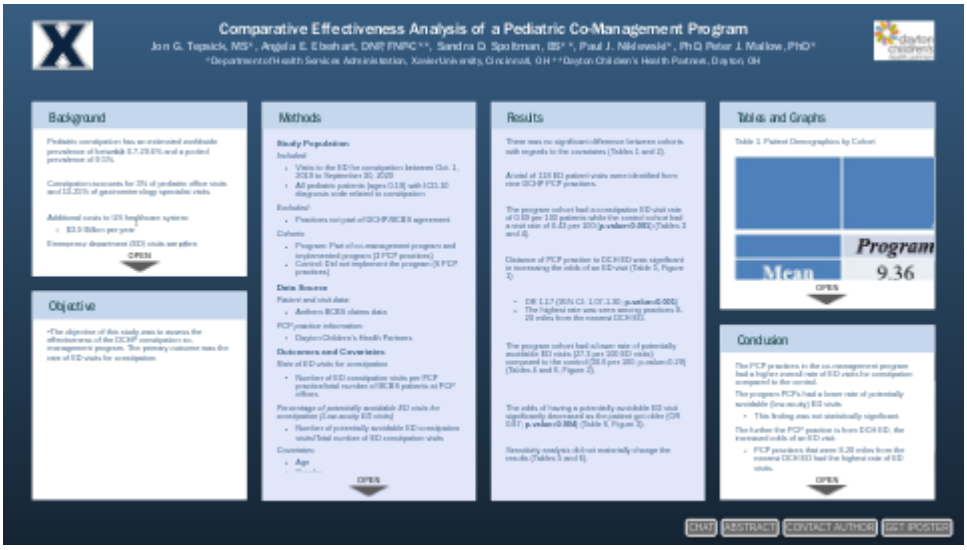
# Comparative Effectiveness Analysis of a Pediatric Co-Management Program

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# BACKGROUND

Pediatric constipation has an estimated worldwide prevalence of between 0.7-29.6% and a pooled prevalence of 9.5%.[1,2]

Constipation accounts for 3% of pediatric office visits and 10-25% of gastroenterology specialist visits.

Additional costs to US healthcare system:

- $3.9 Billion per year[3]

Emergency department (ED) visits are often unnecessary for pediatric constipation.[4,5]

- •99.7% of pediatric constipation patients were discharged compared to 91.9% overall pediatric ED visits.[5]

•Dayton Children's Health Partners (DCHP) constipation co-management program

- Started in 2018
- Goals: To reduce the costs of care and improve patient outcomes for pediatric constipation

# OBJECTIVE

•The objective of this study was to assess the effectiveness of the DCHP constipation co-management program. The primary outcome was the rate of ED visits for constipation.

# METHODS

## Study Population

*Included:*

- Visits to the ED for constipation between Oct. 1, 2019 to September 30, 2020
- All pediatric patients (ages 0-19) with ICD-10 diagnosis code related to constipation

*Excluded:*

- Practices not part of DCHP/BCBS agreement

*Cohorts:*

- Program: Part of co-management program and implemented program (3 PCP practices)
- Control: Did not implement the program (6 PCP practices)

## Data Source

*Patient and visit data:*

- Anthem BCBS claims data

*PCP practice information:*

- Dayton Children's Health Partners

## Outcomes and Covariates

*Rate of ED visits for constipation*

- Number of ED constipation visits per PCP practice/total number of BCBS patients at PCP offices

*Percentage of potentially avoidable ED visits for constipation (Low-acuity ED visits)*

- Number of potentially avoidable ED constipation visits/Total number of ED constipation visits

*Covariates:*

- Age
- Gender
- Prospective risk score
- Total number of total ED visits per patient
- Distance from PCP practice to the nearest Dayton Children's Hosptial (DCH) ED department
  - *Mean distance if more than one PCP office per practice*.

## Statistical Analysis

Cohorts compared by Wilcoxon Sum Rank Test (continuous variables) and chi-sq test (categorical variables).

