Using Teach Back to Evaluate the Efficacy of a Pediatric

Headache Program: A DNP Project

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Abstract

Background: Only 40%-80% of health information is retained during an office visit due to ineffective communication. Caregivers, and patients, are unable to remember how to manage their health care needs. Teach back is an effective tool that encourages a conversation between the caregiver/patient and provider. The purpose of this project is to increase knowledge retention and self-management behaviors using a headache teach back tool.

Methods: The quality department at a large children's hospital in the southwestern United States approved the project as a practice change and parent consent was not required. The project design was a randomized controlled group: pretest-posttest design, quality improvement method. Participants were chosen by convenience sample. Required diagnoses were headache or migraine. Each group had 18 participants, for a total of 36 participants. Ages ranged from four to 18 years of age, with legal guardians present for the intervention group only. New and follow-up patients were included in the project. Demographics for each group were statistically similar. Questionnaires were used to assess knowledge pre and post implementation of teach back tool. Self-management was measured by a follow-up phone call after their appointment to inquire regarding implementation of the headache diary. Charts were reviewed for both groups regarding the number and type of phone calls received by the office.

Outcomes: Paired sample t-test was used to evaluate mean differences in knowledge from pre and post questions of teach back tool. Data analysis concluded a statistical increase in knowledge of triggers and prevention techniques. Cohen's d for triggers was 2.21 and 1.87 for prevention. Self-management of behavior was measured by use of headache diary and determined by a percentage. Sixty-seven individuals started to use the headache diary. Independent t-test was used to compare number of phone calls from each group. Data concluded a decrease in phone calls. However, due to a small sample size, statistical significance could not be established.

Conclusion: Teach back encourages caregiver/patient and provider interaction, which increases health literacy retention and increases self-management behaviors. Future research should focus on patients with headaches with unknown triggers for their headaches.

Keywords: Teach back, Health Literacy, Self-management, headache, migraine

Using Teach Back to Evaluate the Efficacy of a Pediatric Headache Program: A DNP Project

Caregivers only remember 40%-80% of information provided during an office visit, and more than one-half of that information is remembered incorrectly (Agency for Healthcare Research and Quality [AHRQ], 2017). In 2014, only 68.8% of individuals reported their provider gave instructions that they were able to understand (Healthy People 2020, 2014). Ineffective communication, including low health literacy, during an office visit leads to the caregiver's inability to manage their child's health care needs (Lambert & Keogh, 2014).

Communication between the health care professional and patient/caregiver regarding the care of children with headaches should encourage shared decision-making and assist the caregiver to assume responsibility of the child's health (Lambert & Keogh, 2014). To improve communication and increase self-management of care, the integrative technique of teach back can be used to initiate a conversation and correct misunderstandings during the office visit (Slater, Hauang, & Dalawari, 2017). Teach back is a teaching method that asks the individual to recall information in their own words.

Background and Significance

Poor communication and low health literacy have been linked to decreased health maintenance, an increase in hospitalizations, and infrequent use of preventative services (Nouri & Rudd, 2015). Communication is defined as the exchange of information, whether verbal or nonverbal, between individuals (Plainlanguage.gov, n.d.a). Communication requires the use of plain language. Plain language is communication, which is organized and concise (Plainlanguage.gov, n.d.c). Teach back uses plain language during the conversation for the patient/caregiver to understand the information given.

Health literacy is defined as an individual's ability to understand the information made available by their health care provider to make informed decisions regarding their health care (Health.gov, 2018). Health literacy has taken a dominant role in health care and has become one of the foremost national priorities in public health (Shone, 2012). Patients, and caregivers of children diagnosed with headaches, are responsible for understanding and coordinating complex medical care, requiring the ability to process health information. Low health literacy can lead to treatment failure and unwanted complications that could be avoided with appropriate interventions (Thomas, Edwards, & McArdle, 2017). Literature supports the need for increasing effective communication and health literacy between the health care professional and the individual to create better health outcomes. Teach back is the key to improving this communication.

Because children with chronic illnesses, such as headaches, depend on their caregivers to assist with management of their health care, health literacy is highly encouraged for positive health outcomes in this population (Lambert & Keogh, 2014). The provider-caregiver interaction, either through verbal communication or written handouts, directly impacts their child's health (Cutilli, Simko, Colbert, & Bennett, 2018). Patient Information Leaflets (PIF) are used to increase caregiver's health literacy and encourage caregivers to collaborate in their child's health care, though reading comprehension of PIFs remains a struggle for much of the adult population (Nouri & Rudd, 2015). Over 50 million U.S. adults are reading at a junior high reading level (Boles, Liu, & November-Rider, 2016). Patient educational materials are created for an audience with proficient health literacy (Brega et al., 2015). In 2003, the National Center for Education Statistics surveyed adult Americans and discovered that only 12% of the population has proficient health literacy (Boles et al., 2016). Though health literacy affects

caregivers of different education levels and socioeconomic status, caregiver's self-efficacy determines their ability to increase their health literacy (Rajah, Ahmad, Jou, & Murugiah, 2017). Poorly written materials can lead to caregiver confusion and can cause disruption in illness management, leading to negative health outcomes (Protheroe, Estacio, & Saidy-Khan, 2105).

Teach back initiates a conversation between the individual and the health care professional. The method uses a patient-centered approach that encourages patients to interact with the health care professional (Truong, Nguyen, Armor, & Farley, 2017). It involves a conversation using plain language and requires the individual to repeat back the information they have learned. Teach back assesses the true transfer of knowledge and misinformation can be corrected before the individual leaves the office. Regardless of education or age, teach back increases retention of health information (Slater, Huang, & Dalawari, 2017).

Healthy People 2020 is a national program that sets goals and objectives for the nation's health. One Healthy People 2020 objective (HC/HIT-2.2) delineates the need to increase the number of individuals who report that their health care professional gave easy to understand instructions (Office of Disease Prevention and Health Promotion [ODPHP], 2014). Other Healthy People 2020 objectives, HC/HIT 1.1 and HC/HIT 1.2, discuss the need to increase the proportion of individuals who can repeat back care instructions directed by the health care professional, and increase the proportion of individuals who self-management their care (ODPHP, 2014).

Another government agency that supports increasing communication between patients and health care professional is The National Action Plan to Improve Health Literacy. This agency promotes effective communication with the goal of improving caregivers' ability to make informed decisions and improve their child's quality of life (U.S. Department of Health and

Human Services, 2010). The Plain Writing Act of 2010 is a law requiring federal agencies to write in plain language, and mandates that information is understood the first time it is read or spoken (Plainlanguage.gov, n.d.b). National programs, such as Healthy People 2020, The Plain Language Act of 2010, and the National Action Plan to Improve Health Literacy have recognized the health literacy disparities in the United States and are striving to increase awareness and provide solutions for improvement.

