Heart Failure Anticoagulation Teach-Back Education and Readmissions

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Abstract

Heart failure affects millions of Americans each year. Treatment of advanced heart failure with reduced ejection fraction and left ventricular failure is sometimes treated with implantation of a left-ventricular assist device. While living with this life-sustaining machine, anticoagulation with Coumadin is necessary. Many of these patients are readmitted within 30-days of being discharged for pump clots, gastro-intestinal bleeds and even strokes. Patients are often discharged without adequate education on Coumadin management, which promotes inadequate self-care and medication non-adherence. In current practice, healthcare providers lecture information in a quick manner without the evaluation of patients' comprehension. Research suggests implementing the teach-back method during education sessions to assess for comprehension of material to improve medication adherence. Healthcare providers should implement Coumadin teach-back education to heart failure patients with left-ventricular assist devices to improve quality of life, increase medication adherence and decrease 30-day hospital readmission rates.

Keywords: Heart failure, left-ventricular assist device, teach-back education, Coumadin

Heart Failure Anticoagulation Teach-Back Education and Readmissions

Heart failure (HF) is a prevalent disease in the United States, affecting 5.7 million Americans (Centers for Disease Control and Prevention [CDC], 2019). In fact, one in four patients discharged with a diagnosis of HF are readmitted to the hospital within 30 days (Almkuist, 2017). HF patients with severely reduced ejection fraction and left-ventricular failure are sometimes implanted with a left-ventricular assist device (LVAD). This patient population is frequently readmitted to the hospital. Most of these patients take, on average, ten different medications daily (Riegel & Dickson, 2016). Rigid medication regimen combined with inadequate teach-back education causes frequent readmissions.

Background and Significance

Epidemiological Data

One of the fundamentals with LVAD patients is anticoagulation, specifically with Coumadin. Pump thrombosis and ischemic strokes are common problems without anticoagulation or sub-therapeutic levels (Toeg, Ruel & Haddad, 2015). When the international normalized ratio (INR) is supra-therapeutic these patients are at risk for gastro-intestinal bleeding and hemorrhagic strokes. The standard goal INR level for LVAD patients is 2.0-3.0 (Toeg, Ruel & Haddad, 2015). It is common for physicians to individualize the intensity and timing of anticoagulation therapy related to past anticoagulation issues (Toeg, Ruel & Haddad, 2015).

Patients living with heart failure have to cope with a physiologically and psychologically complex disease requiring many medications. Not only does medication nonadherence place patients at risk for advancing their heart failure, but it also becomes costly to the health care system. HF is one of the most common causes of hospital readmissions and accounts for more than $30 billion to the nation’s healthcare system (Reddy & Borlaug, 2019). By 2030, the United

States' healthcare system is projected to spend nearly $70 billion annually on HF (Davidson & Allison, 2017). In the United States, the 30-day average hospital readmission rate for HF is 21.9% (Davidson & Allison, 2017). Many HF patients are discharged with inadequate knowledge regarding HF medication management. Evidence has shown that the teach-back method can play an effective role in medication adherence. When HF patients understand their disease process, know why they are taking their medications and follow up with their physicians regularly, hospital readmissions are decreased.

Teach-Back Method

According to the CDC (2019), about half of people who develop heart failure die within 5 years of being diagnosed. Unfortunately, most of these deaths are related to poor knowledge of essential HF medications and their intricate medication regimen. This is where the teach-back method can have a big impact. The teach-back method is asking open-ended questions and having patients explain the information back to the educator in their own words (Almkuist, 2017). Open discussion format and allowing the patient to ask questions at their pace is the best way to demonstrate teach-back education. When a patient fails to explain a concept, or incorrectly explains a concept; the healthcare provider can step in to re-teach and re-evaluate the concept. Although teach-back method has been around for many years, it is only *recommended* by health care facilities, not *required*.

Many providers lecture information quickly to their patients during short office or hospital visits and never assess for recall. Research has shown that 40-80% of medical education delivered to patients during quick visits or education sessions is forgotten almost immediately or remembered incorrectly (CDC, 2019). Current practice lacks assessing whether the patient understands the new information delivered to them; the teach-back component.

Internal Evidence & PICOT

Rehospitalization rates in patients with HF equate to 50% of patients being readmitted within six months of discharge (Wu et al., 2014). Many HF patients are discharged with inadequate knowledge regarding HF medication management and evidence has shown that the teach-back method can play an effective role in medication adherence. In a large southwestern hospital in the United States, hospital readmission for out of range INR is a common problem amongst their left-ventricular assist device (LVAD) population. With 14 new LVAD implants in 2018, the calculated 30-day readmission rate was 66% (Matushinec, 2019). By the end of 2019, the readmission rate was decreased to 45% (Matushinec, 2019). This quality improvement project explores the effects of Warfarin teach-back education and hospital readmissions amongst the heart failure population with left-ventricular assist device. The PICOT question for this project reads: In adults with LVAD's, how does Coumadin teach-back education, compared to usual education, affect 30-day hospital readmission rates for out of range INR?

Evidence Synthesis

Literature Review

HF is a complex disease that significantly impacts the life of patients and their family. The evidence from the ten studies reviewed clearly shows that teach-back education increases patient knowledge and confidence with medications, therefore increasing adherence. There is a robust amount of literature on HF relating to medication adherence and the teach-back method. HF patients have suboptimal adherence rates to cardiovascular agents resulting in hospital readmissions and poor health outcomes (Armstrong & McAlister, 2016). Hospital discharge is often associated with multiple changes in medication regimens and unfortunately disrupts the

continuity of care (Ferdinand et al., 2017). This disruption in the continuity of patient care often encompasses inadequate patient education.

Almkuist (2017) concluded that effective education with patient comprehension of the medication regimen could decrease the likelihood of readmission by 30%. Many nurses and primary care providers use the teach-back method to ensure patients have a thorough understanding of their disease process; medication regimen, potential side effects, and other home care measures. Peter et al. (2015) explains that the use of teach-back has been effective in improving understanding of the HF disease processes.

In a study conducted by Bates, O'Connor, Dunn & Hasenau (2014), medication adherence was shown to be improved by teach back interventions. Through reiteration of new information and return demonstration (teach-back), the educator can determine whether patients show expertise on the new information. Dastoom, Elahi, Baraz & Latifi (2016) provided teach-back education on four questions to several patients and acheived an average score of 75%. The number of readmission for heart faillure was reduced by 56.2% in the intervention group (44 compared to 21). Griffey et al. (2015) provided an audio-recorded structured interview and followed up with teach-back questions regarding emergency department discharge instructions. It was found that the patients who received teach-back education had higher comprehension of medication and follow-up instruction.

White, Garbez, Carroll, Brinker & Howie-Esquivel (2015) were able to show through their research that patients correctly answered 75% of the teach-back questions while hospitalized and 77.1% during follow up. King & Smith (2015) wanted to ensure that patients had the knowledge and satisfaction with their medication regimen. Teach-back is a concept that can be taught quickly and applied easily to HF patients. A similar study by Howie-Esquivel et al.

