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A Migraine Management Training Program for Primary Care Providers: An Overview of a Survey and Pilot Study Findings, Lessons Learned, and Considerations for Further Research

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Abstract

Background—There are five to nine million primary care office visits a year for migraine in the United States. However, migraine care is often suboptimal in the primary care setting. A prior study indicated that primary care physicians (PCPs) wanted direct contact with headache specialists to improve the migraine care they provide.

Objective—We sought to further examine PCPs' knowledge of migraine management and assess the feasibility of a multimodal migraine education program for PCPs.

Methods—We conducted a survey assessing PCPs' knowledge about migraine. We then held three live educational sessions and developed an email consultative service for PCPs to submit questions they had about migraine. We report both quantitative and qualitative findings.

Results—Twenty-one PCPs completed the survey. They were generally familiar with the epidemiology of migraine (mean prevalence of migraine reported was 12.6 ± 10.1), the psychiatric comorbidities (mean prevalence of comorbid depression was 24.5 ± 16.7 , mean prevalence of comorbid anxiety was 24.6 ± 18.3), and evidence-based behavioral treatments. Fifty-six percent cited cognitive behavioral therapy, 78% cited biofeedback, and 61% cited relaxation therapy as evidence based treatments. Though most were aware of the prevalence of psychiatric comorbidities, they did not routinely assess for them (43% did not routinely assess for anxiety, 29% did not routinely assess for depression). PCPs reported frequently referring patients for non-level A evidence based treatments: special diets (60%), acupuncture (50%), physical therapy (30%), and psychoanalysis (20%). Relaxation therapy was a therapy recommended by 40% of the PCPs. Only 10% reported referring for cognitive behavioral therapy or biofeedback. Nineteen percent made minimal or no use of migraine preventive medications. Seventy-two percent were unaware of or only slightly aware of the American Academy of Neurology guidelines for migraine. There was variable attendance at the educational sessions (N=22 at 1st session, 6 at 2nd session, 15 at 3rd session). Very few PCPs used the email consultative service (N=4).

Conclusions—Though PCPs are familiar with many aspects of migraine care, there is a need and opportunity for improvement. The three live sessions were poorly attended and the email consultative service was rarely used. We provide an in depth discussion of targeted areas for educational intervention, of the challenges in developing a migraine educational program for PCPs, and areas for future study.

Keywords

primary care; migraine; diagnosis; treatment; education; telemedicine

INTRODUCTION

Migraine is a debilitating disorder that affects 12% of the US population¹ and results in \$13 billion of lost productivity per year.² Patients frequently first present with migraine

symptoms to a primary care physician (PCP),^{3,4} and most remain in primary care – only a minority of migraine sufferers are treated at headache centers.⁴ These visits account for five to nine million primary care office visits a year in the United States.^{4,5} However, the care the patients receive in the primary care setting is often suboptimal, with studies showing inaccurate diagnoses, inadequate acute treatment, for example, NSAIDs for severe attacks, and an average of four years between migraine diagnosis and initiation of preventive medications.^{6,7} The American Migraine Prevalence and Prevention (AMPP) study showed that 38% of migraine sufferers meet criteria for preventive treatment but only 11% get it. PCPs hesitate to prescribe migraine preventive medications because of a lack of understanding about efficacy and side effects.^{1,4,8}

Though headache accounts for 10% of PCP visits, and migraine accounts for at least 75% of the headache diagnoses at these visits, few studies have endeavored to improve migraine treatment in the primary care setting.⁹ None of the studies have tried to create ongoing direct communication between PCPs and headache specialists. Physician education via direct face-to-face interaction and distribution of resources is effective in other areas, especially when paired with multiple forms of physician intervention.^{10,11} There have been mixed results with earlier headache educational programs in primary care. One study failed to show a benefit in the diagnosis and treatment of migraine.¹² However, two other studies have demonstrated success, with one study showing that among participating PCPs, almost 50% of patients experienced a 50% or more reduction in headache frequency.^{13,14}

We conducted a knowledge and needs assessment, asking PCPs directly about the kind of migraine educational program which would best serve their needs.¹⁵ PCPs favored opportunities for direct contact with expert physicians (55.5%) and time at staff meetings (45.8%). In response, we explored educational modalities for this direct contact. The continuing medical education (CME) literature shows that: (1) Multiple teaching strategies are effective¹⁶; (2) Live media is more effective than print; (3) Multimedia is more effective than single media interventions; (4) Multiple exposures are more effective than single exposure; (5) Interactive techniques are more effective than didactic ones.¹⁷ In addition, we reviewed the growing literature on telemedicine.¹⁸ In the UK, studies of email triage systems for new neurological outpatient referrals from general practice demonstrated safety and efficacy, and such systems reduced wait time and costs.¹⁹ PCPs reported high satisfaction with such a program.²⁰ Migraine was the second most common reason for the neurology referrals used in the email triage system.²¹

In this current study, we examined the knowledge and needs of PCPs at a city hospital center using a medical home model.¹⁵ The medical home model was created to provide comprehensive patient-centered coordinated care throughout the broader healthcare system, making services accessible while assuring a high standard of patient quality and safety.²² The study also examined the feasibility of a live educational intervention and email consultative service as well as barriers to the educational process and service.