Problem Statement and PICO(T)

At a children's neurology clinic, affiliated with a large children's hospital in the southwest United States, specializing in pediatric headaches, the evaluation of provider-caregiver communication was accomplished by the using a short caregiver health literacy questionnaire. The questionnaires used were written in plain language and distributed at the end of each office visit. The clinic's goal was to evaluate the effectiveness of their health care provider's communication. At the time of initial evaluation, no formal tracking system was in place to monitor the results of questionnaires. The office manager also reported a large number of phone calls from caregivers regarding headache prevention. The office used a headache handout, written in plain language, which was developed in collaboration with the provider and the hospital education center. Teach back was included at the end of the handout that reviewed triggers and prevention techniques for headaches. The handout also included a headache diary, which promoted self-management of care. Prior to initiation of this project teach back and the headache diary were not being reviewed with the patient/caregiver.

Review of the evidence-based literature supported an appropriate intervention to increase health literacy and health outcomes. This inquiry led to the clinically relevant PICOT question "For patient, or caregivers of children, diagnosed with headache/migraine (P), how does teach

back (I), compared to no teach back (O), increase individual's health literacy and self-management (O)?"

Exhaustive Search

Guided by the PICOT question, a search for the literature was conducted in three databases: PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and PsycInfo. Keyword searches included: *health literacy, health information, health outcomes, health behaviors, health disparities, health communication ,teach back, parent, caregiver, child, children, pediatric, chronic illness, pediatric chronic illness, chronic disease, communication, effective communication, education, teaching, teaching health information, knowledge, increase knowledge, internet learning, language, plain language, reading levels, ehealth, YouTube, Facebook, Google, video-based learning, video-based messages, video learning, webinars, patient portal, health videos, online learning, handouts, pamphlets, provider and, health care.* The Boolean connectors "AND" and "OR" were used when examining portions of the PICOT components.

Exclusion criteria included: unpublished articles, journal entries, and publications that were not in English. Inclusion criteria included: articles published within the last five years (preferred), studies with evidenced-based information, studies from scholarly journals, and preferably peer reviewed articles that addressed the other components of the PICOT question. Search limits in PubMed were set for articles published after 2010. Search limits for PsycInfo was set for peer-reviewed articles.

Initial search strategy in all databases used the keywords '*health literacy'.* PubMed yielded a total of 13,117 results, CINAHL yielded 4,951 results, and PsycInfo yielded 7,779 results. To narrow down the search the terms '*health literacy'* AND '*parents'* AND '*chronic*

illnesses were used. Final results in PubMed yielded 28 results, CINAHL yielded seven results, and PyscInfo yielded 11 results. Further search strategies for PubMed included keywords '*health literacy*' AND '*parents*' AND '*education*' which yielded 680 results in PubMed. To narrow the search further, keywords '*information technology*' and '*internet learning*' were used for a final result of 30 articles. Limits included randomized control trials, systematic reviews, and studies published within the last five years. Eight articles were evaluated and critically appraised for the evidence table. These results included three randomized controlled trials, four mixed method studies, and one descriptive exploratory study. Further searches in CINAHL included keywords '*internet based learning*' AND '*health literacy*' which resulted in 14 articles and two were critically appraised and used for the evidence table. Continued searches in PsycInfo with keywords '*health*' AND '*video learning*' resulted in 1,274 articles. Further search terms included '*internet based learning*' and limits were set to randomized control trials within the past five years, though no articles were used for the evaluation table. Hand searches were not completed during this search strategy.

Critical Appraisal & Synthesis

Ten studies were retained for this review, which included three randomized controlled trials, four mixed method studies, two qualitative systematic reviews, and one descriptive exploratory study (Appendix A). Two of the randomized controlled trials were appraised as level two evidence, one was appraised as level three evidence, all four mixed methods studies were appraised as level four evidence, one descriptive qualitative systemic review was appraised as level five evidence, one qualitative systematic review was appraised as level six evidence, and one descriptive exploratory study was appraised at level six evidence.

The conceptual framework was not clearly stated for nine of the studies, but one study used the Conceptual Mode of Factors. Other studies appeared to follow the Self Efficacy Model, Social Cognitive Theory, Chronic Care Model, or Stages of Change Model. Sample size was appropriate for each study and attrition rates were accounted for during the studies (Appendix B).

All ten studies demonstrated a degree of bias. Common biases were channeling bias, recall bias, and author bias. Authors addressed the bias of each study in the limitation section of the articles. The setting for each of the studies were appropriate for the type of research conducted. All interventions contained an online learning component that could be completed in home or at a medical office (Appendix B).

Regarding the demographics of the studies, the majority of the articles included patients over 50 years of age. Two articles examined technology with chronic illness and three others targeted parents. Though some articles evaluated research within the last ten years, all articles had been published within the last five years (Appendix B).

Valid and reliable assessment tools were used in all but two studies. The Rapid Estimate of Adult Literacy in Provider's Office (REALM) was able to access the readability of health information, though it did not assess if patients were able to comprehend the information. This was the first time the Pediatric Rehabilitation Intervention Measure of Engagement for Parents tool was used. This tool shows validity, but not reliability (Appendix B).

Homogeneity was seen throughout the ten studies regarding increasing health literacy through an online source. Heterogeneity was observed with population age and the source of technology intervention. Online web portals, applications, and learning programs proved to be an

effective means to communicate with providers and helped patients engage in health choices (Appendix B).

Purpose and Rational

Children with headaches often require ongoing support for treatment and disease management, requiring their caregivers to have increased contact with their child's health care provider (HCP) (Fiks, 2018). Collaboration between both the patient/caregiver and the HCP is important to achieve and maintain an acceptable quality of life for the child (Schaffler et al., 2018). Evidence highlights the need to increase and retain individuals' health literacy through effective communication techniques, such as teach back. The purpose of this project was to increase health literacy, knowledge retention, and self-management behaviors using teach back.

Conceptual Model

The Self-Efficacy Theory (SET) by Albert Bandura was used to guide the process for the project (Appendix C). The SET is derived from the Social Cognitive Theory and describes that an individual's behavior change is due to their environment, highlighting self-regulation (Tougas, Hayden, McGrath, Huguet, & Rozario, 2015). Self-regulation includes the monitoring of oneself, the judgment of oneself, and the evaluation of oneself (Tougas et al., 2015). The SET stems from the judgment, or the belief in oneself to complete a task (Nursing Theories, 2012). Three interrelated factors that affect one's ability to complete a task are an individual's environment, behavior, and personal/cognitive factors (Nursing Theories, 2012). Self-efficacy is a strong predictor for behavior change (Nursing Theories, 2012).

