Headache Action Plan Project for Youth: System Change through School-Facilitated Intervention

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1. Abstract

Purpose: To establish a generalizable framework for system change in the treatment of pediatric migraine in which community schools become a vehicle for the facilitation of more optimal migraine management.

Scope: Migraine is one of the top five childhood health problems and can become increasingly disabling if not treated early with evidence-based approaches. School nurses and primary care physicians are optimally positioned to initiate treatments to prevent the risk of worsening disability but typically have limited training in migraine management.

Methods: We implemented a migraine education plan for school nurses and PCPs in a targeted school district that comprised focused teaching on evidence-based migraine management supplemented with online patient and provider treatment resources. Patterns of medication prescriptions and headache outcomes were monitored and compared between the targeted region and control regions and relative to baseline; project website usage also was evaluated through analytics. Methods then were replicated and disseminated more broadly to other school districts during a subsequent project year.

Results: Relative to control regions and the year prior to project initiation, primary care provider prescriptions of appropriate preventive and abortive medications for migraine significantly increased, and prescription of inappropriate prescriptions (e.g., opioids) decreased. A significant reduction in headache frequency and headache disability score (PedMIDAS total score) among student participants also was observed during the project period. Approximately 1700 people in the targeted region used educational resources from this project during the pilot year, with an additional 11,000 unique users (including over 600 healthcare providers) of the online resources developed for this project during the subsequent project period.

Conclusions: Targeted education for school nurses and PCPs in the community supplemented by an online tool has promise for creating system change in pediatric migraine management.

Key Words: migraine; children; adolescent; school nurse; primary care provider; education

2. Purpose

Through the provision of focused live migraine education supplemented by easily accessible evidence-based migraine management tools, the proposed project sought to mobilize the "front line" clinicians in the community (school nurses and primary care providers) that are fundamental to positively changing the trajectory of children with migraine soon after symptoms first develop. *The specific overall objective* of the current project was to assess the feasibility and impact on clinically relevant system-level outcomes of implementing a migraine education and care plan strategy in local school districts. *The specific aims* related to this overall objective were to: (a) equip school nurses through focused education with the ability to recognize symptoms of migraine in students, assess the need for improved management, and facilitate evidence-based primary care management as applicable; (b) expedite and optimize evidence-based medical treatment of pediatric migraine in primary care through school nurse-facilitated identification of youth in need of enhanced care, provider education, and provision of easily accessible (web-based) evidence-based treatment guidelines (i.e.,"Headache Action Plans"); and (c) equip students with migraine, their parents, their schools, and their primary care providers with specific information and tools for reducing migraine-related disability.

3. Scope

3.1 Background

Migraines are among the top ten most disabling medical conditions worldwide and for the majority of individuals first develop in childhood, with migraine being one of the top five health problems experienced by youth. Compelling cumulative evidence from the basic sciences and clinical research suggests that in most cases migraines will become increasingly frequent, severe, and disabling if not identified and appropriately treated with evidence-based treatment approaches soon after first development. Thus, migraine potentially could be prevented as a leading cause of worldwide disability assuming that the known gaps to identifying and appropriately treating migraine in youth can be overcome. Based on published data and data we collected from the region served by our own subspecialty institution, we hypothesized that the most gaps included limited knowledge among school-age youth and their families about migraines and the importance of having them evaluated and treated early on by a healthcare provider, combined with limited training of primary care providers in the treatment of pediatric migraine (thereby leading to further delays or omission of diagnosis and optimal treatment). Based on these hypotheses, we required a project plan that not only included increasing education about pediatric migraine care with primary care providers but also a method for reaching children who may otherwise never have their headaches evaluated by a primary care provider. We recognized that effective education strategies for healthcare providers rarely consist of single didactic sessions alone and rather require multiple exposure to content and provision of specific tools for practice. We also recognized based on extant data that school nurses often are the healthcare provider most likely to first encounter youth with migraine. Thus, in addition to implementing a migraine education plan with primary care providers, for the current project we developed a partnership with and education plan for

school nurses serving community schools and also developed easily accessible (web-based) migraine management resources.

