Implementation of a Constipation Action Plan for Patients Discharged From a Pediatric Hospitalist Service

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OBJECTIVE The objective of this study was to determine the effect of a pharmacist-led constipation action plan on the rate of health care utilization.

METHODS We conducted a prospective research study of patients 2 to 18 years of age admitted to a pediatric hospitalist service for constipation. A study pharmacist developed a patient-specific constipation action plan for each enrolled patient. Data were collected from the electronic medical record, patient/caregiver interview, and follow-up phone calls completed by a pharmacist. The primary outcome was to determine the effect of a pharmacist-led constipation action plan on the rate of health care utilization.

RESULTS Twenty-seven patients were enrolled in the study. Median (range) age was 9 (2–18) years. Health care utilization of the entire study population decreased from approximately 8.7 encounters per month prior to implementation to approximately 3 encounters per month after implementation. Patients also reported an increase in daily bowel movements from approximately 1 per day prior to implementation to 2 per day post implementation.

CONCLUSIONS Health care utilization appeared to decrease after implementation of a patient-specific, pharmacist-led constipation action plan.

KEYWORDS constipation; pediatric; pharmacist; polyethylene glycol; senna

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Introduction

Constipation is a common medical problem among children of all ages. Recent reports have estimated a worldwide prevalence of approximately 3%.¹ Constipation can be categorized as functional or non-functional. Functional constipation is diagnosed by using the Rome IV Criteria.² Some examples of criteria used include, but are not limited to, number of bowel movements per week, patient's history of stool retention, and a history of painful bowel movements. Non-functional constipation is attributed to altered anatomy or physiology.

Numerous treatment options are available for patients who experience constipation, including both non-pharmacologic and pharmacologic methods. Current guidelines from the European Society for Paediatric Gastroenterology, Hepatology and Nutrition and the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition do not recommend non-pharmacologic interventions.¹ The guidelines do recommend pharmacologic intervention with polyethylene glycol as first-line therapy over other medications such as lactulose, milk of magnesia, or mineral oil for the maintenance treatment of constipation.¹

In a study of 79 children, comparing polyethylene glycol and milk of magnesia, both groups showed improvement in symptoms while the polyethylene gly-

col group had improved compliance and less patient refusal.³ A cross-over study comparing polyethylene glycol and lactulose found similar success rates treating constipation with both agents; however, patients favored polyethylene glycol treatment.⁴ The authors reported that the preference of polyethylene glycol was likely related to ease of administration compared with lactulose. Another study comparing polyethylene glycol and lactulose found improved outcomes with polyethylene glycol early in treatment but similar outcomes at week 12.⁵ Significantly more side effects were noted in the lactulose group at both week 4 and week 12, with the most common being bloating and abdominal pain.

No evidence or literature was found describing a pharmacist-led constipation action plan detailing either an upward or downward titration of stool softening agents for patients being discharged from the hospital. The use of a constipation action plan led by pharmacists has the potential to increase patient adherence while decreasing hospital readmission. A decrease in hospital readmission could also have a large, positive financial impact on the institution. This study will analyze the implementation of a structured constipation action plan for patients being discharged from the pediatric hospitalist service at a large academic medical center.

Materials and Methods

Study Design. This prospective research study took place over a 12-week period. The study occurred at a 119-bed children's hospital within an academic medical center. The children's hospital includes a general pediatric unit where this study occurred, a pediatric intensive care unit, a neonatal intensive care unit, and a maternal and infant care center. Patients were first identified by the rounding pediatric hospitalist pharmacist and their cases were reviewed with the attending physician for approval. Once approved by the attending physician for potential study enrollment, the patient and caregivers were approached by a study pharmacist to discuss both the study protocol and the consent/assent procedures. A patient-specific constipation action plan (Figure 1) was developed for all enrolled patients by a study pharmacist, taking the patient's medication history and hospital course into account when determining medication dosing.

Polyethylene glycol was the main pharmacologic agent used in all action plans owing to proven efficacy and patient preference over alternative agents. The action plan instructed the patient or caregiver to titrate medications either upward or downward, based on the patient's number of daily bowel movements. Polyethylene glycol was titrated in easy-to-measure increments for the family (e.g., one-half or 1 capful), typically 8.5- to 17-g adjustments. The action plan also provided recommendations to add a second pharmacologic agent if the patient had not had a bowel movement for 5 days despite escalation of polyethylene glycol therapy.