(2015) focused on teach-back education, prompt follow-up appointments and phone calls. Readmission rates were decreased to 12% in the intervention group as compared to 19% in the usual care group. Patients self-reported decreased non-adherence and better understanding of medications according to Hyrkas & Wiggins (2014).

Search Strategy

A thorough review of the most recent evidence took place for this literature review. The databases searched for the literature review included CINAHL, PubMed, and EBSCO databases. The initial search strategy included specific keywords for each part of the PICOT statement. For the population, the terms *heart* and *heart failure* yielded the best results. The term *congestive heart failure* was too specific and yielded to few results. For the intervention, the terms *teach back, teach-back, teach-back method, teach back method, open-loop communication, open loop communication, open loop teaching,* and *open-loop teaching* yielded the best results.

In all three databases, the best results were found using the Boolean connector "OR" to make sure results included the best results for the intervention. Another Boolean connector used was "AND" to make sure the search would include the population, heart failure. MESH terms were also used throughout the databases to yield more precise results. Medical subject headings (MESH) were also used when searching *teach-back, teach back, teach-back communication, heart failure* and *heart.* Inclusion criteria consisted of research articles published within the past five years written in English and peer-reviewed. Research articles published before 2014 were excluded. CINAHL produced 28 references, PubMed produced 17 results and EBSCO produced 266 results. After reviewing abstracts of articles from the initial search, many articles were excluded because the population did not apply or the study was still being conducted and no statistical results were available.

Critical Appraisal and Synthesis

After reviewing available literature, nine studies of high-level evidence were retained (Appendix A & B). The retained studies included two randomized controlled trials, one quasi-experimental, three prospective cohort studies, one non-randomized intervention study, one quality improvement study and one qualitative study (Appendix C). All the studies demonstrated homogeneity within the population; adults with heart failure. Minimal bias was noted throughout the ten studies with only a few having financial support from foundations or universities. Most of the studies were conducted within the United States. Demographics from most of the studies included adults age 60-80 with class I-III heart failure. The studies excluded heart failure stage IV and patients with advanced therapies (continuous infusions and mechanical support).

Commonalities between the studies interventions and findings can be seen in Appendix C. Teach-back education was used across all of the studies. In addition to teach-back education, some studies also included medication reconciliation, teach-back classes, and motivational interviewing. Approximately half of the studies demonstrated decreased readmissions along with increased comprehension of medications. Three other studies reached conclusions that confidence level was increased and medication related problems were decreased. Although not statistically shown, it is highly likely that with increased medication comprehension, readmissions and medication related problems would decrease, while confidence levels increase.

Theoretical Framework & Implementation Framework

The Chronic Care Model (CCM) (Figure 1) was carefully selected to represent the theoretical framework for this project. This model helps address the needs of patients with chronic illness in the primary care setting and is favored in the HF population. (Feinglass, 2009). In the center of the model are productive interactions. Feeding into the center are the informed

patient and proactive healthcare members. When the healthcare members deliver support, education and self-management to the patient, outcomes are improved. This can be applied directly to my study and it shaped the intervention for this study. Education through the teach-back method for the chronic illness of HF has been shown to be effective. When the nurses provide teach-back education, medication adherence should increase and hospital admissions should decrease.

The Model for Evidence Based Practice Change (MEBPC) (Figure 2) was chosen for this project. The model was created in 1999 by Rosswurn and Larabee (Melnyk & Fineout-Overholt, 2018). It is a six-step model that uses evidence-based practice strategies to integrate and promote new strategies. This framework was specifically chosen for this project because is integrates quality improvement principles and teamwork tools. This project aligns more closely with quality improvement and has aspects of teamwork. The last step of this model, integrating and maintaining change, will be after my project if the clinic continues to use my teach-back practice change to decrease hospital readmissions.

Methods

Project Description & Population

This quality improvement project focused on implementing a Coumadin teach-back education tool to LVAD patients. The measurement focused on assessing if patients were readmitted within 30-days of discharge for out of range INR levels. This project began with research to find an appropriate anticoagulation teach-back tool. The *Anticoagulation Knowledge Tool* by Obamiro, Chalmers & Bereznicki (2016) was found to be the most appropriate. Permission was received in August 2019 from the authors permitting use of the tool. The original 28-question tool was condensed to 14 questions. Some questions were altered to be specific for

management of Coumadin for LVAD's according to the mechanical circulatory support team at this facility.

LVAD coordinators, at this facility, are registered nurses who work with the physicians and nurse practitioners on the mechanical circulatory support team. The LVAD coordinators provide a majority of the device and medication education while the physicians and nurse practitioners titrate medications and alter the plan of care. Together as a team through high-quality communication, they manage the LVAD and advanced heart failure medications for optimal outcomes. At this facility, the LVAD coordinators follow this group of patients both inpatient and outpatient in their clinic.

A team meeting was set up with five LVAD coordinators to explain how to provide teach-back education using the modified *Anticoagulation Knowledge Tool* (Appendix D) and how to record data. During their daily LVAD rounding, one LVAD coordinator would sit down with one patient and discuss, in an open-communication teach-back format, the 14 questions on the tool. The goal was to get the most questions correct through the use of teach-back education, re-explanation, and follow-up education. Time spent with the patient was not measured or controlled in this study. The LVAD coordinators were educated in early September 2019. Finalization of project details and approval from institutional review board (IRB) was received in late November 2019. Education was implemented in January to early February 2020. Follow-up to assess if the patient was readmitted within 30-days concluded in early March 2020.

This quality improvement study focused on adult LVAD patients in the hospital setting. Patients needed to have one of the following LVAD devices: HeartMate II (HM II), HeartMate III (HM III), or a HeartWare (HVAD). Patients were not able to participate in the study if they were under the age of 18, unable to provide consent, pregnant or prisoner status. Patients receive

education from the LVAD coordinators on a regular follow-up basis, however, not necessarily using teach-back education. Patients did not need to provide consent to receive the teach-back education because they receive frequent education on their medications and device daily.

Instrumentation & Data Collection

There were two main data collection forms used for this project. The Masterlog (Appendix E) and the Data Collection Form (Appendix F). The Masterlog was kept in a locked file cabinet in the LVAD coordinators locked office. It contained protected health information (PHI) including name and discharge date for the patients. The Masterlog was only for data collection and viewing from the LVAD coordinators. Each time after educating a patient, the LVAD coordinator would document patient name, age range, gender, type of LVAD and number of questions correct. When the patient would discharge, this date was recorded. It was also recorded if the patient was readmitted during the 30-day period for INR issues. After all data collection concluded in March, one of the LVAD coordinators transcribed the data from the Masterlog to the Data Collection Form eliminating PHI. The Data Collection Form contained no PHI and was used for data analysis by the project lead. On the Data Collection Form was age range, gender, type of LVAD, number of questions correct, and readmission within 30 days related to INR.