3.2. Settings and Participants. During the first project year, we focused educational efforts on a specific region of the community served by our institution for which we had identified project "champions" and an established partnership with leadership in the school district in that region (the Olathe School District). The Olathe School District (USD 233) is the second largest school district in the state of Kansas, a state that has no board-certified headache specialists. The district serves over 29,000 students, with 16 schools at the middle and high school level served by 25 school nurses (with another 36 school nurses serving the district's elementary schools). There are approximately 40 primary care providers serving the region encompassed by the Olathe School District. The majority of these school nurses and primary care providers attend small conferences hosted by our institution that enabled us to provide initial exposure to migraine-specific education, followed by additional focused education specifically for these groups on migraine management and use of the resources developed for this project. These methods then were replicated and expanded for additional regions in our general catchment area for the following project year.

4. Methods

4.1 Migraine Education Procedures

4.1.1 Live Education for School Nurses. The education plan for school nurses in the school district targeted during the first project year proceeded sequentially from more general education on pediatric headache to more specific training on use of the electronic supportive resources developed for this project (described more in section 4.1.3) and facilitation of primary care visits for headache evaluation as applicable. The general education session was a didactic presentation on migraine management completed during an Annual School Health Conference attended by school nurses in the regions served by our institution. An additional migraine education session then was done specifically for all school nurses in the targeted school district, during their monthly meeting at the outset of a school year. Similarly, during the subsequent project year, we completed another general talk on migraine management tailored to school nurses during the Annual School Health Conference and provided sign-up sheets for school nurses in various school districts to be provided with additional education and resources. School nurses that signed up received packets by mail containing resources and handouts they could use with students to help with migraine evaluation and management, and also were given an option to sign up for individualized "mentoring" by a headache specialist through monthly phone calls.

4.1.2 Live Education for Primary Care Providers. Education about migraine treatment for community primary care providers similarly proceeded sequentially from more general continuing medical education to targeted education in smaller groups on how to use an electronic treatment decision aid we created for the project (the "Headache Action Plan," described more in section 4.1.3). We provided general education sessions on migraine management to primary care providers as part of the annual Clinical Advances in Pediatrics

Symposium (CAPS) held in the fall of each project year; the presentation comprised evidenced-based guidelines for migraine assessment and management. During the first project year, the general education session then was followed up by a more focused small group meeting with primary care providers serving the targeted school district in order to review the use of electronic "Headache Action Plans" and details about the intent and scope of our overall project. Only a general education session was provided at CAPS again during the subsequent project year, since we decided to make project resources widely available during that year rather than again targeting a specific school district and as such did not have a specific group of PCPs to target with focused smaller group education during that year.

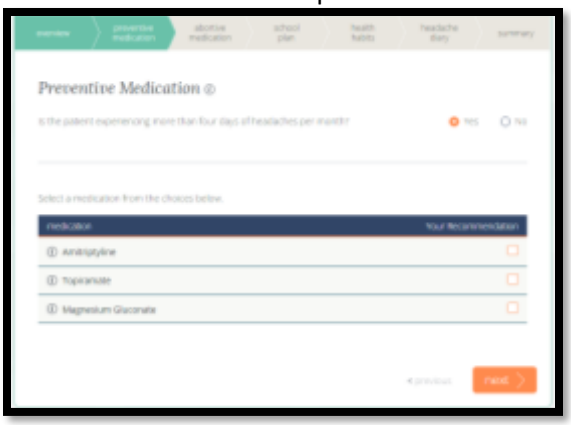
4.1.3 Online Migraine Education Website – the Headache Relief Guide. To supplement live education provided to school nurses and primary care providers, we developed a dedicated multi-use website for this project (www.headachereliefguide.com). One portion of the website was devoted to educating students with migraines (and their families) about the causes and management of migraines and to encourage families to set up headache evaluation visits with primary care physicians if applicable. The patient/family portion of the website was designed in a way to also be useful to school nurses or other healthcare providers both for personal education but also to provide patients with tools for self-management, including interactive tools to help optimize health habits (diet, exercise, sleep, and hydration) and promote skills in relaxation.

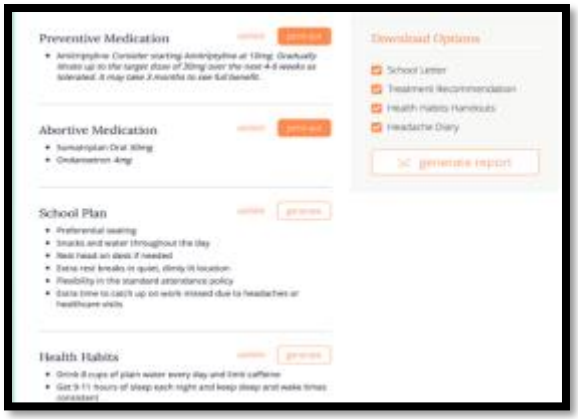
Home page of the Headache Relief Guide website