Patients with chronic illness, such as headaches, require a degree of self-efficacy for an increase in health literacy (Ha Dinh, Bonner, Clark, Ramsbotham, & Hines, 2016). As the individual becomes more comfortable with their knowledge, they will feel more confident to

self-manage their headaches. Individual's self-efficacy is required to foster healthy behaviors and assist with positive health outcomes (Alsem et al., 2017)). With appropriate interventions, such as increasing health literacy with teach back, treatment failure and unwanted complications can be avoided (Thomas, Edwards, & McArdle, 2017).

Evidence Based Practice Model

The evidence-based practice model that was used to guide this project was the Iowa Model of Evidence Based Practice (Appendix D). This model is used to implement changes within the healthcare system. It promotes quality of care by using a feedback system through each step of the process (Iowa Model Collaborative, 2017). Developing and introducing evidence-based guidelines into practice can be challenging. The goal was to address each resistance to change in a quick and efficient manner.

Project Methods

The quality department at a large children's hospital in the southwestern United States approved this as a practice change and parent consent was not required. The project design was a randomized controlled group: pretest-posttest design, quality improvement method. Participants were chosen by convenience sample. Required diagnoses were headache or migraine. Each group had 18 participants, for a total of 36 participants. Ages ranged from four to 18 years of age, with legal guardians present for the intervention group only. New and follow-up patients were included in the project. Demographics for each group were statistically similar. The headache educational handout was a collaborative creation between a neurology provider and the hospital education center, though not proven as valid and reliable. Questionnaires were created to assess knowledge pre and post teach back (Appendix E). Self-management was measured by a follow-up phone call after their appointment to determine if the headache diary was

implemented. Charts were reviewed for both groups regarding the number and type of phone calls received by the office.

The project cost included the time of the provider, the practice staff, and the patient/caregiver. The student initiated contact after the provider had seen the patient. The student provided education included in the headache handout.

The stakeholders invested in the implementation of the program include the hospital, the neurology clinic, the providers and staff at the clinic, and the family/caregiver of the child.

Outcomes

Descriptive statistics were used to review the demographics of the control and intervention group (Appendix F). Gender, age, and patient status (new or follow-up patient) were statistically significant for each group. Groups included differences in race but the proportion of white/Caucasian, Hispanic/Latino, and black/African American was the same. Differences did not impact the study. Paired sample t-test was used to evaluate mean differences in knowledge from pre and post questions of teach back (Appendix G). Mean difference for pre-trigger knowledge was 1.72 and mean difference for post-trigger knowledge was 4.89. Mean difference for pre-prevention techniques was 2.06 and mean difference for post-prevention techniques was 4.94. Data analysis concluded statistical increase in knowledge of triggers and prevention techniques. Cohen's d for triggers was 2.21 and 1.87 for prevention. Cohen's d showed strong correlation. Self-management of behavior was measured by use of headache diary and determined by a percentage (Appendix H). Sixty-seven percent of the participants started to use the headache diary. All patients that used the headache diary reported a decrease in headaches. However, this data was not statistically significant. Independent t-test was used to compare

number of phone calls from each group (Appendix H). Data concluded a decrease in phone calls. However statistical significance could not be established.

The project results showed an increase in patient/caregiver knowledge regarding headache triggers and prevention techniques using teach back. Data also revealed an increase in use of the headache diary with possible reduction of headaches due to self-management. Finally, there was a reduction in phone calls to the office.

Discussion

Teach back should be implemented during office visits for children with headaches. A nurse can provide education with teach back after the HCP has completed the visit. Future projects could focus on helping patients/caregivers to understand the importance of using a headache diary and encourage use over time. Healthy People 2020 encourages the use of technology to increase self-management. The headache handout included two phone applications to assist with tracking the patient's headache.

A primary strength of the project was stakeholder support. All HCPs appreciated the impact of providing education with teach back to patients/caregivers at the time of the visit. Another strength was patient/caregiver willingness to try the headache diary. One limitation of the project was the small sample size. Another limitation was possible bias of the patients when the student called the patient for the follow up phone call.

Conclusion

Teach back is an effective method to provide education in a patient-centered environment. It assesses the patient's knowledge and the need for correction of misinformation to encourage patient/caregiver self-management. Teach back can be used during any office visit, it is inexpensive, and can be implemented for all patient demographics.

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Appendix A

Table 1

Évaluation Table

Quantitative Studies

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Duren-Winfield, V. (2015). Health literacy and computer-assisted instructed: usability and patient preference **Country:** US **Funding:** American Cancer Society **Bias:** Channeling Bias	Social Cognitive Theory	**Design:** RCT **Purpose:** Feasibility of using computer-assisted instruction in patients of varying literacy levels by examining patients' preferences for learning and their ability to use two computer-based educational programs	N= 263 LL n= 146 AL n= 117 Mean age 58.8 (SD=7.2) **Demographic:** Studies from 2007-2008, population was 50-74 years of age **Settings:** Medical office **Inclusion:** Patients with various health literacy	**QNT:** **IV:** Two different educational computer programs **DV:** Number of times a patient needed assistance, ease of computer program use, and understanding of material presented **DV:** Patients' self-related learning from the program, patients' preferences for the program **QLT:** Question: self-related learning	1. REALM. Not valid to assess health literacy 2. Post program Evaluation survey	**QNT/QLT:** chi-square tests for proportions and t-tests for means, multivariate logistic regression model	**QNT:** **DV:** 98% of patients reported easy to use program. Limited group 73%- no assistance Adequate literacy-86%- no assistance **QLT:** **DV:** 80% of patients reported learning something new LG LL = 124 AL = 87 p= 0.24 98% of both groups preferred computer programs rather than brochure	**Level 3** **Weakness:** practices from single health system, portal was administered during study and not voluntarily used, short follow up period **Conclusions:** Portal adaption unlikely in short term, but have potential for benefits to

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				from the program and patients' preferences for the program			LL = 143 AL = 112 p= 0.59 LL more likely than AL to state they learned more from program	communication