Multivariable logistic regression performed to assess the differences between cohorts

- All covariates included
- A priori threshold for significance: 0.05

*Sensitivity analysis*

- Removal of possible PCP practice outlier
- Multivariable logistic regression around potentially avoidable ED visits

# RESULTS

There was no significant difference between cohorts with regards to the covariates (Tables 1 and 2).

A total of 118 ED patient visits were identified from nine DCHP PCP practices.

The program cohort had a constipation ED visit rate of 0.69 per 100 patients while the control cohort had a visit rate of 0.43 per 100 (**p-value<0.001**) (Tables 3 and 4).

Distance of PCP practice to DCH ED was significant in increasing the odds of an ED visit (Table 5, Figure 1)

- OR 1.17 (95% CI: 1.07-1.30; **p-value=0.001**)
- The highest rate was seen among practices 8-20 miles from the nearest DCH ED.

The program cohort had a lower rate of potentially avoidable ED visits (27.3 per 100 ED visits) compared to the control (30.6 per 100, p-value=0.29) (Tables 4 and 6, Figure 2).

The odds of having a potentially avoidable ED visit significantly decreased as the patient got older (OR 0.87; **p-value=0.004**) (Table 6, Figure 3).

Sensitivity analysis did not materially change the results (Tables 5 and 6).

# TABLES AND GRAPHS

Table 1. Patient Demographics by Cohort

| | Age | | Prospective Risk Score | | Patient Total ED Visits | | PCP Distance from ED | |
|---|---|---|---|---|---|---|---|---|
| | *Program* | *Control* | *Program* | *Control* | *Program* | *Control* | *Program* | *Control* |
| **Mean** | 9.36 | 9.85 | 0.99 | 1.62 | 2.09 | 1.94 | 13.03 | 8.14 |
| **SD** | 5.22 | 5.07 | 0.82 | 2.95 | 1.38 | 1.31 | 8.05 | 5.05 |
| **Median** | 8.00 | 11.00 | 0.68 | 0.63 | 2.00 | 1.00 | 7.50 | 8.90 |
| **Min** | 1.00 | 0.00 | 0.23 | 0.21 | 1.00 | 1.00 | 7.50 | 0.00 |
| **Max** | 19.00 | 19.00 | 3.50 | 18.64 | 5.00 | 6.00 | 39.00 | 24.30 |
| **P Value** | *0.67* | | *0.69* | | *0.52* | | *0.26* | |

Table 2. Patient Demographics by Cohort

| | Gender | | Potentially Avoidable ED Visits | |
|---|---|---|---|---|
| | *Program* | *Control* | *Program* | *Control* |
| **n Male** | 10 | 31 | 9 | 26 |
| **Percent** | 30.3% | 36.5% | 27.3% | 30.6% |
| **P Value** | *0.53* | | *0.72* | |

Table 3. ED Visits by Cohort

| | Total BCBS Patients | Number of ED Visits | Percentage |
|---|---|---|---|
| **Program PCP Groups (n=3)** | 4805 | 33 | 0.69% |
| **Control PCP Groups(n=6)** | 19891 | 85 | 0.43% |

Table 4. ED Visits by PCP Practice

| PCP Practice | Total BCBS Patients | Number of ED Visits | ED Visit Rate | Number of Potentially Avoidable ED Visits | Potentially Avoidable ED Visit Rate |
|---|---|---|---|---|---|
| P-PCP1 | 2020 | 13 | 0.64% | 2 | 15.4% |
| P-PCP2 | 584 | 2 | 0.34% | 1 | 50.0% |
| P-PCP3 | 2201 | 18 | 0.82% | 6 | 33.3% |
| Program Total | 4805 | 33 | 0.69% | 9 | 27.3% |
| C-PCP1 | 2295 | 12 | 0.52% | 7 | 58.3% |
| C-PCP2 | 2536 | 11 | 0.43% | 2 | 18.2% |
| C-PCP3 | 8234 | 49 | 0.60% | 14 | 28.6% |
| C-PCP4 | 653 | 3 | 0.46% | 0 | 0.0% |
| C-PCP5 | 1421 | 6 | 0.42% | 0 | 0.0% |
| C-PCP6 | 4752 | 4 | 0.08% | 3 | 75.0% |
| Control Total | 24696 | 85 | 0.34% | 26 | 30.6% |

