

Improving the Adherence to Medications After Myocardial Infarction

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Abstract

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Every year about one million Americans experience myocardial infarction (MI) and approximately two-thirds survive the acute phase of MI. The combination of a beta-blocker, a lipid-lowering agent, an angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB), and aspirin are recommended after MI to reduce the risk of coronary artery disease (CAD) mortality. Non-adherence to prescribed medicines following MI remains a common issue and is associated with increased morbidity and mortality. This paper analyzes literature obtained from several databases summarizing available knowledge about factors contributing to non-adherence, consequences of poor adherence to post-MI medications, and interventions to improve patients' adherence to taking medications after MI. Common factors that contribute to non-adherence to prescribed medicines following MI are depression, presence of comorbid chronic diseases, high cost of medications, medication regimen complexity,

patients' fear of the potential adverse effects, and the absence of instant benefits. To improve health outcomes in patients after MI, advanced practice nurses can facilitate better adherence to post-MI medications by prescribing once-daily agents, scheduling regular follow-up visits to review medicine use, educating about medications side effects, encouraging use of a multi-compartment dose administration aid, assessing and treating patients for depression, and managing patients' chronic diseases.

Key Words: medication adherence, post-MI medicines, interventions to improve adherence

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For submission to: The Journal of the American Academy of Nurse Practitioners

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Introduction

Coronary artery disease is one of the leading causes of death in the United States. Every year about one million Americans experience myocardial infarction (MI), and approximately two-thirds survive the acute phase of MI. MI is defined as myocardial cell death due to prolonged myocardial ischemia caused by either a plaque, erosion, dissection, increased oxygen demand or decreased supply (European Society of Cardiology, 2010). The practice guidelines recommend that patients who have experienced MI, should start on (a) a beta-blocker, (b) a lipid-lowering agent, (c) an angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker, and (d) aspirin, if not contraindicated. The combination of these medicines can reduce the risk of coronary artery disease (CAD) mortality by 80% (Choudhry & Winkelmayr, 2007). CAD is defined as a narrowing of the arteries of the heart. Unfortunately, even when medicines are prescribed, only 45% of patients use ACE inhibitors or ARBs after hospital discharge following an MI (Choudhry et al., 2007). Adherence is defined as a person's willingness to start treatment and the ability to take medicines exactly as prescribed (U.S. Department of Health and Human Services, 2009). The purposes of this paper are to review: (a) the factors contributing to non-adherence to taking medicines after an MI, (b) consequences of medication non-adherence after an MI, and (c) evidence for effective interventions to improve patients' medication adherence after an MI.

Theoretical Framework

The Health Belief Model (HBM), conceptualized by Hochbaum and his colleagues in the 1950s (McKinley, 2007), was chosen to guide the literature review about medication non-adherence after an MI. The HBM was initially used to explain the behavior of individuals who opted not to participate in public health programs oriented toward disease prevention (August,

2005). According to the model, adherence to a recommended health action or behavior depends on the person's perceptions of (a) the threat of illness, (b) the health action's possible benefits in preventing or decreasing susceptibility or severity, or both; and (c) physical, psychological, financial, and other barriers or costs related to initiating or continuing the recommended health action. In the HBM, a cue to action has to take place to initiate the recommended health behavior by making a person aware of his or her feelings about the health threat (Becker et al., 1978). For this paper, the HBM will guide the literature review to identify: 1) common contributory factors of patients' non-adherence to post-MI medicines and 2) implications for interventions to improve medication adherence in patients following MI.

Literature Review

A systemic search of all available studies was completed by using CINAHL, PubMed, Medline and PsycInfo databases between 2000 and 2012. "Improving medication adherence" was the term initially used to search each database. Four hundred eighty-four thousand four hundred twenty five articles were further reduced by limiting the search to journal articles and using modifiers such as, "post-MI patients," and "post-MI medication adherence." The search was also limited to English-language articles. The inclusion criterion were as follows: 1) the study had to involve at least 60 patients who had recently experienced an MI, 2) patients had to have been prescribed at least one long-term post-MI medication, which is recommended by practice guidelines (a beta blocker, an ACE inhibitor/ARB, or a statin), and 3) patients had to have a minimum length of a follow-up period of 90 days. After reviewing 68 articles that were identified as significant to the topic, eleven articles were judged to meet the inclusion criteria and were used for the analysis in this paper.