Results

Descriptive Data

Summary statistics were calculated for each interval and ratio variable. Frequencies and percentages were calculated for each nominal variable (Table 1). There were four participants total in the study. The most frequently observed age range was 60-69 (n = 2, 50%), followed by 70-79 (n = 1, 25%) and 80-89+ (n = 1, 25%). Both genders, male and female, were observed

equally with 2 (50%) in each category. The most frequent type of LVAD seen was the HM III (*n* = 2, 50%), followed by HM II (*n* = 1, 25%) and HVAD (*n* = 1, 25%). Two participants (*n* = 2, 50%) were not readmitted back to the hospital within the 30-day period from discharge. One participant (*n* = 1, 25%) was readmitted within the 30-day period after discharge and one participant (*n* = 1, 25%) expired during the project data collection phase. For the one participant (*n* = 1, 25%) who was readmitted within the 30-day period, their INR upon readmission was supra-therapeutic. For the teach-back education, the number of questions correct out of 14 had an average of 13.50 (*SD* = 0.58, SE_M = 0.29, Min = 13.00, Max = 14.00, *Mdn* = 13.50, Mode = 13.00).

The two participants (*n* = 2, 50%) who were not readmitted back to the hospital within the 30-day period from discharge had an average of 13.50 questions correct (*SD* = 0.71, SE_M = 0.50, Min = 13, Max = 14, *Mdn* = 13.50, Mode = 14). The one participant (*n* = 1, 25%) who was readmitted within the 30-day period after discharge had a mean number of 13 questions correct. The expired patient achieved a mean number of 14 questions correct. These results are displayed in Table 2. Although not statistically significant, the relationships between amount of questions correct and readmission can be perceived as significant for this project. Two patients achieved 13 out of 14 correct during the teach-back. Of those two patients, one was readmitted for supratherapeutic INR. The living participant who scored higher, 14, was not readmitted.

Project Impact & Sustainability

The results can potentially show that when patients have better knowledge on their Coumadin, hospital readmissions for out of range INR can be decreased. The patient with a score of 14 was not readmitted and one of the patients who scored 13 was also not readmitted. This could be related to higher scores on the modified *Anticoagulation Knowledge Tool* questionnaire

resulting in more adequate knowledge retention and improved understanding. At this facility, consistently implementing this tool to the LVAD patients could result in overall decrease in hospital readmission rates. If implemented for one year at this facility, readmission rates could fall far below the 2019 annual readmission rate of 45%. The LVAD population at this facility could potentially encounter fewer complications that come with out of range INR levels resulting in increased longevity. These patients could see a decrease in financial burden from less hospital bills. The hospital may even have better financial outcomes if they are not constantly having to cover heart failure readmissions under 30-days.

The LVAD coordinators at this facility have copies of the modified *Anticoagulation Knowledge Tool* questionnaire so they can continue to implement the teach-back education. Although the education may take more time to deliver, the teach-back education should continue to be provided to all LVAD patients. It could benefit the patients' knowledge retention ultimately improving self-management and quality of life.

Discussion

Limitations & Barriers

There were several barriers while conducting this quality improvement project. The LVAD patient population at this facility is very specific and small. Although the project was approved and ready for implementation, the first patient was not educated until after the New Year. Not as many LVAD patients were admitted to the hospital during the period between late November 2019 and early February 2020 as predicted. This could be due to the cooler weather and many patients staying inside keeping tighter control on their medications. All of the winter holidays seemed to be a barrier as well. Many patients avoid the hospital during the holidays to stay home and enjoy family time. There was also a barrier on the LVAD coordinator side with

holiday hours and scheduling. Scheduling, holidays and lack of available patient population all attributed to small sample size. Some LVAD patients that were admitted were too ill to participate in teach-back education. Time restrictions were another barrier to providing teach-back education. The amount of patients the LVAD coordinators need to see is large: including total artificial hearts, new intubated implants in the ICU and patients getting worked up for an LVAD. After prioritizing and educating these unstable higher-acuity patients, the LVAD coordinators could visit the more stable LVAD patients, similar to the participants in the study. This would not leave much time in the day for long teach-back education sessions.

There were also a few limitations to this quality improvement study. Due to the restricted patient population, the sample size (n = 4) was confined. Non-parametric and parametric tests were unable to be performed. Only descriptive statistics could be run for this sample size. Lack of statistical analysis made the findings not statistically significant. Another limitation of this study is that self-report of improved knowledge from the patients was not collected. This may have strengthened the study if patients were able to answer if they felt more knowledgeable after the teach-back education. Time for the teach-back education sessions was not measured either. If this was measured, an average could have been calculated and length of session could have been evaluated with readmission.

Related Findings & Recommendations

Some of the data from this study suggests that higher scores during the teach-back education session attributes to lower readmission rates. The higher scores during the teach-back session can be directly related to improved knowledge and retention. This was similar to many of the heart failure education studies reviewed for this project. The patient with the lower score was readmitted for an out of range INR level. This participant's lower score could indicate lower

knowledge and incomplete understanding of Coumadin management. Similar to many of the studies in the literature review, time constraints were considered a problem. Healthcare providers only have small amounts of time allotted for each patient to assess and educate. When schedules become busy, these time slots become smaller and complete teach-back education can become hard to incorporate.

There are several recommendations to continue providing teach-back education at this facility. To sustain this project, it would be ideal for the LVAD coordinators to deliver the education, however, with time constraints and other duties this can be difficult. Several studies discussed having a pharmacist provide teach-back education to patients. There could be favorable outcomes from implementing a pharmacist or one LVAD coordinator to solely provide teach-back education on their medications, specifically Coumadin. An educator role in a pharmacist or LVAD coordinator would eliminate other job duties and time constraints for providing teach-back education. For future research, it is recommended to provide a survey to the patients on self-report of improved knowledge. The self-report combine with the readmission status and number of questions correct would strengthen the study and solidify the fact that teach-back education is necessary.

In conclusion, teach-back education can significantly reduce hospital readmissions, increase knowledge retention and improved quality of life. Teach-back education is an effective way to evaluate knowledge retention and learning outcomes. Although statistical significance was not achieved, the relationships between amount of questions correct and readmission can be perceived as significant for this study. Education was retained in the participants with higher scores and readmissions were avoided. Teach-back education is simple and low-cost for the hospital to provide. Providing teach-back education should become integrated into daily

rounding with LVAD patients taking Coumadin to keep them out of the hospital and improve health outcomes.