METHODS

IRB approval was obtained from the NYU School of Medicine. Participants were informed about the study through an online departmental newsletter. All PCPs at Bellevue Hospital Center were invited to attend the migraine educational series and they received CME credit for participation.

A concept model of the intervention can be found in Figure 1. A summary of the intervention can be found in Figure 2. Primary care doctors were given a survey and then invited to participate in an educational intervention. Table 1 indicates the topics covered in the survey, which can be found in Appendix 1. The survey asked PCPs about their knowledge, comfort, and practice patterns regarding migraine management, including questions about abortive and preventive treatments for migraine, including pharmacologic and behavioral treatment, indications for imaging, and concern for medication overuse headache (MOH). The educational intervention offered a combination of live media, multimedia, multiple exposures, and interactive techniques. The live sessions had a combination of PowerPoint slides with traditional lecture, case based learning, and opportunities for questions. Electronic consultative services have been safely and effectively used in Europe, so we decided to assess the feasibility of conducting an email headache consultative service in the US. An email consultative service was developed to address the stated preference for interaction with headache specialists and to continue the momentum from the live sessions. The goal was to provide PCPs with timely advice on how to manage their headache patients. Further, to enhance the learning of all of the participating PCPs, the emails were sent on a listserv so that all PCPs could view other PCPs' questions and their answers. PCPs were also emailed migraine management "tip sheets" (Appendix 2). The initial study design included a pre-test and a post-test to assess the efficacy of the migraine education program.

Statistical Analyses

Survey data were collected via free text (for percentages) and via Likert Scale, and the data were entered into RedCap. Descriptive analyses (means, frequencies, and percentages) were determined using RedCap software.²³ A priori, we had planned to compare preintervention survey results with post-intervention survey results. Feasibility was assessed with attendance at the sessions and the number of questions emailed. Feedback about the program was assessed qualitatively from the PCPs using audio recording of the three live sessions and then transcription.

RESULTS

Demographics of PCP Participants

The study took place in the Primary Care Practice of Bellevue Medical Center, an affiliate of the NYU Medical Center. The Primary Care Practice serves about 28,000 patients who make about 60,000 outpatient visits a year. The top languages spoken are English, Spanish, Bengali, and Chinese. The patient payer mix is regular or managed Medicaid (43%), selfpay (34%), regular or managed Medicare (13%), and commercial insurance (10%). The Primary

Care Practice has 30 full time and nine session attending physicians, as well as six nurse practitioners and seven physician assistants. We targeted the attending physicians. Of the 39 attending physicians, 22 attended the first session (56%). Of these, 21 eligible attending physicians completed the survey for a response rate of 95%. The demographics of survey respondents are summarized in Table 2.

Feasibility of the Educational Sessions-Time Constraints and Pressure and Recruitment

All of the PCPs in the practice were invited to participate and they received CME credit for participation. There was variable attendance: 22 PCPs attended the first session, 6 PCPs attended the second session, and 15 PCPs attended the third session. PCPs at the first session came from varied backgrounds, including 13 different medical schools and 8 different residency training programs. There was also variable consistency of attendance: 5 PCPs from the first session attended the third session. Hence, we were unable to conduct post-intervention analyses.

Survey Data

The first section of the survey asked questions to gauge the PCPs' knowledge including migraine epidemiology, comorbidities, evidence based treatments, and other subjects. Table 3 shows a summary of these results. The PCPs were generally aware of the epidemiology of migraine, the prevalence of psychiatric comorbidities, and the risk of medication overuse headaches (MOH) associated with opioids and barbiturates. Awareness that triptans cause MOH was low. Though they were aware of evidence based nonpharmacologic treatments, they were generally not aware of evidence based guidelines for preventive medications.

The second section of the survey addressed the comfort level of PCPs in diagnosing migraine and in the use of diagnostic technology. About 80% of PCPs were "somewhat comfortable" or "moderately comfortable" though only 5% were "very comfortable."