A separate part of the website, accessible via a "medical provider" login, was designed specifically for primary care providers as a tool to support treatment decisions for youth they

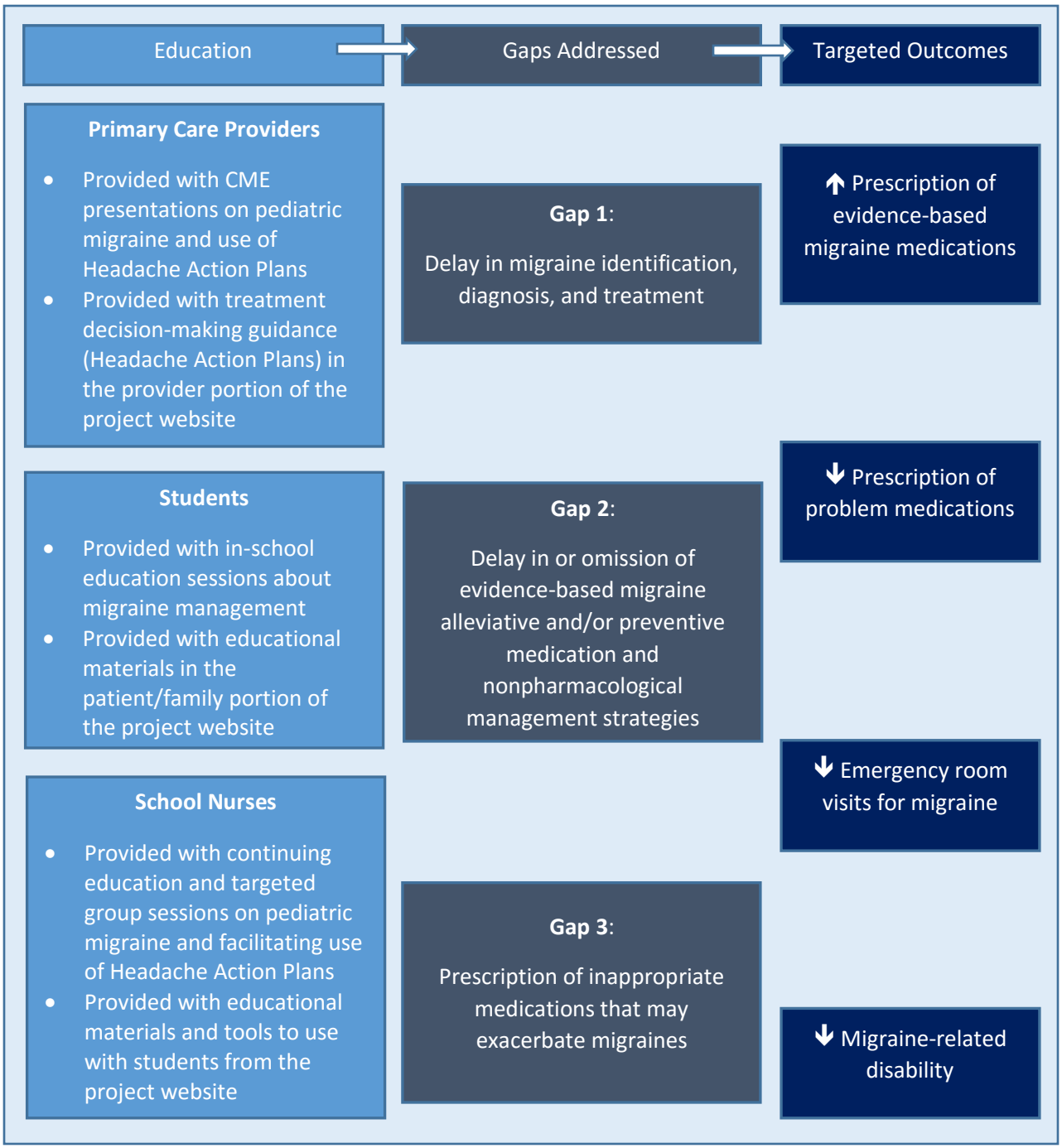
saw with migraines. This tool, referred to as a "Headache Action Plan," guided primary care providers through evidence-based medication choices based on some basic information they entered about the patient. Medications for consideration based on branching logic from the provider's input about the patient included preventive medications/supplements (amitriptyline, topirimate, magnesium), abortive medications (naprosyn, ibuprofen, sumatriptan nasal or oral, almotriptan, rizatriptan), and antiemetics (prochloperazine, ondansetron). Additionally, providers could select lifestyle/health behaviors important for optimizing headache control that they wanted patients to work on, and patient handouts were automatically generated by the tool. A letter of individualized school accommodations also could be selected and automatically generated by the tool for the patient to take to school personnel. The project website was referred to regularly during the live educational talks provided to the school nurses and primary care providers in the targeted community during the first project year; information on the project website then was disseminated more broadly for the next project year via electronic postings.