Appendix A

Evaluation Table: Heart Failure and Teach-Back Method Quantitative Studies

Citation	**Theory/ Conceptual Framework**	**Design/ Method**	**Sample/ Setting**	**Major Variables & Definitions**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/ Results**	**Level/Quality of Evidence; Decision for practice**
Bates et al. (2014). Applying STAAR interventions in incremental bundles: Improving post-CABG surgical patient care. **Country:** United States **Funding:** None **Bias:** None	Inferred to be Transitional Care Model	**Design**: Quasi-experimental **Purpose:** To evaluate the effectiveness of STAAR interventions on readmissions and experience of care.	**N** – 189 **n** – 97 (PEI) **n** – 92 (POI) **Demographics:** Post-CABG, average age 62 **Setting:** Tertiary care facility; mid-western United States **Inclusion:** Post-CABG, 18-90 YO **Exclusion:** CABG PR, cannot participate in self-care, no family support, EX **Attrition:** Not reported	**IV**: Teach-back education **DV 1**: 30-day readmission rates **DV 2:** Patient experience	Educator taught using teach-back on day 3 post-CABG, scheduled cardiology appointment before DC, follow-up calls with each patient on day 3 post-DC using questionnaire	Descriptive Statistics ANOVA Chi-square test	P value < .05 = significant **DV 1**: PEI 25.8%, POI 12.0%, difference between PEI and POI (N = 189) 5.84 with p = 0.02 **DV 2:** 91.6% (n=83) rated teach-back effective, 93.5% (n=83) scheduled follow up appointment	**LOE:** III **Strengths:** reliable instruments, effective teach-back method and assessment of understanding **Weaknesses:** attrition not reported, completed in single tertiary care setting. **Conclusions:** Fewer 30-day readmission rates with the use of teach-back method in conjunction with scheduling follow-up cardiology appointments prior to discharge. **Feasibility:** Recommended for use in practice due to the effectiveness of interventions.

ANOVA – analysis of variance, **CABG** – coronary artery bypass graft, **CABG –** coronary artery bypass graft, **PR -** coronary artery bypass graft in the past, **CHF** – congestive heart failure, **CI** – confidence interval, **DC** – discharge, **DV** – dependent variable, **ED** – emergency department, **EX** – expired before 30-day post-surgery, **IBM** – International Business Machines, **IRR** – incidence rate ratio, **IV** – independent variable, **LOE** – level of evidence, **MA** – mean age, **MI** – motivational interview, **MR** – medication reconciliation, **MRP** – medication related problem, **N** – number of participants in study, **n** – number of participants in subset, **PES** – patient experience scale, **PCP** – primary care provider, **PE** – patient experience, **PEI** – preintervention group, **POI** – postintervention group, **RCT** – randomized control trial, **RN** – registered nurse, **RR** – readmission rate, **SD** – standard deviation, **SPSS** – statistical package for social sciences, **STAAR** – State Action on Avoidable Rehospitalizations, **YO** – years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice
Dastoom et al. (2016). The effects of group education with the teach-back method on hospital readmission rates of heart failure patients. **Country:** Iran **Funding:** Ahvaz Jundishapur University of Medical Sciences **Bias:** Possibly with the University Ahvaz	Teach-back education at different intervals of hospitalization; DC	**Design:** RCT **Purpose:** To determine the effects of group education with the teach-back method on readmission rates of CHF patients	**N** - 91 **n** – 42 control **n** – 49 intervention **Demographics -** CHF patients with low literacy rate, high readmission rate **Setting -** Three academic hospitals in Ahvaz **Inclusion -** Age over 40, diagnosis of CHF for at least 6 months, alert, familiar with Persian language, able to communicate **Exclusion -** Cognitive impairment, NYHA I Symptoms **Attrition** – 10%	**IV** – Education classes; teach-back questionnaire **DV 1 –** CHF readmissions before intervention **DV 2 –** CHF readmissions after intervention	Registration form indicating the disease status, readmission characteristics, demographic data	Mann-Whitney Chi-Square SPSS	**DV 1 –** (n = 42) 0.71 with 0.45 SD. (n = 49) 0.75 with 0.43 SD. P = 0.66 **DV 2 –** (n = 42) 038 with 0.49 SD. (n = 49) 0.06 with 0.24 SD. P = 0.001	**LOE** – II **Strengths –** Significant reduction in CHF hospital readmissions **Weaknesses –** Did not include patient education questionnaire **Conclusions –** teach-back method is effective in reducing readmissions **Feasibility –** The interventions used should be considered an important part of comprehensive care to help patients develop self-care skills and reduce readmission rates.

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Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice
Griffey et al. (2015). The impact of teach-back on comprehension of discharge instructions and satisfaction among emergency patients with limited health literacy. **Country:** United States **Funding:** None **Bias:** None	Patient education and knowledge	**Design:** RCT **Purpose:** To evaluate teach-back and standard discharge instructions in CHF patients.	**N:** 408 **n** – 127 **n** - 127 **Demographics:** 87.8% African American, 59.5% female, mean age 34.7 YO **Setting:** Urban academic ED **Inclusion:** All patients 18 YO and older, being discharged, consent **Exclusion:** score of 6 or more on the REALM-R, aphasia, non-english speaking, mental handicap, psychiatric chief complaint, clinical intoxication	**IV –** teach-back DC instructions; interviews **DV 1 –** Comprehension **DV 2 –** Perceived comprehension	Nurse educated patients using teach back for DC. After DC, patients participated in interviews to assess comprehension.	Mantel-Hanzel chi-squared test	**DV 1 –** Comprehension **DV 2 –** Perceived comprehension	**LOE:** II **Strengths:** large sample size, randomization within the ED, focus on teach-back **Weaknesses:** Convenience sampling, excluded Spanish-speaking patients **Conclusions:** Teach-back appears to improve comprehension for post-ED care among patients with low health literacy. **Feasibility:** Can be reproduced and shows promising results for improved comprehension.

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			Attrition: Not discussed					
Citation	**Theory/ Conceptual Framework**	**Design/ Method**	**Sample/ Setting**	**Major Variables & Definitions**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/ Results**	**Level/Quality of Evidence; Decision for practice**
Howie-Esquivel et al. (2015). A strategy to reduce heart failure readmissions and inpatient costs. **Country:** United States **Funding:** Gordon and Betty Moore Foundation; UCSF Clinical Research Award **Bias:** None discussed	Education model and teaching key concepts	**Design:** Prospective Cohort study **Purpose:** To evaluate the effect of a disease management intervention on rehospitalization rates in CHF patients.	**N** – 1,033 n – 485 **Demographics:** Mean age 80.1 ± 8.2 and 80.2 ± 8.3; CHF **Setting:** Hospital **Inclusion:** 65 YO and older, on cardiology services, CHF diagnosis **Exclusion:** Admitted for less than 24 hours, required advanced CHF therapies **Attrition:** Not disclosed	**IV:** TEACH-HF **DV 1:** pre-TEACH 30-day readmission rate **DV 2:** post-TEACH 30-day readmission rate **DV 3:** pre-TEACH 90-day readmission rate **DV 4:** post-TEACH 90-day readmission rate	Teach-back education using TEACH-HF: education in the hospital, follow-up appointments, consultation, home follow-up calls	Chi-square t-test Mann-Whitney U-test	**DV 1:** 19% n=93 **DV 2:** 12% n=68 (P= 0.001, p<0.01) **DV 3:** 30% n=147 **DV 4:** 19% n=102 (P= 0.001, p<0.01)	**LOE**: III **Strengths:** Associated with significant reduction in all-cause hospital readmissions within 30 and 30 days; large sample size **Weaknesses:** Lack of concurrent control group **Conclusions:** The TEACH-HF intervention was associated with fewer all-cause hospital readmissions. **Feasibility:** Recommended to implement CHF disease management education and follow-up support
Citation	**Theory/ Conceptual Framework**	**Design/ Method**	**Sample/ Setting**	**Major Variables & Definitions**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/ Results**	**Level/Quality of Evidence; Decision for practice**

