Title
Building a Structured Field within Clinical Notes in a Migraine Practice: A Quality Improvement Project

Author
Moreno, Angel Leonel

Publication Date
2020

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Building a Structured Field within Clinical Notes in a Migraine Practice: A Quality Improvement Project

A dissertation submitted in partial satisfaction of the

requirements for the degree of Doctor of Nursing Practice

by

Angel Leonel Moreno

2020

ABSTRACT OF THE DISSERTATION

Building a Structured Field within the Progress Note in Migraine Documentation:

A Doctor of Nursing Practice Quality Improvement Project

by

Angel Leonel Moreno

Doctor of Nursing Practice

University of California, Los Angeles, 2020

Professor Andrew C. Charles, Co-Chair

Professor Wendie A. Robbins, Co-Chair

Background: Documentation practices in an outpatient migraine clinic describe migraine and headache days (MHD) experienced per month in narrative form within an electronic health record (EHR). Narrative data is time consuming to use in clinic-based research (Meyers et al., 2018). The Model of Improvement's Plan-Study-Do-Act (PDSA) and the Chronic Care Model (CCM) guided the methodology of this QI project aiming to 1). build a structured field (SF) within an EHR clinical note, and 2). to describe the characteristics of patients who self-record and track their migraine days compared to those who do not. This work includes the first PDSA cycle. Methods: A MHD SF for the EHR clinical note was developed based on the literature review, clinical practice guidelines and informaticists consultation. Migraine clinical patients

were recruited and divided into two groups based on whether they kept a record of MHD in a diary or not. Participants completed a questionnaire assessing education level, income, and marital status. A chart review then quantified additional characteristics including age, sex, history of migraine medication use, MHD frequency and severity, age of migraine onset, and zip code. The documented migraine data will be input into the MHD SF once the SF is built. Results**:** The MHD SF is currently being built. A total of 52 patients have been enrolled for the feasibility portion of the project, 28 tracked MHDs and 24 did not. Migraine characteristics and demographic data were compared between the two groups. There were no statistically significant differences between the groups ($p > 0.05$) except for the number of preventives tried, which was higher in the documented MHD group ($M = 8.89$, $SD = 5.32$) compared to the group that did not keep a diary ($M = 5.92$, $SD = 3.50$), $p=0.03$. Conclusion**:** The COVID-19 pandemic delayed the construction of the MHD SF. Changes in clinic dynamics and patient access changed with COVID-19 which impacted the original feasibility portion of the work involving LVNs and patients. This QI project will improve therapy evaluation and facilitate clinic-based research. The PDSA and CCM provide the project practical and conceptual structure and supports the projects sustainability.

The dissertation of Angel Leonel Moreno is approved.

Mary P. Cadogan

Paul M. Macey

Andrew C. Charles, Committee Co-Chair

Wendie A. Robbins, Committee Co-Chair

University of California, Los Angeles

2020

Dedication

I dedicate this Doctor of Nursing Practice Scholarly Project for the betterment of all beings, seen and unseen, and thank everyone that has played a role in this achievement; my loved ones, family, friends, mentors, colleagues and patients.

May this work contribute to the promotion of wellness, the achievement of happiness, and complete self-realization of patients and clinicians.

Table of Contents

ACKNOWLEDGMENTS

Human beings are members of a whole,

In creation of one essence, and soul.

If one member is afflicted with pain,

Other members uneasy will remain.

If you have no sympathy for human pain,

The name of human, you cannot attain.

-Saadi Shirazi, 12th century poet.

Martha Rogers, a nurse leader, published the Science of Unitary Human Beings in 1970, with updates in 1988 and 1990. She tapped into a wisdom described by the ancients, that teaches us we are all connected. You and I, are one… as well as our individual selves. Rogers used western terms to describe what sages taught long ago and her nursing theory continuously influences my practice of nursing science and art.

A special acknowledgement to the UCLA-Goldberg Migraine, without whom this degree would not have been possible.

Deep and heartful gratitude to Ana Isabel Moreno, Jimmy Moreno, Ereni Ines Moreno, Kitty Moreno, Gaiane Lopez, Thomas Scott Nowlin, Oded Simha, and Gagik Geozalian, whose support and encouragement kept me going when I could not take another step, thank you. A special thanks to my committee, Wendie Robbins, Andrew Charles, Mary Cadogan and Paul Macey who guided me through this journey. Especially grateful for Nancy Jo Bush and Suzette Cardin for developing the Doctor of Nursing Practice program at the UCLA School of Nursing. To my cousins, aunts, uncles, family (alive and departed), friends, teachers, mentors and

colleagues; you are all a constant source of wisdom, inspiration, laughs and meaningful times. Thank you all.

BIOGRAPHICAL SKETCH

EDUCATION

2018 – Present**: University of California, Los Angeles. School of Nursing.**

- Doctor of Nursing Practice Candidate
- Doctoral focus: Build a structured field within the electronic health record to document migraine headache days in order to improve the ability of clinicians and patients to evaluate therapeutic outcomes of migraine therapies and to describe the differences in migraine characteristics between two migraine groups, one that documents MHDs and one that does not document MHDs.

2012 – 2014: **University of California, Los Angeles. School of Nursing.**

- Master of Science in Nursing
- Adult/Gerontology Primary Care Nurse Practitioner, Occupational Health subspecialty.
- Clinic experience: Cleaver Family clinic - 6 quarters, UCLA Occupational Health – 5 quarters, Long Term care facility – 2 quarters, Home Health – 2 quarters, Palliative Care – 1 quarter

2005 – 2010: **Mount Saint Mary's College, Los Angeles.**

- Bachelorette of Science in Nursing Major with a Minor in Spanish.

EMPLOYMENT

6/2015 – Present: *Nurse Practitioner II*, **UCLA-Goldberg Migraine Program.**

- Evaluate, diagnose, treat and manage patients suffering from migraine, trigeminal autonomic cephalalgias, various neuralgias, and other headache conditions.
- Promote wellness in the headache population using mindfulness and complementary and alternative modalities as adjunct therapies to allopathic approaches.

- Perform procedures such as chemo denervation, tendon injections and nerve blocks.

8/2010 – 6/2015: *Registered Nurse II*, **Santa Monica UCLA and Orthopedic Hospital.**

- Manage the care of critically ill patients in a general ICU.
- Collaborate with CNS in conducting research analysis and present findings to unit.
- Utilize yoga, meditation and other relaxation techniques at bedside for patients and families suffering from pain and anxiety. Trained in Urban Zen.

2007 – 2012: *Tonic Herbalist*, **Dragon Herbs.**

- Promote wellness using of complementary and alternative strategies.
- Educate clients on newly diagnosed illnesses.

PROFESSIONAL ORGANIZATIONS

- American Holistic Nurses Association (2009-2014)
- Sigma Theta Tau, Honor Society of Nursing (2012-2017)
- California Association for Nurse Practitioners (2013-Present)
- American Society for Pain Management Nursing (2019-Present)

CERTIFICATIONS

- Kundalini Yoga Instructor (2010)
- Urban Zen Integrative Therapist (2012)
- Registered Nurse
- Nurse Practitioner License
- Furnishing License
- Adult-Gerontology Primary Care Nurse Practitioner Certification through the American Nurses Credentialing Center (2014)

Chapter 1

Introduction

Migraine is a common neurologic condition affecting hundreds of millions of people around the world with significant sequelae that prevents those affected from living a better life. Finding a reliable and effective treatment, and eventually a cure, will improve the lives of millions of people. Improving migraine documentation in the electronic health record (EHR) by adding a structured field (SF) to better track migraine metrics, such as migraine headache days (MHD), will help achieve this aim by improving migraine therapy evaluation and facilitating clinic-based research. Migraine is highly prevalent around the world and the United States of America as one in six people in the United States suffer with migraine (Burch, Rizzoli, & Loder, 2018) and is the seventh leading disorder worldwide (Global Burden of Disease, 2015). Therapies for the disorder have been variably effective and often poorly tolerated, leading to poor medication adherence and forcing patients to cycle through available medications to find relief. Migraine incurs significant direct and indirect costs for patients and industry and disproportionately affects women and vulnerable populations in lower socioeconomic statuses (SES). Effective and consistent documentation of therapeutic outcomes in a MHD SF will help patients and clinicians better understand therapeutic outcomes improve migraine patients' quality of life (QOL).

Migraine Therapy

Patients with migraine use prophylactic approaches to prevent migraine attacks and acute therapies to treat migraine attacks when they occur. Preventive medications are considered effective if MHD are reduced by 50% or more within three months (Silberstein, 2015). A systematic review by Hepp, Bloudek, & Varon (2014) found migraine patients had poor

adherence to migraine prophylaxis and that adverse events caused by preventive medications was the most typical reason for discontinuation. Lipton et al. (2016) found that currently available acute therapies are commonly ineffective, with 56% of migraine survey participants reporting poor relief at 2 hours after taking a acute medication, and 53% of participants reporting poor relief in 24 hours. The same study found that, of the 44% of participants that did find adequate relief, 25% of them had another migraine attack within 24 hours (Lipton et al., 2016). A survey study of 1,165 migraine patients from around the world found that the average number of different medications ever used by patients with episodic migraine was $M = 2.9$, $SD = 3.6$, and $M = 3.9$, $SD = 3.5$ in patients with chronic migraine (Blumenfeld et al., 2013). Discontinuing acute medication can lead to negative consequences. About 80% of patients with migraine who completely discontinued acute therapies were unlikely to report being able to work or function normally with a headache (Lipton et al., 2019). Novel migraine therapies targeting the calcitonin gene-related peptide emerged in 2018 and have revolutionized the migraine field. The calcitonin gene-related peptide monoclonal antibody (CGRP MAB) drug class demonstrated a reduction of MHD per month by 50% or more in 50% of patients that received erenumab 140 mg/ml in the clinical trial setting (Goadsby et al., 2017). Quantifying clinical responses to established and novel therapies by documenting MHD SF within the EHR will improve medication adherence and restore hope in a patient with migraine to live a less disabled life.

Migraine Cost

Migraine management carries a high monetary and QOL burden. Direct migraine costs have been estimated to be $9.2 billion per year (Raval & Shah, 2017). Chronic migraine, which is defined as 15 MHD a month or more by the International Headache Society (2018), is three times as expensive as episodic migraine (Messali et al., 2016). Indirect costs of migraine include

a 50% reduced work productivity (Munakata et al., 2009), lower reported QOL scores (Blumenfeld et al., 2011), and higher work absences and short-term disability costs (Gilligan et al., 2018). Migraine is commonly associated with lower SES, and given the associated expenses, can be an obstacle that prevents patients with migraine from achieving a higher SES.

Migraine and Vulnerable Populations

Migraine disproportionately affects women and vulnerable populations in lower SES. Migraine affects women three times as much as men (Vetvik & MacGregor, 2017), which is around 20% of women in the United States (Burch, Rizzoli, & Loder, 2018). Those in lower SES, such as the unemployed, those in a lower family income bracket, the elderly, and those with disabilities report higher migraine frequency compared to their more affluent counterparts (Burch, Rizzoli, & Loder, 2018). The American Migraine Prevalence and Prevention report demonstrated that household income predicted migraine risk because a household income of $90,000 and above reduced migraine risk by 50% (Lipton et al., 2007). Charleston et al. (2018) found that people living in areas of low SES reported more migraine disability and suggests increased stress caused by violence, food insecurity and lack of healthcare access as contributing factors. Befus, Irby, Coeytaux, and Penzien (2018) propose that migraine is a treatable condition and should be classified as a health equity issue because those who lack access to care experience worse outcomes. SES of parents directly predicts adult educations level of their children (Acacio-Claro, Doku, Koivusilta, & Rimpela, 2017) and Charleston and Heisler (2016) developed a theoretical model for Headache Literacy suggesting that lower education levels negatively affect headache literacy and self-care leading to worse headache outcomes. Finding effective therapies for migraine can lead to economic advantages for migraine patients and create a more equitable reality for them to achieve their goals.

The Los Angeles County Department of Public Health's report of Key Indicators of Health by Service Planning Area (SPA) (2017) published a snapshot comparing health outcomes across the 8 SPAs (Appendix A).