Sample Screens of the electronic Headache Action Plan





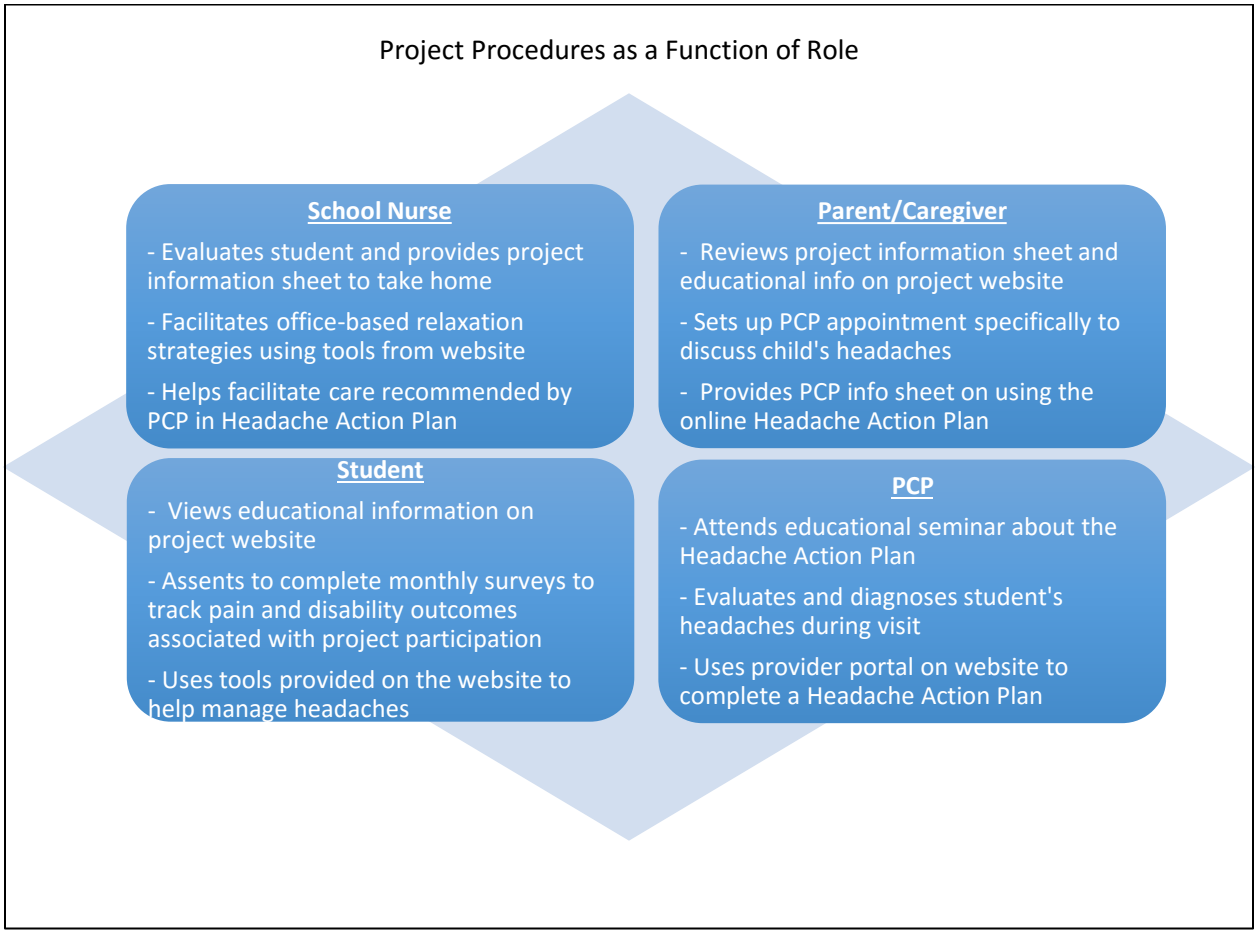
An overview of migraine education provided and the intended targets and outcomes is provided in the following graphic:



4.2 Other Project Procedures

School nurses in the targeted school district (and during the subsequent project year those who had signed up during a general education talk to receive migraine management resources) were instructed to provide information sheets to take home to students they saw in their offices with migraine symptoms. The information sheets provided information about the

project and directed families to the project website for more information. Students had the option on the website of signing up for the IRB-approved study portion of this project, which involved prospective collection of data on headache and headache-related disability in order to track patient-reported outcomes in the targeted school district during the project period. Students electing this option were first screened with a series of survey questions aimed at confirming migraine diagnosis and ensuring the student was in the targeted school district. An overview of study procedures as a function of role is provided in the following diagram:



4.3 Measures and Data Collection

Per recommendations for evaluation of continuing medical education efforts, outcomes evaluated during the project included both practice change outcomes and patient health outcomes.

4.3.1 Practice Change Outcomes. Practice change outcomes evaluated during this project included prescription of appropriate migraine medications (preventive and/or abortive medication included in the Headache Action Plan) and prescription of problematic medications for migraine (opioid or butalbital-containing compounds). We used a recurring custom-built medical record query that compared proportions of patients in the targeted school district versus other districts that had an appropriate preventive and/or abortive migraine medication initiated by a PCP, and that had a problematic medication prescribed. We also compared these proportions over time.

4.3.2 Emergency Department Utilization. We also used recurring custom queries of our electronic medical record system to evaluate trends in ED use for migraine management. Specifically, over the course of a full academic year since first implementing the project education plan, we determined the proportion of youth seen in the ED for migraine each month from the target region of the community; we then compared this proportion to baseline data obtained from the academic year preceding the implementation for the project education plan.

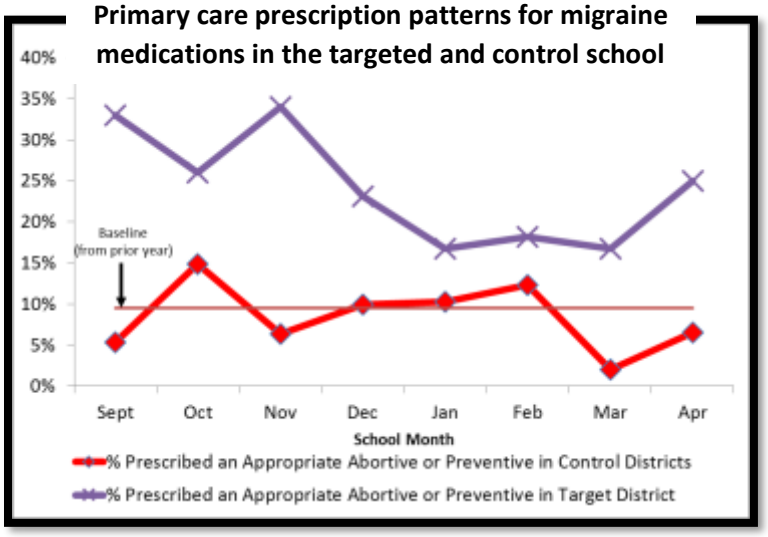
4.3.3 Patient Health Outcomes. We collected information on headache characteristics (frequency, intensity, duration) and headache-related disability (PedMIDAS questionnaire) using an online survey system. Students in the targeted school district that had provided online consent (and parent permission) to complete these surveys were automatically sent a survey link each month during the school year.

4.3.4 Other Outcomes. We collected qualitative feedback data related to the educational talks provided as part of the project. Additionally, web analytics was used to evaluate use and reach of the online resources developed for this project.