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Hasum, L.K.E. (2017). The long-term effects of using telehomecare technology on functional health literacy: results from a randomized trial **Country:** Denmark **Funding:** None declared	SET	**Design:** RCT **Purpose:** Explore how the use of telehomecare technology affects the level of functional health literacy	N= 90 IG = 47 Mean age: 70.2 CG = 43 Mean age: 69.5 **Demographics:** patients with COPD **Settings:** in home **Inclusion:** diagnosed COPD, listed with a general practitioner, fixed residence, speak Danish,	**IV:** use of telehomecare technology **DV Groups:** unadjusted mean: IG, CG with HLS, HLSN, HLSR **DV:** level of functioning health literacy	Danish Test of Functional Health Literacy in Adults	Chi-square test, independent t-test, paired t-test, multiple regression analysis	**IG** HLS: Baseline 70.26 Follow-up:75.40 HLSN: Baseline: 37.26 Follow-up: 39.60 HLSR: Baseline: 33.0 Follow-up: 35.81 **CG:** HLS: Baseline: 72.84 Follow-up: 77.21	**Level 2** **Weakness:** specific knowledge about COPD should have been assessed before and after study, sample was not balanced **Conclusion:** Significant increase in functional health literacy

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Bias: Channeling Bias			phone connection **Exclusion:** cognitive impairment, unable to understand Danish sufficiently to complete questionnaires				HLSN: Baseline: 36.95 Follow-up: 40.26 HLSR: Baseline: 35.88 Follow-up: 36.95 HLS p=0.62 HLSN p= 0.71 HLSR p= 0.61	score in both groups, but study is unable to provide cause of increase
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Meppelink, C. (2015). The effectiveness of health animations in audiences with different health literacy levels: an experimental study **Country:** Netherlands **Funding:** Not	SET	**Design:** RCT **Purpose**: Investigate what features of spoken health animations improve information recall and attitudes and whether there are differences between literacy groups	N= 231 Mean age 68.22, 52.4% male Low SAHL-D score <= 24 (108 patients) High SAHL-D score >= 25 (123 patients) **Demographics:** 55 years or older	**IV:** Text modality (written verses spoken) **IV:** Visual format (illustrations verses animations **DV:** Information recall **DV:** Attitudes	1. SAHL-D 2. NPIRQ Valid instrument 3. 7 point Likert Scale 4. 7 semantic differential	MANOVA, PROCESS	**Text:** IR, A **LHL:** IR: written 9.12 IR: spoken 11.42 p=0.03 A: written 5.75 A: spoken 6.20 P= 0.02 **HHL:** IR: written 14.83 IR: spoken 15.77 A: written 5.83 A: spoken 6.11	**Level 2** **Limitations:** the animation was divided up into short segments **Conclusion:** Animated visual information combined with spoken text is the best way to

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specified **Bias:** Recall Bias			**Settings:** Non-clinical settings **Inclusion:** Patients with low or high health literacy, 55 years or older **Excluded:** Literacy levels did not meet inclusion criteria				**Visual:** IR, A **LHL:** IR: WI = 29 IR: WA =35 IR: SI = 23 IR: SA = 21 A: WI = 5.78 A: WA = 5.71 A: SI = 6.22 A: SA = 6.19 **HHL:** IR: WI = 33 IR: WA =29 IR: SI = 29 IR: SA = 32 A: WI = 5.87 A: WA = 5.80 A: SI = 6.03 A: SA = 6.18	communicate complex health message to people with LHL
Mixed Method								
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Fiks, A.G.	Conceptual	**Design:** Mixed-	N= 9133	**QNT:**	1. Logistic	Chi-square	**QNT:**	**Level 3**

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(2016). Adoption of a portal for the primary care management of pediatric asthma: a mixed-methods implementation study **Country:** US **Funding:** Grant from Agency for Healthcare Research and Quality and Eunice Kennedy Shriver National Institute of Child Health & Human Development **Bias:** Authors were involved with other online platforms	Mode of Factors	method study **Purpose:** feasibility of using a patient portal for pediatric asthma in primary care, impact on management, and barriers and facilitators of implementing success	**Demographic:** Parents with children with asthma **Setting:** Primary care practices **Inclusion:** English speaking parent of children 6-12 years of age with asthma diagnosis within 12 months, Medicaid insurance	IV: use of patient portal DV: adoption of portal DV: sustained use of portal QLT: 1. Speak to the doctor. 2. Make a change to their child's medication dosage. 3. Make a change to their home environment	regression. Valid and reliable 2. 5- point Likert scale	tests, t-tests, Fisher, and Mann-Whitney U	DV: Adoption: n=237 DV: Sustained use: n= 156 QLT: First survey CD: 20 CM: 12 CE: 15 Secondary CD: 49 CM: 11 CE: 8 QLT: Themes: 1. importance of practice organizations, asthma severity, and innovation characteristics for implementation success	**Weakness:** practices from single health system, portal was administered during study and not voluntarily used, short follow up period **Conclusions:** Portal adaption unlikely in short term, but have potential for benefits to communication
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Irizarry, T.	Stages of	**Design:** Mixed-	N= 100	**QNT:**	1. Likert-scale	Descriptive	**QNT:**	**Level 3**

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(2017). Patient portals as a tool for health care engagement: a mixed-method study of older adults with varying levels of health literacy and prior patient portal use **Country:** US **Funding:** Aging Institute of University of Pittsburg Medical Center **Bias:** Sampling Bias	Change Model	method study **Purpose:** explore attitudes toward portal adoption and its perceived usefulness as a tool in health care management	**Demographic:** Participants 65 years or older with cognitive ability to answer questions **Setting:** in home **Inclusion:** NS **Exclusion:** participants must be living in an independent residence	**IV:** Apply health literacy tool **DV Groups:** PS, FU, FG **DV:** Technology attitudes **DV:** Portal use **QLT:** 1. experience with technology-HRI 2. Impressions about patient portal demonstration and usefulness and PU	questions. Valid and reliable 2. Patient Activation Measure. Valid and reliable	statistical analysis	DV-TA: PS n=5.72 FU n= 6.33 FG n= 6.26 p=0.01 DV-PU: PS n= 0 FU n= 25 FG n=11 p= <0.001 **QLT:** 1. Don't want to feel pushed into doing anything 2. Adopt only if required 3. Somebody needs to help me 4. General convenience of the portal for simple tasks and medical history 5. Appreciates current features and excited about new ones	**Weakness:** statistically significant differences of the population between the groups, low literacy group was larger, 75% of groups were white, portal was in English only **Conclusion:** Health care organizations should consider: 1. Portal adoption campaign tailored to needs of adults. 2. Task-specific training 3. Target caregiver proxy uses as part of training. 4. Info line for