The Electronic Health Record and Structured Fields

The Institute of Medicine (2003) recommended healthcare organizations to use an electronic health record (EHR) to promote patient safety and improve the quality and efficiency of care. The EHR has since become the standard of care in the United States health system and has improved trustworthiness between clinician and patient, improve patient safety and increase the efficacy of care (Ozair, Jamshed, Sharma, & Aggarwal, 2015). However, the structure in which data is documented into the EHR has not been standardized in clinical practices. Moreover, narrative, uncodified documentation is difficult to use for quality improvement projects or clinic-based research (Meyers et al., 2018), thus limiting the benefits achieved with an EHR. Clinicians miss the EHR's full potential when narratively documenting clinical notes as if it was a paper chart.

Clinical notes containing SF help providers document important information more consistently in a way that can be retrieved efficiently. Cicchini et al. (2016) improved cancer staging documentation from 28% to 60% over 12 months after having cancer staging attending physicians document in a structured note format that contained cancer staging specific SF. Neuroradiologists utilizing structured notes have demonstrated improved rates of documenting important findings in multiple sclerosis diagnosis and achieved a 100% radiologist utilization rate (Dickerson et al., 2017). Future goals utilizing SF within progress notes to track metrics is to leverage large codified data with biobanking and predict response to therapy for future patients (Meyers et al., 2018).

Clinician documentation practices in an academic migraine clinic in Southern California document notes in narrative and structured formats. The subjective section of the clinical note is documented in a narrative-only form, while current medications, vital signs and laboratory results are documented in an SF. Documenting subjective data in a narrative form does not leverage EHR features that help clinicians capture and track subjective metrics, such as MHD and acute medications doses used a month, migraine severity and duration, among other metrics, efficiently. Narrative data is free-text, uncodified data that is challenging to use for quality improvement projects and research (Meyers et al., 2018). A systematic review and meta-analysis found that effective utilization the EHR can improve the quality of healthcare by increasing efficiency and adherence to guidelines while decreasing medication errors and adverse drug (Campanella et al. 2015). Campanella et al. (2015) suggest that clinicians can enhance the benefit of the EHR by including a decision support system and expanding SFs.

The reliability of subjective data documented in migraine notes depends on the accuracy of what patients report. Migraine patients can keep track of their MHD as a way to evaluate the efficacy of migraine therapies and documenting MHD reduces recall bias when reporting MHD per month (Torelli & Jensen, 2010). Tracking MHD is so critical in migraine research that the change in MHD a month is a primary end point when conducting randomized controlled trials of preventive treatments (Tassorelli et al., 2018). Furthermore, a systematic review evaluating psychological interventions for migraine found that 14 out the 19 studies selected used headache diaries as their dependent variables (Sullivan, Cousins, & Ridsdale, 2016). Traditionally, MHD were tracked using paper and pencil approaches, and now electronic methods of tracking MHD are available. Bandarian-Balooch, Martin, McNally, Brunelli, and Mackenzie found that short-form migraine diaries and electronic migraine diaries had equivalent adherence when measuring

headache variables (2017). A systematic review by Ramsey et al. (2014) found that adherence rates to paper diaries were between 83% and 95% and adherence to electronic diaries was 90% in migraine patients.

Provider documentation and patient self-monitoring practices vary, and this variation can yield inconsistent documentation quality. Variation in documentation styles between providers has been found to reduce efficacy and safety when documenting in EHRs (Cohen, Friedman, Ryan, & Richardson, 2019). Linder, Schnipper, and Middleton (2012) found that providers who dictated their notes had lower quality of clinical documentation compared to providers who documented in structured notes for the management of patients with coronary artery disease and diabetes. Solely narrative notes vary in documentation method and completion, can miss key clinical data, and make it difficult to determine evidence of meeting documentation quality measures (Edwards, Neri, Volk, Schiff, & Bates, 2014). While narrative sections of clinical notes are important, limiting the note within an EHR to be solely narrative is a missed opportunity.

The ideal clinical note in migraine medicine has not been established in the literature. Marmura and Nahas (2010) discuss the advantages and disadvantages of using an EHR to document clinical notes and suggest that an ideal migraine clinical note would include the clinical plan from the previous note, a combination of SFs documenting MHD frequency and severity, weight, blood pressure and QOL indicators plus narrative free-text to describe findings not covered by the SF. Structured notes increase the quality of documentation and yield a more consistent note (Bink et al., 2018; Cecchini, Framski, Lazette, Vega, Strait, & Adelson, 2016; Narayanan et al., 2017; Simon et al., 2018; Simon et al, 2019; Meyers et al., 2018). In fact, the work by Maraganore et al. (2015) has improved documentation methods and their group is combining the improved note with DNA biobanking, paving the way for more precise medicine

that may lead to predicting responses to therapy in future patients. Rheumatology practices have incorporated Patient Reported Outcome Measurement Information System where patients can directly document clinical outcomes that generate into SFs within a clinical note, a strategy that has increased patient engagement and improved clinical outcomes (Schmajuk & Yazdany, 2017). Incorporating more SFs into clinical notes will allow providers to maximize the benefit an EHR can provide and may encourage patients to increase their participation in their healthcare by documenting directly into their chart.

Documenting subjective data within the clinical notes of a migraine clinic in a narrative-only format limits the EHRs ability to demonstrate the outcomes of the care provided and hinders clinic-based research. Adding an SF within the subjective section of a clinical note to document MHD per month exercises the EHR's ability to better demonstrate the impact therapies have on MHD and increases documentation consistency between providers. This DNP scholarly QI project aimed to create a novel MHD SF in a migraine clinic's EHR and to ascertain feasibility of having patients keep MHD diaries to supply more reliable MHD for the SF. The MHD per month data would be input into the MHD SF once built. This initial PDSA cycle only included patients seen by the PI.

Chapter 2

Review of Literature

A review of literature using the search terms, “structured” “data” “field” “discrete” “electronic medical record or electronic health record” “headache” “migraine” “neurology” “diary” “calendar” “quality improvement” and “meaningful use” was conducted in various combinations in the PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and Web of Science data bases. The filters of humans, English and 10-year limit were added to the results of combinations from the above search terms. PubMed yielded the most results and 50 publications were chosen based on the abstracts if the abstracts included key terms that discussed structured notes. Further exploration of related publications and cited by publications from chosen abstracts produced an additional 25 publications. Of the 75 abstracts reviewed, 50 publications were read in detail and 20 were included in the review of literature. CINAHL produced six results and three of the publications were chosen for this project. Further research into similar articles and reviewing cited publications and a manual search of relevant bibliographies also helped uncover 5 pertinent publications.

Simon et al. (2019) built customized stroke-structured clinical documentation support into the EHR used in their practice. This paper is this author’s DNP scholarly project executed in a stroke clinic. The aim was to develop notes containing structured and free text fields. SFs included information on stroke events, such as the National Institutes of Health Stroke Scale, timing, presenting symptoms and locations of stroke events, residual deficits, stroke subtype, diagnostic work up and sequalae, as well as laboratory findings. Optional SFs included measures capturing disease impact and mood changes, such as the Barthel Index, Epworth Sleepiness Scale, and Short Test of Mental Status. Workflow processes had medical assistants document

patient self-reported items, cognitive testing was documented by registered nurses, and other pertinent data was documented by stroke neurologists. The research group met every 2 weeks with programmers to review ease of use and make modifications based on clinician and staff feedback. As of August 2018, 2,332 patients had been evaluated. Best Practice Alerts were created as hard stops depending on the scores and intervention for those scores needed to be documented. Change in patient outcomes has not been evaluated, but this work demonstrates feasibility of workflow and use of SFs in a stroke clinic.

Cecchini et al. (2016) conducted a quality improvement project utilizing the PDSA quality improvement framework, to improve cancer stage data capture. In this study an EHR was customized with a structured module that required physicians to enter a cancer stage. Primary outcomes were measuring the increase in use of the structured staging module. Secondary outcomes included physician responses to the process and to inquire why the process was not used. If staging could not be done, free text areas were available to describe the issue. PDSA cycles guided the intervention and primary outcomes were measured at 4, 8, and 12 months post-intervention. This group found an increase in staging documentation from 28% to 60% after 12 months demonstrating statistically significant improvement ($p < 0.001$) in rates of cancer staging. Limitations included lack of timely staging, the exclusion criteria of patients before 2014 and advanced practice participation such as nurse practitioners (NP) or physician assistants.

Meyers et al. (2018) created a note containing structured and narrative fields in order to improve quality and support practice-based research within a headache clinic. The note is currently being tested in 14 headache clinics throughout the United States and data on headache outcomes are pending. This quality improvement project structured General Anxiety Disorder 7-item, Center for Epidemiology Studies Depression Scale and the Migraine Disability Assessment

questionnaire, among others. The developers of the tool met every 2 weeks for three months, although the methodology used to guide this project was mentioned they used principles from the model of improvement. The workflow created utilized a medical assistant to input patient-reported data so face-to-face time with the neurologist was not changed. Cohort characteristics were analyzed once 100 patients with clean data were achieved and correlation between metrics and initial visits were compared. Dashboards measuring trends were created. Referrals to appropriate providers were carried out when patients screened positive for depression or anxiety. Data collection continues and will be published in the future. Limitations in this research include lack of tracking number of days a month affected by migraine, doses of acute medications taken per month or other QOL indicators. The Migraine Disability Assessment Scale does include this data, but frequent testing with the same tool incurs the risk of test-retest validity issues. This work does not address provider and staff response to the structured note.

The articles above demonstrate the feasibility of utilizing SFs in multiple clinical environments. Strategies to reduce undue burden on providers using structured notes were explored and avoided reducing face-to-face time between patients and providers. The articles above described methods of avoiding pitfalls associated with structured notes. The Model of Improvement was helpful in guiding this type of documentation QI project. Adding SFs into a clinical note within a migraine practice is feasible and allows for the creation of dashboards and clinic-based research. Gaps in the published studies include failure in measuring the patient's ability to account for migraine days using migraine calendars and describing the clinical provider and staffs experience with the SF.

Chapter 3

Theoretical Models

The Model for Improvement will be used to guide the process of this DNP scholarly QI project and the Chronic Care Model will provide the theoretical context that guided the development of this project. The Model for Improvement applies five principles for improvement; 1. Knowing why you need to improve, 2. Having a feedback mechanism to tell you if the improvement is happening, 3. Developing an effective change that will result in improvement, 4. Testing a change before attempting to implement, and 5. Knowing when and how to make the change permanent (Langley et al., 2009). The model is comprised of two sections, the first of which asks three questions; 1. What are we trying to accomplish, 2. How will we know that a change is an improvement, and 3. What change can we make that will result in improvement (Langley et al., 2009)? The second section is comprised of plan-do-study-act (PDSA) cycles used to test changes, determine if a change is an improvement, alter the change if needed, then re-evaluate (Langley et al., 2009). Melnyk and Morrison-Beedy (2019) outline the PDSA cycle where; 1. The plan phase consists of creating a plan once an improvement project has been identified, 2. The do phase implements the plan created on a small scale, 3. Results of the do phase are analyzed in the study phase, and 4. Changes based on results are implemented into a new plan and the cycle starts again at a larger scale. After the fourth PDSA cycle, the process of permanence is started and the change can spread if applicable (Langley et al., 2009). This scholarly project is the first round of PDSA on the journey to eventually spread this documentation style using the MHD a month SF as the standard documentation practice in a migraine clinic after evaluating its impact on migraine documentation.

The Chronic Care Model (CCM) addresses quality gaps associated with the demands a chronic condition exerts on a health system. Migraine is a chronic disorder that has acute episodes and the CCM is an appropriate model to address this condition. The CCM aims to change a reactive healthcare system to a proactive one, anticipating the needs of patients with chronic illness by increasing patient self-management, integrating decision support into provider practice, and providing information technology (Coleman, Austin, Brach, & Wagner, 2009). This scholarly project utilizes these guiding points in developing the SF to document migraine and headache days, tailoring migraine documentation to the migraine population.