5. Results

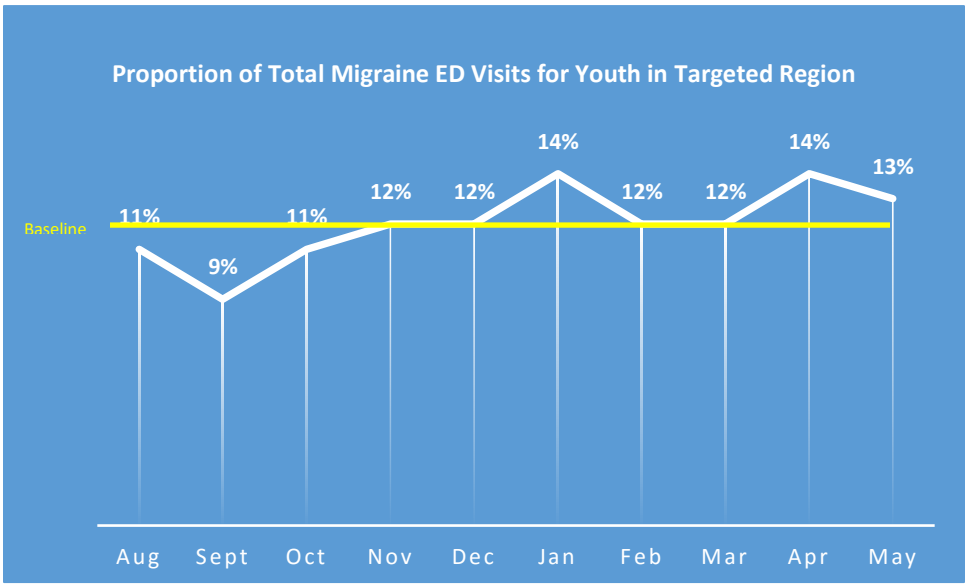
5.1 Practice Change Outcomes

For the medical record queries, 641 encounters were used for computing baseline prescription trends and 1,221 encounters were used for computing prescription trends between target and control regions during the first academic year that our educational procedures were implemented. Relative to baseline data on primary care prescription patterns for the year prior to implementation of our project education plan, prescription of appropriate medications for management of migraine was reliably higher on average in the targeted school district (see figure below). Similarly, relative to data on primary care prescription patterns in regions that were outside of the region initially targeted for focused education efforts, prescription of appropriate medications for migraine management was reliably higher (see figure below). These data were interpreted to support the impact of project educational activities on this aspect of primary care practice related to migraine management.



