

Reducing Readmission Rates in Heart Failure and Acute Myocardial Infarction by Pharmacy Intervention

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Abstract: Background: Hospital readmissions are common, costly and largely preventable. Objectives: To evaluate the impact of a pharmacy-led medication discharge and post discharge counseling program on 30 day readmission rates for HF (heart failure) and AMI (acute myocardial infarction). Methods: Three month prospective, quality improvement, pilot study with HF and AMI patients who received pre-discharge and post-discharge medication counseling from December 2013 to February 2014 whose 30 day readmission rates were compared to readmission rates from the previous fiscal year. Results: Fifty-one patients were included in the study. Primary endpoint of 30-day readmission rates showed a 33.9% decrease for AMI and a 50.1% decrease for HF in readmission rates compared to the previous fiscal year, with a potential annual savings of \$458,800. The study also identified 25.5% of patients having at least one medication error that was identified through medication reconciliation. Conclusions: Pharmacy provided medication reconciliation and medication discharge counseling reduced readmission rates as well as decreased medication errors. There is also a potential for significant health cost savings.

Key words: Readmission, pharmacy intervention, discharge counseling, medication reconciliation, heart failure, acute myocardial infarction.

1. Introduction

Hospital readmissions are common, costly, largely preventable, and suggest poor quality of care. Nearly 20% of Medicare beneficiaries are readmitted within 30 days after discharge resulting in costs of approximately \$17 billion annually [1]. Unplanned readmissions have been attributed to things such as premature discharge; failure to coordinate and reconcile medications; poor communication between hospital personnel, patients, caregivers, and community-based clinicians; and poor discharge planning [1, 2].

In response to these high readmission numbers, associated costs, as well as a way to improve patient care, the government passed the ACA (Affordable Care Act) in 2010. The ACA established the HRRP (Hospital Readmission Reduction Program), which

required the CMS (Centers for Medicare and Medicaid Services) to reduce repayment to hospitals that have excess readmissions for selected conditions beginning at October 1, 2012. The current conditions being measured and penalized for are HF (heart failure), AMI (acute myocardial infarction), and PN (pneumonia). Beginning in fiscal year 2015, CMS plans to include COPD (chronic obstructive pulmonary disease) exacerbations as well as elective total hip and knee arthroplasty [3].

Readmissions are defined as all readmissions, for any reason, to any short-term acute care hospital within 30 days of discharge, with two exceptions: planned readmissions and same-day readmissions for the same condition to the same hospital. CMS has developed a calculation to measure a hospital's readmission rates, which is then compared to the national average to determine if a hospital is considered to have excess readmissions [3]. The current penalty is up to 2% reduction in annual repayment and will increase to 3% for fiscal year 2015. All acute care hospitals paid under

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the CMS inpatient prospective payment system are at risk for these penalties. As of October 1, 2013, 2,225 hospitals will incur penalties totaling \$227 million [4].

With financial penalties increasing for excess 30 day readmissions, many hospitals have attempted to identify causes for readmissions and implemented interventions to reduce these rates. Proper medication management and patient understanding of their medication regimen and disease states play a large role in preventing readmissions in patients with heart failure and acute myocardial infarction. Currently most of the medication discharge counseling is performed by health care professionals other than those in pharmacy, typically nurses. This is an area that pharmacists could potentially have a significant impact in reducing readmissions. Several studies have been done on pharmacists providing discharge counseling, but few have looked at the impact of pharmacists providing a follow-up telephone call in addition to discharge medication counseling [5-8].

Although MHSW (Memorial Hermann Southwest Hospital) has been below the national average in 30 day readmission rates for the past two fiscal years for HF and AMI, there has been a slight increase in readmissions from fiscal year 2012 to fiscal year 2013 (Fig. 1). With all hospitals focusing on decreasing readmission rates it can be expected to see the national average to decrease in the upcoming years. Therefore, MHSW piloted a pharmacy-led medication discharge program to help prevent readmissions for HF and AMI.

The counseling program involved pharmacy residents and pharmacy students providing discharge medication counseling to all patients discharged with HF and AMI as well as providing a telephone follow-up 3-5 days after patient were discharged home. The discharge counseling process was based off the Hospital to Home initiative led by the American College of Cardiology and the Institute for Healthcare Improvement [9]. The standard practice previously was for a member of nursing to provide medication education and a member of patient relations provided the follow-up telephone calls. This study evaluated the impact of having a member of pharmacy perform both of these tasks.