The third major category addressed PCPs' migraine management practice patterns. The survey addressed the conditions under which a PCP would order an MRI scan for a patient presenting with particular symptoms (Table 4). Table 5 describes how PCPs manage the patients. In terms of acute treatment, PCPs reported prescribing opioids to few patients (2% 6 4.6 [0-20]). Barbiturates were reported to be prescribed slightly more frequently to patients: 4.2% 18.3 (0-33). PCPs also reported that they prescribe anti-nausea medications in 2.5% of patients. The majority of PCPs (66.7%) said that they would be likely (61.9%) or extremely likely (4.8%) to prescribe preventive medications for their patients. However, close to one-fifth (19%) said that they would be unlikely to do so (never, almost never) and another 14.3% said that they were neutral regarding the matter. As shown in Table 5, reasons for not prescribing the preventive medicine included the belief that medicines do not work, or being afraid of side effects.

New data from this survey reveal the degree to which PCPs consider asking about possible headache related conditions that might affect headache outcomes (Table 5). Though most reported screening for depression, a minority conducted routine assessments for anxiety disorders or temporal mandibular disorders (TMD). Also, in this study, PCPs reported frequently referring patients for special diets (60%), acupuncture (50%), physical therapy

(30%), and psychoanalysis (20%).²⁴ None of these treatments are A-level evidence based treatments, based on the American Academy of Neurology/American Headache Society Guidelines.²⁵ Relaxation therapy was a therapy recommended by 40% of the PCPs. Only 10% reported referring patients for cognitive behavioral therapy or biofeedback, which are level A evidence based therapies according to guidelines.²⁵ When asked if they know how to find a provider who does these treatment modalities, all PCPs stated that they knew how to find a physical therapist; 50% knew how to find an acupuncturist, and 42% knew how to find a cognitive behavioral therapist; 8.3% knew how to find a biofeed-back provider. All PCPs said that they had previously made the diagnosis of MOH.

Questions Asked by the PCPs (Data from the Email Consultative Service and from the Question and Answer Sessions) and Their Suggestions for Improved Migraine Educational Opportunities

Though 21 PCPs were given the opportunity to email a headache specialist with questions, only 4 (19%) took advantage of this opportunity. PCPs were also given the opportunity to ask questions during the sessions. Examples of questions asked by PCPs during the live session and the responses can be found in Appendix 3-a. Questions asked by PCPs via email and examples of the emailed responses can be found in Appendix 3-b. Question topics ranged from headache triggers to indications for imaging to various migraine treatment options and more.

There was time devoted at the end of the third educational session to provide suggestions for improving the program. PCPs said that they would have preferred centralized resources for easy access and wanted opportunities to get their questions answered in real time, not over email. They also said that if there had been an urgent need for an answer, they would just page the neurology resident on call to find out what to do, since this would yield a faster response time than email.

DISCUSSION

Several themes emerged from this study: (1) PCPs have difficulty translating knowledge about treatment into clinical practice. (2) About one fifth made minimal or no use of migraine preventive medications. (3) PCP attendance at a multi-day live program was poor. (4) The email consultative service was seen as a burden by some PCPs and not widely acceptable for a variety of reasons,

A number of interesting findings emerged from the survey. Among them, PCPs had a significant amount of knowledge even prior to the start of the educational program. Regarding comorbidities, the physicians indicated that they assess depression more frequently than anxiety. This is intriguing because previous studies indicate that anxiety disorders are associated with more disability than depression.^{26,27} The majority do not consistently assess for temporomandibular joint disorders, which is important because TMD and migraine are comorbid conditions^{28,29} and migraine symptoms improve when migraine and TMD are simultaneously treated.^{30,32} PCPs are familiar with the evidence based treatment options; they know that biofeedback, CBT, and relaxation are evidence based treatments for migraine. However, acupuncture and special diets were also incorrectly

considered evidence based therapies. Despite the fact that the PCPs know which alternative treatments are evidence based, they often refer for non-evidence based treatments: special diets (60%) and acupuncture (50%). However, only 10% refer for CBT and only 10% refer for biofeedback. This could be due to an inability for PCPs to access the appropriate practitioners who can help with evidence-based treatment. Fifty percent know how to find a practitioner for acupuncture but only 8.3% know how to find a practitioner for biofeedback. As in the prior study, PCPs are familiar with MOH and about one-fifth are unlikely to prescribe preventive medication.¹⁵ Compared to our prior study, the PCPs were more comfortable diagnosing migraine: approximately half were moderately or extremely comfortable in this study compared to about one-third in the prior study. Similar to our prior study, the majority of the PCPs were not familiar with the AAN/AHS guidelines or the Choosing Wisely Campaign recommendations. Perhaps professional societies should focus on guideline dissemination and implementation strategies.^{33,34} This study, as well as two prior studies, suggest that there is still a significant need for educating PCPs about when imaging is necessary.^{15,34} In our study, just over two-fifths would not generally order imaging for patients with the onset of new type of headache or in persons with new onset headache over age 50. Only just over one-fourth would order imaging for a headache with neurologic symptoms. These are indications for imaging typically accepted by headache specialists. This pattern of perhaps not ordering imaging when it is necessary is in contrast to prior findings that 62% of CT head/brain studies are inappropriate according to evidence based treatment (EBT) guidelines, and they are most often ordered for chronic headache.³⁵