The literature review was organized into the following categories: factors contributing to medication non-adherence in patients after MI (three articles), consequences of medication non-adherence in patients after MI (three articles), and interventions to improve medication adherence in patients after MI (four articles). The literature in each of these areas will be analyzed.

Factors Contributing to Medication Non-Adherence in Patients After MI

Ho et al. (2009) conducted a retrospective cohort study of 15,767 patients in a cardiac artery disease registry to examine adherence rates to beta blockers, ACE inhibitors, and statins. Patient characteristics associated with non-adherence and the clinical consequences of non-adherence to these medicines were documented. The medication adherence rate was determined numerically as the proportion of days covered which was calculated by dividing the total number of days supplied for each class of medication by the time interval observed. The adherence rate to beta blockers was 28.8%, to ACE inhibitors or ARBs was 21.6%, and to statin medications was 26.0%. Non-adherence was more prevalent in patients who were younger and in those who had chronic obstructive pulmonary disease and/or depression as comorbid conditions (Ho et al., 2009).

The main strengths of the study were its large sample size, the presence of data including class specific medication adherence rates, and the median follow-up period of four years. Lack of sufficient facts about drop-out data, reasons for discontinuation of medicines, and implications for the future practice were the major limitations of the study.

Arif et al., (2007) conducted a cross-sectional survey in Pakistan that involved 275 patients who had experienced an MI and 298 patients who had experienced a stroke. The purpose of the study was to determine and compare compliance rates to prescribed medicines, to analyze

compliance with specific types of medicines, and determine reasons for discontinuing prescribed medicines after two years following MI or stroke. The study was performed in two phases: a retrospective medical record review and a structured telephone interview. The researchers used descriptive statistics and bivariate analyses (Chi-square and Fisher exact tests) to analyze non-adherence in patients who had experienced stroke versus MI. Multivariate analysis with forward conditional logistic regression was used to distinguish independent causes of non-adherence to medicines prescribed to patients following MI or stroke. The majority of patients (75%) were highly adherent with post-MI medication regimen, defined as consuming more than half of the medicines prescribed post-MI. In both the stroke and MI groups, antihypertensive medications showed the highest adherence rates (78% in stroke group, 98% in MI group) followed by antiplatelet agents (75% in stroke group, 94% in MI group) and lipid-lowering agents (59% in stroke group, 70% in MI group). Antidiabetics and anticoagulants were the medicines with the lowest adherence rates (28% in the stroke group, 22% in the MI groups for antidiabetic medicines and 7% and 5% for anticoagulants respectively) (Arif et al., 2007).

The main reasons reported for non-adherence to prescribed medicines after MI and stroke were the lack of instant symptom improvement, lack of perceived need for the medicines, high cost of medicines, side-effect intolerance, and difficulty finding needed medicines on the Pakistani market (Arif et al., 2007).

The strengths of the study were the presence of data on reasons for medication non-adherence and the presence of data including class specific medication discontinuation rates. The weaknesses of the study were its limitations in regard to geography (Pakistan only) and retrospective design of the study. Also in regard to study limitations it should be noted that Pakistan is a developing nation with many factors that hinder patients' access to and participation

in healthcare, including poor health literacy, reduced access to medications, low educational level, prioritization of men's health over women's health, and limited financial resources.