2. Methods

This was a 3-month, single-center, retrospective, pilot study with an intervention period from December 2013 to February 2014. Since this was a pilot study performing tasks already required in the hospital, neither IRB approval nor informed consent were required. Patients were included in the study if they were admitted as an inpatient to MHSW, received both pre-discharge and post-discharge counseling from a pharmacy member, and had a discharge diagnosis of either HF or AMI. Patients were included regardless of success of follow-up given protocol was followed and two attempts were made to contact the patient, or one attempt if incorrect contact information was available. Patients were excluded if they were discharged to another acute care facility, left against medical advice,

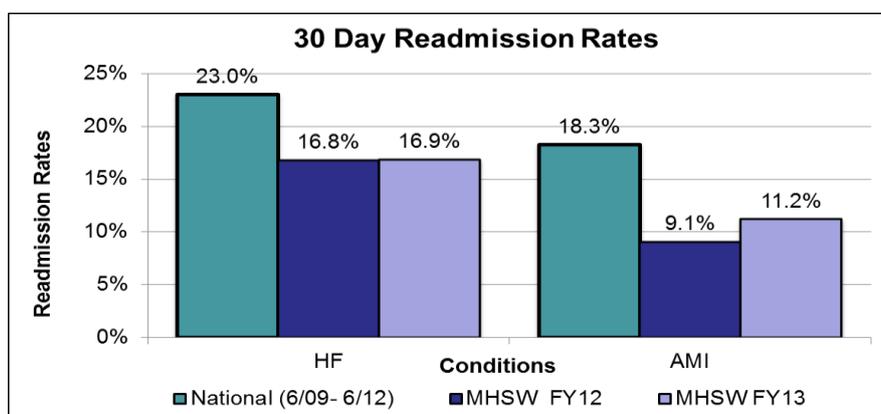


Fig. 1 Memorial Hermann South West Hospital (MHSW) 30 day readmission rates for fiscal year (FY) 2012 and 2013 compared to national average.

or did not receive appropriate post-discharge follow-up.

2.1 Intervention

A medication discharge program was implemented utilizing fourth year pharmacy students and pharmacy residents who provided medication reconciliation and medication counseling of all cardiac medication prior to and following discharge. The three steps in the process were patient identification, inpatient medication reconciliation and counseling, and post-discharge medication reconciliation and counseling. Extensive education and training was provided using guidelines and demonstrations. Competency was determined by observation.

Identification of patients to be counseled was accomplished by using both the DRG codes from the hospital's daily census report and the patient's admitting diagnosis. Patient's electronic medical record was reviewed for a more accurate diagnosis prior to counseling.

After patients were identified as candidates for counseling according to the program a patient work-up and medication reconciliation were performed, using patient work-up form (Fig. 2). Inpatient medications were reconciled against patient's home medications on admission as well as the appropriateness of the medications for the given disease state. If any discrepancies were identified, and there was no documentation explaining in the patient's electronic medical record, the physician was contacted. A medication information packet was then created for all cardiac medications using Lexi-comp® patient handout feature. If a patient's home medication was a different drug in the same class from what they were receiving in the hospital, patient was informed of this during counseling. Patients were counseled on medication name, brand and generic, dose and frequency, indication, duration, possible side effects, importance of adherence, medications to avoid, as well as the importance of controlling other disease states

such as diabetes, hypertension, and hyperlipidemia. Along with the medication packet prepared, the patient also received written information on the patient's disease state with basic medication information. The goal was to counsel patients on day 2 of their admission as many patients only stay 3 to 4 days. For non-English speaking patients translators were used as necessary.

Upon discharge, patient's electronic medical record was again reviewed for diagnosis confirmation prior to follow-up, which was again reviewed upon analysis. For the post-discharge follow-up, patients were contacted via telephone where medication reconciliation was conducted, as well as, more in-depth questions and education regarding medications. The medication reconciliation was similar to the inpatient reconciliation however during the follow-up patients were asked to recite what medications they were currently taking, dose, and frequency, which was compared to the home medication list provided at discharge. If being unable to recite the medications, the medication list was read to the patient to verify their current regimen. Regardless of the manner for which the reconciliation was performed, for each medication the indication and any pertinent information were reiterated. Patients were asked about any trouble obtaining their medications, if they were experiencing any side effects, and they had any questions. If an issue was identified to require follow-up, it was document as such in the online callback form and patients were also instructed to follow-up with their primary provider or cardiologist if anything should arise. The goal was to follow-up in 3-5 days of discharge with a maximum of two callback attempts, which is in line with the previous standard of practice.