Feasibility of intervention strategy

Few PCPs attended the second and third educational sessions and only 18% used the email consultative service. Low participation rates may reflect the practice setting, the specifics of our education program, and our approach to implementation. Our study was conducted in an urban municipal hospital with high clinical demands. We targeted all PCPs but there was no mandate to participate. Scheduled in person sessions may be particularly difficult in this setting.

A previous migraine education program achieved higher levels of participation.¹⁴ That program was endorsed by the head of the primary care clinic and took place during scheduled CME time. Factors associated with successful engagement in headache education merits additional study.²⁰ In many contexts, the feasibility and efficacy of such a program may not be met unless participation is expected and required. Also, it may be easier if it fits into patient care flow within the electronic medical record system.

We provided CME credit but otherwise there was no incentive to attend.

Limitations

This study has several limitations, including modest sample size and single location, which limits generalizability. PCPs had varied schedules, which made it difficult for all participants to attend 3 one-hour educational sessions. Getting PCPs together in their workplace has been a major factor in reducing the effects of educational interventions in other studies.³⁶ PCPs have limited time with patients, which makes it difficult to compose and send emails to

specialists during the physician-patient encounters. PCPs voiced frustration that they may not have good follow-up with their patients, and thus not having an immediate answer to their questions made the email consultative service less valuable to them. In addition, the email consultative service added an additional time burden. Time burden has previously been an issue when electronic consult systems have been utilized elsewhere. The costs of the primary care physicians' time input was higher (more than double) for those using the email system due to the PCPs providing feedback to the patient though cost savings were achieved as a result of a reduction in time input from the consultant neurologist, which fell by more than 50%.²⁰ However, we do not know all of the details for why they did not utilize the opportunity. Other possible reasons are: (1) PCPs may not have wanted to publicize their knowledge deficits on a listserv. (2) Resistance to change/unwillingness to learn about the new technology. In future studies, data on objective medical outcomes will be important to evaluate the impact on patient outcomes. Some challenges may also have been compounded by the city hospital system, including limited formularies and rules against sending "secure" emails to physicians outside of the city hospital system, even at affiliated hospitals. When the email consultative service was trialed in the UK, the National Health Service (NHS) also questioned sending emails outside of the health system and a successful program became defunct.²⁰

Areas for Future Consideration and Study

There are multiple approaches to improving educational interventions. PCP participants suggested the following: (1) have one website as a resource page which PCPs can reference when they are with the patient; (2) provide them with a handout with the algorithm for the stepwise management of migraine, including when to refer to a headache specialist; (3) have a pager for headache questions (a "phone-a-specialist" hotline) where PCPs can get answers to their questions in real time; (4) record and distribute the educational sessions to work around their work schedules. However, this last option would limit the face-to-face interaction with the headache specialist. Face to face interaction has been proven to be an effective educational tool in other studies.¹¹ The email system could be replaced with a more informal IM system that requires less time for the PCPs to receive answers to questions but it might be less practical for the consulting neurologist(s). The email system could also be integrated into the referral request system. Prior studies indicate that structured referral sheets take three minutes to complete. The average time it took for a consultant to reply was 19 hours. Close to one-fifth (19%) of the electronic referrals did not require a neurology appointment.²¹ Incentives could be provided to participants in such programs, as is being piloted in some of the hospitals of the authors of this study. There could be initiatives like Project ECHO, a program that links teams of specialists at academic "hubs" with primary care clinicians in local communities.³⁷

It would be valuable to examine the effect of the size of the patient panel on PCP treatment and diagnosis of migraine. In the US, panels are typically large. The practice panel in Europe for primary care physicians is much less that is, in Norway it is 1200 patients but in the US it is 2300 patients.³⁸ Studies state that PCPs in the US would have to spend 21.7 hours per day to provide all recommended acute, preventive and chronic care for a panel of 2500 patients.³⁹⁻⁴¹ There are two solutions to this: (1) Have smaller panel loads. The ideal