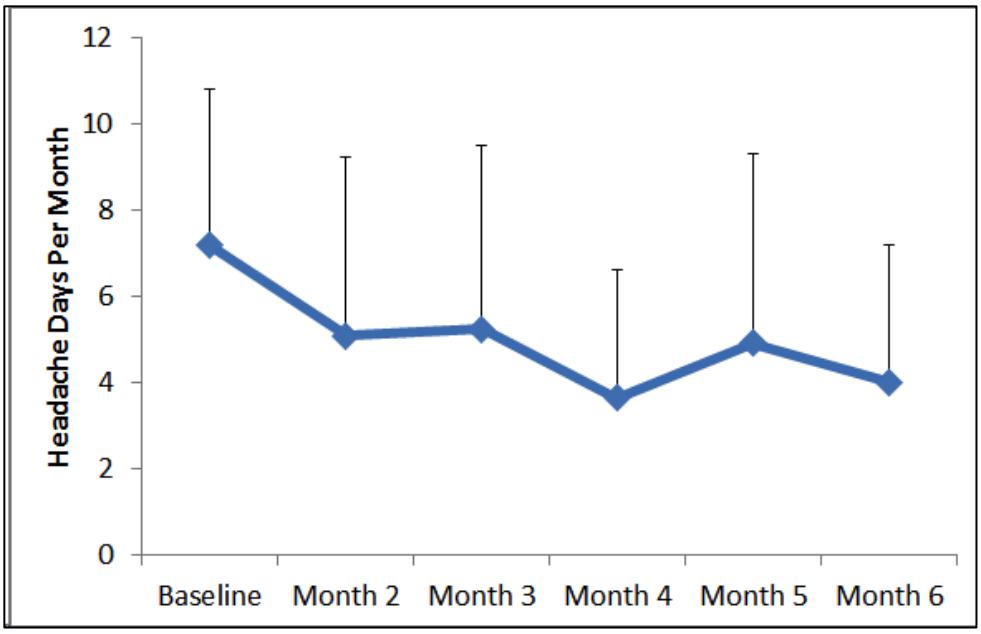
5.2 Emergency Department Utilization

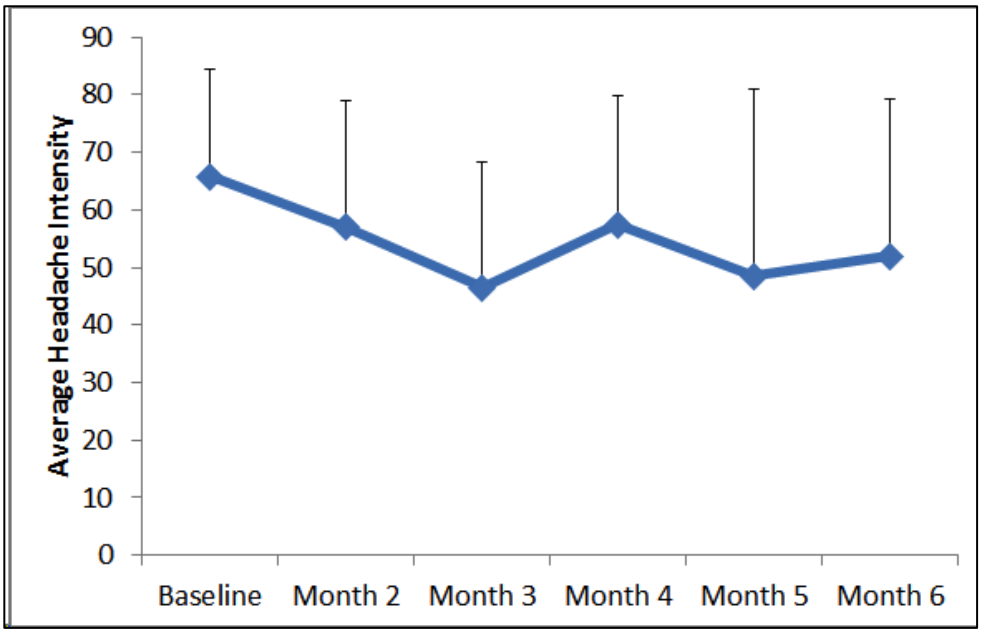
We collected data on 1937 ED visits for migraine at our institution over the course of the first academic year that the project education plan was implemented. Of these, 209 (11%) ED visits were from students in the targeted school district region. This did not represent much of a change from a baseline proportion of about 12%. The figure below shows the monthly percentages of patients seen in the ED for migraine that were from the targeted school district region. These data do not support a significant impact of the project educational efforts on reducing ED utilization for pediatric migraine. However, the relative stability of these numbers may partly reflect a subset of patients with refractory migraine that may require a greater level of care and management than can be provided in general practice settings; management of this subset of patients was not the main focus of the educational efforts developed and implemented for this project.

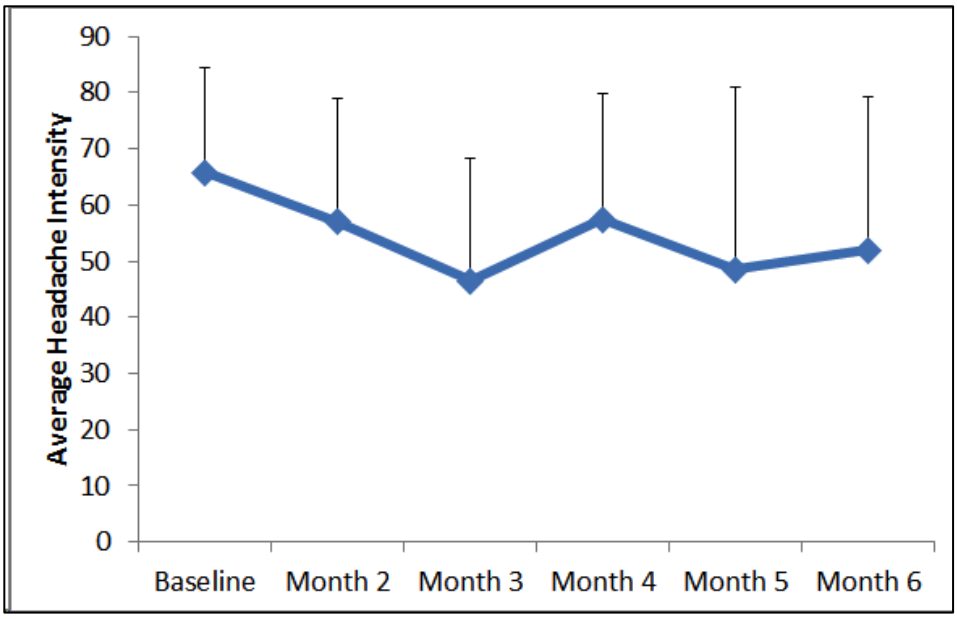


5.3 Patient Health Outcomes

A total of 95 students in the targeted school district completed the online screening process to participate in the study portion of this project, of which 41 were eligible and completed monthly surveys about their headache status over the course of 6 months. Of these respondents, 62% were female, and the average age was 14.3 years (*SD* = 2.1 years). Based on multilevel growth model analyses of the data provided by these students, we observed a significant change in headache frequency, intensity, and disability over time since youth began participating in the project. In particular, headache frequency reduced by about 1 headache day per month from a basleine average of 7 headaches per month (or a 50% reduction in headache frequency over a 6 month period), headache intensity was reduced by 30% over a 6 month period, and days of headache-related disability were reduced by about by 1.5 days/month (or a 50% reduction over a 6 month period). These changes are repsresented graphically below. We concluded that these data supported the impact on important health outcomes of the educational resources provided to school nurses, primary care providers, students and their families during this project.