Chapter 4

Methods

This DNP scholarly QI project aimed to create a novel MHD SF in a migraine clinic's EHR and to ascertain feasibility of having patients keep MHD diaries to supply more accurate MHD for the SF. The MHD per month data would be input into the MHD SF once built. This initial PDSA cycle only included patients seen by the NP Principal Investigator.

The novel COVID-19 pandemic altered this project's original timeline and methodology and the PI adjusted the original methodology in order to continue the endeavor. At the beginning of the QI project the author began building the MHD SF in collaboration with IT. There were a series of meetings with stakeholders, which included patients, migraine specialists, the clinic manager, the medical director, the licensed vocational nurses (LVNs), and IT. However, the pandemic changed the time line once informaticists were pulled by the hospital system to build COVID-19 smart phrases, shortcuts, and optimization. The author resumed building the MHD SF on April 22, 2020 in collaboration with informaticists and migraine clinicians.

Originally, patients were going to be asked to keep MHD per month data and present that data to the LVNs, who would then input that data into the MHD SF, and the field would populate into the NP's note. The migraine clinic currently sees migraine patients for follow up via telemedicine in order to reduce the spread of the novel virus, thus patients are not interacting with the LVNs at the moment. The PI planned to train the LVN's to document MHD in the SF.

The Structured Field Staff Satisfaction Questionnaire (SFSSQ), a three question, 1-5 Likert scale questionnaire and a write-in section for additional comments was to be administered to the LVN and NP staff at the end of the current PDSA cycle (Appendix B). Responses would help identify areas of improvement for the MHD SF before initiating the second PDSA cycle,

which will open patient enrollment opportunity to patients seen by the NP and two fellow physicians. The SFSSQ was omitted since the MHD SF has not been completed.

The NP Principal Investigator lost patients prepared to participate in this QI project because some patients lost access to the migraine clinic once they became unemployed and lost their health insurance. Other patients were lost to follow up when the migraine clinic triaged patients, maximizing telemedicine follow up and limiting the number of patients coming to the migraine clinic. Patients typically seen by the NP for procedures were transferred to the attending physicians schedules for those procedures. Patients typically managed by attending physicians were scheduled with the NP for telemedicine appointments. Many of the appointments with the NP became emergent visits trying to keep patients from going to the ER due to migraine.

Prior to the pandemic, the NP Principal Investigator averaged 40 to 50 patients a week. Clinic visits decreased significantly after the pandemic started, ranging between 10 to 25 consultations per week. Patients with severe migraine are scheduled at a higher frequency, seen every two to four weeks and patients that do not require therapy changes are seen once every three to six months.

Revised Methodology

Participants

The influx of patients typically seen by attending physicians into the PI's schedule presented an opportunity to enroll participants in the QI project based on whether they either documented or did not document MHD per month. Convenience sampling included recruiting migraine patients within an academic migraine telemedicine clinic in Southern California. Inclusion criteria were: being a patient of the clinic's NP (PI on this QI project), age 18 years and

older, having a diagnosis of migraine, with or without aura, or chronic migraine, as defined by the International Classification of Headache Disorders-3 (International Headache Society, 2018), and volunteering to participate in this QI project by filling out an online questionnaire. Exclusion criteria included patients in the clinic not seen by NP, clinic patients seen by NP that do not have a diagnosis of migraine with or without aura or chronic migraine, migraine patients with comorbid chronic daily headache, and migraine patients who chose not to participate.

Instruments

The Migraine Demographic Data Questionnaire (MDDQ) is a two-part questionnaire developed by the PI to tabulate demographic and migraine characteristics (Appendix C for part 1; Appendix D for part 2). The first part of the MDDQ was completed by patients who met inclusion criteria and agreed to participate. This part of the MDDQ collected marital status, highest education level, income range and preferred healthcare language not systematically documented in the EHR. These variables were codified to facilitate analysis (Appendix E).

Part two of the MDDQ quantified migraine characteristics through a manual chart review completed by the PI. The following migraine characteristics were collected in the chart review: age, gender, zip code, type of insurance – commercial or federal/state sponsored, age of migraine onset, number of preventive and acute medications ever used, and number of preventive and acute medications currently used. The last documented blood pressure, weight, height, average MHD per month, and average severity of migraine attacks were also migraine variables tabulated. These variables were codified to facilitate analysis (Appendix F). All variables of interest in this QI project have been reported to directly or indirectly influences migraine risk (Blumenfeld et al., 2013; Burch, Rizzoli, & Loder, 2018; Charleston et al., 2018; Hepp, Bloudek, & Varon, 2014; Messali et al., 2016; Vetvik & MacGregor, 2017).

Definitions

The International Classification of Headache Disorder, 3rd edition, definition of a headache day was used which is the "number of days during an observed period of time affected by headache for any part or the whole day" (International Headache Society, 2018), to define MHD in this work.

Preventive medications are defined as medications "used to reduce the frequency, duration, or severity of attacks" by Silberstein (2015), and is the definition used for preventive medications in this work. Standard migraine preventive medication classes include anti-epileptic (depakote, gabapentin, topiramate), antidepressant (TCA, SSRI, SNRI), betablocker (atenolol, labetalol, propranolol), calcium channel blocker (verapamil, nicardipine, flunarizine), serotonin antagonist (cyproheptadine, pizotifen), select nonsteroidal anti-inflammatories (NSAID) (Celebrex and meloxicam only), and botulinum toxin (Botox, Xeomin, Myobloc) medication classes (Siberstein, 2015). Atypical preventive medication classes include alpha-adrenergic agonists (clonidine, tizanidine, guanfacine), ACEI (lisinopril, enalopril, captopril), ARB (candesartan, telmisartan) and the NMDAR antagonists (memantine) drug classes (Rau & Dodick, 2019). The CGRP MAB medication class (erenumab, fremanezumab, galcanezumab, and eptinezumab) is the first medication class to be developed specifically as a migraine preventive (Ceriani, Wilhour, & Silberstein, 2019). Prior to the CGRP MABs, every medication used to prevent migraine was developed for other conditions, found to reduce migraine disability in some patients with migraine, and secondarily adopted as migraine prophylaxis (Charles, 2018). Migraine clinicians have the opportunity to demonstrate the life enhancing effects of the new therapies and the MHD SF will aid them in doing so.

Acute medications in migraine are defined as, “acute therapy taken to relieve the pain of migraine attacks” (Becker, 2015) and is the definition used for acute medication in this work. Acute medications include acetaminophen, NSAID (ibuprofen, indomethacin, nabumetone, naproxen, diclofenac, ketorolac, etodolac, mefenamic acid, aspirin) , triptans (sumatriptan, rizatriptan, zolmitriptan, eletriptan, almotriptan, naratriptan, frovatriptan), triptan-NSAID combinations (treximate), ergotamines (methelergonavine, migranal), and medication combinations that include butalbital (fioricet, fiorinal) or caffeine (excedrin, aceminophen/caffeine) (Becker, 2015). Antiemetics (ondansetron, prochlorperazine and metochlopramide) (Lew & Punnapuzha, 2020) and muscle relaxers (cyclobenzaprine, baclofen) were considered to be acute medications in migraine therapy for the purposes of this work. The ditan (lasmitidan) and gepant (ubrogepant and rimegepant) (Ceriani, Wilhour, & Silberstein, 2019) medication classes debuted in 2020 and are counted as acute medications in this work. Medication classes targeting the CGRP pathways seem to exhibit both preventive and acute properties (Charles, 2019), thus defining where the agents will be classified is important for this work.

Most of the migraine variables tabulated were found in SFs within the participants’ charts. Three variables tabulated in this QI project, the age of migraine onset, MHD per month, and the average severity of migraine attacks as measured by the 1-10 numerical scale, were found in narrative data documented in clinic visits. Variations of each medication dose and route were counted as one. For example, sumatriptan 100 mg tablets, sumatriptan 20 mg/ml nasal spray, and sumatriptan 6 mg/ml subcutaneous injections count as one.

Insurance type was categorized into two groups; commercial, such as HMO and PPO insurances, and state or federally sponsored insurance, such as Medicare, medical, or Tricare.

Blood pressure was measured in mmHg. Weight was measured in pounds, height was measured in inches, and pain severity was measured on a 0-10 numerical pain scale.

Zip codes were categorized into their respective SPA (Los Angeles County, 2002). SPA distribution was analyzed and compared between the two migraine groups to explore for differences.

Data Analysis

Stata 15.1 was used to analyze the data collected. Data were checked for valid coding. The questionnaire responses and chart review data were summarized using descriptive statistics: mean/standard deviation for continuous data such as age, weight, and height; and frequency/percent for categorical data such as marital status, education level, and income category. Chi square (^{2}) tests, Wilcoxen rank-sum (Mann-Whitney U) tests, and two sample *t* tests were used to compare the group of patients who recorded their MHD to those who did not on the demographic and migraine characteristics. A *p*-value <0.05 was considered statistically significant.

Chapter 5

Results

The MHD SF remains under construction. Of the 100 patients that met inclusion criteria during the QI time period, 40 choose not to participate and 8 had a diagnosis of chronic daily headache as well as chronic migraine. Fifty-two participants were enrolled in the study. A total of 28 participants reported keeping MHD diaries and 24 did not keep diaries. Participants kept track of MHD in a varieties of ways (Appendix G). Some participants kept a tally of the number of attacks that occurred a month, others kept a calendar where they documented MHD and treatments used per attack, and others used an application to help them keep track of migraine days where they documented duration and most bothersome symptoms. The systematic documentation of most bothersome symptoms would be useful in the evaluation of therapeutic approaches.

No difference in migraine characteristics and demographics was found between the two groups (with alpha equal to 0.5 criterion), except for the number of preventive medications ordered ever, which was higher in the MHD documentation group, $p = 0.03$. The migraine group that documented MHD tried more preventive therapies in the past (*M* 8.7 *SD* 5.3) versus the group that did not document (*M* 5.9 *SD* 3.5), $z = 2.2$, $p=0.03$.

The participants unanimously reported English as their health care language. There were mostly women (85%), the most frequently reported education level completed was a bachelor's degree (44%), almost half of the participants reported a household income less than $75,000 per year (46%), and almost half reported being married (44%). The average age was 46 years (*SD* = 18.5), and a majority had commercial insurance (81%).

The Los Angeles County Department of Health published health outcomes for the eight SPA regions in Los Angeles County (2017) (Appendix A), therefore, categorizing zip codes into their respective SPA regions gives insight to health factors and general outcomes of people living in those regions. Analysis comparing the distribution of SPA regions per group did not find statistically significant differences. When comparing the two groups after excluding zip codes not in Los Angeles County, no statistical difference were detected. This analysis did reveal the cohorts most common SPA regions, 2 (18.9%), 4 (16.2%), and 5 (46%), low represented regions, 1 (5.4%), 6 (5.4%) and 8 (8.1%), and regions with no representation, 3 and 7.

Table 1: Means (*M*) and standard deviations (*SD*) for continuous migraine variables for all participants, group that documented MHD and group that did not document MHD.

	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
Blood Pressure, Systolic	121.1 (15.6)	120.3 (15.8)	122.2 (15.6)
Blood Pressure, Diastolic	77.21 (7.8)	76.5 (8.1)	78 (7.6)
Weight, pounds	155.1 (46.8)	143.9 (35.1)	168 (55.6)
Height, inches	65.1 (3.7)	65.57 (3.8)	64.45 (3.6)
Age (years) at migraine onset	21.3 (14.5)	21.2 (14.5)	21.46 (14.7)
Migraine frequency, days per month	10 (8.3)	10 (7.7)	10 (9.1)
Migraine severity, 1-10 scale	4.8 (2)	5.1 (1.8)	4.5 (2.2)
All preventives tried	7.5 (4.8)	8.9 (5.3)	5.9 (3.5)*
Current preventives	2.5 (1.7)	2.4 (1.8)	2.5 (1.7)
All acute therapies tried	8.1 (4.5)	8.6 (4.7)	7.4 (2.1)
Current acute therapies.	2.7 (1.8)	2.4 (1.5)	3.1 (2.7)

* $t(50) = 2.2$, $p = 0.03$

Table 2: Highest education completed for all participants, group that documented MHD and group that did not document MHD.