medical practice model has less than 1000 patients per PCP.⁴² However, this is unlikely to occur because even more patients would be without a PCP given the shortage of PCPs and because of financial considerations. (2) Have team models of care to reduce the burden on PCPs,⁴³ with care managers or nurses providing headache education. Headache education has been shown to improve adherence and the effectiveness of treatment,⁴⁴ with improved self-efficacy,^{14,45} use of acute medication,^{46,47} and migraine disability.⁵¹ In addition, headache education has led to a decreased need to healthcare utilization.⁴⁸ Specific methods for communication can be used, including the “Ask-Tell-Ask” strategy used in the American Migraine Communication Study 2,⁴⁹ which is also recommended by behavioral headache specialists.⁵⁰ NPs can help treat the patients with abortive and preventive medications. This is already done for other chronic disease such as diabetes, asthma, and depression.⁵¹⁻⁵³ There could also be a nurse tele-health program with calls by nurses to check in on patients, follow-up on their headache frequency, report this information to the doctors, and counsel patients about medication overuse headache and obtaining treatment for comorbid depression and anxiety. Also, the effectiveness of group visits for patients with migraine could be explored.⁵⁴

Conclusion

Our study was a follow-up and a continuation of a prior study and assessed the feasibility of a multimodal educational program for PCPs including an email consultative service. We found several challenges in developing such programs, and provide considerations for future program development.

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REFERENCES

1. Lipton RB, Bigal ME, Diamond M, et al. Migraine prevalence, disease burden, and the need for preventive therapy. *Neurology*. 2007; 68:343–349. [PubMed: 17261680]
2. Hu XH, Markson LE, Lipton RB, Stewart WF, Berger ML. Burden of migraine in the United States: Disability and economic costs. *Arch Intern Med*. 1999; 159:813–818. [PubMed: 10219926]
3. Lipton RB, Stewart WF, Simon D. Medical consultation for migraine: Results from the American Migraine Study. *Headache*. 1998; 38:87–96. [PubMed: 9529763]
4. Gibbs TS, Fleischer AB Jr, Feldman SR, Sam MC, O'Donovan CA. Health care utilization in patients with migraine: Demographics and patterns of care in the ambulatory setting. *Headache*. 2003; 43:330–335. [PubMed: 12656703]
5. Collins JG. Prevalence of selected chronic conditions, United States, 1979-1981. *Vital Health Statistics*. 1986; 10:1–66. [PubMed: 2950651]
6. Shapero G, Dowson A, Lacoste JP, Almqvist P. Improved migraine management in primary care: Results of a patient treatment experience study using zolmitriptan orally disintegrating tablet. *Int J Clin Pract*. 2006; 60:1530–1535. [PubMed: 17109663]
7. Dekker F, Dieleman JP, Neven AK, Ferrari MD, Assendelft WJ. Preventive treatment for migraine in primary care, a population-based study in the Netherlands. *Cephalalgia*. 2013; 33:1170–1178. [PubMed: 23720498]
8. Mafi JN, Edwards ST, Pedersen NP, Davis RB, McCarthy EP, Landon BE. Trends in the ambulatory management of headache: Analysis of NAMCS and NHAMCS data 1999-2010. *J Gen Intern Med*. 2015; 30:548–555. [PubMed: 25567755]