ANOVA – analysis of variance, **CABG** – coronary artery bypass graft, **CABG –** coronary artery bypass graft, **PR -** coronary artery bypass graft in the past, **CHF** – congestive heart failure, **CI** – confidence interval, **DC** – discharge, **DV** – dependent variable, **ED** – emergency department, **EX** – expired before 30-day post-surgery, **IBM** – International Business Machines, **IRR** – incidence rate ratio, **IV** – independent variable, **LOE** – level of evidence, **MA** – mean age, **MI** – motivational interview, **MR** – medication reconciliation, **MRP** – medication related problem, **N** – number of participants in study, **n** – number of participants in subset, **PES** – patient experience scale, **PCP** – primary care provider, **PE** – patient experience, **PEI** – preintervention group, **POI** – postintervention group, **RCT** – randomized control trial, **RN** – registered nurse, **RR** – readmission rate, **SD** – standard deviation, **SPSS** – statistical package for social sciences, **STAAR** – State Action on Avoidable Rehospitalizations, **YO** – years old

Hyrkas et al. (2014). A comparison of usual care, a patient-centered education intervention and motivational interviewing to improve medication adherence and readmission of adults in an acute-care setting. **Country:** United States **Funding:** The Hearst Foundation, Maine Medical Center **Bias:** None	Patient education and knowledge of self-care	**Design:** Non-randomized intervention study **Purpose:** To compare medication adherence and readmissions in patients who received patient-centered interventions.	**N** – 303 **Demographics:** Adults, inpatients, surgical intervention received **Setting:** Hospital **Inclusion:** 18 YO and older, able to read/write/speak English, access to phone on DC **Exclusion:** Trialing new medications, patients enrolled at another medication study, mental health/substance abuse issues **Attrition:** 10%	**IV:** Teach-back, MI **DV 1:** Medication confidence **DV 2:** patient experience MI	RN's asked patients to rank importance and confidence of taking medications. High confidence/importance scores enabled patients to receive teach-back education. Low confidence/importance scores enabled patients to receive MI.	Chi-square Fischer exact test Mann-Whitney U-test	**DV 1:** Improved confidence from before hospital DC (mean = 9.04, SD = 1.55) to 48-72 hours after DC (mean = 9.46, SD = 1.20, P=0.00) and from T2 to 30 days after DC (mean = 9.66, SD = 0.76, P = 0.00) **DV 2:** PES mean 6.60 (SD = 0.78) MI group PES mean 6.41 (SD = 1.26) patient-centered intervention group	**LOE**: III **Strengths:** patients reported much lower rates of nonadherence, helpful for complex medication regimens **Weaknesses:** limited generalizability **Conclusions:** Patients who lack confidence in ability to adherence to complex medication regimen, motivational interviewing may increase medication adherence. **Feasibility:** Recommended for use in practice due to the effectiveness of interventions.
Citation	**Theory/ Conceptual Framework**	**Design/ Method**	**Sample/ Setting**	**Major Variables & Definitions**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/ Results**	**Level/Quality of Evidence; Decision for practice**
Peter et al. (2015). Reducing	Inferred to be Transitional Care Model	**Design:** Quality Improvement	**N** – 469 **Demographics:**	**IV:** Teach-back	Patients asked 4 questions/day by RN during admission	Statistical analysis not stated –	**DV 1:** 94% **DV 2:** 85% **DV 3:** 90%	**LOE**: V

ANOVA – analysis of variance, **CABG** – coronary artery bypass graft, **CABG –** coronary artery bypass graft, **PR -** coronary artery bypass graft in the past, **CHF** – congestive heart failure, **CI** – confidence interval, **DC** – discharge, **DV** – dependent variable, **ED** – emergency department, **EX** – expired before 30-day post-surgery, **IBM** – International Business Machines, **IRR** – incidence rate ratio, **IV** – independent variable, **LOE** – level of evidence, **MA** – mean age, **MI** – motivational interview, **MR** – medication reconciliation, **MRP** – medication related problem, **N** – number of participants in study, **n** – number of participants in subset, **PES** – patient experience scale, **PCP** – primary care provider, **PE** – patient experience, **PEI** – preintervention group, **POI** – postintervention group, **RCT** – randomized control trial, **RN** – registered nurse, **RR** – readmission rate, **SD** – standard deviation, **SPSS** – statistical package for social sciences, **STAAR** – State Action on Avoidable Rehospitalizations, **YO** – years old

readmissions using teach-back. **Country:** United States **Funding:** None **Bias:** Many of the authors are patient education specialists, nursing administrators and vice presidents of the Department of Medicine	relating to education	**Purpose:** To provide core-measure education using teach-back method to decrease hospital readmissions	Patients admitted with heart failure **Setting:** Tertiary care facility medical surgical unit **Inclusion:** All patients with heart failure **Exclusion:** Not stated **Attrition:** Not reported	**DV 1:** Correct responses for knowledge questions **DV 2:** Correct responses for attitude questions **DV 3:** Correct responses for behavior questions **DV 4:** readmission rates	about CHF knowledge, attitude, and behaviors.	looked at correct responses by CHF patients using the 3-day education approach	**DV 4:** 12% reduction	**Strengths:** demonstrated that using the whole healthcare team to document and provide teach-back can improve education understanding **Weaknesses:** attrition not reported, no statistical analysis except for looking at how many patients scores questions correct over a 3-day education session **Conclusions:** Teach-back is an essential tool in patient education and is easily incorporated without additional cost to the organization **Feasibility:** Recommended for use in practice due to the effectiveness of interventions.
Citation	**Theory/ Conceptual Framework**	**Design/ Method**	**Sample/ Setting**	**Major Variables & Definitions**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/ Results**	**Level/Quality of Evidence; Decision for practice**