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								patients to call and ask portal questions
King, G. (2017). Connecting families to their health record and care team: the use, utility, and impact of a client/family health portal at a children's rehabilitation hospital **Country:** Canada **Funding:** Canada Health Infoway Inc. **Bias:** An author is affiliated with Canada Health Infoway	SET	**Design:** Mixed-method study **Purpose:** examine the use, utility, and impact on engagement in care and caregiver-provider communication of a client/family portal providing access to EHR and e-messaging	n= 869 **Demographics:** Jan 2015-March 2016 parents of children with special health care needs **Setting:** PH/PO **Inclusion:** Printed in English **Exclusion:** NS	**QNT:** **IV:** patient portal **DV:** portal use Groups: E, TL, DL **QLT:** 1. caregiver themes 2. provider themes	1. Pediatric Rehabilitation Intervention Measure of Engagement for Parents (unpublished instrument). 2. Content Analysis Approach	Aggregate scores, survey scales	**QNT:** M: E = 253 TL = 22.2 DL = 19.2 Average log in 2.5 times/month **QLT:** Themes: Caregiver: 1. Information benefits 2. Recommendations to increase use and utility 3. Scope of adoption and future vision Themes: Provider: 1. Utility to set up	**Level 3** **Strengths:** data collection on login info, breadth of info collected, included caregiver and provider **Weakness:** descriptive nature, short time frame (6-8 weeks), may not have reach data saturation for qualitative portion **Conclusion:** Caregivers saw benefit while

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							appointments 2. Identified technical shortcomings 3. Uncertainty in portal use related to lack of knowledge, comfort, or confidence using portal 4. Concerned use, effort, and investment in the portal	providers did not, possible future portal change: more patient engagement with portal itself
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Li, Tim. (2013). Evaluation of a web-based social network electronic game in enhancing mental health literacy for young people **Country:** Asia **Funding:** Health	SET	**Design:** Mixed Method **Purpose:** To assess the effectiveness of fully automated, Web-based, social network electronic game enhancing mental health knowledge and	N= 73 Mean age 20.82 Female = 42 Male = 31 **Demographics:** Nov 2011- Dec 2011 **Setting:** in home **Inclusion:** ages	**QNT:** **IV:** Web-based, electronic game **DV:** mental health knowledge **QLT:** Learning motivation 1. Value 2. Expectancy	1. Motivational Strategies for Learning Questionnaire (MSLQ). Instrument is reliable and valid 2. 7-point Likert scale	t-test, Descriptive statistics, Linear regression	**QNT:** Mental health knowledge groups: Pre-post tests M: Pre-score: 19 Pre-score: 21.21 Improvement: 2.21 $p<0.001$	**Level 3** **Weakness:** exploratory study, lack of control group, small sample size, high dropout rate, biased sample **Conclusion:**

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		problem-solving skills of young people	17-25, adequate internet literacy and a Facebook account, reachable via local network **Exclusion:** None specified	3. Affect: test anxiety			**QLT:** Value: M: IGO= 4.97 EGO = 3.91 TV = 4.70 Expectancy: CLB = 4.75 SE= 4.80 Affect: TA= 3.34	social and gaming features may enhance the effectiveness of internet-based intervention on health education for young adults
Care and Promotion Fund **Bias:** Performance Bias								
Qualitative Studies								
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Kim, H. (2017). Health literacy in the ehealth era: a systematic review **Country:** US, Europe, Oceania, North America **Funding:** No Funding **Bias:** Transfer Bias	SET	**Design:** Systematic Review **Purpose:** aimed to identify studies on online health services use by people with limited health literacy to understand how health literacy should be addressed in the	N= 644 n= 74 **Demographics:** Articles were published between 2010 and 2014 **Setting:** in home **Inclusion:** focus on health or	How do studies online health services used by people with limited health literacy understand health literacy should be addressed in the ehealth era?	eHEALS, S-TOFHA, REALM, NVS, METER, SILS, Web Performance tests, Active Australia Questionnaire	Thematic Synthesis	Themes: 1. Evaluation of health-related content 2. Development and evaluation of ehealth services 3. Development and evaluation of health literacy measurement tools 4. Interventions to improve health	**Level 5** **Weakness:** word search did not use controlled vocab, exact keywords were excluded, only English studies, time frame was 2010-March 2014

Key: **A**- Attitude; **AL**- Adequate Literacy; **CFG**- Clinical Focus Groups; **CG**- Control Group; **CLB**- Control of Learning Beliefs; **COPD**- Chronic Obstructive Pulmonary Disease; **DL**- Days Logged In; **DV**- Dependent Variable; **E**- Exposure; **EGO**- Extrinsic Goal Orientation; **eHEALS**- eHealth Literacy Scale; **EHR**- Electronic Health Record; **FU**- Follow-up; **FG**- Focus Group; **HLH**- High Health Literacy; **HLS**- Health Literacy Score; **HLSN**- Health Literacy Score Numeracy; **HLSR**- Health Literacy Score Reading; **IG**- Intervention Group; **IGO**- Intrinsic Goal Orientation; **IR**- Information Recall; **IV**- Independent Variable; **LHL**- Low Health Literacy **LL**- Low Literacy; **M**- Mean; **METER**- Medical Term Recognition Test; **n**- Number of participants; **N**- Number of studies; **NPIRQ**- Netherlands Patient Information Recall Questionnaire; **NS**- None Stated; **NVS**- Newest Vital Sign; **PCO**- Primary Care Office; **PH**- Participant's Home; **PO**- Provider's Office; **PS**- Phone Survey; **QLT**- Qualitative; **QNT**- Quantitative; **RCT**- Randomized Control Trial; **REALM**- Rapid Estimate of Adult Literacy in Medicine; **SAHL-D**- Short Assessment of Health Literacy in Dutch; **SE**- Self-Efficacy; **SET**- Self Efficacy Theory; **SILS**- Single Item Literacy Screener; **S-TOFHA**- Short Test of Functional Health Literacy in Adults; **TA**- Technology Attitude; **TV**- Task Value; **TL**- Times Logged In; **US**- United States

			ehealth era	ehealth literacy, addressing ICTs on the internet and/or mobile apps for health purpose, printed in English, original empirical articles **Exclusion:** studies which did not meet all five inclusion criteria, target audience was health professionals, non-empirical				literacy 5. Online health information seeking behavior	**Conclusion:** Efforts should be made to make ehealth services easily accessible to low-literacy individuals and to enhance individual health literacy through educational programs
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results		Level/Quality of Evidence; Decision for practice/ application to practice
Melholt, C. (2018). Cardiac patients' experiences with a telerehabilitation web portal: implications for ehealth literacy	SET	**Design:** Descriptive Exploratory **Purpose:** To explore how cardiac patients experience their use of a telerehabilitation	N=49 Mean age 60.64 =/- 10.75 82% male **Demographics:** Sept 2014-Feb 2015 **Setting:** in	When using the telerehabilitation tool, how to patient's' view tool for recuperation and how does the use of the w\web portal affect their ehealth literacy skills?	Questionnaires using 5 point Likert scale,, Survey Xact	Wilcoxon Signed-Rank test	Themes: 1. Easy to access, user-friendly, and written in understandable language. 2. Using an online rehabilitation portal generally improves cardiac patients'		**Level 6** **Weakness:** cardiac patients already using computers, telephones, and internet **Conclusion:** use