Education, highest level completed	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
High School	14 (26.9%)	7 (25%)	7 (29.2%)
Bachelor's degree	22 (42.3%)	13 (46.4%)	9 (37.5%)
Graduate degree	13 (25%)	7 (25%)	6 (25%)
Doctoral degree	1 (1.9%)	0 (0%)	1 (4.2%)
Post-Doctoral degree	2 (3.9%)	1 (3.6%)	1 (4.2%)

^{2} = 1.5, *df* = 4, *p* = 0.9.

Table 3: Income reported for all participants, group that documented MHD and group that did not document MHD.

Income, thousands of dollars per year	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
Under 15	2 (3.9%)	1 (3.6%)	1 (4.2%)
15 – 24.999	0 (0%)	0 (0%)	0 (0%)
25 – 34.999	1 (1.9%)	0 (0%)	1 (4.2%)
35 – 49.999	5 (9.6%)	2 (7.1%)	3 (12.5%)
50 – 74.999	7 (13.5%)	3 (10.7%)	4 (16.7%)
75 – 99.999	9 (17.3%)	6 (21.4%)	3 (12.5%)
100 – 149.999	6 (11.5%)	4 (14.3%)	2 (8.3%)
150 – 199.999	10 (19.2%)	6 (21.4%)	4 (16.7%)
200 or more	12 (23.1%)	6 (21.4%)	6 (25%)

^{2} = 3.1, *df* = 7, *p* = 0.9, Fishers Exact *p* = 0.9

Table 4: Marital status reported for all participants, group that documented MHD and group that did not document MHD.

Marital Status	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
Single	16 (30.8%)	10 (35.7%)	6 (25%)
Married	23 (44.2%)	13 (46.4%)	10 (50%)
Domestic Partnership	4 (7.7%)	1 (3.6%)	3 (12.5%)
Widowed	2 (3.9%)	2 (7.1%)	0 (0%)
Divorced	6 (11.5%)	2 (7.1%)	4 (16.7%)
Separated	1 (1.9%)	0 (0%)	1 (4.2%)

^{2} = 5.8, *df* = 5, *p* = 0.3, Fishers Exact *p* = 0.4

Table 5: Gender category listed in chart for all participants, group that documented MHD and group that did not document MHD.

Gender	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
Female	44 (84.6%)	24 (85.7%)	20 (83.3%)
Male	8 (15.4%)	4 (14.3%)	4 (16.7%)
Other	0 (0%)	0 (0%)	0 (0%)

^{2} = .06, *df* = 1, *p* = 0.8.

Table 6: Insurance type listed in chart for all participants, group that documented MHD and group that did not document MHD.

Insurance	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
Commercial	42 (80.8%)	21 (75%)	21 (87.5%)
State or Federally funded	10 (19.2%)	7 (21%)	3 (12.5%)

$^2 = 1.3$, $df = 1$, $p = 0.3$.

Table 7: Last documented migraine severity found in chart for all participants, group that documented MHD and group that did not document MHD.

Migraine severity, 1-10 scale.	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
0	0 (0%)	0 (0%)	0 (0%)
1	0 (0%)	0 (0%)	0 (0%)
2	6 (11.5%)	2 (7.1%)	4 (16.7%)
3	11 (21.2%)	4 (14.3%)	7 (29.2%)
4	10 (19.2%)	6 (21.4%)	4 (16.7%)
5	5 (9.6%)	4 (14.3%)	1 (4.2%)
6	7 (13.5%)	5 (17.9%)	2 (8.3%)
7	7 (13.5%)	5 (17.9%)	2 (8.3%)
8	5 (9.6%)	1 (3.6%)	4 (16.7%)
9	1 (1.9%)	1 (3.6%)	0 (0%)
10	0 (0%)	0 (0%)	0 (0%)

$^2 = 8.8$, $df = 7$, $p = 0.3$. The 0-10 pain scale asks patients to rate their pain, 0 meaning no pain, 1 and 2 meaning mild, 3 and 4 meaning tolerable, 5 and 6 meaning very distressing, 7 and 8 meaning very intense, 9 and 10 meaning excruciating/unbearable (Jensen, Turner, Romano, & Fisher, 1999).

Table 8: Analysis of zip codes categorized by SPA regions for all participants, group that documented MHD and group that did not document MHD.

Service Planning Area	All participants *M* (*SD*) *N* = 53	Documented MHD *M* (*SD*) *n* = 28	Did not document MHD *M* (*SD*) *n* = 24
1	2 (3.6%)	0 (0%)	2 (8.3%)
2	7 (13.5%)	5 (17.9%)	2 (8.3%)
3	0 (0%)	0 (0%)	0 (0%)
4	6 (11.5%)	2 (7.1%)	4 (16.7%)
5	17 (32.7%)	10 (35.7%)	7 (29.2%)
6	2 (3.8%)	1 (3.6%)	1 (4.2%)
7	0 (0%)	0 (0%)	0 (0%)
8	3 (5.8%)	2 (7.1%)	1 (4.2%)
9 - Not in Los Angeles County	15 (28.9%)	8 (28.6%)	7 (29.2%)

$^2 = 4.6$, $df = 6$, $p = 0.6$.

Table 9: Analysis of zip codes categorized by SPA regions within Los Angeles County only for all participants, group that documented MHD and group that did not document MHD.

Service Planning Area	All Participants *M* (*N* = 37)	Documented MHD *M* (*n* = 20)	Did not document MHD *M* (*n* = 17)
1	2 (5.4%)	0 (0%)	2 (11.8%)
2	7 (18.9%)	5 (25%)	2 (11.8%)
3	0 (0%)	0 (0%)	0 (0%)
4	6 (16.2%)	2 (10%)	4 (23.5%)
5	17 (46%)	10 (50%)	7 (41.2%)
6	2 (5.4%)	1 (5%)	1 (5.9%)
7	0 (0%)	0 (0%)	0 (0%)
8	3 (8.1%)	2 (10%)	1 (5.9%)

$^2 = 4.6$, $df = 5$, $p = 0.5$.

Chapter 6

Discussion

This DNP scholarly project was a documentation practice improvement QI project. It represents the first PDSA cycle of building and documenting MHDs in a MHD SF. This PDSA cycle started with patient participants managed by the PI, who is an NP. A MHD SF for the EHR clinical note was developed and is being built. The feasibility of having patients keep diaries to supply data needed for the MHD SF was demonstrated with 52 patient participants, 28 who historically recorded their MHD and 24 who did not. When demographic and migraine characteristics were compared between the two groups, no statistically significant differences were found in anthropomorphic characteristics, such as blood pressure, height, and weight, or in migraine characteristics, such as age of migraine onset, migraine frequency and severity or number of acute medications tried, or current use of preventive and acute medications. The group that tracked MHD met statistical significance for having more preventive medications tabulated from the medication tab than the group that did not track MHDs (M = 8.9, SD = 5.3 v. M = 5.9, SD = 3.5, respectively). Participants that recorded MHDs may have been more systematic in their approach to migraine therapy and cycled through preventive medications faster in order to reduce migraine's impact, resulting in more preventive medications found on chart review.

Participant characteristics in this migraine clinic reflected what has been described in migraine literature regarding the gender most affected, and migraine's cost and impact on QOL. Most of the participants were women (85%), many cycled through preventive (M = 7.5, SD = 4.8) and acute (M = 8.1, SD = 4.4) medications, almost all currently used preventive (M = 2.5, SD = 1.7) and acute (M = 2.7, SD = 1.8) medications. This echoes the financial impact of migraine therapy, and the migraine days per month frequency (M = 10, SD = 8.3) and severity

(M = 4.8, SD = 2) provides insight into migraine's impact on the participants QOL. Of note, one participant who met criteria for preventive therapy had no current preventive medications listed in the chart, as counted by the methodology used in this QI project, and was an outlier in adhering to current migraine preventive therapy recommendations (Silberstein, 2018; Charles 2018). Upon further investigation, the participant incorporates non-pharmacologic and lifestyle approaches to reduce migraine's impact. This illustrates the need for documenting non-pharmacologic approaches in a systematic manner within the EHR.

Participants in this study were diverse in SES elements, but overall the participants reported features belonging to a higher SES. This is evidenced by the reported highest education level achieved; bachelor's (42%), graduate (25%), doctoral (2%) and post-doctoral (4%) (totaling 73%), the majority of participants reported earning more than $100,000 per year (54%), most having commercial insurance (81%), and most having zip codes in more affluent SPA regions, 2 (19%) and 5 (46%) totaling 65%.

A majority of participants with zip codes in Los Angeles County lived in SPA regions 2 (19%), 4 (16%), and 5 (46%) (totaling 81%). Of these three SPA regions, 2 and 5 are reported to have better health outcomes than 4, as reported by the Los Angeles County Department of Public Health, Office of Health Assessment and Epidemiology report (2017) (Appendix A). SPA 2 is reported to have low housing instability, adult obesity and type 2 diabetes and high percentage of adults exercising in their neighborhood. SPA 5 is reported to have low difficulty accessing medical care, adult obesity, smoking cigarettes and number of days that poor health limited physical activity and high percentage of feeling safe from crime, adults exercising and being insured. In contrast, SPA 4 is reported to have low rates of insured adults, high rates of difficulty accessing medical care and adults living with depression The disproportionate enrollment of

participants from SPA regions 2, 4, and 5 may be due to location of the migraine clinic, which is in SPA five, or other socioeconomic factors, such as having reliable transportation, access to healthcare, or having knowledge that specialized care for migraine exists. Low or no representation from SPA regions 1, 3, 6, 7, and 8 may indicate an unmet need in managing migraine in these regions.

Limitations

The beta version of the MHD SF developed in this PDSA cycle (Appendix H) will be completed in collaboration between migraine specialists and informaticists. Published literature has not quantified changes in therapeutic outcomes in migraine clinics that document migraine characteristics in SFs. This field of study remains to be explored and findings published.

While the current participant sample is small and lacks the necessary power to draw definitive conclusions, this QI project has generated new queries to be explored, such as new migraine characteristics to trend and new medication designations to consider. Given the small data set from one migraine clinic, and the multiple comparisons, these findings need to be retested with a larger sample to explore queries generated. Since this project collected, tabulated and described various migraine characteristics in participants from one migraine clinic, the findings cannot be generalized to other migraine clinics. The COVID-19 pandemic presented pandemic scale challenges. The author navigated the project while adjusting to clinical demands and adjusted the methodology in order to continue the project.

The methodology used to tabulate past and current medications was completely dependent on the medication listed in the medication history tab of the EHR. Limiting the count of preventive and acute approaches to the medication history tab did not include non-medication approaches used to prevent or resolve migraine. Lifestyle behaviors such as regular exercise,

meal intervals, caffeine use and sleep habits are therapeutic staples in migraine management (Charles, 2018), and were not counted as a preventive or acute approach. A secondary analysis of the United States 2012 National Health Interview Survey by Zhang et al., (2017) found that 3% of patients with migraine reported using complementary and alternative modalities (CAM), such as receiving acupuncture and chiropractic treatments, inhaling and applying essential oils, and/or ingesting herbal supplements specifically for migraine management. Interest in non-invasive, percutaneous neuro-modulatory devices has increased in the last decade and novel devices have been approved by the United States Food and Drug Administration. The type of energy and frequency of energy type vary among neuro-modulatory devices, some deliver single-pulsed transcranial magnetic stimulation and others emit electrical current stimulation, that have been shown to reduce migraine disability (Grimsrud & Singh, 2018). Lifestyle, CAM and neuro-modulatory approaches are not systematically documented in this clinic, thus were not included in the preventive or acute therapy tabulation. Other limitations identified in this QI project is in methodology used to tabulate different doses and routes of the same medication because the various routes and doses were counted as one. The PI did not count IV fluid noted in the medication tab as an acute treatment because it was not clear if the order was for fluid resuscitation due to migraine, or for surgical indications. The medication count in this QI project under represents the true number of medications and therapies ever tried and currently used.