2.2 Outcomes

Data collection and analysis were done to evaluate the effectiveness of the medication discharge counseling program by comparing MHSW 30 day readmission rates for HF and AMI from fiscal year 2013 to the 30 day readmission rates of the patients

Patient Name/FIN/Location		Phone #: _____	Date of Admission: _____
Patient Demographics			
Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female Age: _____			
Race: <input type="checkbox"/> Caucasian <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Other: _____			
Language: <input type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> Other: _____			
Allergies: _____			
Past Medical History		Admission Diagnosis	
<input type="checkbox"/> CAD <input type="checkbox"/> PCI <input type="checkbox"/> CABG <input type="checkbox"/> Previous MI <input type="checkbox"/> PCI <input type="checkbox"/> CABG <input type="checkbox"/> CHF <input type="checkbox"/> Diabetes A1c: _____ <input type="checkbox"/> Hypertension <input type="checkbox"/> Hyperlipidemia LDL: _____ <input type="checkbox"/> Afb <input type="checkbox"/> Stroke <input type="checkbox"/> COPD <input type="checkbox"/> CKD <input type="checkbox"/> Hypothyroidism <input type="checkbox"/> Valve replacement <input type="checkbox"/> MVR <input type="checkbox"/> AVR <input type="checkbox"/> Obesity (BMI >30) <input type="checkbox"/> Current Smoker <input type="checkbox"/> Other: _____		<input type="checkbox"/> Heart Failure <input type="checkbox"/> Systolic <input type="checkbox"/> Diastolic <input type="checkbox"/> Acute Myocardial Infarction <input type="checkbox"/> NSTEMI <input type="checkbox"/> STEMI <input type="checkbox"/> Medication Management <input type="checkbox"/> PCI: <input type="checkbox"/> BMS <input type="checkbox"/> DES <input type="checkbox"/> CABG	
Patient Counseling			Date Counseled: _____
<input type="checkbox"/> Medications <input type="checkbox"/> Name <input type="checkbox"/> Indication <input type="checkbox"/> Dose/Freq <input type="checkbox"/> Adherence <input type="checkbox"/> Side effects <input type="checkbox"/> Duration <input type="checkbox"/> Medication counseling packet given <input type="checkbox"/> Medications to Avoid Importance of: <input type="checkbox"/> Blood pressure control <input type="checkbox"/> Hyperlipidemia control <input type="checkbox"/> Diabetes control <input type="checkbox"/> Follow-up appointments Caregiver present: <input type="checkbox"/> Yes, relation: _____ <input type="checkbox"/> No <input type="checkbox"/> Translator Used Counseled by: <input type="checkbox"/> Student <input type="checkbox"/> Resident Time Spent: _____ min (workup and counseling)			
Medication Errors/Interventions		# of errors _____	Discharge
Error: (please explain) _____			Date of Discharge: _____
<input type="checkbox"/> Omission <input type="checkbox"/> Duplication <input type="checkbox"/> Wrong Drug <input type="checkbox"/> Wrong Dose/Frequency <input type="checkbox"/> Allergy <input type="checkbox"/> Contraindication <input type="checkbox"/> Other			Discharge Diagnosis: <input type="checkbox"/> HF <input type="checkbox"/> AMI
Interventions: _____ (please explain any interventions made)			Discharged home: <input type="checkbox"/> Yes <input type="checkbox"/> No
			Length of hospital stay: _____ days
Follow-up Phone Call			Date: Attempt # 1: _____ Attempt # 2: _____
Spoke with: <input type="checkbox"/> Patient <input type="checkbox"/> Caregiver			
<input type="checkbox"/> Patient is correctly taking all meds (if No, please explain) _____ <input type="checkbox"/> Patient states understanding of medications <input type="checkbox"/> Patient has follow-up appointments scheduled <input type="checkbox"/> Medication errors identified (if ye, please explain) _____ <input type="checkbox"/> Translator Used			
Phone call made by: <input type="checkbox"/> Student <input type="checkbox"/> Resident			Time spent for phone call: _____ min

Fig. 2 Patient work-up form.

included in the study. The primary endpoint was 30 day readmission rates to any Memorial Hermann Healthcare System hospitals. Other data that was evaluated included the time requirements for the counseling, medication errors, and the potential cost savings.