Choudhry et al. (2011) conducted the Post-Myocardial Infarction Free Rx Event and Economic Evaluation (MI FREEE) cluster-randomized, controlled study. Inclusion criteria were patients younger than 65 years of age with 2845 of the patients having full prescription medication coverage and 3010 patients having usual prescription medication coverage by Aetna. The goal of the study was to determine whether eliminating out-of-pocket costs of medicines may increase adherence and improve outcomes in patients following MI. The study used administrative claims for its data collection. Medication adherence was determined by dividing the number of days a patient had a supply of each medication class by the number of days of eligibility for that medication. The median duration of follow-up was 394 days. The results of the study revealed that in the usual-coverage group, rates of adherence were 35.9% for ACE inhibitors or ARBs, 45.0% for beta-blockers, 49.0% for statins, and 38.9% for all three medication classes. In the full-coverage group, rates of adherence, as compared to the usual coverage group, increased by 5.6 percentage points for ACE inhibitors or ARBs, by 4.4 percentage points for beta blockers, by 6.2 percentage points for statins, and by 5.4 percentage points for all three medication classes. The rates of total major vascular events or revascularization were notably reduced in the full-coverage group (21.5 vs. 23.3, $P = 0.03$) as was the rate of the first major vascular event (11.0 vs. 12.8, $P = 0.03$) (Choudhry et al., 2011).

The strengths of the study were its large sample size, use of randomized cluster sampling, measurements of class-specific medication adherence rates, median follow-up of greater than a year, and data regarding outcome event rates between the two groups. There are several limitations of the study, such as the reliance on the utilization of administrative claims for data

collection, restriction to participants with Aetna insurance only, and lack of information about reasons other than cost that contributed to medication discontinuation.

Consequences of Medication Non-Adherence in Patients After MI

Ho et al., (2006) conducted a prospective cohort study examining 1521 patients post-MI from 19 hospitals. The patients were questioned regarding adherence to post-MI medicines and consequences of non-adherence. Rates of medication use for aspirin, beta blockers, statins, and the combination of all three medicines were compared. The results indicated that approximately one in five patients discontinued use of aspirin, beta-blockers, or statins and one in eight patients discontinued use of all three medicines within one month after MI. The patients who discontinued all the medicines showed lower one-year survival rate (88.5% survived) compared with patients continuing use of one, two, or three of recommended post-MI medications (96.4%, 97.8%, and 97.8%, log-rank $P= 0.00$, respectively). In addition, the patients who discontinued all their medicines had more comorbid conditions and were less likely to have coronary revascularization during hospitalization (Ho et al., 2006).

The major strengths of the study included the large and generalized sample of the study, the use of interview specialists, rigorous inclusion criteria, and use of three different sources for collecting data to ensure accuracy. The weaknesses of the study included reliance on patients' self-reporting of medication use and lack of data presenting reasons for medication discontinuation.

Rasmussen, Chong, and Alter (2007) conducted a population-based, observational and longitudinal study between 1999 and 2003 of 31,455 seniors, ages 65 and older after MI using an electronic data base to explore the relationship between medication adherence and mortality. Adherence rates were calculated by using data on the quantity dispensed and number of days

supplied from each filled prescription and the proportion of days on which a patient had medicines available in the year following the first filled prescription after discharge (proportion of days covered (PDC)). The results showed a positive relationship between adherence to statins and beta-blockers and survival following MI. Patients with poor adherence to statins (PDC < 40%, P= 0.001) were at 25% higher risk of death than the patients with high levels of adherence to statins (PDC > 80%). Adherence and mortality relationship was similar in statins users and beta blockers users. The study results did not indicate any relationship between calcium channel blocker adherence and mortality (Rasmussen, Chong, and Alter, 2007).

The strengths of the study included a long follow-up period, medication class-specific adherence-mortality gradients and the study's large sample size. The limitations of the study were the study's restriction to older adults, lack of data on reasons for discontinuation of medicines, restricted geographical area of the research (Ontario, Canada only), and the use of electronic medical records and prescription claims database as a data source.

Jackevicius, Li, and Tu (2008) conducted a population-based cohort study of 4591 patients following MI that were 65 years of age and older to determine the causes of medication non-adherence and to measure outcomes, such as one-year mortality, associated with primary non-adherence to post-MI medications. An MI registry linked with administrative records in Ontario, Canada including a prescription claims database were used to collect the data. The one-year mortality rates for patients who filled all, some, or none of their post-MI prescriptions were 12.8%, 20.5%, and 30.4%, respectively. The patients who filled some versus all (OR, 1.44; 95% CI, 1.15 to 1.79; P= 0.001) and none versus all (OR, 1.80; 95% CI, 1.35 to 2.42; P= 0.0001) of their discharge medicines were at a higher risk of death within one year following discharge. The study also suggested that factors such as discharge medication counseling and post-

discharge follow-up may help to improve medication adherence in patients after MI (Jackevicius, Li, & Tu, 2008).