Future opportunities

This QI project has inspired ideas for more areas of migraine exploration. Future PDSA cycles should address the methodologic limitations discussed above; determining the method of tabulating various doses and routes of medications, categorizing lifestyle, CAM and neuro-modulatory approaches as acute, preventive, or both, and determine if IV fluid should be counted

as an acute medication. Adding a category of medication that is simultaneously preventive and acute therapy, such as medications modulating the CGRP system, CAM approaches, and neuro-modulatory devices considered both preventive and acute treatment would be of benefit. Another analysis of interest is exploring the relationship between migraine onset and tracking MHDs.

Future iterations of this QI project can increase the number of SFs built to aid in systematic documentation of migraine characteristics. Characteristics of interest can include the date of initial clinic visit, the severity and frequency of migraine attacks during the initial visit, average duration of migraine attacks, and most bothersome migraine symptoms. The need to systematically document lifestyle, CAM and neuro-modulatory approaches used to manage migraine has been demonstrated in this QI project. Other SFs can be created to facilitate documenting characteristics helpful in evaluating responses to acute treatments such as the length of time it takes to terminate a migraine attack and side effects experienced from the acute therapy.

Further analysis of participant characteristics with a larger data set may help illuminate the relationship between SPA region and migraine disability. It is likely that those with zip codes from SPA regions with worse health outcomes are disproportionately affected by migraine. The 52 patients in the study sample were not representative of all SPA regions. A better understanding of patients SPA regions can guide the clinic's approach in patient recruitment as well as inform clinicians of the challenges patients with migraine face in their SPA region.

The current use of SFs to document migraine characteristics in this clinic are limited to past medical history diagnoses, review of systems, medications, blood pressure, heart rate, weight, height, body mass index, temperature, and pain level on the 1-10 pain scale. This is an area in documentation practices that is prime for further development. The evolution of this QI

project can eventually include linking therapeutic outcomes to genetic traits, which is currently being done in the NorthShore health system (Meyers et al., 2018), in order to develop the capability to predict responses to migraine therapy. This form of documentation can also spread to other medical practices who manage chronic conditions with acute exacerbations, such as other neurology practices, and even pulmonology and cardiology practices managing asthma, COPD and CHF, as well as the primary care setting.

Conclusion

Migraine continues to affect hundreds of millions of people around the world despite advances in migraine pathophysiology understanding and the development of novel therapies. Finding reliable and effective treatments, and eventually a cure, will improve QOL, reduce the disability caused by this neurologic condition, and reduce a barrier for patients to achieve their full potential. Documentation of migraine characteristics is essential in the practice of migraine medicine and is indispensable in the evaluation of therapies. Improving the structure in which migraine data is recorded within the EHR will help clinicians leverage one of the EHRs function in retrieving characteristic documented in SF and trend changes overtime. This QI project began the process to facilitate the migraine clinicians ability to efficiently document MHDs per month within a SF in the EHR. This will help support clinical decision making to either continue or change treatments. Building a SF to document subjective variables adds value to medical practices that manage chronic health conditions accompanied by acute exacerbation, such as migraine and epilepsy. Building a SF encourages and facilitates providers to document important data consistently, increasing the rate of documenting variables of interest, and result in a more consistent note among providers. A SF enables the EHR to extract variables of interest, facilitating clinic-based research and demonstrate change of a variable over time. The EHR has

the capability to visually demonstrate the change in variables of interest if they are documented in SFs.

Gaps that remain in using the MHD SF include building the MHD SF, documenting MHD in the field, tracking changes in MHD over time, evaluating the MHD SF contribution to improved MHD documentation and explore its impact in aiding clinicians and patients to determine whether or not to continue with a treatment course or not. This QI project also explored the published literature utilizing SF and described the process of building a MHD SF in this migraine clinic.

In addition to beginning the process of developing a novel MHD SF in a migraine clinic, this QI project successfully described select migraine characteristics of participants who documented MHDs compared to those who did not. Statistical analysis demonstrated that both groups were similar, except that the number of preventives tried was higher in the group that tracked MHDs. While a larger sample size would be needed to better detect differences in migraine characteristics between the groups created, this QI project demonstrated the feasibility of describing migraine characteristics of patients in this clinics and is another step in improving the clinician's understanding of their patient population. Better understanding of patients may help clinicians build a therapeutic report with those they serve and custom tailor migraine treatments that will hopefully lead to better migraine control. Future analysis to better understand the impact of SPA regions on migraine can help clinicians link the patients environment to health outcomes. Continuing this project will uncover more areas of improvement to better serve patients and cure migraine. Documenting notes narratively limits the EHR's ability to track changes in migraine characteristics and is not an efficient way to use the EHR. A SF built to document MHDs in a clinical note bridges the documentation gap and will increase the

efficiency and validity of MHD documentation. Future studies demonstrating migraine outcomes after implementing this documentation intervention are needed to demonstrate value added.

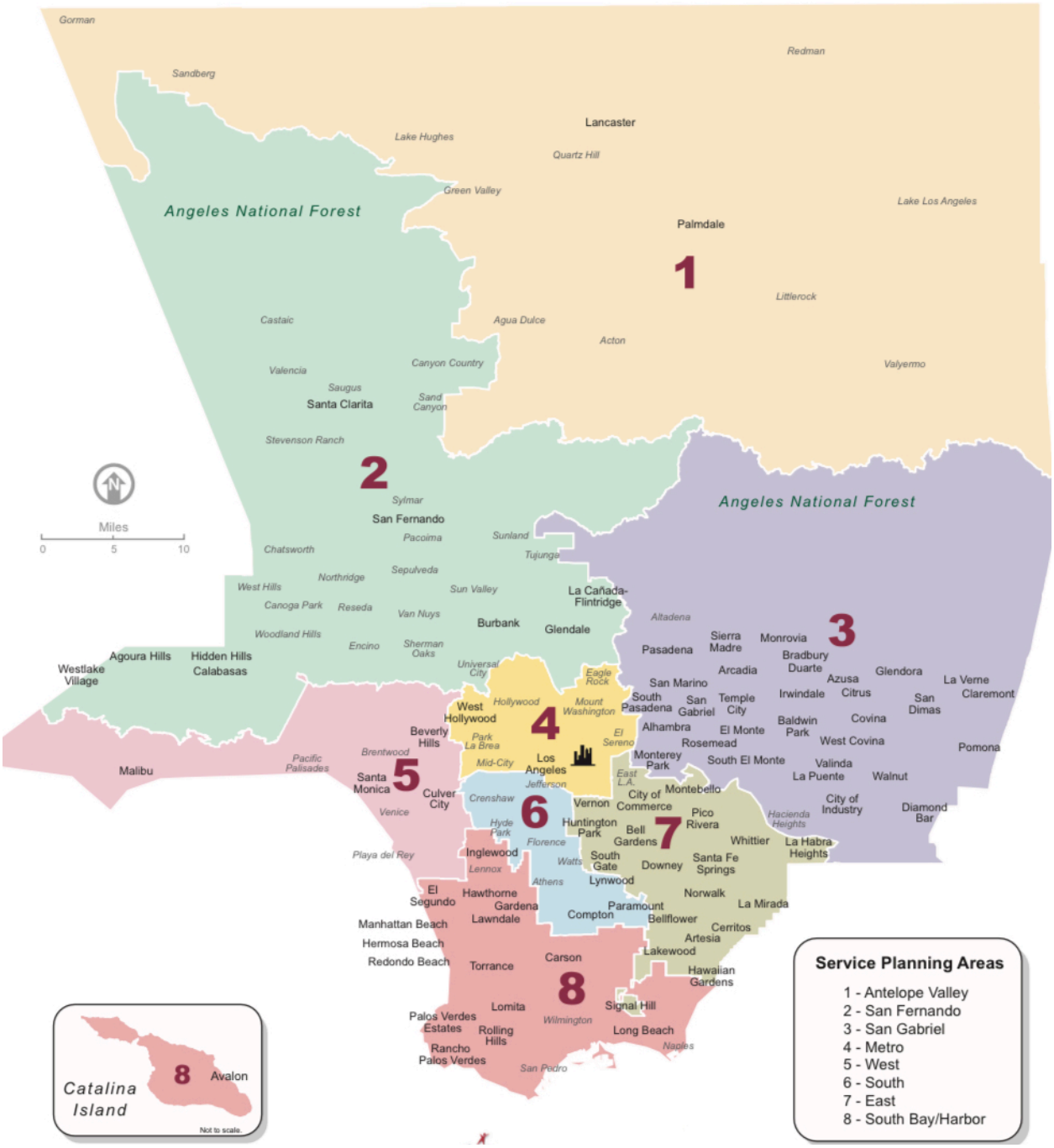
Appendix A

County of Los Angeles Service Planning Area **(**Los Angeles County Department of Public Health, Office of Health Assessment and Epidemiology, 2017)

Service Planning Area 1			
Acton Del Sur Gorman Hi Vista	Lake Hughes Lake Los Angeles Lancaster Leona Valley	Littlerock Liano Palmdale Pearblossom	Quartz Hill South Antelope Valley Valyermo
Service Planning Area 2			
Agoura Hills Burbank Calabasas Canoga Park Canyon Country Castaic Chatsworth	Encino Glendale Hidden Hills La Canada-Flintridge Northridge Pacoima Reseda Sand Canyon	San Fernando Santa Clarita Saugus Sepulveda Sherman Oaks Stevenson Ranch Sunland Sun Valley	Sylmar Tujunga Universal City Valencia Van Nuys West Hills Westlake Village Woodland Hills
Service Planning Area 3			
Alhambra Altadena Arcadia Azusa Baldwin Park Bradbury Citrus City of Industry	Claremont Covina Diamond Bar Duarte El Monte Glendora Hacienda Heights Irwindale	La Puente La Verne Monrovia Monterey Park Pasadena* Pomona Rosemead San Dimas	San Gabriel San Marino Sierra Madre South El Monte Temple City Valinda Walnut West Covina
Service Planning Area 4			
Eagle Rock El Sereno	Hollywood Downtown Los Angeles	Mid-City Los Angeles Mount Washington	Park La Brea West Hollywood
Service Planning Area 5			

Beverly Hills Brentwood	Culver City Malibu	Pacific Palisades Playa del Rey	Santa Monica Venice
Service Planning Area 6			
Athens Compton	Crenshaw Florence	Hyde Park Lynwood	Paramount Watts
Service Planning Area 7			
Artesia Bellflower Bell Gardens Cerritos City of Commerce	Downey East Los Angeles Hawaiian Gardens Huntington Park La Habra Heights	Lakewood La Mirada Lynwood Montebello Norwalk	Paramount Pico Rivera Santa Fe Springs South Gate Vernon Whittier
Service Planning Area 8			
Avalon Carson Catalina Island El Segundo Gardena	Hawthorne Inglewood Lennox Lomita Long Beach*	Hermosa Beach Manhattan Beach Naples Palos Verdes Estates Rancho Palos Verdes	Redondo Beach Rolling Hills San Pedro Signal Hill Wilmington

***The cities of Long Beach and Pasadena are not served by the Los Angeles County Department of Public Health, as each of these cities has its own health department.**


Gorman
Sandberg
Redman
Lancaster
Lake Hughes
Quartz Hill
Green Valley
Angeles National Forest
Lake Los Angeles
Palmdale
1
Littlerock
Castaic
Agua Dulce
Acton
Valencia
Canyon Country
Valyermo
Saugus
Santa Clarita
Sand Canyon
Stevenson Ranch
2
Sylmar
San Fernando
Angeles National Forest
Pacoima
Sunland
Tujunga
Chatsworth
Sepulveda
Northridge
West Hills
Sun Valley
La Cañada-Flintridge
Canoga Park
Reseda
Van Nuys
Altadena
Burbank
Glendale
Woodland Hills
Encino
Sherman Oaks
Pasadena
Sierra Madre
Monrovia
3
Agoura Hills
Hidden Hills
Calabasas
Westlake Village
Universal City
Eagle Rock
Bradbury
Duarte
Arcadia
Azusa
Glendora
La Verne
San Marino
Irwindale
Citrus
Claremont
Hollywood
Mount Washington
South Pasadena
San Gabriel
Temple City
San Dimas
West Hollywood
4
Alhambra
El Monte
Baldwin Park
Covina
Beverly Hills
Park La Brea
El Sereno
Rosemead
West Covina
Pomona
Brentwood
Monterey Park
South El Monte
Valinda
Malibu
Pacific Palisades
Mid-City
Los Angeles
East L.A.
La Puente
Walnut
Santa Monica
5
Culver City
Jefferson
Montebello
City of Commerce
City of Industry
Crenshaw
Vernon
Diamond Bar
Venice
6
Huntington Park
Pico Rivera
Hacienda Heights
Hyde Park
Bell Gardens
7
Whittier
La Habra Heights
Florence
Inglewood
Watts
South Gate
Downey
Santa Fe Springs
Playa del Rey
Lennox
Athens
Lynwood
Norwalk
El Segundo
Hawthorne
Gardena
Paramount
La Mirada
Lawndale
Compton
Bellflower
Manhattan Beach
Cerritos
Artesia
Hermosa Beach
Lakewood
Redondo Beach
Torrance
Carson
Hawaiian Gardens
8
Lomita
Signal Hill
Palos Verdes Estates
Wilmington
Rolling Hills
Long Beach
Rancho Palos Verdes
Naples
San Pedro
Miles
0
5
10
Catalina Island
8
Avalon
Not to scale.
Service Planning Areas
1 - Antelope Valley
2 - San Fernando
3 - San Gabriel
4 - Metro
5 - West
6 - South
7 - East
8 - South Bay/Harbor

Determinants of health per category with no statistically significant distinction of better or worse outcomes:
Gender, age group, race, foreign born, marital status, disabled, sexual orientation, education, employment status, poverty as defined by the Federal Poverty Level, and access to mental healthcare.