ANOVA – analysis of variance, **CABG** – coronary artery bypass graft, **CABG –** coronary artery bypass graft, **PR -** coronary artery bypass graft in the past, **CHF** – congestive heart failure, **CI** – confidence interval, **DC** – discharge, **DV** – dependent variable, **ED** – emergency department, **EX** – expired before 30-day post-surgery, **IBM** – International Business Machines, **IRR** – incidence rate ratio, **IV** – independent variable, **LOE** – level of evidence, **MA** – mean age, **MI** – motivational interview, **MR** – medication reconciliation, **MRP** – medication related problem, **N** – number of participants in study, **n** – number of participants in subset, **PES** – patient experience scale, **PCP** – primary care provider, **PE** – patient experience, **PEI** – preintervention group, **POI** – postintervention group, **RCT** – randomized control trial, **RN** – registered nurse, **RR** – readmission rate, **SD** – standard deviation, **SPSS** – statistical package for social sciences, **STAAR** – State Action on Avoidable Rehospitalizations, **YO** – years old

White et al. (2014). Is teach-back associated with knowledge retention and hospital readmission in hospitalized heart failure patients. **Country:** United States **Funding:** None **Bias:** Possibly with the University of California, San Francisco	Inferred to be Transitional Care Model relating to education	**Design:** Prospective cohort study **Purpose:** To provide core-measure education using teach-back method to decrease hospital readmissions	**N** – 276 **n** – 188 patients received teach-back strategies as part of their educational experience throughout their length of stay **Demographics:** Patients admitted with heart failure **Setting:** Tertiary care facility medical surgical unit **Inclusion:** All patients with heart failure **Exclusion:** Not stated **Attrition:** N/A	**IV –** Educational class, handout **DV 1 –** Teach-back effectiveness **DV 2 –** Teaching time **DV 3** – Readmissions **Definition -** Patients educated by two CHF RN's during hospitalization ranging from 15-120 minutes; 7 days after discharge with phone call.	CHF Teach-Back Questionnaire Progress notes Electronic order for teach-back	SPSS Fischer exact test McNemar test	**DV 1** – Hospitalized: 84.4% (n = 233) answered 75% of questions correctly Follow-up: 77.1% (n = 145) **DV 2 –** Hospitalized: n = 233 SD education time 36(13.66) minutes **(**P < 0.001). Follow-up: n = 145 SD education time 37(14.78) minutes (P = 0.023) **DV 3** – 30 days after DC 14.9% (n = 41) patients were readmitted (P = .775). CHF specific readmission 3.3% (n = 9)	**LOE** – III **Strengths:** demonstrated that using the whole healthcare team to document and provide teach-back can improve education understanding **Weaknesses:** attrition not reported, no statistical analysis except for looking at how many patients scores questions correct over a 3-day education session **Conclusions:** Teach-back is an essential tool in patient education and is easily incorporated without additional cost to the organization **Feasibility:** Recommended for use in practice due to the effectiveness of interventions.

ANOVA – analysis of variance, **CABG** – coronary artery bypass graft, **CABG –** coronary artery bypass graft, **PR -** coronary artery bypass graft in the past, **CHF** – congestive heart failure, **CI** – confidence interval, **DC** – discharge, **DV** – dependent variable, **ED** – emergency department, **EX** – expired before 30-day post-surgery, **IBM** – International Business Machines, **IRR** – incidence rate ratio, **IV** – independent variable, **LOE** – level of evidence, **MA** – mean age, **MI** – motivational interview, **MR** – medication reconciliation, **MRP** – medication related problem, **N** – number of participants in study, **n** – number of participants in subset, **PES** – patient experience scale, **PCP** – primary care provider, **PE** – patient experience, **PEI** – preintervention group, **POI** – postintervention group, **RCT** – randomized control trial, **RN** – registered nurse, **RR** – readmission rate, **SD** – standard deviation, **SPSS** – statistical package for social sciences, **STAAR** – State Action on Avoidable Rehospitalizations, **YO** – years old

Citation	Theory/ Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Results	Level/Quality of Evidence; Decision for practice
Wu et al. (2014). A single-item self-report medication adherence question predicts hospitalizations and death in patients with heart failure **Country:** United States **Funding:** National Heart, Lung, and Blood Institute **Bias:** The funding agent had no role in the study other than funding	Theory of self-care/deficit	**Design:** Prospective cohort study **Purpose:** To compare different levels of self-care training	**N** - 592 **Demographics -** Mean age 56-74 YO, Caucasian followed by African American **Setting -** 4 sites; cardiology outpatient clinics and general internal medicine sites. **Inclusion -** Diagnosis of CHF, NYHA II-IV symptoms in the past 6 months, current use of loop diuretic, no cognitive impairment **Exclusion -** Cognitive impairment, NYHA I symptoms **Attrition** – Not discussed	**IV –** Education **DV 1–** all cause hospitalizations/death full adherence **DV 2 –** all cause hospitalizations/death non-adherence **DV 3 –** CHF hospitalizations/death full adherence **DV 4 –** CHF hospitalizations/death non-adherence **Definitions –** Single session received 40 minutes in-person self-care training; on-going phone support	Patient self-report; interview	Chi-square T-test	**DV 1–** (n = 429) 0.71 events/year **DV 2 –** (n = 163) 0.86 events/year **DV 3–** (n = 429) 0.28 events/year **DV 4 –** (n = 163) 0.33 events/year All cause - IRR 0.83 CHF – IRR 0.84 95% CI, p = 0.05	**LOE**: III **Strengths:** Self-report is the most frequently used method to assess medication adherence because it is inexpensive, feasible and provides a gross indicator of adherence. **Weaknesses:** Measured by self-report, need more studies to test validity, did not collect serum sodium/diuretic dose **Conclusions:** Medication adherence is associated with all-cause/CHF-related hospitalizations/death; self-reported adherence predicts health outcomes **Feasibility:** Recommended for use in practice due to the effectiveness of interventions.

ANOVA – analysis of variance, **CABG** – coronary artery bypass graft, **CABG –** coronary artery bypass graft, **PR -** coronary artery bypass graft in the past, **CHF** – congestive heart failure, **CI** – confidence interval, **DC** – discharge, **DV** – dependent variable, **ED** – emergency department, **EX** – expired before 30-day post-surgery, **IBM** – International Business Machines, **IRR** – incidence rate ratio, **IV** – independent variable, **LOE** – level of evidence, **MA** – mean age, **MI** – motivational interview, **MR** – medication reconciliation, **MRP** – medication related problem, **N** – number of participants in study, **n** – number of participants in subset, **PES** – patient experience scale, **PCP** – primary care provider, **PE** – patient experience, **PEI** – preintervention group, **POI** – postintervention group, **RCT** – randomized control trial, **RN** – registered nurse, **RR** – readmission rate, **SD** – standard deviation, **SPSS** – statistical package for social sciences, **STAAR** – State Action on Avoidable Rehospitalizations, **YO** – years old