The main strengths of the study were its large sample size and drug-specific filling rates findings. The main limitations of the study were its age restriction to patients 65 years-old and older, lack of data on comorbid conditions and the possible covariates that may impact mortality, and lack of data on medicines prescribed by ambulatory physicians in addition to medicines prescribed at the time of hospital discharge.

Interventions to Improve the Adherence to Medications After MI

Smith et al. (2008) conducted a cluster, randomized controlled trial of 836 patients following MI using a qualitative method to explore if a direct-to-patient intervention can improve adherence to beta blockers after MI. The study's results showed that after two mailings two months apart describing the importance of using beta-blockers, the proportion-of-days covered (PDC: the quantity of medicine dispensed and days supplied from each prescription) in the intervention group was 80 % or more at nine months after the intervention. Patients in the intervention group had a mean absolute increase of 4.3% of days covered per month compared with patients in the control group representing 1.3 extra days ($P= 0.04$). The patients in the intervention group were 17% more likely (relative risk, 1.17; 95% confidence interval, 1.02-1.29) to have 80% of days covered than the patients in the control group (Smith et al., 2008).

The major strengths of the study were the large sample of the study, use of pharmacy records for data collection, and the study's large geographical footprint, which took in areas from very different regions of the United States. The main limitations of the study included a lack of data on medication discontinuation reasons and the patients' participation in a prepaid integrated system of care delivery as inclusion criteria for the study.

Shah et al. (2009) conducted a cohort study of 292 patients following MI (with a mean age of 65 years) to determine long-term adherence to medicines after MI and the factors associated with long-term medication adherence among these patients. The study concluded that among patients who filled a prescription for statins, beta blockers, or ACE inhibitors/ARBs, only 44%, 48%, and 43% respectively continued taking the medicines for three years following MI. Enrolling in cardiac rehabilitation was the single, most important factor to determine medication adherence (Shah et al., 2009).

The study's strengths were the prolonged follow-up period of four years and the cohort's community-based origin. The study's weaknesses were the limited scope in terms of socioeconomic groups that were covered by the study, use of medical records and pharmacy claims for data collection, and no statistical data presented on factors affecting medication discontinuation.

Daugherty et al. (2008) evaluated 1516 hospitalized patients following MI using the multicenter Prospective Registry Evaluating Outcomes After Myocardial Infarction: Events and Recovery registry. The goal of the study was to determine whether early follow-up at one month and six months improves adherence to aspirin, beta blockers, ACE inhibitors, and statins and survival rate at six months. Patients who received early follow-up from healthcare providers were more likely to be prescribed beta blockers (80.1% vs 71.3%; $P= 0.001$), aspirin (82.9% vs 77.1%; $P= 0.01$), or statins (75.9% vs 68.6%; $P= 0.005$) at six months compared to patients who did not receive early follow-up. The relationship has been shown between early follow-up and beta blocker use (risk ratio, 1.08; 95% confidence interval, 1.02-1.15). Also, more statin use was shown in patients receiving collaborative follow-up (risk ratio, 1.11; 95% confidence interval, 1.01-1.22). Patients who received follow-up at one month compared with patients without any

follow-up were more likely to be alive at six months after hospital discharge (98.5% vs 96.9%, unadjusted HR, 0.46; 95% CI, 0.23-0.91) (Daugherty, 2008).

The main strengths of the study included a large sample and data on adherence rates to each of the recommended medicines. The limitations were lack of data on reasons of mortality, use of medical records for data collection, short follow-up period of six months, and no data on reasons of patients' loss to follow-up.

The National Heart Foundation of Australia (2011) developed a toolkit "Improving adherence in cardiovascular care" for healthcare professionals which is a comprehensive summary of evidenced-based studies published from 1972-2011. The goal of the toolkit was to help improve medication adherence in cardiac patients. The information in the toolkit is divided into six modules and each module is assigned a specific topic, such as defining and describing adherence, the principles, how to identify non-adherent patients, how to help patients in self-management, how to improve patients' adherence to cardiovascular medicines, and roles of healthcare professionals in facilitating patient adherence to prescribed medicines. The interventions to improve patients' adherence to cardiac medicines included patient education about medicines in a form of verbal discussion and written instructions, such as brochures, newsletters, and fact cards. In addition to the verbal and written forms of education, the toolkit suggested the use of behavioral interventions to improve medication adherence in cardiac patients.

