Using Design Thinking to Understand the Reason for Headache Referrals and Reduce Referral Rates

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Abstract

Background

The demand for neurology services exceeds the current supply. We convened multiple stakeholders to learn what drives our primary care providers (PCPs) to refer patients with headache to our neurology practice. This information guided a collaborative effort to evaluate the impact of an electronic health record (EHR) headache tool on care delivery in our PCP clinics.

Recent Findings

Neurology referrals and MRI ordering declined by 77% and 35%, respectively, after the release of the EHR tool for an estimated savings of $207,600 over 3 months. PCPs prescribing habits minimally changed.

Implications for Practice

Electronically embedding a neurologist's knowledge in our PCP office was an effective way to shape the demand for headache consultation. By further leveraging stakeholder collaboration, we plan to improve the tool and disseminate it across our health system to reduce headache burden and health care costs.

Introduction

The need for neurologists is outpacing the provider pool,[1] with most institutions attempting to address the supply and demand mismatch by increasing the provider supply. Another strategy, demand shaping, has been proposed by the AAN 2019 Transforming Leaders Program[2] and others.[3,4] Innovations like educating non-neurologists, implementing tiered intervention options, and providing outreach may be ways to reduce the need for neurology services, although in the case of headache education, only one study has shown an impact on referrals[5] and few have demonstrated an impact on prescribing habits.[6]

Twenty percent of our department's referrals are for headache, a proportion that mirrors other institutions.[7] An internal review of 141 consecutive headache referrals revealed that 77% had a final diagnosis of a primary headache disorder. It is important to note that 61% of referrals had not tried any prescription medication and only 19% had tried two or more prescription medications. Only one of the charts documented all 3 ID migraine features[8] of light sensitivity, nausea, and debilitating severity. Documentation of red flags for relevant medical illness (16%) and atypical headache features (28%) was also low. Group interviews and surveys with our primary care providers (PCPs) and advanced practitioners found that our PCPs felt comfortable with both diagnosing primary headache disorders and with initiating 2–3 preventive medications and a triptan before referring to neurology. Thus, the referral pattern did not match the PCP's perceptions of their practice pattern.

To better understand this discrepancy, we implemented a design thinking (DT) process.[9] DT, also known as human-centered innovation, aims to improve the user experience of a particular product or service. It consists of 5 phases: empathizing with the stakeholders and collecting data, defining the problem, ideating solutions, creating a prototype, and then formally testing. Further innovations are based on the results of testing. We proposed that by better understanding the factors that contribute to a referral to neurology, we could reimagine a process of headache care in the PCP office, reduce the need for referral, and reshape the demand for neurology consultation.

Methods

We convened a multispecialty group including PCPs (physicians and advanced practitioners), neurologists, clinical pharmacists, administrators, and informaticians to analyze the referral process for headaches at our institution. Qualitative data on the workflow and mindset that led to these referrals were collected in the empathy phase through one-on-one meetings, group meetings, and shadowing PCPs and their clinic staff. The primary need identified was "access to neurology." PCPs cited 3 main reasons for referral: assistance in diagnosis and management, patient request for referral, and lack of time to manage the headache. In addition, PCPs felt that there was a lack of communication and partnership with neurology, citing that neurology notes often lacked sufficient details including medication doses, duration, and alternative treatment options. PCPs were sympathetic to the neurology department backlog and amenable to our tactic to shape demand. Interviews with our neurologists validated the numerical data we collected on the headache referral population.

In DT, the "ideation" phase encourages wildly creative or even impractical ideas because they can help reframe the problem and identify solutions previously not considered. During a stakeholder group session, one proposed solution was to embed a neurologist in the PCP's office. While on a system level, this idea was not feasible and it led to the team recognizing that it was not the neurologist, but the neurologist's knowledge, that was needed in the PCP's office. The DT question became, "How might we insert the neurologist's skill set into the primary care office during a patient encounter." As the PCP chairperson identified, "We need to make it easier to do the right thing!"