Table 5. Multivariable Logistic Regression Results

| Covariate | Odds Ratio | 95% Confidence Intervals | | P-Value |
|---|---|---|---|---|
| Age | 1.04 | 0.94 | 1.14 | *0.48* |
| Gender | 0.66 | 0.25 | 1.74 | *0.40* |
| Total Number of Patient ED Visits | 1.17 | 0.82 | 1.67 | *0.40* |
| Prospective Risk Score | 0.71 | 0.47 | 1.05 | *0.09* |
| Distance from PCP Practice to DCH ED | 1.17 | 1.07 | 1.30 | ***0.001*** |

Table 6. Sensitivity Analysis: Multivariable Logistic Regression on Potentially Avoidable ED Visits

| Covariate | Odds Ratio | 95% Confidence Interval | | P-Value |
|---|---|---|---|---|
| Program | 0.57 | 0.20 | 1.63 | *0.29* |
| Age | 0.87 | 0.80 | 0.96 | ***0.004*** |
| Gender | 1.42 | 0.57 | 3.53 | *0.45* |
| Total Number of Patient ED Visits | 0.90 | 0.63 | 1.30 | *0.58* |

Table 7. Sensitivity Analysis: Multivariable Logistic Regression C-PCP6 Removed

| Covariate | Odds Ratio | 95% Confidence Interval | | P-Value |
|---|---|---|---|---|
| Age | 1.02 | 0.92 | 1.12 | *0.76* |
| Gender | 0.79 | 0.29 | 2.15 | *0.64* |
| Total Number of Patient ED Visits | 1.03 | 0.69 | 1.54 | *0.88* |
| Prospective Risk Score | 0.84 | 0.54 | 1.29 | *0.42* |
| Distance from PCP Practice to DCH ED | 1.33 | 1.15 | 1.54 | ***0.0002*** |

Figure 1.