The Health Belief Model was chosen to guide healthcare professionals to improve adherence to cardiac medications. The HBM suggests that the patients' beliefs and perception of disease severity, potential treatment benefits from treatment, fears of adverse medication reactions, and desire to adhere to the treatment should be assessed in order to determine the likelihood of medication adherence. Based on the results of the conversation, Motivational Interviewing

techniques were suggested by the toolkit to improve patients' adherence to prescribed medicines to treat cardiovascular disease. Other interventions to improve medication adherence were telephone calls and letters as reminders about the importance of taking medicines as prescribed, home blood pressure monitoring, calendar blister packages, and regimen simplification (The National Heart Foundation of Australia, 2011).

The main strengths of the paper were the comprehensive and detailed information on adherence to cardiac medications and the interventions to improve it which was based on numerous evidence-based studies published from 1972-2011. The main limitations of the toolkit were the lack of data and research methods and the inclusion of a population with a variety of cardiovascular conditions (including hypertension, heart failure, and coronary artery disease).

Discussion

Non-adherence to medication recommendations following MI is a serious problem which can lead to increased morbidity and mortality. The purpose of this paper was to review the factors contributing to non-adherence to post-MI medicines, the consequences of medication non-adherence after MI, and effective interventions to improve patients' adherence to taking medicines after MI. The articles selected for the review were evidence-based and peer-reviewed; however, more well-designed studies are necessary to formulate recommendations about effective interventions to improve adherence to post-MI medications.

Analysis of several studies has shown that common factors that contribute to non-adherence to post-MI medications are the absence of instant benefits to patients, the absence of noticeable symptoms, medication side effects intolerance, the high cost of medications, and need for multiple-dose daily treatment. Patient characteristics associated with non-adherence to post-MI medications are young age, the presence of chronic obstructive pulmonary disease, and

depression. Most of the studies that identified factors contributing to non-adherence to post-MI medications included data about class-specific medication adherence rates which was the main strength of the studies. The main limitation of the studies aimed at identifying factors contributing to non-adherence to post-MI medications was the use of retrospective design and electronic medical records or prescription claims as their data source. Thus, findings were dependent on the accuracy of the source data which could not be verified by the researchers. Restricted geographical area of research, short follow-up periods, and lack of information about the reasons participants discontinued medicine use were the other weaknesses of the studies.

The main consequence of non-adherence to post-MI medications is increased mortality, especially with poor adherence to statins and beta-blockers. Studies that were chosen to investigate a relationship between poor adherence to post-MI medications and mortality rate were evidence-based studies. They used large sample sizes, rigorous inclusion and exclusion criteria, and employed appropriate statistical techniques to evaluate adherence and mortality according to use of specific medicines. The main weaknesses of these studies were limited geographical area of research, age restriction, analysis of existing databases, and lack of data on reasons participants discontinued medicines use.

Interventions to reduce medication regimen complexity, remind patients about the importance of medication adherence, schedule early follow-up to review medicines, educate patients about potential side effects of medicines and an importance of enrolling in cardiac rehabilitation, and encourage patients to use multi-compartment dose administration aids (e.g., calendar blister packaging) have been shown to successfully increase medication adherence in patients following MI. Motivational Interviewing is another successful technique to improve patients' adherence to prescribed medicines following MI. The main strengths of the studies were large samples and

prolong follow-up period. The weaknesses of the studies included lack of data on reasons of patients' mortality, use of medical records for data collection, and no data on factors affecting medication discontinuation.

The Health Belief Model was chosen as a theoretical framework of this paper to understand the reasons for non-adherence to post-MI medicines and formulate effective interventions to improve post-MI medication adherence. Intervention success is dependent on a healthcare provider's ability to develop a trusting relationship with the patient. A trusting relationship allows the patient to share with the healthcare provider his or her health beliefs, possible concerns about prescribed medicines, fears about possible side effects, and any physiological, psychological, or financial problems which can interfere with the patient's ability to take prescribed medicines.