Determinants of health per category with statistically significant distinction of better or worse outcomes:
Housing, food, neighborhood, air quality, climate change, school readiness, television viewing, parental support, breastfeeding, childcare, community, health-related quality of life, special health care needs, insurance, regular source to care, access to medical care, access to dental care, women's health, immunizations, alcohol and drug use, nutrition, tobacco use, physical activity, overweight and obesity, diabetes, cardiovascular disease, reproductive health, injury, mental health, communicable diseases, respiratory disease, cancer, and all-cause mortality.

The following is a migraine-oriented, curated list of the category's sub-category that was found to be statistically different from the SPA as a cohort when determining better or worse outcomes:

SPA 1	
High	Housing instability – 11.3% No parks – 27.9% Number of days poor health limited physical activity – 3.2% Number of unhealthy days – 7.4% Adults receiving enough emotional support – 71.5% Adults who smoke cigarettes – 18.2% Adults who drink at least one soda or sweetened drink a day – 37.4% Adult obesity – 29.6% Adults with T2DM – 13.9% Adults with HTN – 30.3% Suicide rate – 8.6% Unintentional drug-related death rate – 12.2 Adults with depression – 12.5% Alzheimer's disease death rate – 40.8% All-cause mortality – 775.8
Low	Adults exercising in neighborhood – 35.3% Incidence of HIV/AIDS – 13.2%

SPA 2	
High	Adults exercising in neighborhood – 50.4% Adults receiving enough emotional support – 69.1% Adults with HTN –8.6%
Low	Housing instability – 3% No parks – 12.9% Health is fair/poor – 17.5% Adults who did not see a dentist in the last year – 34.9% Adults who drink at least one soda or sweetened drink a day – 28.0% Adult obesity – 19.8% Adults with T2DM – 4.5% Incidence of HIV/AIDS – 15.2% All-cause mortality – 574.4 Adults who misused prescription drugs in the past year – 3.9%

SPA 3	
High	Adults with depression – 6.4%
Low	Food insecure – 21.8 No parks – 12.5% Adults receiving enough emotional support – 55.5% Adults with HTN – 6.9% Unintentional drug-related death rate – 4.5 Incidence of HIV/AIDS – 1.2% All-cause mortality – 562.2

SPA 4	
High	No parks 19.2% Difficulty accessing medical care – 28.6% Unintentional drug-related death rate – 8.8 Adults with depression – 10.8% Incidence of HIV/AIDS – 69.6%
Low	Alzheimer's disease death rate – 19.1% Adults insured – 84.8% All-cause mortality – 552.3

SPA 5	
High	Safe from crime – 97.4% Adults exercising in neighborhood – 50.4% Adults receiving enough emotional support – 74.8% Adults insured – 95.3% Adults who achieve recommended exercise activity – 73.4% Unintentional drug-related death rate – 8.6
Low	Health is fair/poor – 10% Number of days poor health limited physical activity – 3.2% Difficulty accessing medical care – 13.1% Adults who did not see a dentist in the last year – 28.9% Adults who smoke cigarettes – 8.3% Adults who drink at least one soda or sweetened drink a day – 21.7% Adult obesity – 10.3% Adults with T2DM – 4.5% Adults with HTN – 17.1% Alzheimer's disease death rate – 23.3% Incidence of HIV/AIDS – 16.7% All-cause mortality – 483.3

Spa 6	
High	Housing instability – 11.3% No parks – 19.2% Health is fair/poor – 17.5% Difficulty accessing medical care – 32.5% Adults who did not see a dentist in the last 56.9% Adults who drink at least one soda or sweetened drink a day – 41.9% Adult obesity – 34.1% Adults with T2DM – 12.3% Unintentional drug-related death rate – 8.7 Incidence of HIV/AIDS – 35.1% All-cause mortality – 726.6
Low	Area safe from crime – 40% Adults exercising in neighborhood – 39.4% Adults receiving enough emotional support – 55.7% Adults insured – 82.2% Adults with HTN – 4.1% Alzheimer's disease death rate – 22.0%

SPA 7	
High	Adults who did not see a dentist in the last year – 46.9% Adults who drink at least one soda or sweetened drink a day – 40.3% Adult obesity – 28.0% All-cause mortality – 604.2
Low	Unintentional drug-related death rate – 5.1 Alzheimer's disease death rate – 23.1% Incidence of HIV/AIDS – 15.7%

SPA 8	
High	Adults with HTN – 9.0% Unintentional drug-related death rate – 8.0 All-cause mortality – 624.1
Low	Difficulty accessing medical care – 19.1%

Appendix B

The Structured Field Staff Satisfaction Questionnaire (Not implemented due to COVID-19)

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) The structured fields are easy to use.					
2) The discrete data fields are useful for the clinic.					
3) The discrete data fields take too long to fill out.					

Do you have any suggestions to improve this process?

Appendix C

Migraine Demographic Data Questionnaire, part 1.

Please place an x next to your answer where applicable.

Highest level of education completed:

_ Elementary
_ Middle School
_High School
_None of the above
_Graduate
_Baccalaureate
_Doctoral
_ Post-Doctoral

Yearly household income:

_ Under 15,000 per year
_ 15,000 – 24,999
_ 25,000 – 34,999
_ 35,000 – 49,999
_ 50,000 – 74,999
_ 75,000 – 99,999
_ 100,000 – 149,999
_ 150,000 – 199,999
_ 200,000 and over

Preferred language for healthcare: _____

Marital status:

_ Single
_ Married
_ Domestic Partnership
_ Widowed
_ Divorced
_ Separated
_ Other

Appendix D

Migraine Demographic Data Questionnaire, part 2.

1. Age
2. Gender
3. Last documented blood pressure
4. Last documented weight
5. Last documented height
6. Zip code
7. Insurance: commercial, government sponsored (Tricare, Medical, Medicare) or none
8. Age of migraine onset
9. Average number of migraine frequency
10. Average severity of migraine attack
11. Number of preventive medications tried
12. Number of migraine preventive medications currently used
13. Number of acute therapies tried
14. Number of acute migraine therapies currently used

Appendix E

Migraine Demographic Data Questionnaire, part 1 – Codified.

1. Highest level of education completed:
    a. 1 = Elementary
    b. 2 = Middle School
    c. 3 = High School
    d. 4 = Baccalaureate
    e. 5 = Graduate
    f. 6 = Doctoral
    g. 7 = Post-Doctoral
    h. 8 = None of the above

2. Yearly household income:
    a. 0 = Under 15,000 per year
    b. 1 = 15,000 – 24,999
    c. 2 = 25,000 – 34,999
    d. 3 = 35,000 – 49,999
    e. 4 = 50,000 – 74,999
    f. 5 = 75,000 – 99,999
    g. 6 = 100,000 – 149,999
    h. 7 = 150,000 – 199,999
    i. 8 = 200,000 and over

3. Preferred language for healthcare
    a. 0 = English
    b. 1 = Spanish
    c. 2 = Other

4. Marital status:
    a. 1 = Single
    b. 2 = Married
    c. 3 = Domestic Partnership
    d. 4 = Widowed
    e. 5 = Divorced
    f. 6 = Separated
    g. 7 = Other

Appendix F

Migraine Demographic Data Questionnaire, part 2 – codified

15. Age
16. Gender
    a. 0 = female
    b. 1 = male
17. Last documented blood pressure
18. Last documented weight
19. Last documented height
20. Zip code
    a. 1 = SPA 1
    b. 2 = SPA 2
    c. 3 = SPA 3
    d. 4 = SPA 4
    e. 5 = SPA 5
    f. 6 = SPA 6
    g. 7 = SPA 7
    h. 8 = SPA 8
    i. 9 = Zip code is not part of Los Angeles County
21. Insurance
    a. 0 = Commercial insurance – HMO, PPO
    b. 1 = State or federally sponsored insurance – Medical, Medicare,
22. Age of migraine onset
23. Average number of migraine frequency
24. Average severity of migraine attack
25. Number of preventive medications tried (including current preventives used)
26. Number of migraine preventive medications currently used
27. Number of acute therapies tried
28. Number of acute migraine therapies currently used

Appendix G

Examples Participant Calendars/Diaries.

Weight: 201 lb

Not enough exercise since starting to work from home on March 16th.

MEDICATION (APRIL 2019–APRIL 2020)

Current:

- Caffeine: 300 mg per day (since 2017)
- Emgality: 120 mg per month (since April 2019)
- Nortiptyline: 50mg per day, one hour before bedtime (since April 2019)
- Triptans: Rotating through Eletriptan, Frovatriptan, and Sumatriptan. All of them typically take 2-4 hours to relieve pain. Frovatriptan appears to be the most effective at keeping pain at bay (since 2016).
- Cambia: occasionally, with triptan

Past:

- Dexamethasone, followed by Nabumetone: (5/26/2019–6/7/2019)
- Botox (2/20/2019, 5/14/2019, 8/15/2019, 11/05/2019)

HEADACHE HISTORY

- Headaches most days, but only take a triptan when pain is too much to bear.
- January: 8 triptans
- February: 6 triptans
- March: 12 triptans
- April: 17 triptans

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Dec 29th	Dec 30th	Dec 31st	Jan 1st	Jan 2nd	Jan 3rd **Frovatriptan**	Jan 4th
Jan 5th	Jan 6th	Jan 7th **Sumatriptan**	Jan 8th **Frovatriptan**	Jan 9th	Jan 10th	Jan 11th
Jan 12th	Jan 13th	Jan 14th **Eletriptan**	Jan 15th	Jan 16th	Jan 17th	Jan 18th **Eletriptan**
Jan 19th **Sumatriptan**	Jan 20th	Jan 21st	Jan 22nd **Frovatriptan**	Jan 23rd	Jan 24th	Jan 25th
Jan 26th	Jan 27th **Frovatriptan**	Jan 28th	Jan 29th	Jan 30th	Jan 31st	Feb 1st
Feb 2nd	Feb 3rd	Feb 4th	Feb 5th	Feb 6th	Feb 7th **Sumatriptan**	Feb 8th **Sumatriptan**
Feb 9th **Frovatriptan**	Feb 10th	Feb 11th	Feb 12th	Feb 13th	Feb 14th	Feb 15th