9. Ahmed F. Headache disorders: Differentiating and managing the common subtypes. *Br J Pain*. 2012; 6:124–132. [PubMed: 26516483]
10. Thomson, O'Brien MA.; Oxman, AD.; Davis, DA.; Haynes, RB.; Freemantle, N.; Harvey, EL. Educational outreach visits: Effects on professional practice and health care outcomes. *Cochrane Database Syst Rev*. 2000 CD000409.
11. Giguere A, Legare F, Grimshaw J, et al. Printed educational materials: Effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev*. 2012; 10 CD004398.
12. Smelt AF, Blom JW, Dekker F, et al. A proactive approach to migraine in primary care: A pragmatic randomized controlled trial. *CMAJ*. 2012; 184:E224–31. [PubMed: 22231680]
13. Kristoffersen ES, Straand J, Vetvik KG, Benth JS, Russell MB, Lundqvist C. Brief intervention for medication-overuse headache in primary care. The BIMOH study: A double-blind pragmatic cluster randomised parallel controlled trial. *J Neurol Neurosurg Psychiatry*. 2015; 86:505–512. [PubMed: 25112307]
14. Smith TR, Nicholson RA, Banks JW. Migraine education improves quality of life in a primary care setting. *Headache*. 2010; 50:600–612. [PubMed: 20148982]
15. Minen MT, Loder E, Tishler L, Silbersweig D. Migraine diagnosis and treatment: A knowledge and needs assessment among primary care providers. *Cephalalgia*. Jun 29.2015 >pii: 0333102415593086. [Epub ahead of print].
16. Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance. A systematic review of continuing medical education strategies. *JAMA*. 1995; 274:700–705. [PubMed: 7650822]
17. Marinopoulos SS, Dorman T, Ratanawongsa N, et al. Effectiveness of continuing medical education. Agency for Healthcare Research Quality. 2010 Available at: <http://archive.ahrq.gov/downloads/pub/evidence/pdf/cme/cme.pdf>.
18. Bashshur R, Shannon G, Krupinski E, Grigsby J. The taxonomy of telemedicine. *Telemed J E Health*. 2011; 17:484–494. [PubMed: 21718114]
19. Patterson V, Humphreys J, Henderson M, Crealey G. Email triage is an effective, efficient and safe way of managing new referrals to a neurologist. *Qual Saf Health Care*. 2010; 19:e51. [PubMed: 20511602]
20. Patterson V, Humphreys J, Chua R. Email triage of new neurological outpatient referrals from general practice. *J Neurol Neurosurg Psychiatry*. 2004; 75:617–620. [PubMed: 15026509]
21. Williams L, O'Riordan S, McGuigan C, Hutchinson M, Tubridy N. A web-based electronic neurology referral system: A solution for an overburdened healthcare system? *Ir Med J*. 2012; 105:301–303. [PubMed: 23240282]
22. Defining the PCMH. Patient Centered Medical Home Resource Center. Available at: <https://www.pcmh.ahrq.gov/page/defining-pcmh>. Accessed 2015.
23. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009; 42:377–381. [PubMed: 18929686]
24. American Academy of Neurology. Clinical Practice Guideline Process Manual. The American Academy of Neurology; St. Paul, MN: 2011. 2011.
25. Campbell JK, Penzien DB, Wall EM. Evidenced-Based Guidelines For Migraine Headache: Behavioral and Physical Treatments. Available at: <http://tools.aan.com/professionals/practice/pdfs/gl0089.pdf>. Accessed 2015.
26. Lanteri-Minet M, Radat F, Chautard MH, Lucas C. Anxiety and depression associated with migraine: Influence on migraine subjects' disability and quality of life, and acute migraine management. *Pain*. 2005; 118:319–326. [PubMed: 16289799]
27. Guidetti V, Galli F, Fabrizi P, et al. Headache and psychiatric comorbidity: Clinical aspects and outcome in an 8-year follow-up study. *Cephalalgia*. 1998; 18:455–462. [PubMed: 9793697]
28. Goncalves DA, Camparis CM, Franco AL, Fernandes G, Speciali JG, Bigal ME. How to investigate and treat: Migraine in patients with temporomandibular disorders. *Curr Pain Headache Rep*. 2012; 16:359–364. [PubMed: 22610505]