Senna was chosen as the second pharmacologic agent for most patients because it provided a different mechanism of action compared with polyethylene glycol, is available on our hospital formulary, and is easily obtainable at outpatient pharmacies. Patients and caregivers received education on the constipation action plan during their hospital admission and were given the opportunity to ask questions. They were also counseled regarding the desired stool consistency, which was described as either soft-serve ice cream or pudding. Caregivers were contacted once weekly by telephone for 8 weeks by a pharmacist to discuss the patient's polyethylene glycol dose and bowel habits after hospital discharge. The pharmacist provided dose recommendations and action plan guidance as needed throughout the follow-up period.

Patient Selection and Data Collection. Patients included in the study were 2 to 18 years of age, admitted to the pediatric hospitalist service for constipation, and prescribed polyethylene glycol at hospital discharge. Patients were excluded if the patient or caregivers were unwilling to participate in the study or if the patient had any of the following diagnoses: Hirschsprung disease, cerebral palsy, spina bifida, cystic fibrosis, or hypothyroidism.

Baseline demographics including information re-

Table. Demographics (N = 27)

Characteristics	Results
Patients complete at 8 wk, n (%)	10 (37)
Age, median (range), yr	9 (2–18)
Female, n (%)	16 (59.3)
Weight, median (range), kg	29.4 (12.2–108.9)

garding the patient's prior-to-admission bowel regimen, average number of daily bowel movements, and health care utilization in the previous year for constipation were collected during study enrollment. Health care utilization was defined as a hospital admission, emergency room visit, gastrointestinal specialist visit, caregiver-requested acute care office visit, or urgent care visit. Patients were considered lost to follow-up if the pharmacist was unable to reach them within 3 weeks of hospital discharge or 3 weeks after the last date of pharmacist contact.

Additional prospective data were collected during each of the weekly follow-up pharmacist phone calls. Collected data included average number of daily bowel movements, daily dose of polyethylene glycol, number of missed polyethylene glycol doses, reason for missed doses, presence of incontinence above baseline, stool consistency, presence of blood in stool, addition of new medications, and health care utilization as described above.

Outcomes. The primary outcome was to determine the effect of a pharmacist-led constipation action plan on the rate of health care utilization. Secondary objectives included comparing the number of bowel movements per week, determining the number of polyethylene glycol dose adjustments required during the 8-week follow-up period, and determining compliance to the prescribed bowel regimen.

Statistical Analysis. Data were analyzed with only descriptive statistics. Inferential statistical tests were not completed based on study design and sample size.

Results

Twenty-seven patients were enrolled in the study. Baseline patient demographics are presented in the Table. Six patients were either lost to follow-up or withdrew before the first pharmacist follow-up call. Ten patients completed the full 8 weeks of follow-up. Of the remaining patients, 8 patients were considered lost to follow-up and 3 patients withdrew from the study during the follow-up period. The duration of follow-up after study enrollment ranged from 54 to 67 days.

Patients had a total of 104 health care utilization encounters in the year prior to study enrollment (approximately 8.7 encounters per month collectively), including their admission at study enrollment. Health care

Figure 1. Sample constipation action plan.

utilization, stratified before and after implementation from each type of health care encounter, is presented in Figure 2. Patients had 6 total health care utilization encounters after implementation of the pharmacist-led constipation action plan (approximately 3 encounters per month collectively).

The median number of daily bowel movements before and after action plan implementation increased from 0.9 (range, 0.14–3.5) to 2 (range, 0.5–3). Stool consistency was also assessed throughout the follow-up period. Most patients (71%) reported achieving the desired stool consistency; however, 16% reported diarrhea and 13% had firm stools. The median daily weight-based discharge dose of polyethylene glycol was 0.98 g/kg/day (range, 0.31–2.91). The final reported median daily weight-based polyethylene glycol dose was 0.58 g/kg/day (range, 0–3.86).

The entire patient population reported missing 33 total polyethylene glycol doses throughout the follow-up period. Ten patients reported missing zero doses. Three patients reported missing more than 1 dose of polyethylene glycol in any given week of follow-up. Patients required a median of 1 dose adjustment per week (range, 0–2). Seventy-six dose adjustments were required throughout the entire study. Thirty interventions (39.5%) were driven solely by the customized action plan. Twenty-three interventions (30.25%) were implemented by the pharmacist during the weekly telephone encounters. Twenty-three interventions (30.25%) were implemented by the caregivers without pharmacist consultation, outside of the action plan recommendations. Patients required a median of 3 interventions throughout the entire duration of the study (range, 0–10).