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Feb 16th	Feb 17th Sumatriptan	Feb 18th Frovatriptan Cambia	Feb 19th	Feb 20th	Feb 21st	Feb 22nd
Feb 23rd	Feb 24th	Feb 25th	Feb 26th	Feb 27th Frovatriptan Cambia	Feb 28th	Feb 29th
Mar 1st	Mar 2nd Frovatriptan	Mar 3rd	Mar 4th Frovatriptan	Mar 5th	Mar 6th	Mar 7th
Mar 8th Frovatriptan	Mar 9th	Mar 10th	Mar 11th	Mar 12th Frovatriptan	Mar 13th	Mar 14th
Mar 15th Frovatriptan	Mar 16th	Mar 17th	Mar 18th	Mar 19th	Mar 20th	Mar 21st
Mar 22nd Frovatriptan Cambia	Mar 23rd Sumatriptan	Mar 24th Sumatriptan	Mar 25th Sumatriptan	Mar 26th Sumatriptan	Mar 27th Sumatriptan	Mar 28th
Mar 29th	Mar 30th	Mar 31st Sumatriptan	Apr 1st Sumatriptan	Apr 2nd Sumatriptan	Apr 3rd	Apr 4th
Apr 5th	Apr 6th Eletriptan	Apr 7th Sumatriptan	Apr 8th Sumatriptan	Apr 9th	Apr 10th Sumatriptan	Apr 11th Sumatriptan
Apr 12th	Apr 13th Sumatriptan	Apr 14th Frovatriptan	Apr 15th Frovatriptan	Apr 16th	Apr 17th Eletriptan	Apr 18th Frovatriptan
Apr 19th	Apr 20th Frovatriptan	Apr 21st	Apr 22nd Eletriptan Cambia	Apr 23rd Sumatriptan	Apr 24th Frovatriptan	Apr 25th
Apr 26th Frovatriptan	Apr 27th	Apr 28th	Apr 29th	Apr 30th	May 1st	May 2nd

Migraine Listing

Time Period: **2/26/20 - 5/25/20**

Attack Type: **All**

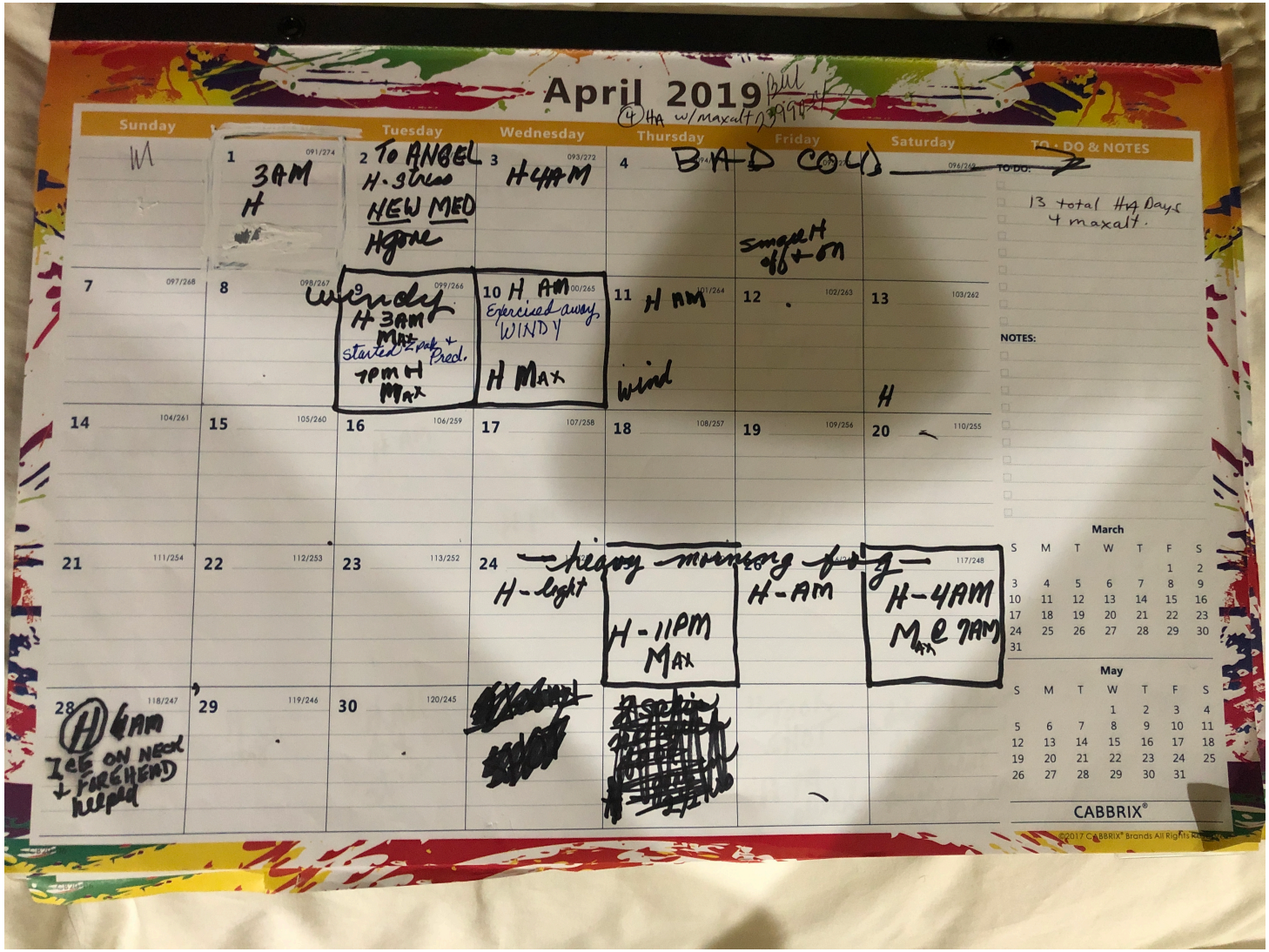
Number of Attacks	Attack Days	Attack-Free Days	Avg Attack Duration
5	7	83	11h 41m

#	Started	Lasted	Pain Level	Affected Activities	Potential Triggers	Symptoms	Auras	Pain Positions		Medication	Non Drug Relief Methods
								Left	Right		
1	5/18/20 08:14 Location: Home	10h 00m	5	Could not fall asleep, Slower [at work]	Stress, Lack of sleep, Neck pain	Anxiety, Nausea, Neck pain, Depressed mood	Irritability, Unusually depressed	Left Back of Neck, Left Back of Head (Lower)	Right Back of Neck, Right Back of Head (Lower)	**Somewhat Helpful** - 1x Relpax **Unsure** - 2x Advil, 1x Tylenol	**Helpful** - Heat pad **Somewhat Helpful** - Massage, Drink water **Unsure** - Dark room rest
Notes: 5/19/2020, 9:19 PM: Pain spread to both sides											
2	4/26/20 09:57 Location: Home	05h 21m	5		Stress, Irregular sleep, Neck pain	**Most Bothersome** - Facial pressure Neck pain, Confusion/Light headed		Left Front Head, Left Back of Neck	Right Back of Neck, Right Front Head, Right Back of Head (Lower)	**Unsure** - 1x Advil	
Notes:											
3	4/25/20 09:03 Location: Home	06h 05m	6		Stress, Rebound headache, Neck pain	**Most Bothersome** - Neck pain Ringing in ears / Tinnitus, Facial pressure, Blurred vision, Confusion/Light headed, Insomnia		Left Back of Neck, Left Back of Head (Lower)	Right Back of Neck, Right Eye, Right Back of Head (Lower)	**Unsure** - 2x Advil, 1x Relpax, 1x Flexeril	
Notes:											

#	Started	Lasted	Pain Level	Affected Activities	Potential Triggers	Symptoms	Auras	Pain Positions		Medication	Non Drug Relief Methods
								Left	Right		
4	4/22/20 21:48 Location: Home	06h 00m *(ended in sleep)*	7		Stress, Neck pain	Ringing in ears / Tinnitus, Dizziness, Nausea, Neck pain, Confusion/Light headed, Nasal congestion	Headache, Irritability, Visual disturbance	Left Back of Neck	Right Back of Neck, Right Back of Head (Upper), Right Eye, Right Back of Head (Lower)	**Helpful** - 2x Relpax **Unsure** - 1x Advil	**Somewhat Helpful** - Massage, Sleep **Unsure** - Drink water, Dark room rest
Notes: Chronic neck pain is definite trigger of migraines											
5	3/3/20 06:00 Location: Bed (at Home)	31h 00m	7	Slower [at home], Woke up during sleep, Slower [at work]		Anxiety, Facial pressure, Neck pain, Insomnia	Headache, Irritability	Left Back of Neck	Right Back of Neck, Right Temple, Right Back of Head (Upper), Right Eye, Right Back of Head (Lower)	**Helpful** - 2x Relpax **Unsure** - 2x Advil	**Helpful** - Heat pad, Drink water **Somewhat Helpful** - Ice packs **Unsure** - Sleep
Notes:											

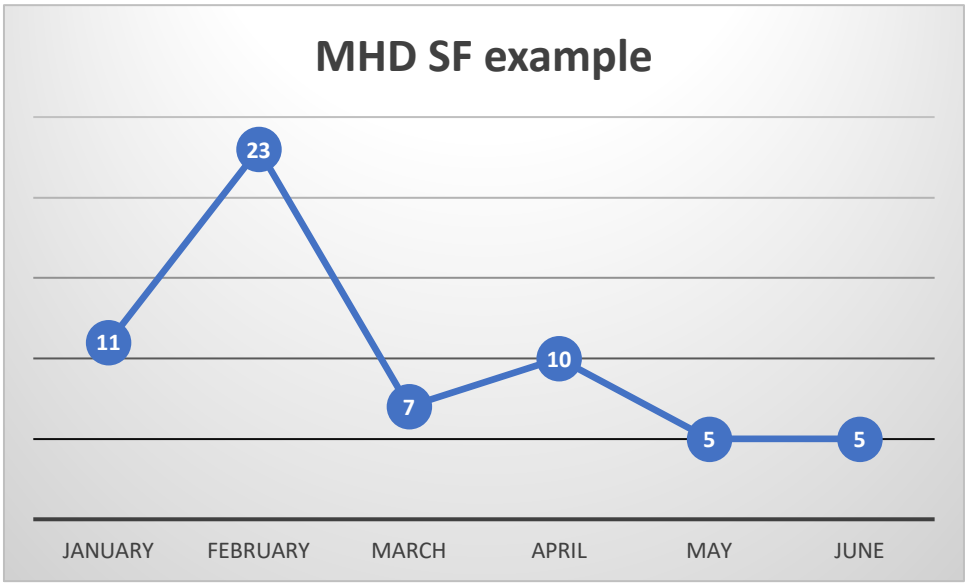
April 2020 – four days migraine-free. Highlighted days are no triptan days.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
5 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	6 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	7 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	8 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	9 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	10 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	11 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine
12 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	13 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	14 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	15 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	16 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	17 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	18 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine
19 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	20 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	21 AJOVY fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	22 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	23 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	24 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	25 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine
26 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	27 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	28 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 200 Celebrex 400 magnesium 10 Memantine	29 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 400 magnesium 10 Memantine	30 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 400 magnesium 10 Memantine	5/1 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 400 magnesium 10 Memantine	5/2 fish oil w/meal 300 co-q 10 400 magnesium 200 Celebrex 10 Memantine fish oil w/meal 400 magnesium 10 Memantine


April 2019
Sunday
Tuesday
Wednesday
Thursday
Friday
Saturday
TO-DO & NOTES
TO DO:
13 total H4 Days
4 maxalt.
NOTES:
3AM
H
TO ANGEL
H-Stress
NEW MED
Hgone
H 4AM
BAD COLD
smoke H off + on
Windy
H 3AM
MAX
started Zpak + Pred.
7pm H
MAX
10 H AM
Exercised away
WINDY
H MAX
11 H AM
Wind
H
H-light
heavy morning fog
H-11PM
MAX
H-AM
H-4AM
MAX @ 7AM
4AM
ICE ON NECK
+ FOREHEAD
helped
March
May
CABBRIX®

Appendix H

Migraine headache day structured field, beta version



References

Acacio-Claro, P.J., Doku, D.T., Koivusilta, L.K., & Rimpela, A.J. (2017). How socioeconomic circumstances, school achievement and reserve capacity in adolescence predict adult eductation level: A three-generation study in Finland. *International Journal of Adolescence and Youth, 23,* 382-397. doi: 10.1080/02673843.2017.1389759