29. Goncalves DA, Bigal ME, Jales LC, Camparis CM, Speciali JG. Headache and symptoms of temporomandibular disorder: An epidemiological study. *Headache*. 2010; 50:231–241. [PubMed: 19751369]
30. Goncalves DA, Camparis CM, Speciali JG, et al. Treatment of comorbid migraine and temporomandibular disorders: A factorial, double-blind, randomized, placebo-controlled study. *J Orofac Pain*. 2013; 27:325–335. [PubMed: 24171182]
31. Speciali JG, Dach F. Temporomandibular dysfunction and headache disorder. *Headache*. 2015; 55(Suppl 1):72–83. [PubMed: 25644695]
32. Bevilacqua Grossi D, Lipton RB, Bigal ME. Temporomandibular disorders and migraine chronification. *Curr Pain Headache Rep*. 2009; 13:314–318. [PubMed: 19586596]
33. Grimshaw JM, Thomas RE, MacLennan G, et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess*. 2004; 8:iii–iv. 1–72. [PubMed: 14960256]
34. Callaghan BC, Kerber KA, Pace RJ, Skolarus L, Cooper W, Burke JF. Headache neuroimaging: Routine testing when guidelines recommend against them. *Cephalalgia*. 2015
35. Lehnert BE, Bree RL. Analysis of appropriateness of outpatient CT and MRI referred from primary care clinics at an academic medical center: How critical is the need for improved decision support? *J Am Coll Radiol*. 2010; 7:192–197. [PubMed: 20193924]
36. Watkins C, Timm A, Gooberman-Hill R, Harvey I, Haines A, Donovan J. Factors affecting feasibility and acceptability of a practice-based educational intervention to support evidence-based prescribing: A qualitative study. *Fam Pract*. 2004; 21:661–669. [PubMed: 15528289]
37. Arora S, Geppert CM, Kalishman S, et al. Academic health center management of chronic diseases through knowledge networks: Project ECHO. *Acad Med*. 2007; 82:154–160. [PubMed: 17264693]
38. Alexander GC, Kurlander J, Wynia MK. Physicians in retainer (“concierge”) practice. A national survey of physician, patient, and practice characteristics. *J Gen Intern Med*. 2005; 20:1079–1083. [PubMed: 16423094]
39. Yarnall KSH, Østbye T, Krause KM, Pollak KI, Gradison M, Michener JL. Family physicians as team leaders: “Time” to share the care. *Prev Chronic Dis*. 2009; 6:A59–A64. [PubMed: 19289002]
40. Yarnall KSH, Pollak KI, Østbye T, Krause KM, Michener JL. Primary care: Is there enough time for prevention? *Am J Public Health*. 2003; 93:635–641. [PubMed: 12660210]
41. Østbye T, Yarnall KSH, Krause KM, Pollak KI, Gradison M, Michener JL. Is there time for management of patients with chronic diseases in primary care? *Ann Fam Med*. 2005; 3:209–214. [PubMed: 15928223]
42. Altschuler J, Margolius D, Bodenheimer T, Grumbach K. Estimating a reasonable patient panel size for primary care physicians with team-based task delegation. *Ann Fam Med*. 2012; 10:396–400. [PubMed: 22966102]
43. Scherger JE. It’s time to optimize primary care for a healthier population. *Med Econ*. 2010; 87:86–88. [PubMed: 21287940]
44. Holroyd KA, Cordingley GE, Pingel JD, et al. Enhancing the effectiveness of abortive therapy: A controlled evaluation of self-management training. *Headache*. 1989; 29:148–153. [PubMed: 2496052]
45. Cady R, Farmer K, Beach ME, Tarrasch J. Nurse-based education: An office-based comparative model for education of migraine patients. *Headache*. 2008; 48:564–569. [PubMed: 18377379]
46. Holroyd KA, Cottrell CK, O’Donnell FJ, et al. Effect of preventive (beta blocker) treatment, behavioural migraine management, or their combination on outcomes of optimised acute treatment in frequent migraine: Randomised controlled trial. *BMJ*. 2010; 341:c4871. [PubMed: 20880898]
47. Cady RK, Martin VT, Geraud G, et al. Rizatriptan 10-mg ODT for early treatment of migraine and impact of migraine education on treatment response. *Headache*. 2009; 49:687–696. [PubMed: 19472447]
48. Rothrock JF, Parada VA, Sims C, Key K, Walters NS, Zweifler RM. The impact of intensive patient education on clinical outcome in a clinic-based migraine population. *Headache*. 2006; 46:726–731. [PubMed: 16643574]

49. Hahn SR, Lipton RB, Sheftell FD, et al. Healthcare provider-patient communication and migraine assessment: Results of the American Migraine Communication Study, phase II. *Curr Med Res Opin.* 2008; 24:1711–1718. [PubMed: 18471346]
50. Singer AB, Buse DC, Seng EK. Behavioral treatments for migraine management: Useful at each step of migraine care. *Curr Neurol Neurosci Rep.* 2015; 15:14. [PubMed: 25708673]
51. Willens D, Cripps R, Wilson A, Wolff K, Rothman R. Interdisciplinary team care for diabetic patients by primary care physicians, advanced practice nurses, and clinical pharmacists. *Clinical Diabetes.* 2011; 29:60–68.
52. Hunkeler EM, Meresman JF, Hargreaves WA, et al. Efficacy of nurse telehealth care and peer support in augmenting treatment of depression in primary care. *Arch Fam Med.* 2000; 9:700–708. [PubMed: 10927707]
53. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: The chronic care model, Part 2. *JAMA.* 2002; 288:1909–1914. [PubMed: 12377092]
54. Quinones AR, Richardson J, Freeman M, et al. Educational group visits for the management of chronic health conditions: A systematic review. *Patient Educ Couns.* 2014; 95:3–29. [PubMed: 24468199]

Fig. 1.
Concept model: an approach to the migraine patient in primary care.

Fig. 2.
Flow diagram.

Table 1

Initial Primary Care Survey Covered the Following Topics

Primary Care Survey Question Topics
Assessment of migraine disability and screening for psychiatric comorbidity
Comfort in diagnosing migraine
Comfort in ordering and interpreting diagnostic tests for headache disorders
Types of management tools used (headache diaries, step-wise treatment plans)
Comfort with preventive pharmacologic and non-pharmacologic treatment options
Interest in learning more about treating special patient populations (pregnant women, the elderly, cardiac conditions)
Knowledge of medication overuse headaches (MOH) and its causes
Understanding of psychiatric conditions comorbid with migraine

Same topics assessed in the study *Minen MT, Loder E, Tishler L, Silbersweig D. Migraine diagnosis and treatment: A knowledge and needs assessment among primary care providers. Cephalalgia. 2015 Jun 29. pii: 0333102415593086. [Epub ahead of print].*