3. Results

A total of 51 patients met inclusion criteria and were included in the study, 27 of the patients had a discharge diagnosis of AMI and 24 had a discharge diagnosis of HF, of which 66.7% and 54.2% were males,

respectively. For the 51 patients included, 33.3% were Caucasian, 29.4% African American, 25.5% Hispanic, and 11.8% were Asian descent. Regarding successfulness of callback, 67% of AMI patients were reached and 60% of HF patients. The mean length of stay was 6.2 days and 4.8 days for AMI and HF respectively. Other patient characteristics can be found in Table 1.

For the primary endpoint of 30 day readmission rates, the readmission rates of the 51 patients included in the study were compared to the readmission rates of the previous fiscal year, fiscal year 2013 for each HF and

Table 1 Patient characteristics.

Patient Characteristics	AMI (n = 27)	HF (n = 24)
Age, mean (years)	62.5	68.9
Sex, male	18 (66.7%)	13 (54.2%)
Language:		
English	24 (88.9%)	19 (79.2%)
Spanish	3 (11.1%)	5 (20.8%)
Vietnamese	0	1 (4.2%)
Length of stay, mean (days)	6.2 (2.3-18.6)	4.8 (1.2-17.1)
Day of stay counseled, mean	3	2
Successful callbacks	17 (67%)	13 (56.5%)
Day of follow-up after discharge	5 (1-8)	6 (2-10)

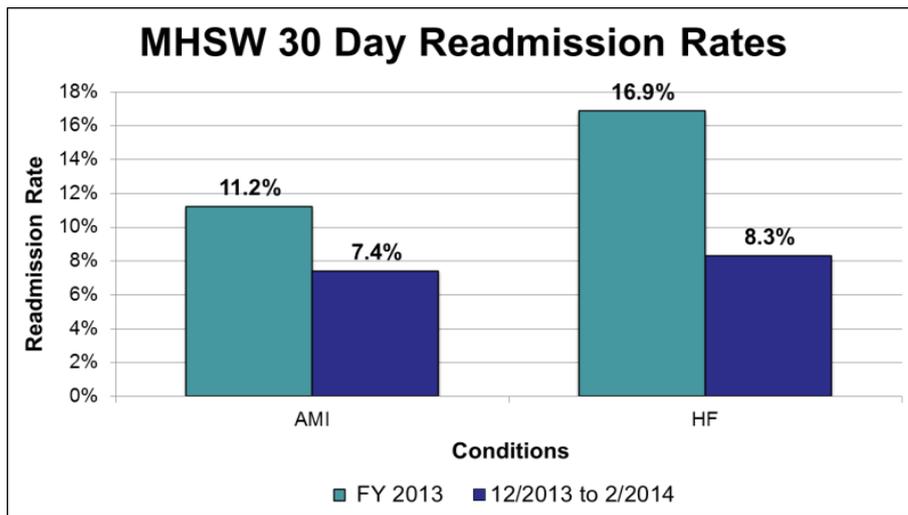


Fig. 3 Primary endpoint of readmissions during the study period of Dec 2013 to February 2014 to fiscal year (FY) 2013* readmission rates. *July 2012 to June 2013

AMI. The study found a 33.9% decrease in 30 day readmissions rates compared to the previous fiscal year for AMI and a 50.9% decrease in HF. There were two patients in each group readmitted to a Memorial Hermann Healthcare System hospital within 30 days of discharge which equates to a 7.4% readmission rate for AMI and an 8.3% rate for HF (Fig. 3). There were no trends related to medications found among the patients that were readmitted. Of the four patients readmitted, two were readmitted for reasons relating to their diagnosis. One of these patients, is frequently admitted due to lack of resources, was readmitted for another HF exacerbation. The second patient was readmitted for pseudoaneurysm of his groin, following stent placement for an AMI. The other two patients, one from each group were readmitted for reasons unrelated

to their cardiac disease.