In response to this, the team developed a Best Practice Alert (BPA). The BPA included a questionnaire for diagnosing common primary headache disorders (migraine, chronic daily headache, and medication overuse headaches), red flag reminders, an "Express Lane" link for commonly prescribed medications and imaging, and a link for an electronic provider-to-provider consultation (Figure). Providers could also dismiss the BPA if they preferred to document and order tests in their standard fashion. The BPA was prototyped on paper and then iteratively improved as an electronic health record (EHR) tool over 3 months with PCP feedback leading to the final product. Of note, although not shown, the BPA included a section to facilitate insurance approval for a CGRP inhibitor and to order a laboratory test for C-reactive protein.
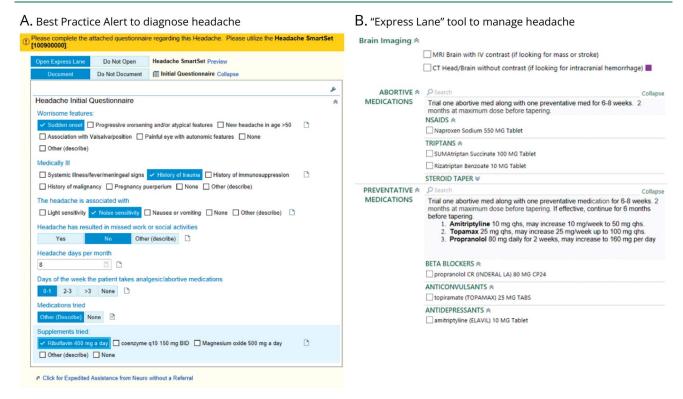
Two primary care sites (10 physicians and 6 advanced practitioners) tested the BPA, which automatically appeared whenever a headache diagnosis was entered as a chief complaint or problem for the encounter. The clinic director at each site served as the local champion. Because providers reported comfort with diagnosing and managing headache, no headache education was offered. Instead, providers were trained to use the tool and given a "headache tips" sheet that mirrored the BPA and Express Lane data. We compared provider habits for the 3 months before and the 3 months after release of the EHR tool.

Results

Providers entered primary or generic headache diagnoses in the EHR 986 times before the BPA release and 874 times after its release. Neurology referrals were placed 332 times before releasing the BPA and 76 times after its release (a 77% decline). Providers chose to use the Express Lane for tests and medications only 5% of the time, placing orders predominantly outside of the tool. Seventy-seven brain MRI scans and 31 head CT scans were ordered before the BPA release while 50 brain MRI scans (a 35% reduction) and 33 head CT scans were ordered afterward. Prescriptions for migraine preventative medications (153 prescriptions before and 154 prescriptions after BPA release), narcotics (28 before and 22 after), and triptans (95 before and 90 after) were unchanged. Two CRGP inhibitor prescriptions were written before the BPA release and 3 after its release. Steroid (33 before and 69 after) and NSAID prescriptions (9 before and 40 after) increased after implementation of the BPA.

Conclusions

We developed a headache tool that empowered PCPs to, in their words, "make it easier to do the right thing." We chose provider habits as our study outcomes because these were discrete data points readily available in the EHR. By multiplying the average number of patients served by our PCPs in 3 months (930) by the percentage reduction in consultations (232 patients at $550 per visit) and MRI scans (40 images at $2,000 per test), we identified a reduction in spending of $207,600 over 3 months, a yearly savings of $830,400. Patient-reported outcomes such as headache pain scores were not part of the PCP existing workflow. As such, we could not determine whether there was improvement in headache symptoms, but we doubt there would be, given the lack of change in prescribing habits.

Figure "Tips-and-Tricks": An Electronic Alert for Diagnosing and Managing Patients With Headache During a Primary Care Visit

(A) The Best Practice Alert pops up on the screen when a headache diagnosis is entered as the chief complaint or problem associated with the patient encounter. It includes a questionnaire with established criteria and red flags to appropriately diagnose the primary headache disorder (migraine, chronic daily headache, or medication overuse headaches) as well as a link for electronic provider-to-provider consultation to neurology. (B) The Express Lane tool provides imaging suggestions and options for commonly prescribed preventive and abortive medications along with a short reminder of their dosage and tapering schedule. Images © 2024 Epic Systems Corporation.

While the numerical results are powerful, what makes this approach more intriguing is the innovative DT methods used to create change. The phrase *inappropriate referral* was stricken from our vocabulary, opting instead to create a strong multi-departmental collaboration allowing for multiple perspectives and a solution that benefitted all stakeholders. An ongoing partnership and feedback ensured effective communication as we worked through our improvement process.