Findings from the literature review had several limitations. Although all the articles included in this study were evidence-based, more prospective studies should be done and analyzed in order to develop specific conclusions. Some evidence-based articles reviewed in this study had small sample sizes and short follow-up periods. The literature reviewed in this study used different measures of adherence with different instruments which can interfere with accuracy and consistency of the results across different studies. More standardized assessment of adherence and the type of non-adherence needs to be developed to guide the development of effective interventions to improve post-MI medication adherence.

Significance for Nurse Practitioner Practice

Nurse practitioners play an important role in improving patients' adherence to prescribed medicines post-MI. There are several interventions which can be utilized by nurse practitioners in their practice to improve adherence to medicines in patients post-MI including frequent

education about the disease with emphasis on its causes, the severity of the disease, treatment guidelines, how the medicines work, possible medication side effects, and consequences of not following the prescribed regimen. Educating patients about the critical importance of adhering to the post-MI treatment regimen despite the absence of symptoms is an important step. Another strategy to improve patients' adherence to post-MI medicines is the periodically reviewing patients' current medications in conjunction with the following measures if applicable: simplification of the medication regimen, scheduling regular follow-ups, assessing and treating patients for depression, managing chronic diseases, and encouraging patients to use a multi-compartment dose administration aid. Another strategy that might be successful in improving adherence to post-MI medicines is reminding patients about the importance of taking post-MI medicines by mailing or emailing written information that is messaged in lay terms at an appropriate literacy level.

For better adherence to post-MI medicines, it is important for nurse practitioners to establish a trusting relationship with their patients in order to assess the patients' barriers to medication adherence and successfully apply interventions to eliminate existing barriers. Nurse practitioners can improve patients' adherence to post-MI medicines by using Motivational Interviewing techniques.

Summary

Adherence to pharmacological therapies in patients after MI is poor, thus, leading to increased morbidity, mortality, and rehospitalization (Choudhry & Winkelmayr, 2007). A literature review revealed that non-adherence to post-MI medicines is common in young patients and patients with chronic obstructive pulmonary disease and depression (Ho et al., 2009). The primary factors contributing to non-adherence to post-MI medicines are the requirement of a

multiple-dose daily treatment, the absence of instant benefits to patients, the absence of obvious symptoms, high cost of medicines, and the potential for adverse effects. Consequences of non-adherence to post-MI medicines include higher one-year mortality rates (Ho et al., 2006).

Advanced practice nurses can help increase adherence to post-MI medicines and improve health outcomes in patients after MI by simplifying the medication regimens by prescribing single-dose daily agents, frequently reviewing medications with patients, educating patients about medication side effects and an importance of enrolling in cardiac rehabilitation, scheduling regular follow-up appointments, and encouraging use of a multi-compartment dose administration aid.

Unfortunately, despite the severity of the problem of non-adherence to post-MI medicines, there are very few studies available which focus on adherence to post-MI medicines or on interventions to improve adherence.

Absence of meta-analyses, loss of patients to follow-up, small sample sizes, lack of standardized adherence measures, and lack of specific medications adherence rates and its relationship to morbidity and mortality are the common limitations of studies on non-adherence. In order to develop effective interventions and to increase adherence to medicines following MI, a greater number of studies need to be done. Future research using prospective design, standardized adherence measures, drug-specific adherence rate calculations, designs that control for confounding variables, and follow-up period of more than a year needs to be done so that more effective interventions to improve adherence to medicines following MI, thus, improving survival among patients after MI, can be added to present methods.