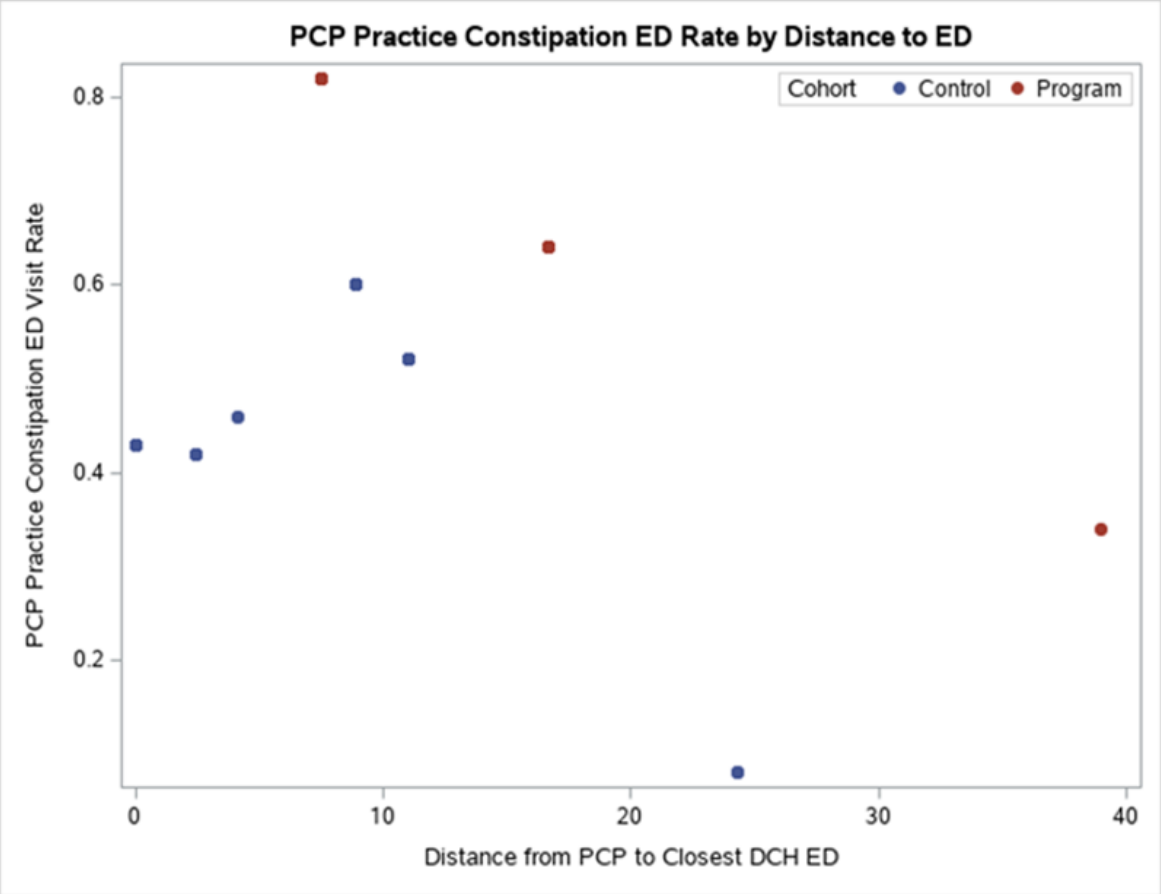



Figure 2.