Our tool and collaboration focused on the near 80% of referrals for primary headache disorder, most of which had a limited medication trial. Using established criteria for migraine, chronic daily headache, and medication overuse headache, our PCPs had fingertip access to a neurologist's knowledge during the patient encounter. The simplicity of the tools addressed the PCP's time constraints as well. While we cannot assume that PCPs were able to diagnose primary headache disorders more quickly, the reduction in referrals and imaging suggests to us that PCPs were more comfortable with excluding secondary headache disorders and responding to patient's requests for a neurology consultation. By reducing headache referrals, we created access to patients with other neurologic conditions. Because our institution is part of an integrated health system, reducing unnecessary testing fit our value-based care objectives.

Finding partial success is a key component to the DT process, where failures are an expected substrate for iterative change. The cohort's large size indicates that some patients would have been candidates with triptan or prophylactic medication, and we conclude that the tool did not affect prescribing habits. The increase in NSAIDs and steroids for acute flares was promising, but certainly not the impact we sought. This lack of change may, in part, be a consequence of our decision to not provide headache-specific education. The 2 reasons for this decision were[1] our PCPs reporting that they felt that their knowledge was satisfactory and[2] previous case-based headache training at 4 other PCP clinics resulting in an increase in referrals.

Although our providers changed their referral and MRI-ordering behavior, they only used the tool 5% of the time. Providers we interviewed felt that the tool's value was as a reminder on how to approach headache management. We found that their clinic notes often documented red flags and headache symptoms in the precise order as that in the BPA. We recognize that depending on the provider's expertise, the impact of the tool may have ranged from an effective jog of memory to a line-by-line reference tool to a Hawthorne-like effect where the act of being observed led to a change in behavior.

TAKE-HOME POINTS

1. Despite well-established diagnostic criteria and evidence-based treatments, undertreated primary headache disorders are the most common reason for referral to neurology.

2. Primary care providers refer headache patients to neurologists for assistance with diagnosis and management, at the patient's request and to compensate for time constraints.

3. A design thinking approach helps bring together multiple perspectives, creates local champions, and develops solutions to serve all stakeholders.

4. A tool that puts the neurologist's skill set in the room with a primary care provider reduced referrals to neurology and MRI orders. It did not change the number of preventative or abortive medications prescribed to patients.

5. Design thinking allows for identification of the root cause of a problem and opens the door for future improvements based on data.

Our collaboration and open communication have been key to ongoing improvement. We developed a series of 4 easily digestible 90-second videos on diagnosis and treatment of primary headache disorders. While the videos were well received by primary care leadership, subsequent meetings with individual PCPs revealed that often providers had either not watched the videos or were unaware of them because of a failure of dissemination. This lesson helped us determine that the best place to share education is during local departmental meetings. Our team considered using telehealth to embed the neurologist in primary care clinics.[10] Recognizing that we lacked the physicians to develop this, we trained our clinical pharmacy team because others have[11] to assess, counsel, and treat patients with indirect physician oversight, allowing for more rapid access and at a lower cost. Our team is also evaluating new ways to obtain and document patient symptoms and improve the quality of neurologist's recommendations, to better use electronic consultations. Finally, our next iteration will be assessing the effectiveness of this tool on a system-wide level using a cluster randomized trial.

Given the high prevalence of headache, it makes sense to find a way to increase access to headache care. We present a novel solution that aims to increase the utilization of current technology and evidence-based practices to shape demand for headache referrals to neurology. Our design thinking approach has shown effective first steps toward improving the mismatch between limited access to neurology expertise and demand for access within our integrated health system. Future innovations that improve PCP's prescribing habits and include patient outcome monitoring will lead to better use of time-tested medications and measurable effect on value-based care.

Appendix Authors

Name	Location	Contribution
Ashish D. Patel, MD	Neurology, Geisinger, Danville, PA	Drafting/revision of the manuscript for content, including medical writing for content
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Edward Stefanowicz, MBA	Neurology, Geisinger, Danville, PA	Major role in the acquisition of data; study concept or design
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Brian Seeley, DO	Community Medicine, Geisinger	Major role in the acquisition of data; study concept or design
Scott Friedenberg, MD	Geisinger, Danville, PA	Drafting/revision of the manuscript for content, including medical writing for content; major role in the acquisition of data; study concept or design; analysis or interpretation of data

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