Appendix B

Evaluation Table: Heart Failure and Teach-Back Method Qualitative Studies

Citation	Conceptual Framework	Design/ Method	Sample/Setting	Major Variables & Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/Quality of Evidence; Decision for practice/ application to practice
Riegel et al. (2016). A qualitative secondary data analysis of intentional and unintentional medication nonadherence in adults with chronic heart failure. **Country:** United States **Funding:** Not stated **Bias:** Possibly with the Kynett Foundation	Common Sense Model of Illness Representation Necessity Concerns Framework	Grounded Theory	**N** – 112 **Demographics:** 37% female, 63% male, mean age 58.9, 58% white, 36% graduated high school **Setting:** Varied **Inclusion:** Studies conducted by Dickson and Riegel **Exclusion:** No mention of medication adherence **Attrition:** Not stated	**IV:** Open-ended questions about medication adherence **DV 1:** Rarely non-adherent **DV 2:** Frequently non-adherent **DV 3:** Intentionally non-adherent **DV 4:** Reformed non-adherent	Open-ended questions to elicit self-care accounts and medication adherence Medication adherence was judged based on patient statements In-depth narratives	Data examined and re-coded by investigator as intentional and unintentional medication nonadherence. Qualitative accounts explored and placed into framework.	**DV 1:** 22% (n=25) **DV 2:** 51% (n=57) **DV 3:** 19% (n=21) **DV 4:** 8% (n=9)	LOE: V **Strengths:** The use of qualitative secondary analysis techniques, large sample size, three studies were descriptive **Weaknesses:** Similar general questions used to gather self-care accounts in all 4 studies, one study was testing motivational interviewing, relied on subjective reports **Conclusions:** Medication nonadherence is prevalent in CHF and influence by modifiable factors. **Feasibility:** Should be used in practice to modify misconceptions about CHF, beliefs, concerns, and contextual factors

ANOVA – analysis of variance, **CABG** – coronary artery bypass graft, **CABG –** coronary artery bypass graft, **PR -** coronary artery bypass graft in the past, **CHF** – congestive heart failure, **CI** – confidence interval, **DC** – discharge, **DV** – dependent variable, **ED** – emergency department, **EX** – expired before 30-day post-surgery, **IBM** – International Business Machines, **IRR** – incidence rate ratio, **IV** – independent variable, **LOE** – level of evidence, **MA** – mean age, **MI** – motivational interview, **MR** – medication reconciliation, **MRP** – medication related problem, **N** – number of participants in study, **n** – number of participants in subset, **PES** – patient experience scale, **PCP** – primary care provider, **PE** – patient experience, **PEI** – preintervention group, **POI** – postintervention group, **RCT** – randomized control trial, **RN** – registered nurse, **RR** – readmission rate, **SD** – standard deviation, **SPSS** – statistical package for social sciences, **STAAR** – State Action on Avoidable Rehospitalizations, **YO** – years old

Appendix C

Synthesis Table: Heart Failure and Teach-Back Method All Studies

	Almkuist	Bates	Dastoom	Griffey	Howie-Esquivel	Hyrkas	Peter	Riegel	White	Wu
General Information										
Year	2017	2014	2016	2015	2015	2014	2015	2016	2014	2014
Type of Study	SR	QE	RCT	RCT	PCS	NRIS	QI	GT	PCS	PCS
Level of Evidence	I	III	II	II	III	III	V	V	III	III
Number of Subjects	189, 23, 276, 1,285	189	91	408	1,033	303	469	112	276	592
Interventions										
Teach-Back Education										
Classes										
MI										
Findings										
Decreased Readmissions										
Increased Comprehension										
Increased Confidence										

GT – grounded theory, **MI** – motivational interviewing, **MR** – medication reconciliation, **MRP** – medication related problems, **NRIS** – non-randomized intervention study**, PCS** – prospective cohort study, **SR** – systematic review, **QE –** quasi experimental, **QI –** quality improvement,

Appendix D

Modified Anticoagulation Knowledge Tool Questionnaire

Heart Failure Anticoagulation Teach-Back Education and Hospital Readmissions

Teach-Back Questionnaire

1. What is the name of your anticoagulant medicine?
2. Why has your doctor prescribed you this medicine?
3. How does this medicine work in your body?
4. How many times a day do you need to take this medicine?
5. For how long do you need to take this medicine (for example, 3 months, and 6 months, life-long)?
6. Why is it important to take this medicine exactly as your doctor has told you?
7. Is it important to take this medicine at the same time each day?
8. What should I do if I miss a dose?
9. What is the best step to take if you accidentally take too much of this medicine?
10. Is it safe to take anti-inflammatory medicines like ibuprofen (Advil®) while you are taking this medicine?
11. Is it safe to take vitamin supplements and herbal medicines with this medicine without consulting your doctor?
12. What are some signs of bleeding that you should watch out for while taking this medicine?
13. What is your target INR range?
14. When should I check my INR?

Appendix E

Masterlog

Heart Failure Anticoagulation Teach-Back and Readmissions

Master Log

ID	Name	Age Range 1 40 - 49 2 50 - 59 3 60 - 69 4 70 – 79 5 80 – 89+	GENDER 1 Male 2 Female	Type of LVAD 1 HM II 2 HM III 3 HVAD	Number of Questions Correct	Discharge Date	Readmission Within 30 days 1 Yes 2 No	INR 1 Supratherapeutic INR 2 Subtherapeutic INR
101								
102								
103								
104								
105								
106								
107								
108								
109								
110								
111								
112								
113								
114								
115								
116								
117								
118								
119								
120								

Appendix F

Data Collection Form

Heart Failure Anticoagulation Teach-Back and Readmissions

Data Collection Form

ID	Age Range 1 40 - 49 2 50 - 59 3 60 - 69 4 70 – 79 5 80 – 89+	GENDER 1 Male 2 Female	Type of LVAD 1 HM II 2 HM III 3 HVAD	Number of Questions Correct	Readmission Within 30 days 1 Yes 2 No	INR 1 Supratherapeutic INR 2 Subtherapeutic INR
101						
102						
103						
104						
105						
106						
107						
108						
109						
110						
111						
112						
113						
114						
115						
116						
117						
118						
119						
120						

Table 1

Frequencies and Percentages for Nominal Variables

Variable	*n*	%
AGE_RANGE		
60-69	2	50
70-79	1	25
80-89+	1	25
Missing	0	0
GENDER		
FEMALE	2	50
MALE	2	50
Missing	0	0
Readmitted_within_30_days		
No	2	50
Yes	1	25
Expired	1	25
Missing	0	0
TYPE_OF_LVAD		
HM II	1	25
HM III	2	50
HVAD	1	25
Missing	0	0
INR		
Supratherapeutic	1	25
Missing	3	75

Note. Due to rounding errors, percentages may not equal 100%.

Table 2

Interval and Ratio Variables by Readmission Within 30 Days

Variable	*M*	*SD*	*n*	SE_M	Min	Max	*Mdn*	Mode
NUMBER_OF_QUESTIONS_CORRECT								
No	13.50	0.71	2	0.50	13.00	14.00	13.50	14.00
Yes	13.00	-	1	-	13.00	13.00	13.00	13.00
Expired	14.00	-	1	-	14.00	14.00	14.00	14.00

Note. '-' denotes the sample size is too small to calculate statistic.