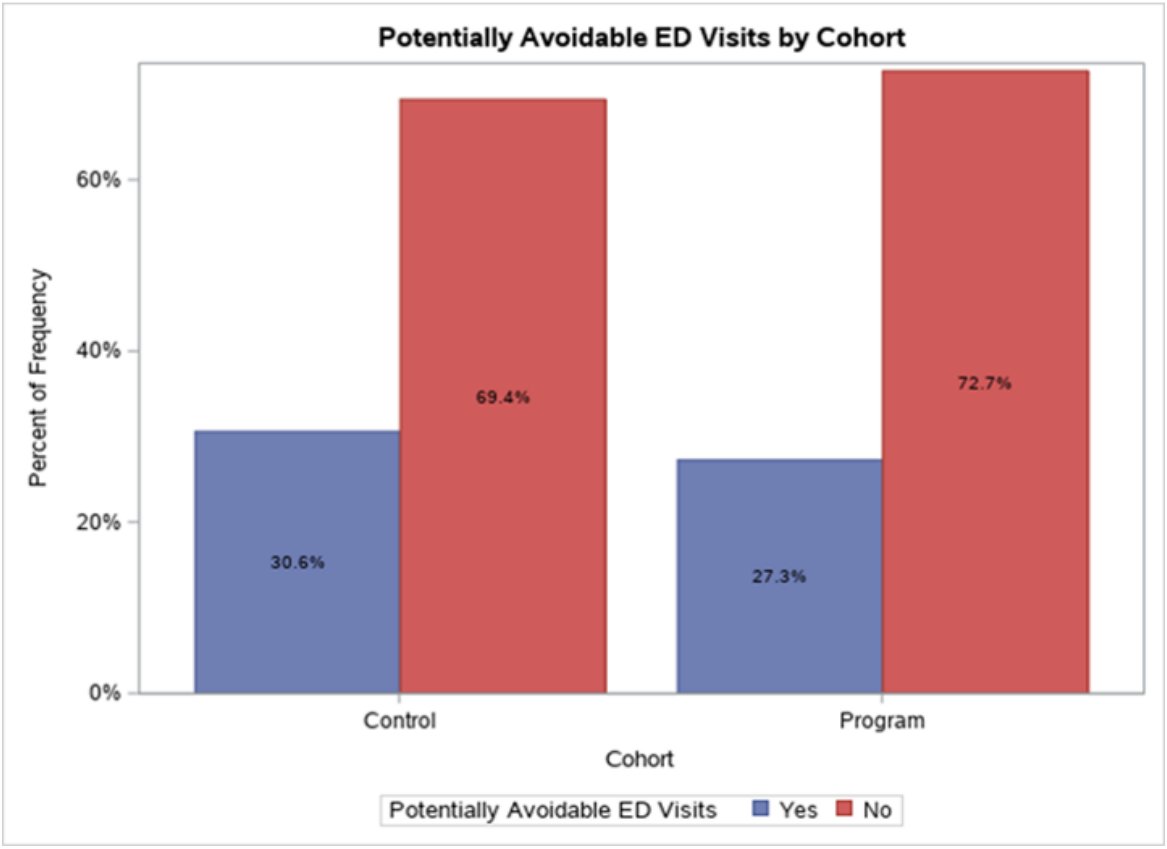
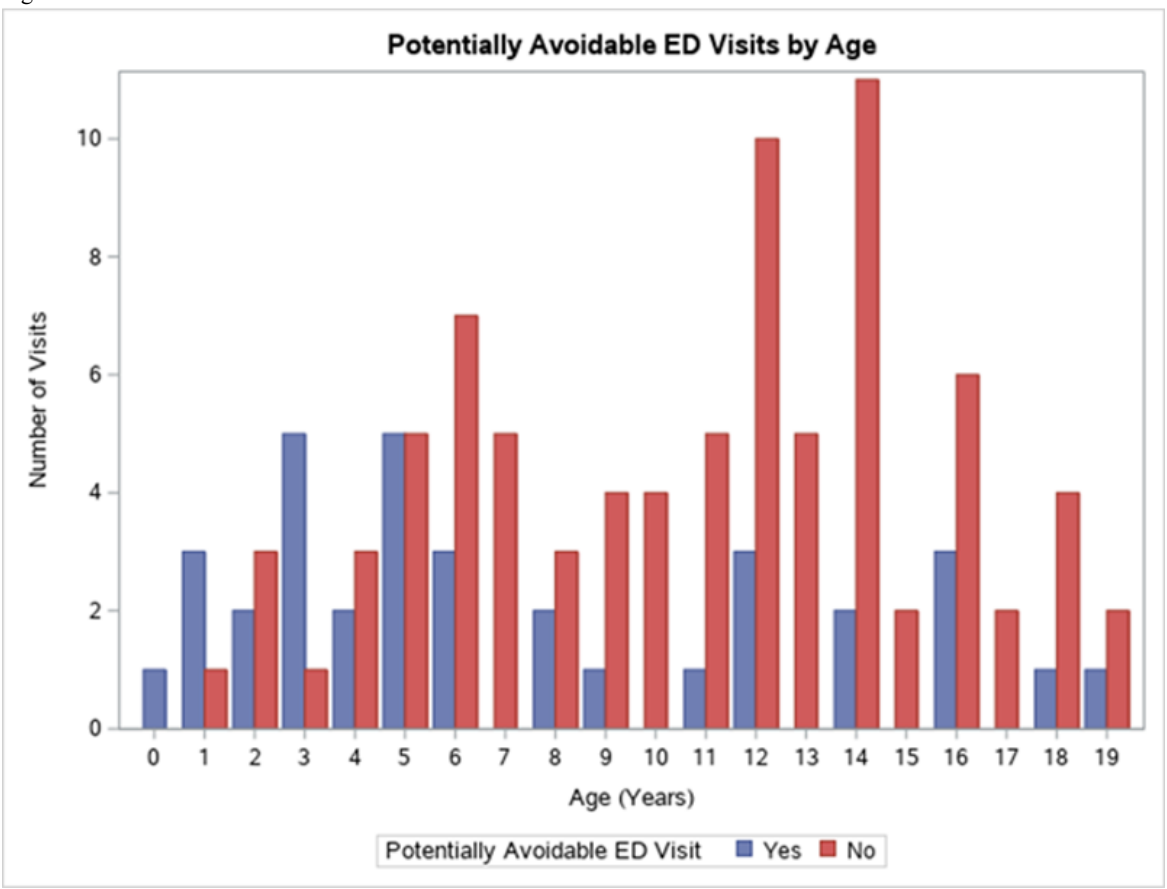