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice
Country: Netherlands **Funding:** Eir Research and Business Park **Bias:** Recall Bias		tool for recuperation from surgery and study how the patients' use of the interactive 'Active Heart' web portal affected their health	home **Inclusion:** patients that had ischemic heart or heart failure, above 18, live in Hjoerring or Frederikshavn Municipalities, have internet connection, use information technology, able to understand the study info **Exclusion:** lack of ability to speak and understand Danish, pregnant, breastfeeding, neuro disease, use of wheelchair, patient in other studies				interest in ehealth literacy	of a cardiac telerehabilitation web portal can be beneficial for patient education and can increase cardiac patients' ehealth literacy skills
Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data analysis (stats used)	Findings/ Results	Level/Quality of Evidence; Decision for practice/ application to practice

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Schaffler, J. (2018). The effectiveness of self-management interventions for individuals with low health literacy and/or low income: a descriptive systematic review **Country:** US **Funding:** No funding **Bias:** Transfer Bias	Chronic Care Model	**Design:** Descriptive Systematic Review **Purpose:** Review self-management interventions in populations with low income or low health literacy and synthesize the efficacy of the interventions	N = 23 n = 5457 **Demographics:** Groups of adults with low income or low self-management **Settings:** provider's office **Inclusion:** English and French full text	How does self-management interventions impact individuals with low health literacy and/or low income?	Quality Summary Score, Efficacy Assessment Based on Self-Management Skills, peer-reviewed, quasi-experimental	Thematic Synthesis	Themes: 1. No patterns linking mode of delivery or the person implementing the intervention to efficacy. 2. Interventions using three or four self-management skills were more effective than those presenting less than three or five skills. 3. Problem solving is a key component of effective self-management across various chronic conditions	**Level 5 Weakness:** few studies did not explain core components of self-management, low methodological quality of some studies, some illnesses had small number of analysis, health comorbidities not documented well **Conclusion:** Effective interventions focused on problem-solving, taking action, and resource utilization

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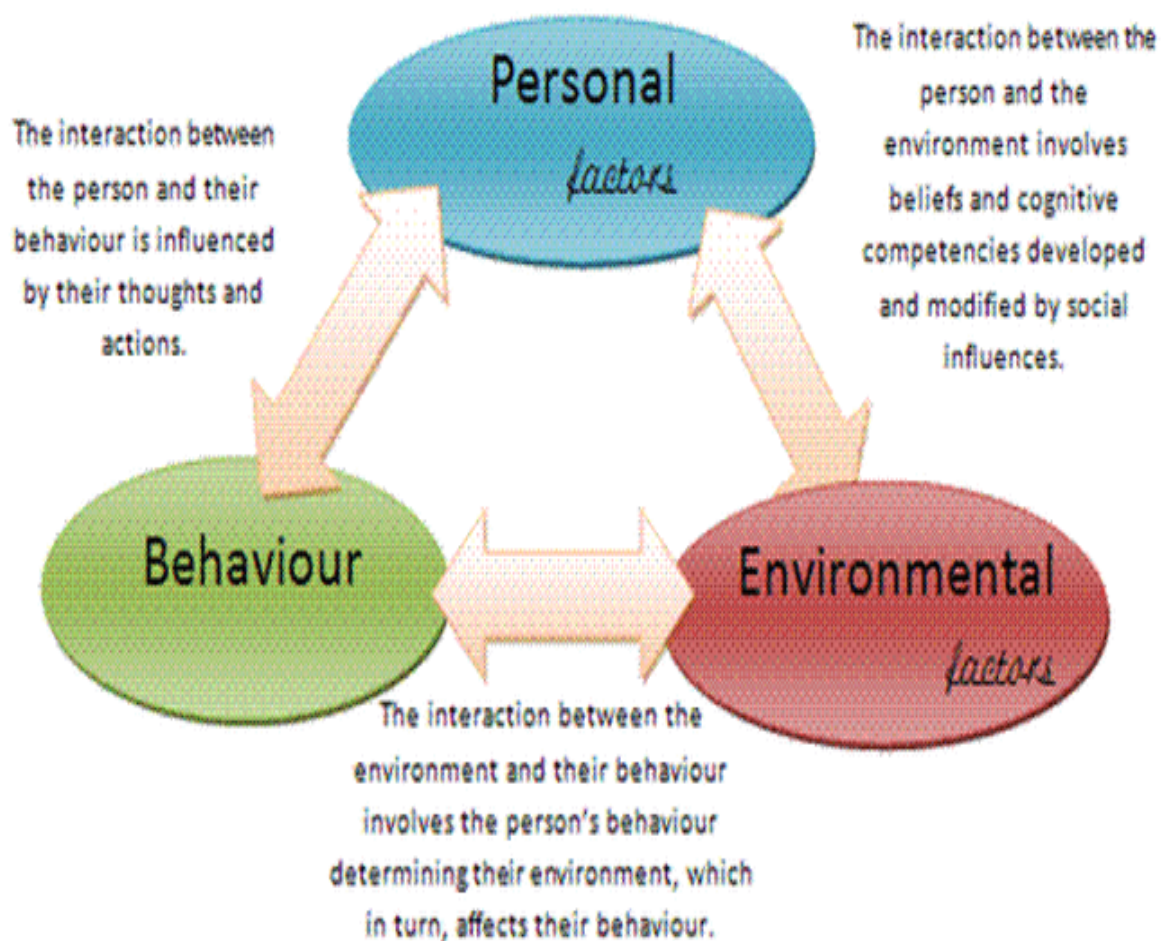
Appendix B