Medication reconciliation data analysis showed that 25.5% of the patients a medication error or discrepancy was identified. Nearly half of these errors, 46%, were due to an omission of a medication. An example of an error of omission was the absence of statin, with no contraindication, for an AMI patient. In these situations, the physician was contacted and the error was corrected. An error of duplication was identified on the post-discharge follow-up in which a patient was receiving one ACE inhibitor in the hospital, and had a different ACE inhibitor at home and following discharge was taking both medications, patient was instructed to only take one and follow-up with his physician. A few patients stated adverse reactions, particularly to the beta-blockers. Patients were

educated on the side effects as well as the importance of this medication and instructed to speak with their physician if problem worsened. Fig. 4 shows types medication errors identified during medication reconciliations.

The time requirements for implementation of the medication discharge counseling program were assessed. Using the averages of the 51 patients included in the study, the average counseling time per AMI patient was 36 minutes and 39 minutes per HF patient. These numbers were used to extrapolate a weekly time requirement based on MHSW admissions from fiscal year 2013 (Table 2). The weekly estimated

time requirement was calculated to be 16.9 hours. However, this number is likely underestimated as the time spent for patient identification, interventions, and unsuccessful follow-up is not included.

Finally, the potential annual savings were evaluated based on the primary endpoint finding and the readmission data from fiscal year 2013. According to internal data from MHSW, every readmission costs the hospital \$7,400. Therefore, by implementation of a pre-discharge and post-discharge pharmacist-led medication counseling program targeting HF and AMI patients the potential annual savings could reach \$458,800 (Table 3).

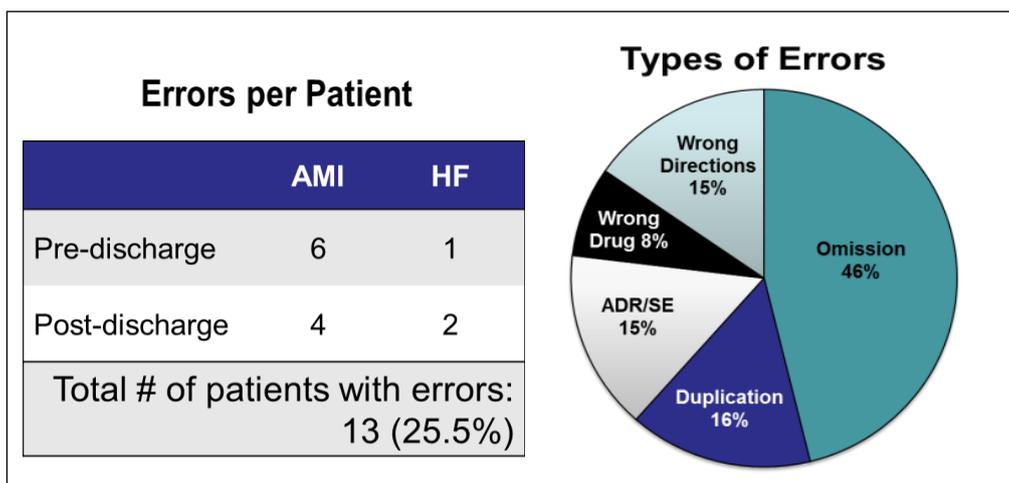


Fig. 4 Medication errors.

Table 2 Counseling time requirements.

	Inpatient counseling time (min)	Post discharge counseling time (min)	Total counseling time (min)	# of admissions per year	Estimated weekly requirement (hrs)
AMI	24 (15-35)	12 (5-20)	36	437	5.1
HF	29 (10-60)	10 (5-20)	39	522	6.5
Weekly counseling time					11.6
Weekly administrative time (Time for unsuccessful follow-ups, patient identification, and interventions)					5.3
Estimated total weekly time requirement					16.9

Table 3 Potential annual savings.

	# of admissions per year	Percent decrease in readmission rate	Projected # or prevented readmissions	Potential annual savings
AMI	437	34%	17	\$125,800
HF	522	50.8%	45	\$333,000
Estimated potential annual savings: \$458,800				

4. Discussion

The results of this study are consistent with other literature, which showed benefit of a pharmacist providing medication reconciliations on decreasing medication errors. Previous similar studies varied on findings on decrease of 30 day readmission rates; however the majority of studies only provided either pre-discharge counseling or post-discharge counseling, not both. The results of this research study found that pharmacy led medication reconciliation and pre-discharge and post-discharge medication counseling can have a positive impact on readmission rates as well as decreasing medication errors, and potentially healthcare savings.