Potentially Avoidable ED Visits by Cohort
Percent of Frequency
60%
40%
20%
0%
69.4%
72.7%
30.6%
27.3%
Control
Program
Cohort
Potentially Avoidable ED Visits
Yes
No

Figure 3.


Potentially Avoidable ED Visits by Age
Number of Visits
10
8
6
4
2
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Age (Years)
Potentially Avoidable ED Visit
Yes
No

# CONCLUSION

The PCP practices in the co-management program had a higher overall rate of ED visits for constipation compared to the control.

The program PCPs had a lower rate of potentially avoidable (low-acuity) ED visits

- This finding was not statistically significant.

The further the PCP practice is from DCH ED, the increased odds of an ED visit.

- PCP practices that were 8-20 miles from the nearest DCH ED had the highest rate of ED visits.

The odds of a potentially avoidable ED visit decreased as the patient's age increased.

### References:

[1] Koppen, I. J. N., Vriesman, M. H., Saps, M., Rajindrajith, S., Shi, X., van Etten-Jamaludin, F. S., Di Lorenzo, C., Benninga, M. A., & Tabbers, M. M. (2018). Prevalence of functional defecation disorders in children: A systematic review and meta-analysis. The Journal of Pediatrics, 198, 121-130.e6. https://doi.org/10.1016/j.jpeds.2018.02.029

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[5] Nutter, A., Meckler, G., Truong, M., & Doan, Q. (2017). Constipation and paediatric emergency department utilization. Paediatrics & Child Health, 22(3), 139–142. https://doi.org/10.1093/pch/pxx041

# ABSTRACT

**Objective** The objective of this study was to assess the effectiveness of the Dayton Children's Health Partners (DCHP) constipation co-management program. The primary outcome was the rate of constipation emergency department (ED) visits.

**Methods** De-identified patient data was obtained from a private insurer for pediatric ED visits for constipation between October 1, 2019 and September 30, 2020. Two cohorts were constructed: one in which the primary care provider (PCP) practices implemented the co-management program and one in which the practices had not. Multivariable logistic regression was performed to assess the difference between cohorts. Sensitivity analyses were performed to gauge the robustness of the results to alternative model specifications.

**Results** A total of 118 ED patient visits for constipation were identified from nine DCHP PCP practices. The program cohort had a constipation ED visit rate of 0.69 per 100 patients while the control cohort had a visit rate of 0.43 per 100 (p-value<0.001). Distance from the PCP practice to the nearest Dayton Children's Hospital (DCH) ED was significant in increasing the odds of an ED visit (OR 1.17; p-value=0.001). The program cohort had a lower rate of low-acuity ED visits (27.3 per 100 constipation ED visits) compared to the control cohort (30.6 per 100; p-value=0.29). The odds of having a low-acuity ED visit significantly decreased as the patient got older (OR 0.87; p-value=0.004). The sensitivity analyses did not materially change the results.

**Conclusions** The results show that the implementation of the constipation co-management program did not produce lower rates of ED visits for constipation over the examined time period. The distance of the PCP practice to the nearest DCH ED was the most significant factor. The rate of low-acuity ED visits for constipation, while lower for practices in the co-management program, failed to reach statistical significance.