Synthesis Table

	Duren-Winfield	Hasum	Meppelink	Fiks	Irizarry	King	Li	Kim	Melholt	Schaffler
Year	2015	2017	2015	2016	2017	2017	2013	2017	2018	2018
Theory/Framework	Social Cognitive Theory	SEM	SEM	Conceptual Mode of Factors	Stages of Change Model	SEM	SEM	SEM	SEM	Chronic Care Model
Level of Evidence	III	II	II	III	III	III	III	VI	VI	V
Design	RCT	RCT	RCT	Mixed-Method	Mixed-Method	Mixed-Method	Mixed-Method	Systematic Review	Descriptive Exploratory	Descriptive Systematic Review
Sample Size	263	90	231	9133	100	869	73	N= 644 n= 74	49	N=23 n=5457
Setting										
At home		X			X	X	X	X	X	
Medical office	X									
Non-clinical setting			X							
Primary Care Practice				X						
Provider's Office						X				X
Demographics										
Studies from 2007-2008	X									
Studies from 2015-2016							X			
Over 50 years old	X	X	X		X				X	
Parents				X		X				
Chronic illness		X		X						

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|										
Independent Variables										
Computer programs	X									
Telehomecare technology		X								
Text modality/Visual format			X							
Use of patient portal				X		X			X	
Health Literacy Tool					X				X	X
Web-based electronic game							X			
Dependent Variables										
Patient Assistance	X									
Portal use	X			X	X	X			X	
Understanding materials	X									
Increase in health literacy/Info recall	X	X					X	X	X	X
Attitudes			X		X					X
Findings										
Portal adoption					X	X				
Increase in literacy		X					X		X	X
Visual graphics			X							
Communication	X			X						
Problem-solving										X

Appendix C

Self-Efficacy Model

(Image of Self-efficacy model, n.d.)

Appendix D

Iowa Model of Evidence Based Practice
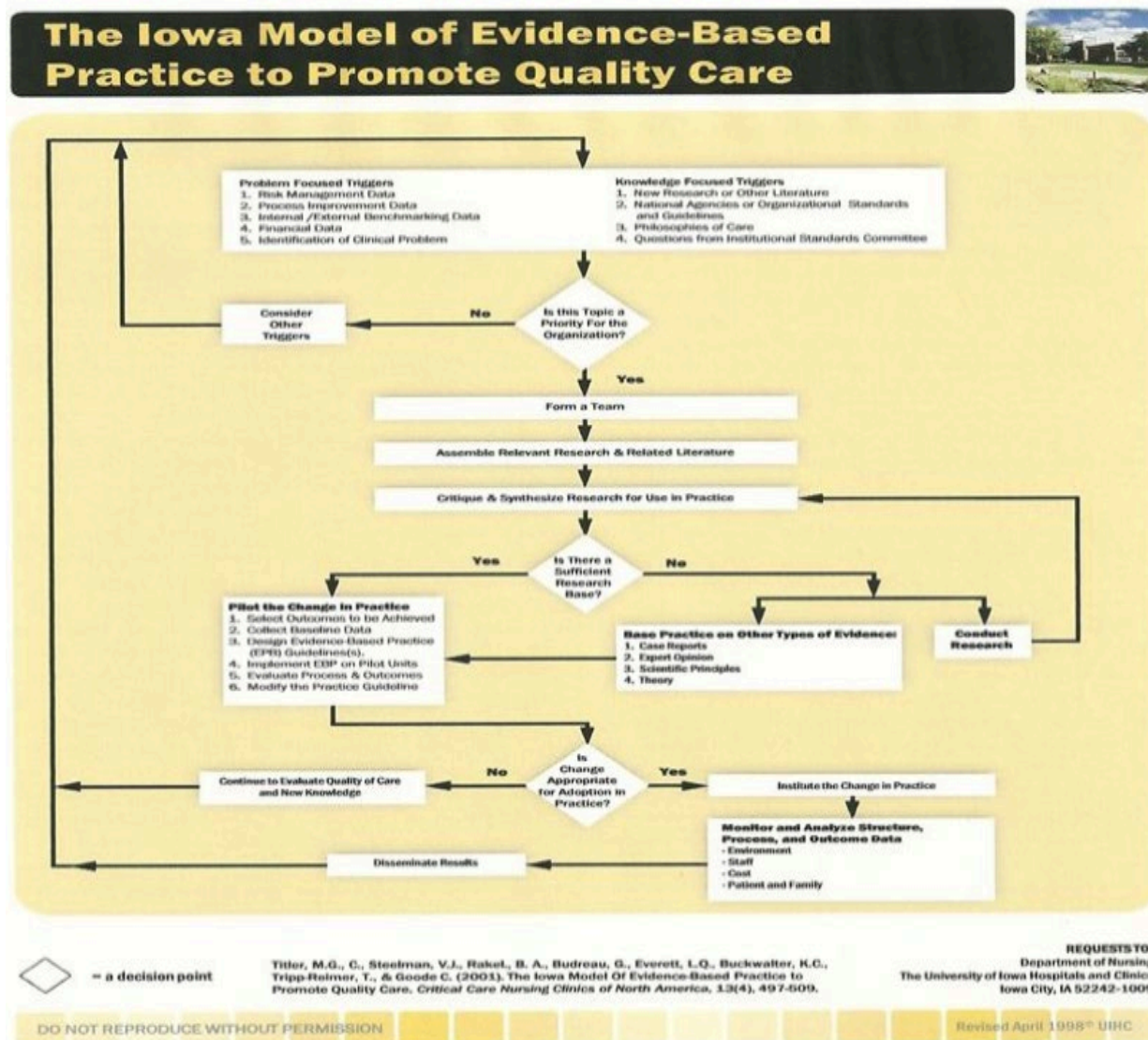
(Image of Iowa model of Evidence Based Practice, n.d.)

Appendix E

Questionnaire of Knowledge Questions

\#
Date of Visit:
Age:
Current headache?   Yes/No
Focus: prevention/triggers

Pre-Questionnaire

1. In a few words, what does the word 'headache mean to you'?

2. What other symptoms do you have when you get a headache?

3. Can you name a few triggers?

4. How could you prevent your headaches?

Post-Questionnaire
1. After talking about ways to prevent headaches, could you tell me a few ways how you will prevent your headaches?
    a.

2. Can you name some of your triggers that you will avoid?
    a.

Additional Comments:

Increase awareness for "prevention" topic?   Yes
Increase awareness for "trigger topic"   No

Appendix F

Patient Demographics

Table A1

Ages of Participants in Quality Improvement Study

Age	Control Group[a]	Intervention Group[b]
Mean(std.)	12.56(3.148)	14.00(3.395)
Totals (N=36)		

Note: Each group had 18 participants.

[a]Youngest age was 7 years, oldest age was 17 years.
[b]Youngest age was 4 years, oldest age was 18 years.

Table B2

Gender Differences within the Quality Improvement Study[*]

Gender	Control Group	Intervention Group
Male	38.9	61.1
Female	38.9	61.1
Totals (N=36)		

Note: Each group had 18 participants.

[*]Reported in percentages.