4.1 Limitations and Future Implications

As with all readmission studies, the data is limited to the specific hospital system as there is no database to identify patients who are readmitted to other facilities. The same holds true with this study, as the data is limited to the Memorial Hermann Hospital System. Also, due to this study being a pilot study, the sample size of 51 may not fully show the total effects of implementing a counseling program such as this. A major difficulty encountered in this study was the step of patient identification, using DRG codes from the daily census report and admitting diagnosis was found to not always be the most accurate and up-to-date method of identifying patients appropriate for counseling. Often times what a patient was admitted for, upon further investigation, was not the same as what they were diagnosed with, and identifying this was often time consuming. Creating a daily report of all HF and AMI patients would help alleviate much of this burden. Another hurdle to overcome is identifying when patients are to be discharged. Many AMI patients are only in the hospital for 3 days, so when the patient was not counseled on day 1 or 2 of their admission they were missed. Lastly, the time required to implement and provide effective counseling may not always be

available when considering the other daily job requirements of the pharmacists. For facilities that do have pharmacy interns, they must be trained and competency must be observed every six weeks, which can be cumbersome. It might be beneficial to have trained pharmacists on staff to implement this process and assure the patients are getting the appropriate information.

4. Conclusion

Pharmacy-led medication reconciliation and pre-discharge and post-discharge medication counseling can have a positive impact on 30 day readmission rates of AMI and HF patients. By providing patients adequate education not only in the hospital but also after discharge, we can benefit both the patient as well as the hospital.

References

- [1] Berenson, R. A., Paulus, R. A., and Kalman, N. S. 2012. "Medicare's Readmissions-Reduction Program—A Positive Alternative." *N. Engl. J. Med.* 366: 1364-6.
- [2] Jha, A. K., Orav, E. J., and Epstein, A. M. 2009. "Public Reporting of Discharge Planning and Rates of Readmissions." *N. Engl. J. Med.* 361: 2637-45.
- [3] Centers for Medicare and Medicaid Services. Readmissions Reduction Program. August 2, 2013. Accessed September 10, 2013. <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html>.
- [4] CMS: The 2,225 Hospitals That Will Pay Readmissions Penalties Next Year. The Advisory Board Daily Briefing. August 5, 2013. Accessed October 1, 2013. <http://www.advisory.com/Daily-Briefing/2013/08/05/CMS-2225-hospitals-will-pay-readmissions-penalties-next-year>.
- [5] Szkiladz, A., Carey, K., Ackerbauer, K., Heelon, M., Friderici, J., and Kocpca, K. 2013. "Impact of Pharmacy Student and Resident-Led Discharge Counseling on Heart Failure Patients." *Journal of Pharmacy Practice* 26 (6): 574-9.
- [6] Thompson, C. A. 2012. "Integrated Pharmacy Practice Helps Reduce Heart Failure Readmission Rate." *AM J. Health Syst. Pharm.* 69 (18): 1540-1.
- [7] Bradley, E. H., Curry, L., Horwitz L. I., Sipsma, H., Wang, Y. F., Walsh, M. N., Goldmann, D., White, N., Piña, I. L.,

- and Krumholz, H. M. 2013. "Hospital Strategies Associated with 30-Day Readmission Rates For Patients With Heart Failure." *Circulation: Cardiovascular Quality and Outcomes* 6 (4): 444-50.
- [8] Gil, M., Mikaitis, D. K., Shier, G., Johnson, T. J., and Sims, S. 2013. "Impact of a Combined Pharmacist and Social Worker Program to Reduce Hospital Readmissions." *JCMP* 19 (7): 558-63.
- [9] Wiggins, B. S., Rodgers, J. E., Diomenico, R. J., Cook, A. M., and Page, R. L. 2013. "Discharge Counseling for Patients with Heart Failure or Myocardial Infarction: A Best Practices Model Developed by Members of the America College of Clinical Pharmacy's Cardiology Practice and Research Network Based on the Hospital to Home (H2H) Initiative." *Pharmacotherapy* 33 (5): 558-80.