References

- Arif, H., Aijaz, B., Islam, M., Aftab, U., Kumar, S., & Shafqat, S. (2007). Drug compliance after stroke and myocardial infarction: A comparative study. *Neurology India*, 55(2), 130-135.
- August, S. M. (2005). Medication adherence among the elderly: A test of the effects of the Liberty 6000 technology (Doctoral dissertation). Retrieved from http://digital.library.unt.edu/ark:/67531/metadc4979/m1/1/high_res_d/dissertation.pdf
- Becker, M. H., Radius, S. M., Rosenstock, I. M., Drachman, R. H., Schuberth, K. C., & Teets, K. C. (1978). Compliance with a medical regimen for asthma: A test of the health belief model. *Public Health Reports*, 93(3), 268-277.
- Choudhry, N. K., Avorn, J., Glynn, R. J., Antman, E. M., Schneeweiss, S., Toscano, M., ... Shrank, W. H. (2011). Full coverage for preventive medications after myocardial infarction. *The New England Journal of Medicine*, 365(22), 2088-2097.
- Choudhry, N. K., Setoguchi, S., Levin, R., Winkelmayer, W. C., & Shrank, W. H. (2008). Trends in adherence to secondary prevention medications in elderly post-myocardial infarction patients, *Pharmacoepidemiology and Drug Safety*, 17(12): 1189–1196.
- Choudhry, N. K., & Winkelmayer, W. C. (2007). Medication adherence after myocardial infarction: A long way left to go. *Journal of General Internal Medicine*, 23(2), 216-218.
- Daugherty, S. L., Ho, M. P., Spertus, J. A., Jones, P. G., Bach, R. G., Krumholz, H. M., Peterson, E. D. (2008). Association of early follow-up after acute myocardial infarction with higher rates of medication use. *Archives of Internal Medicine*, 168(5):485-491.
- European Society of Cardiology. (2010). Universal Definition of Myocardial Infarction. Retrieved from <http://www.escardio.org/guidelines-surveys/esc-guidelines/GuidelinesDocuments/guidelines-universal-MI-slides.pdf>

- Ho, M. P., Spertus, J. A., Masoudi, F. A., Reid, K. J., Peterson, E. D., Magid, D. J., ... Rumsfeld, J. S. (2006). Impact of medication therapy discontinuation on mortality after myocardial infarction. *American Medical Association, 166*, 1842-1847.
- Ho, M. P., Magid, D. J., Shetterly, S. M., Olson, K. L., Maddox, T. M., Peterson, P. N., ... Rumsfeld, J. S. (2009). Medication non-adherence and adverse outcomes in CAD patients. *Cardiology Review, 26*(2), 22-26.
- Jackevicius, C. A., Li, P., & Tu, J. V. (2008). Prevalence, predictors, and outcomes of primary nonadherence after acute myocardial infarction. *Circulation, 117*, 1028-1036.
- McKinley, T. (2007). Health Belief Model (HBM). Mercer University. [PPT slides]. Retrieved from http://faculty.mercer.edu/thomas_bm/classes/641/Health%20Belief%20Model.pdf
- National Heart Foundation of Australia. (2011). Improving Adherence in Cardiovascular Care: A Toolkit for Health Professionals. Retrieved from <http://www.heartfoundation.org.au/SiteCollectionDocuments/Improving-adherence-in-cardiovascular-care-toolkit.pdf>
- Rasmussen, J. N., Chong, A., & Alter, D. A. (2007). Relationship between adherence to evidence-based pharmacotherapy and long-term mortality after acute myocardial infarction. *Journal of American Medical Association, 297*(2), 177-186.
- Shah, N. D., Dunlay, S. M., Ting, H. H., Montori, V. M., Thomas, R. J., Wagie, A. E., & Roger, V. L. (2009). Long-term medication adherence after myocardial infarction: Experience of a community. *The American Journal of Medicine, 122*(10), 961.e7-961.e12.
- Smith, D. H., Kramer, J. M., Perrin, N., Platt, R., Roblin, D. W., Lane, K., ... Soumerai, S. B. (2008). A randomized trial of direct-to-patient communication to enhance adherence to

beta blocker therapy following myocardial infarction. *Archives of Internal Medicine*, 168(5), 477-483.

U.S. Department of Health and Human services. (2009). What is treatment adherence? Retrieved from http://www.aidsinfo.nih.gov/contentfiles/whatistreatmentadherence_fs_en.pdf

U.S. Department of Health and Human Services. (2011). Acute myocardial infarction (AMI): mortality rate. Retrieved from <http://qualitymeasures.ahrq.gov/content.aspx?id=26500>