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ScienceDirect
Research in Social and Administrative Pharmacy 12 (2016) 713–721
RESEARCH IN SOCIAL & ADMINISTRATIVE PHARMACY

Original Research

Changes in medication regimen complexity and the risk for 90-day hospital readmission and/or emergency department visits in U.S. Veterans with heart failure

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Abstract

Background: Heart failure (HF) hospitalization is associated with multiple medication modifications. These modifications often increase medication regimen complexity and may increase the risk of readmission and/or emergency department (ED) visit.
Objectives: To determine the association between changes in medication regimen complexity (MRC) during hospitalization of patients with heart failure and the risk of readmission or ED visit at 90 days. Secondary objectives include examining the association between changes in MRC and time to readmission as well as the relationship between number of medications and MRC.
Methods: This was a retrospective cohort study that included U.S. Veterans hospitalized with heart failure. MRC was quantified using the medication regimen complexity index (MRCI). The change in MRCI was the difference between admission MRCI and discharge MRCI recorded during the index hospitalization. Demographic and clinical data were collected to characterize the study population. Patient data for up to one year after discharge was recorded to identify hospital readmissions and ED visits.
Results: A total of 174 patients were included in the analysis. Sixty-two patients (36%) were readmitted or had an ED visit at 90 days from the index hospitalization. The mean change (SD) in MRCI during the index hospitalization among the cohort was 4.7 (8.3). After multivariate logistic regression analysis, each unit increase in MRCI score was associated with a 4% lower odds of readmission or ED visit at 90 days but

All authors have declared no potential conflicts of interest.
Funding source: This work was supported by the American Foundation for Pharmaceutical Education (AFPE) Pharmacy Faculty Fellow Award. The funding source had no role in the design, conduct of the study; collection, management, analysis or interpretation of the data; or preparation, review or approval of the manuscript.

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1551-7411/$ - see front matter Published by Elsevier Inc.
http://dx.doi.org/10.1016/j.sapharm.2015.10.004

this finding was not statistically significant (OR 0.955; 95% CI 0.911–1.001). In the cox proportional hazard model, the median time to hospital readmission or ED visit was 214 days. Each unit increase in MRCI score was associated with a modest but non-significant increase in probability of survival from readmission or ED visit (HR 0.978; 95% CI 0.955, 1.001).
Conclusion: Changes in medication regimen complexity that occur during hospitalization may also be associated with optimization of medical therapy and do not necessarily portend worse outcomes in patients with HF.
Published by Elsevier Inc.

Keywords: Medication regimen complexity index; MRCI; Heart failure; Patient readmission; Outcomes assessment; Polypharmacy

Introduction

Medication regimen complexity (MRC) has been identified as a key contributor to medication non-adherence and an increased risk for rehospitalization due to adverse drug events.[1,2] Patients with heart failure (HF) have inherently complex medication regimens due to the multiple therapeutic targets that exist and the need for routine symptomatic management. Additionally, patients with heart failure suffer from multiple comorbid conditions, which necessitate the use of additional medications that further add complexity. In patients with cardiovascular disease, non-adherence to beta-blockers, ace-inhibitors and statins increase the risk of mortality.[2]

Hospitalized patients often experience numerous medication modifications which increase MRC.[3] Furthermore, extensive in-hospital medication modifications may increase post-discharge mortality in elderly patients.[4] One study found that nearly 51% of HF patients experienced at least one or more medication errors within one month of hospital discharge.[5] Among the medication errors identified in this study, half were related to medication non-adherence. These poor outcomes have often been linked to poly-pharmacy and complex medication regimens.[6–9] Hospitalized patients with heart failure often have multiple medication changes that can increase MRC.

MRC is often measured using only the number of medications prescribed or the number of medication changes made. Such measurements have the potential to over estimate or underestimate the extent of MRC. The medication regimen complexity index (MRCI) is a novel tool developed to objectively quantify MRC.[10] The MRCI, a 65-item survey, includes the number of medications, but further characterizes regimen complexity by including the consideration of different dosage forms, dosing frequency, dietary considerations and directions for use. The MRCI score is computed using weighted averages for the number of drugs, dosage frequency, administration instructions and prescribed dosage forms. MRCI has the ability to discriminate between levels of complexity in two regimens with the same number of drugs. These additional attributes to MRC have been linked to poor outcomes and medication non-adherence in chronic illness.[9] Complex medication regimens at hospital admission evaluated using MRCI have also been associated with higher risk of readmission for an adverse drug event within 30 days.[2]

MRCI has been described and validated in a variety of patient populations (hypertension, diabetes, chronic obstructive pulmonary disease, epilepsy) but the degree and range of MRCI scores in patients with HF has not been reported.[11–14] Furthermore, the relationship between changes in MRCI and clinical outcomes in hospitalized patients with HF is unknown. Given the high rate of readmission associated with heart failure, a better understanding of changes in MRC and its association with outcomes is needed.

Objectives

Changes in medication regimens that occur as a result of hospitalizations often increase MRC. Whether changes in MRC during hospitalization influences subsequent likelihood of hospital readmission or emergency department (ED) visit is unknown. The objective of this study was to determine the associations between changes in medication regimen complexity using MRCI and outcomes in HF patients. It was hypothesized that in patients hospitalized with HF, increases in