Figure 1

Theoretical Framework: Chronic Care Model

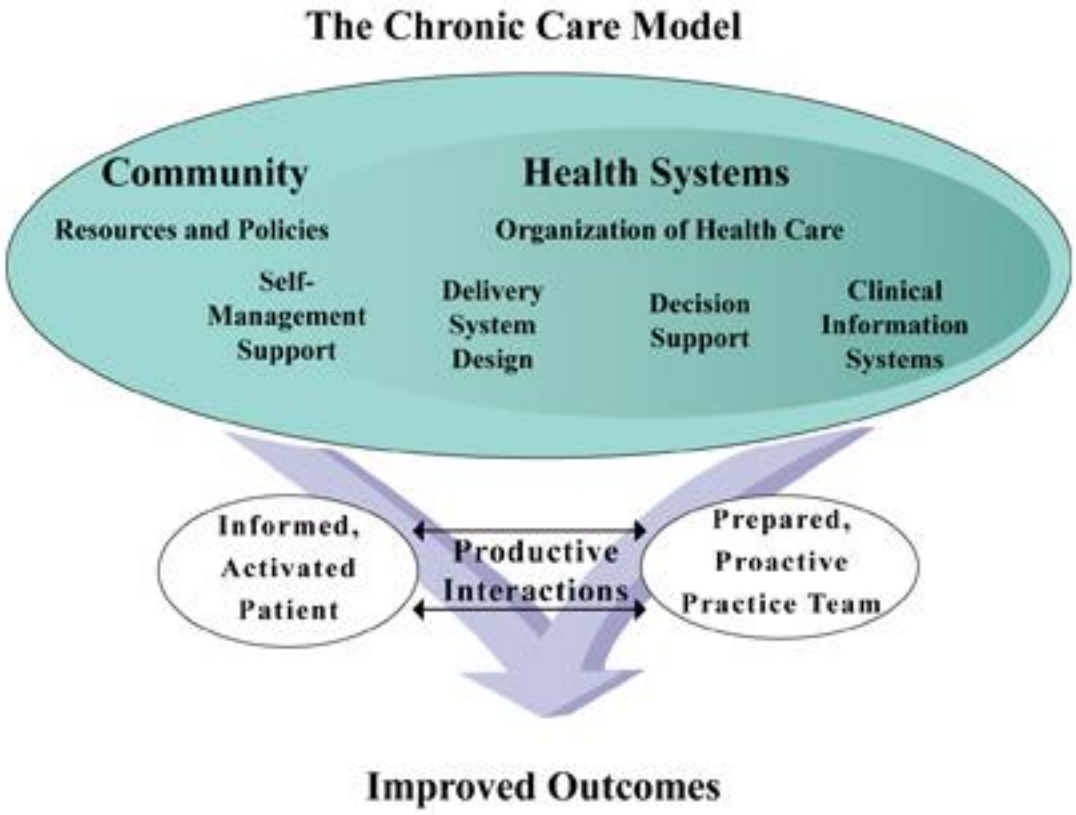

Figure 2

Evidence-Based Practice Model: Model for Evidence-Based Practice Change

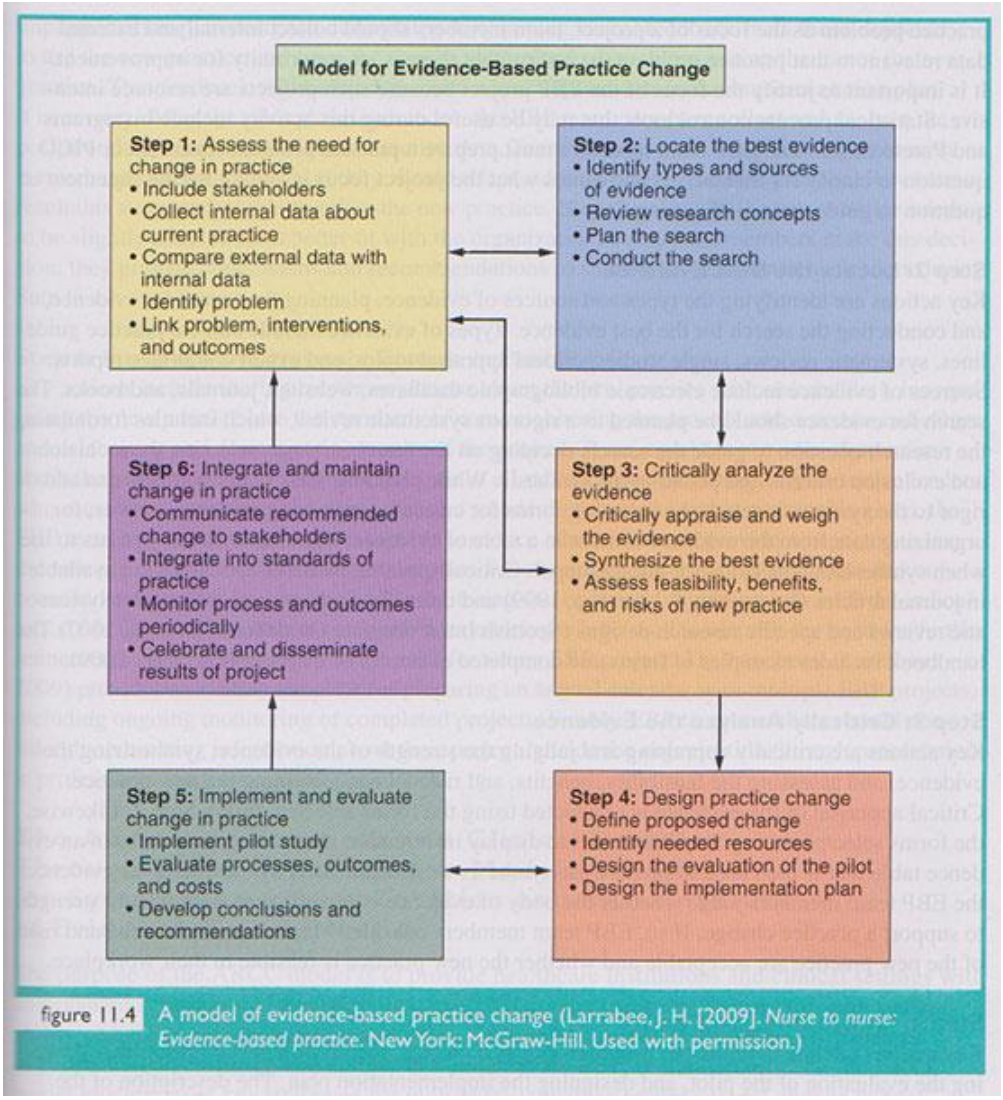

figure 11.4 A model of evidence-based practice change (Larrabee, J. H. [2009]. *Nurse to nurse: Evidence-based practice*. New York: McGraw-Hill. Used with permission.)

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