Table C3

Racial Differences within the Quality Improvement Study[*]

Race	Control Group	Intervention Group
Hispanic/Latino	11.1	27.8
White/Caucasian	83.3	61.1
Black/African American	5.6	11.1
Totals (N=36)		

Note: Each group had 18 participants.

[*]Reported in percentages.

Table D4

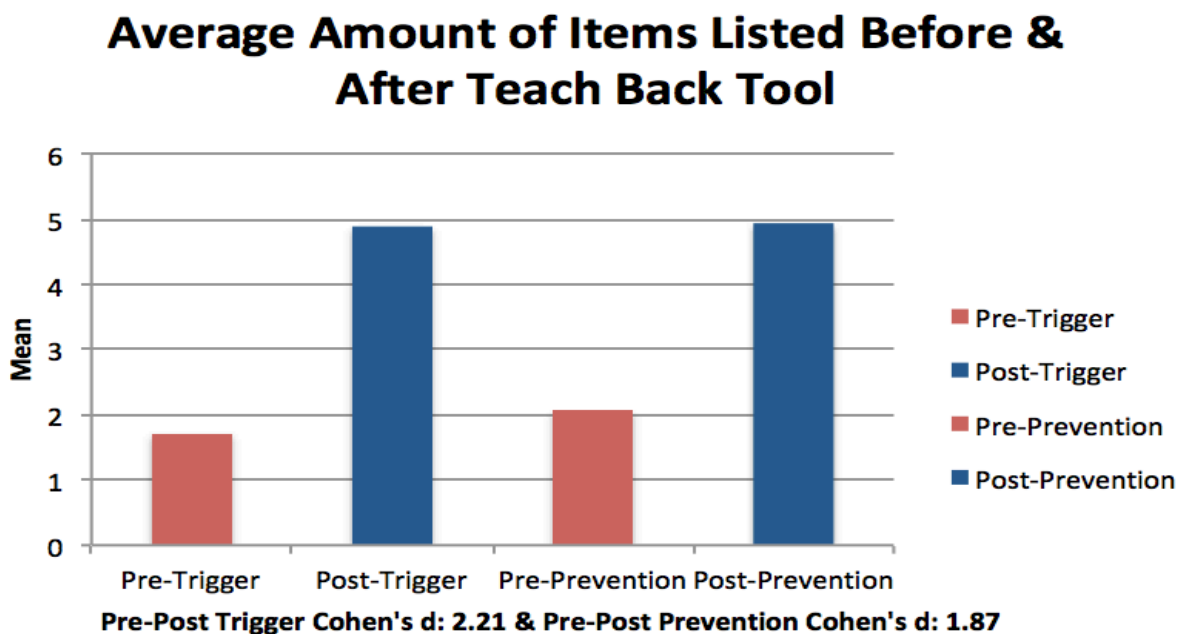*New Patients and Follow Up Patients within the Quality Improvement Study[*]*

Patient	Control Group	Intervention Group
New Patient	72.2	27.8
Follow Up	27.8	72.2
Totals (N=36)		

Note: Each group had 18 participants.

[*]Reported in percentages.

Appendix G

Mean Pre and Post Triggers and Prevention

Average Amount of Items Listed Before & After Teach Back Tool

Pre-Post Trigger Cohen's d: 2.21 & Pre-Post Prevention Cohen's d: 1.87

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_Trigger	1.72	18	1.018	.240
	Post_Trigger	4.89	18	1.745	.411
Pair 2	Pre_Prevention	2.06	18	1.056	.249
	Post_Prevention	4.94	18	1.893	.446

Appendix H

Percentage of Patients who Used Headache Diary

Percent of Patients Using Headache Diary

67%

33%

- Using Headache Diary
- No Response
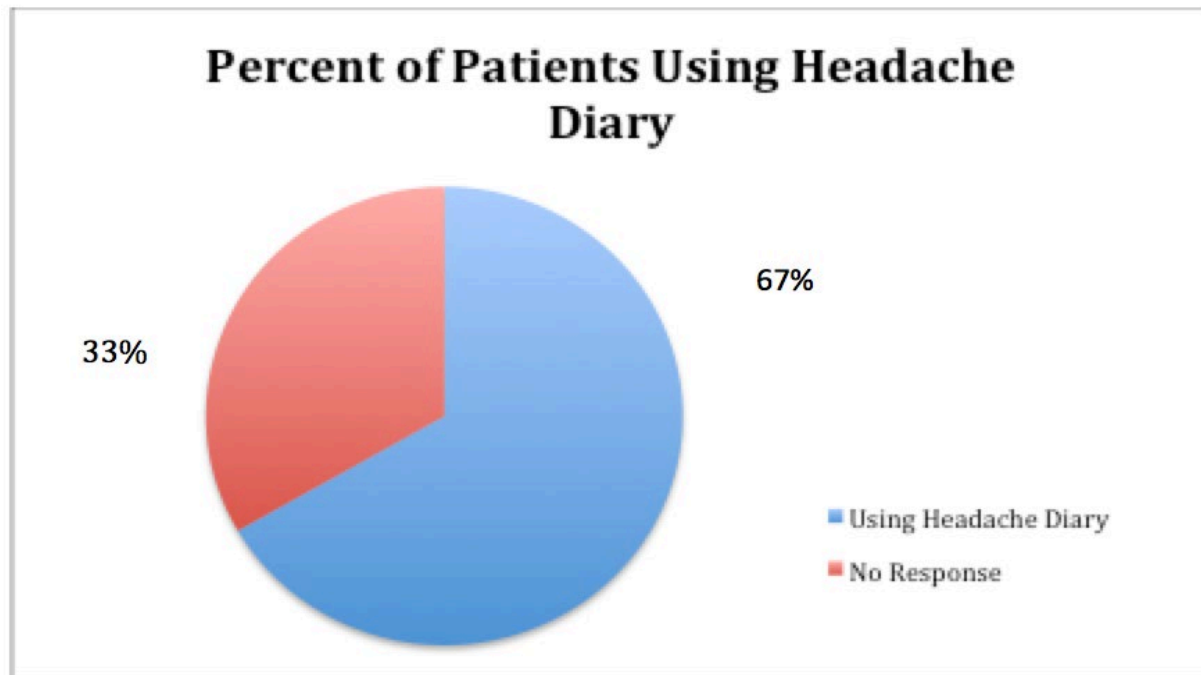
Assessment of Phone Calls

Table 2		
Independent Sample T-test		
Phone Calls		
	Mean(std.)	Cohen's d
Control Group	0.5(0.514)	0.512
Intervention Group	0.28(0.461)	0.512
Total (N=36)		
Note: Each group had 18 participants.		