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Table 2

Demographics and Practice Characteristics of Participating PCPs

Question	Response (N)
Female Gender	85.7% (21)
Years in practice	8.9 SD±6.7 (20)
Hours spent a week treating patients	29.2 SD±13.0 (21)
% of practice where headache is the chief complaint	15.9% SD±15.0 (20)

Table 3

Knowledge-Based Questions

Question	Mean % Response±SD (range)/(frequency)	Correct Response	N
What % of the US population has migraine?	12.6%±10.1	10–15%	21
What % of migraineurs has depression?	24.5%±16.7 (5-70)	10–20%	19
What % of migraineurs has anxiety?	24.6%±18.3 (5-80)	10–20%	18
Which medications contribute to rebound/medication overuse headache?	NSAIDs – 85.0% (17)	Y	20
	Tylenol – 60.0% (12)	?	
	Triptans – 45.0% (9)	Y	
	Narcotics – 80.0% (16)	Y	
	Barbiturate-containing medications (eg, Fioricet, Fiorinal) – 90.0% (18)	Y	
Is it evidence based?	Cognitive behavioral therapy – 55.6% (10)	Y	18
	Biofeedback – 77.8% (14)	Y	
	Acupuncture – 55.6% (10)	N	
	Chiropractic manipulation – 11.1% (2)	N	
	Relaxation therapy – 61.1% (11)	Y	
	Physical therapy – 27.8% (5)	N	
	Special diets – 50.0% (9)	N	
Are you aware of the American Academy of Neurology guidelines for prescribing preventative medications for migraine?	Psychoanalysis – 27.8% (5)	N	21
	Not at all – 28.6% (6)		
	Slightly – 42.9% (9)		
	Somewhat – 23.8% (5)		
	Moderately – 4.8% (1)		
Are you familiar with the Choosing Wisely Campaign recommendations to limit opioid use and imaging in migraineurs?	Extremely – 0% (0)		20
	Not at all – 35.0% (7)		
	Slightly – 20.0% (4)		
	Somewhat – 35.0% (7)		
	Moderately – 5.0% (1)		
	Extremely – 5.0% (1)		

Table 4

Imaging–Expert Response

Condition	Never	Almost never	Occasionally/sometimes	Almost every time	Every time	N
New type of headache in someone over 50	0.0% (0)	4.8% (1)	33.3% (7)	38.1% (8)	23.8% (5)	21
Headache not responding to treatment	0.0% (0)	38.1% (8)	33.3% (7)	14.3% (3)	14.3% (3)	21
Worsening headache	0.0% (0)	28.6% (6)	38.1% (8)	33.3% (7)	0.0% (0)	21
Headache with neurologic symptoms	0.0% (0)	4.8% (1)	23.8%	38.1% (8)	33.3% (7)	21

Table 5**Management Decisions**

Question	N
When you don't prescribe preventative medications, which of the following reasons affect your choice/behavior?	N=19
Don't think that they work	53.0% (10)
Never thought about it	0.0% (0)
Afraid of side effects	15.8% (3)
Other	89.5% (17)
Do you ask patients to keep a headache diary?	N=21
Never	9.5% (2)
Rarely	9.5% (2)
Sometimes	4.8% (1)
Often	52.4% (11)
Always	23.8% (5)
How effective do you think your patients find your treatment for migraine?	N=20
Not at all effective	0% (0)
Slightly effective	5% (1)
Somewhat effective	45% (9)
Moderately effective	50% (10)
Extremely Effective	0% (0)
Do you assess for temporomandibular jaw dysfunction?	N=21
Never	4.8% (1)
Almost never	4.8% (1)
Occasionally/sometimes	42.9% (9)
Almost every time	33.3% (7)
Every time	14.3% (3)
Do you assess for anxiety?	N=21
Never	0% (0)
Almost never	0% (0)
Occasionally/sometimes	42.9% (9)
Almost every time	42.9% (9)
Every time	14.2% (3)
Do you assess for depression?	N=21
Never	0% (0)
Almost never	4.8% (1)
Occasionally/sometimes	23.8% (5)
Almost every time	61.9% (13)
Every time	9.5% (2)
Do you assess for sleep?	N=21
Never	0% (0)
Almost never	4.8% (1)

Question	N
Do you assess for caffeine use?	Occasionally/sometimes 28.6% (6)
	Almost every time 52.4% (11)
	Every time 14.3% (3)
	N=21
	Never 0% (0)
	Almost never 0% (0)
	Occasionally/sometimes 23.8% (5)
	Almost every time 57.1% (12)
	Every time 19.0% (4)