Headache Days Per Month
12
10
8
6
4
2
0
Baseline
Month 2
Month 3
Month 4
Month 5
Month 6


Average Headache Intensity
90
80
70
60
50
40
30
20
10
0
Baseline
Month 2
Month 3
Month 4
Month 5
Month 6



5.4 Other Outcomes

5.4.1 Feedback on Education Sessions. Ratings on quality of the educational talks provided for this project were completed by 169 primary care providers and 48 school nurses. Ratings on the achievement of objectives, quality of content, and quality of communication all averaged in the top category range (>4/5). Open-ended feedback on the evaluation forms also was very positive.

Sample feedback from the focused education provided to school nurses:

- "I really learned a lot about headaches and new ways to prevent, treat and just to have a better understanding of triggers to educate students/parents about them so they can find a doctor that will help them"
- "The information was really great - will be really helpful for myself and my students"
- "I really appreciated the validation of tried and true headache management techniques and resource/guidelines for referral and pursuit for further evaluation"

Sample feedback from the focused education provided to PCPs:

- "Excellent talk on headaches and very practical and helpful to my practice."
- "I now have additional skills to use to deliver headache management strategies"
- "I really enjoyed learning about the [headache action plan] tool and will incorporate this into my practice"

5.4.2 Online Resource Utilization. Data collected using web analytics on our project's educational resource website (headachereliefguide.com) indicated that during the first year of the project in which we targeted a specific school district region for migraine education efforts, 614 uniqe students/families from that region used the educational content on the website and 47 unique healthcare providers used the "Headache Action Plan" resource. Over the course of the entire project period, web analytics data showed that we have had almost 13,000 unique users from US, Canada, and even European countries viewing the educational content on the website, including over 600 physicians that have used the online "Headache Action Plan." Further, we have had over 120,000 views for some

of the patient self-management training videos we created during this project, with these videos being integrated into other platforms and translated for other countries. We concluded from these data that the online tools we developed for this project were widely accessed and may have positively impacted migraine care well beyond the region initially targeted for this project.

5.5 Results Summary

Overall, the data collected for this project indicated a high level of satisfaction with the live and online educational materials developed and implemented during the project period. In turn, data generally supported an impact of the project's migraine education efforts both on provider practices (medical prescription patterns) and some patient health outcomes (headache frequency, intensity, and disability). Thus, we believe the project at least preliminarily demonstrated that targeted education for school nurses and community PCPs supplemented by "user friendly" online management tools has promise for creating system change in pediatric migraine management. The resources developed for this project continue to be widely used and have provided the foundation for "spinoff" projects, such as a program we are currently implementing and evaluating that involves individualized mentorship in headache management by headache specialists with school nurse "champions" throughout the state of Missouri.

6. Project Output

The following lists formal academic presentations and papers/abstracts associated with the project to date:

Output Type	**Reference**
Presentation	Connelly M, Bickel J. Toward improving the system of pediatric migraine care in the community through targeted education and technology: the HAPPY project. Presented at the 46th Annual Meeting of the Child Neurology Society, Kansas City, MO, October 4-7, 2017.
Presentation	Bickel J, Connelly M. Toward improving migraine management in primary care: the HAPPY project. Oral and poster presentation at the American Academy of Neurology 68th Annual Meeting, Vancouver, BC, April 15-21, 2016.
Presentation	Bickel J, Connelly M. The Headache Relief Guide. Presented at the American Academy of Neurology Annual Meeting, April 22-28, 2017.
Abstract	Bickel J, Connelly M. Toward improving migraine management in primary care: the HAPPY project. Neurology 2016;86(16), Supp I8.005.
Peer-reviewed article	Connelly M, Bickel J, Wingert T, Galemore, C. (2017). The Headache Action Plan Project for Youth (HAPPY): school nurses as facilitators of system change in pediatric migraine care. NASN School Nurse, Aug 1:1942602X17719300.
Online resources	www.headachereliefguide.com