Bandarian-Balooch, S., Martin, P.R., McNally, B., Brunelli, A., & Mackenzie, S. (2017). Electronic-diary for recording headaches, triggers, and medication use: Development and Evaluation. *Headache, 57,* 1551-1569. doi: 10.1111/head.13184

Becker, W.J. (2015). Acute migraine treatment in Adults. *Headache, 55,* 778-793. Doi: 10.1111/head.12550

Befus, D.R., Irby, M.B., Coeytaux, R.R., & Penzien, D.B. (2018). A critical exploration of migraine as a health disparity: The imperative of an equity-oriented, intersectional approach. *Current Pain and Headache Reports, 22,* 1-8. doi: 10.1007/s11916-018-0731-3

Burch, R., Rizzoli, P., & Loder, E. (2018). The prevalence and impact of migraine and severe headache in the United States: Figures and trends from government health studies. *Headache, 58,* 496 – 505. doi: 10.1111/head.13281

Bink, A., Benner, J., Reinhardt, J., De Vere-Tyndall, A., Stieltjes, B., Hainc, N., & Stippich, C. (2018). Structured reporting in neuroradiology: Intracranial tumors. *Frontiers in Neurology, 9,* 1-10. doi: 10.3389/fneur.2018.00032

Blumenfeld, A.M., Bloudek, L.M., Becker, W.J., Buse, D.C., Varon, S.F., Maglinte, G.A., …Lipton, R.B. (2013). Patterns of use and reasons for discontinuation of prophylactic medications for episodic migraine and chronic migraine: Results from the second

International Burden of Migraine Study (IBMS-II). *Headache, 53,* 644-655. doi: 10.1111/head.12055

Campanella, P., Lovato, E., Marone, C., Fallacara, L., Mancuso, A., Ricciardi, W., & Specchia, M.L. (2015). The impact of electronic health records on healthcare quality: A systematic review and meta-analysis. *European Journal of Public Health, 26,* 60-64. doi: 10.1093/eurpub/ckv122

Cecchini, M., Framski, K., Lazette, P., Vega, T., Strait, M., & Adelson, K. (2016). Electronic intervention to improve structured cancer stage data capture. *American Society of Clinical Oncology, 12,* 949 – 956. doi: 10.1200/JOP.2016.013540

Ceriani, C.E., Wilhour, D.A., & Siberstein, S.D. (2019). Novel medications for the treatment of migraine. *Headache, 59,* 1597-1608. Doi: 10.1111/head.13661

Charles, A. (2018). The pathophysiology of migraine: Implications for clinical management. *Lancet, 17,* 147-182. doi: 10.1016/S1474-442(17)30435-0

Charles, A. (2019). Targeting calcitonin gene-related peptide: A new era in migraine thearpy. *Lancet, 394,* 1765-1774. doi: 10.1016/S0140-6736(19)32504-8

Charleston, L., & Heisler, M. (2016). Headache Literacy – a definition and theory to help improve patient outcomes of diverse populations and ameliorate headache and headache care disparities. *Headache, 56,* 1522-1526. doi: 10.1111/head.12954

Charleston, L., Royce, J., Monteith, T.S., Broner, S.W., O'Brien, H.L., Manrriquez, S.L., Robbins, M.S. (2018). Migraine care challenges and strategies in the US uninsured and underinsured adults: A narrative review, part 1. *Headache*, 58, 506-511. doi: 10.1111/head.13286

Cohen, G.R., Friedman, C.P., Ryan, A.M., Richardson, C.R., & Adler-Milstein, J. (2019). Variation in physicians' electronic health record documentation and potential patient harm from that variation. *Journal of General Internal Medicine, 34,* 2355-2367. doi: 10.1007/s11606-019-05025-3

Coleman, K., Austin, B.T., Brach, C., & Wagner, E.H. (2009). Evidence on the chronic care model in the new millennium. *Health Affairs, 28,* 75-85. doi: 10.1377/hlthaff.28.1.75

Edwards, S.T., Neri, P.M., Volk, L.A., Schiff, G.D., & Bates, D.W. (2014). Association of note quality and quality of care: A cross-sectional study. *BMJ Quality & Safety, 23,* 406-413. doi: 10.1136/bmjqs-2013-002194

GBD 2015 Disease and Injury Incidence and Prevalence Collaborators (2016). Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: A systematic analysis for the Global Burden of Disease Study 2015. *The Lancet, 388,* 1542-1602. doi: 10.1016/S0140-6736(16)31678-6

Goadsby, P.J., Reuter, U., Hallstrom, Y., Broessner, G., Bonner, J.H., Zhang, F.,…Lenz, R.A. (2017). A controlled trial of erenumab for episodic migraine. *The New England Journal of Medicine, 377,* 2123 – 2132. doi: 10.1056/NEJMoa1705848

Hepp, Z., Bloudek, L., & Varon, S.F. (2014). Systematic review of migraine prophylaxis adherence and persistence. *Journal of Managed Care & Specialty Pharmacy, 20,* 22-33. doi: 10.18553/jmcp.2014.20.1.22

International Headache Society. (2018). The International Classification of Headache Disorders, 3rd edition. *Cephalalgia, 38,* 1-211. doi: 10.1177/0333102417738202

Jensen, M.P., Turner, J.A., Romano, J.M., Fisher, L.D. (1999). Comparative reliability and validity of chronic pain intensity measures. *Pain, 83,* 157 – 162. doi: 10.1016/S0304-3959(99)00101-3

Langley, G.J., Moen, R.D., Nolan, K.M., Nolan, T.W., Norman, C.L., & Provost, L.P. (2nd Ed.). (2009). *The improvement guide*. San Francisco, CA: Jossey-Bass.

Lew, C., & Punnapuzha, S. (2020). Migraine medications. StatPearls. Treasure Island, Florida: StatPearls Publising. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK553159/

Linder, J.A., Schnipper, J.L., & Middleton, B. (2012). Method of electronic health record documentation and quality of primary care. *Journal of the American Medical Informatics Association, 19,* 1019 – 1024. doi: 10.1136/amiajnl-2011-000788

Lipton, R.B., Bigal, M.E., Diamond, M., Freitag, F., Reed, M.L., & Stewart, W.F. (2007). Migraine prevalence, disease burden, and the need for preventive therapy. *Neurology, 68,* 343- 349. doi: 10.1212/01.wnl.0000252808.97649.21

Lipton, R.B., Hutchinson, S., Ailani, J., Reed, M.L., Fanning, K.M., Manack Adams, A., Buse, D.C. (2019). Discontinuation of acute prescription medication for migraine: Results from the Chronic Migraine Epidemiology and Outcomes (CaMEO) Study. *Headache, 59,* 1762-1772. doi: 10.1111/head.13642

Lipton, R.B., Munjal, S., Buse, D.C., Fanning, K.M., Bennett, A., & Reed, M.L. (2016). Predicting inadequate response to acute migraine medication: Results from the American Migraine Prevalence and Prevention (AMPP) study. *Headache, 56,* 1635-1648. doi: 10.1111/head.12941

Los Angeles County – Department of Health Services. (2002). Number of neonatal deaths by zip code and service planning area. Retrieved from http://publichealth.lacounty.gov/mch/fhop/FHOP02/Individuals/089IM02_MND.pdf

Los Angeles County Department of Public Health, Office of Health Assessment and Epidemiology. (JAN, 2017)*Key Indicators of Health by Service Planning Area.* Retrieved from: http://publichealth.lacounty.gov/ha/docs/2015lachs/keyindicator/ph-kih_2017-sec%20updated.pdf

Maraganore, D.M., Frigerio, R., Kazmi, N., Meyers, S.L., Sefa, M., Walters, S.A., & Silverstein, J.C. (2015). Quality improment and practice-based research in neurology using the electronic medical record. *Neurology: Clinical Practice, 5,* 419-429. doi: 10.1212/CPJ.0000000000000176

Marmura, M.J. & Nahas, S.J. (2010). What might the ideal electronic medical record for migraine headache look like? *Current Pain and Headache Reports, 14,* 233-237. doi: 10.1007/s11916-010-0107-9

Melnyk, B.M., & Morrison-Beedy, D. (2019). Generating evidence through intervention research versus using evidence in evidenced-based practice/quality improvement. In Melnyk, B.M., & Morrison-Beedy, D (2nd Eds.), *Intervention research and evidence-based quality improvement: Designing, conducting, analyzing, and funding.* (pp. 3 – 9). New York, NY: Springer.

Meyers, S., Simon, K.C., Bergman-Bock, S., Campanella, F., Marcus, R., Mark, A., … Maraganore, D.M. (2018). Structured clinical documentation to improve quality and support practice-based research in headache. *Headache, 58,* 1211-1218. doi: 10.1111/head.13348

Narayanan, J., Dobrin, S., Choi, J., Rubin, S., Pham, A., Patel, V.,…Maraganore, D.M. (2017). Structured clinical documentation in the electronic medical record to improve quality and to support practice-based research in epilepsy. *Epilepsia, 58,* 68-76. doi: 10.1111/epi.13607

Rau, J.C. & Dodick, D.W. (2019). Other preventive anti-migraine treatments: ACE inhibitors, ARBs, calcium channel blockers, serotonin antagonists, and NMDA receptor antagonists. *Current Treatment Options Neurology, 21,* 1-28. doi: 10.1007/s11940-019-0559-0

Ramsey, R.R., Ryan, J.L., Hershey, A.D., Powers, S.W., Aylward, B.S., Hommel, K.A. (2014). Treatment adherence in patients with headache: A systematic review. *Headache, 54,* 795-816. doi: 10.1111/head.12353

Rogers, M.E. (1992). Nursing science and the space age. *Nursing Science Quarterly, 5,* 27-34. doi: 10.1199/089431849200500108

Schmajuk, G., & Yazdany, J. (2017). Leveraging the electronic health record to improve quality and safety in rheumatology. *Rheumatology International, 37,* 1603-1610. doi: 10.1007/s00296-017-3804-4

Silberstein, S.D. (2015). Preventive migraine treatment. *Continuum, 21,* 973-989. doi: 10.1212/CON.0000000000000199

Simon, K.C., Hentati, A., Rubin, S., Franada, T., Maurer, D., Hillman, L., …Maraganore, D.M. (2018). Successful utilization of the EMR in a multiple sclerosis clinic to support quality improvement and research initiatives at the point of care. *Multiple Sclerosis Journal – Experimental, Translational and Clinical, 30,* 1-10. doi: 10.1177/2055217318813736

Simon, K.C., Munson, R., Ong, A., Gil, F.R., Campanella, F., Hillman, L., …Maraganore, D.M. (2019). Design and implementation of structured clinical documentation support tools for treating stroke patients. *Journal of Stroke and Cerebrovascular Diseases, 28,* 1229 – 1235. doi: 10.1016/j.jstrokecerebrovasdis.2019.01.011

Sullivan, A., Cousins, S., & Ridsdale, L. (2016). Psychological interventions for migraine: A systematic review. *Journal of Neurology, 263,* 2369-2377. doi: 10.1007/s00415-016-8156-z

Tassorelli, C., Diener, H.C., Dodick, D.W., Silberstein, S.D., Lipton, R.B., Ashina, M.…Wang, S.J. (2018). Guidelines of the International Headache Society for controlled trials of preventive treatment of chronic migraine in adults. *Cephalalgia, 38,* 815-832. doi: 10.1177/0333102418758283

Thaker, V.V., Lee, F., Bottino, C.J., Perry, C.L., Holm, I.A., Hirschhorn, J.N., & Osganian, S.K. (2016). Impact of an electronic template on documentation of obesity in a primary care clinic. *Clinical Pediatrics, 55,* 1152-1159. doi: 10.1177/0009922815621331

Torelli, P. & Jensen, R. (2010). Headache diaries and calendars. In Aminoff, M.J., Boller, F., & Swaab, D.F. (Eds.), *Handbook of Clinical Neurology* (pp. 137-146). doi: 10.1016/S0072-9752(10)97010-3