Six new medications were started during the follow-up period: azithromycin, melatonin, methylphenidate,

Figure 2. Health care utilization.

multivitamin, ranitidine, and tamsulosin. All listed medications had the potential to cause constipation at varying reported rates; however, only 1 caregiver reported this side effect. For this patient, constipation was reported to have resolved after discontinuation of the over-the-counter product. Five medications had the potential to cause diarrhea, and this was reported to have occurred in 1 patient.

Discussion

Our study found that health care utilization appeared to decrease after the implementation of a pharmacist-led, patient-specific constipation action plan. Enrolled patients required approximately 8.7 health care encounters per month collectively prior to implementation of the action plan. Patients required only 3 health care encounters per month collectively after implementation. Patients also

experienced an overall increase in the median number of daily bowel movements. Only 1 hospital admission was reported throughout the study follow-up period.

Sandweiss et al⁶ completed a quality improvement project in the emergency department that involved providing patients with standardized constipation medications and education prior to emergency department discharge. The authors noted an overall decrease in both abdominal radiography and emergency department admission rates after implementation of their standardized process.

A study by Steiner et al⁷ evaluated the treatment compliance of 50 children with chronic functional constipation. The authors defined medication adherence as >75% of empty medication containers for the given study period. Non-adherence was reported in 62% of patients at month 1 and 70% of patients at month 6. A majority of non-compliance was due to adverse events followed by lack of financial resources to obtain medication. Patients also appeared to be more adherent when prescribed polyethylene glycol vs other laxatives at month 6 of the study. This study supports anecdotal reports that compliance with a prescribed bowel regimen remains an issue even after patients present with constipation, often owing to adverse effects. Patients in our study reported similar reasons for non-adherence, although lack of access to medication was not commonly encountered. Caregivers in our study reported high compliance with the prescribed bowel regimens, in accordance with published literature.

Modin et al⁸ evaluated 3 methods of constipation follow-up: telephone, web-based, or no planned follow-up (control).⁸ The study found increased treatment success in the web-based group compared with control only at 3 and 6 months. No differences were observed between any group at 12 months.

Modin et al⁹ also completed a randomized, placebo-controlled trial comparing polyethylene glycol with placebo for the maintenance treatment of constipation for 24 weeks after successful disimpaction. The authors found that 67% of polyethylene glycol patients were successfully treated at 24 weeks compared with 32% of patients in the placebo group (hazard ratio 3.21; 95% CI: 1.73 – 5.94).

A health care cost impact study was completed by Liem et al¹⁰ using data from 2003 and 2004. The authors included patients younger than 18 years. They found that annual mean unadjusted costs for patients with constipation were significantly higher than for those without constipation (\$3430 USD vs \$1099 USD, $p < 0.001$). After cost adjustments and extrapolation, the authors reported an annual increased health care cost of approximately \$3.9 billion USD attributed to children with constipation compared with children without constipation.

Our study appears to be the first of its kind, combining a customized constipation action plan with scheduled pharmacist follow-up telephone calls. Anecdotally, this

approach led to many positive outcomes. For example, caregivers expressed satisfaction with the constipation action plans and stated the plans were easy to follow at home. Caregivers also stated they found it helpful to have a health care provider assist with dose titration and answer questions after hospital discharge. Caregivers felt that going forward, 8 follow-up calls may not be required to achieve similar results, therefore decreasing required health care resources. In addition to caregiver satisfaction, medical staff at our institution also reported satisfaction and excitement during implementation of this research study.

This study did have some limitations. This was a single-center study with a small sample size and relatively short duration of follow-up. Data collection was potentially affected by recall bias because baseline information was predominantly provided by caregiver memory. Like many other telephone-based research studies, we also experienced difficulty reaching patients or caregivers during the follow-up period. Finally owing to the nature of the study, notification of a pending patient discharge from the primary service was not always received in a timely manner. This led to shorter than desired counseling sessions for affected patients.

Conclusion

Health care utilization appeared to decrease after implementation of a patient-specific, pharmacist-led constipation action plan. Only 1 hospital admission was reported throughout the study follow-up period. The median number of reported daily bowel movements increased for patients throughout the study follow-up period. Data from this study support future implementation of a constipation action plan with corresponding education that is provided to patients at hospital discharge from our pediatric hospitalist service. All patients required dose titration to achieve the desired effect and families overall were compliant with the dosing regimens. Future research should evaluate whether standardized plans would achieve similar results compared with customized plans and the need for follow-up intervention.

Article Information

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Ethical Approval and Informed Consent. The authors assert that all procedures contributing to this work comply with the

ethical standards of the relevant national guidelines on human experimentation and have been approved by the appropriate committees at our institution. All patients and/or caregiver(s) provided written informed consent and/or assent (as applicable) at enrollment.

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