Deaconess Billings Clinic Center on Aging

Pharmacy Intervention to Prevent Outpatient Medication Errors in Elderly Patients After Acute Hospital Stay

Beginning in 2002, the American Medical Group Association (AMGA), the National Committee for Quality Assurance (NCQA) and Pfizer Inc. sponsored a collaborative demonstration project to support improvements in patient safety in the ambulatory health care setting. The Safety Collaborative for the Outpatient Environment, or SCOPE, had two primary goals: (1) to promote patient-safety-improvement innovations in the ambulatory setting through grants to support improvement initiatives—10 grants of up to $50,000 were awarded to support new or ongoing projects designed to improve patient safety—and (2) to establish a collaborative of physician-led organizations to standardize patient-safety definitions and evaluation criteria, share information on best practices, and recognize outstanding performance. The collaborative was supported through conference calls, online resources, consultation with experts in the field, and an annual project meeting. At the end of the year-long collaboration, special recognition was given to the most effective projects. This article details the project of the Deaconess Billings Clinic Center on Aging.

The Issue

The estimated rate of medication errors in hospitalized patients is approximately one per patient per day.[1] Elderly patients with chronic diseases admitted to an acute hospital may face increased risk for medication errors. Many have complex medication regimes, decreased cognitive functioning, increased frailty, and financial burdens, all of which can heighten the potential for misuse of medications. These risks can increase further during times of care transition into and out of the hospital, as medications are stopped or changed over the course of the hospital stay. There are many potential opportunities for medication communication gaps, such as incomplete or incorrect information lists on admission or discharge, lack of communication of medication changes to the primary care physician at discharge, and limited patient education regarding changes in medication at discharge.

THE DEACONESS BILLINGS CLINIC DECIDED TO TEST WHETHER A PHARMACIST REVIEW OF ELDERLY PATIENTS' FULL MEDICATION HISTORY AT TIME OF DISCHARGE, COMBINED WITH PATIENT EDUCATION REGARDING MEDICATIONS, WOULD REDUCE THE RISK OF MEDICATION ERRORS AND IMPROVE PATIENT ADHERENCE TO THEIR MEDICATION REGIME AFTER DISCHARGE.

To address these communication concerns, the Deaconess Billings Clinic decided to test whether a pharmacist review of elderly patients' full medication history at time of discharge, combined with patient education regarding medications, would reduce the risk of medication errors and improve patient adherence to their medication regime after discharge.

Project Development

DBC Center on Aging is the clinical outcomes research arm of Deaconess Billings Clinic. The main goals of the Center on Aging are to identify the most effective ways to organize, manage, and deliver high quality care; improve patient safety; and reduce medical errors through translational and outcomes research.

Patricia J. Coon, M.D., executive medical director and principal investigator of the Center on Aging, identified this funding opportunity as a way to study improvements in both quality and patient safety. Karen Zulkowski, D.N.S., R.N., C.W.S., co-investigator and Connie Koch, CMPE, manager, assisted Dr. Coon in the organization and implementation of this project.

Senior organizational leadership at DBC as well as pharmacy staff and management fully supported this project. Center on Aging staff including Dr. Coon presented this

opportunity to Nicholas Wolter, M.D., CEO, and Mark Rumans, M.D., chief of staff, as well as DBC's Practice and Quality Committee and Nursing Clinical Practice Council. The entire organization recognized and supported this valuable opportunity to help attain one of DBC's strategic goals.

DBC's strategic plan includes a goal to provide outstanding quality, defined as *the right care for each patient, the first time and every time*. Within this goal are the following objectives:

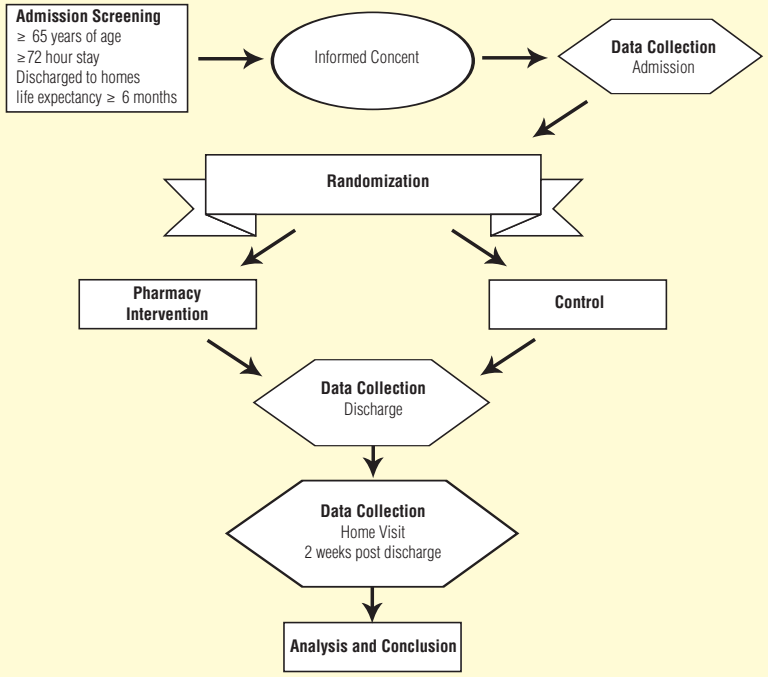
1. All departments will strive to provide the highest quality of care and service at all times

2. Be a national leader in systems design aimed at improving clinical outcomes

3. Achieve benchmark performance in patient safety and medication error prevention

4. Expand the role of research

FIGURE 1
Study Workflow



The Intervention

The goal of the intervention was to ensure that patients leave the hospital on the correct medications and doses, including necessary outpatient medications that may have been held or stopped during the acute hospital stay. In order to evaluate the success of the intervention, the project also tracked a control group of patients who received usual hospital discharge procedures (see Figure 1).

A nurse recruited patients aged 65 or older to participate in the study and obtained consent before randomizing them into the pharmacy intervention or control group. Upon admission to the study, each patient participated in an interview conducted by the nurse to obtain the patient's age, gender, mental status, quality of life, depression, medication history (prescribed and over the counter), medication adherence, and any adverse drug events.

Upon discharge, control patients received usual discharge procedures. For the intervention group, the pharmacist reconciled the medication orders, reviewed the patient's medication records upon admission, during the hospital stay, and at discharge. If necessary, the pharmacist would consult the patients' physician regarding any medication discrepancies, duplication of therapy, or contraindicated medications. The pharmacist also provided medication instructions and education to the patients either at discharge or by phone within two days of discharge from the hospital.

A chart review was performed on all patients two weeks after discharge to identify medication errors at admission, during the hospital stay, at discharge, and at two weeks post-discharge. All patients also received face-to-face[2] interviews two weeks after discharge by study research nurses to assess the accuracy of their medication lists and patient adherence to the prescription regimen.

What Constitutes a Medication Error?

For the purpose of this project, a medication error was defined as any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional or patient. Medication errors were further divided into two types: (1) preventable medication errors, medication error that "reached" the patient and resulted in the patient taking the wrong medication or dose or omitting a necessary medication; and (2) potential medication error, medication errors that did not "reach" the patient because the error was detected and corrected before it reached the patient. The following data were collected: (1) number or total medication errors (preventable plus potential); (2) the number of preventable medication errors; (3)

the number of potential medication errors; (4) the number of adverse drug events (ADEs) that resulted as a consequence of the medication error (preventable ADE); and (5) source of medication error or ADE, i.e., healthcare professional type (physician-, R.N.-, or pharmacist-based) or patient adherence issue.

Results

Results from the study indicate that medication reconciliation and patient education at the time an elderly patient is discharged from the hospital appears to decrease the risk of medication errors.

The results of the study demonstrated:

- *Medication errors (preventable and potential)* were identified in 86 percent of patients in the pharmacist intervention group and 92 percent in the control group. The number of the medication errors per patient in the pharmacist intervention group and control group was 3.43 and 4.69, respectively.

- *Physician-based medication errors* or *patient adherence issues* (patient-based medication errors) accounted for 88-89 percent of all medication errors in both groups. The majority of the physician-based errors were due to incorrect or incomplete discharge medication lists. Patient adherence issues included failure to start a prescribed medication, self-adjusting medication doses, or starting or stopping prescribed medication without authorization.

- *The pharmacist intervention on physician-based medication errors* demonstrated that there were 0.46 preventable physician-based medication errors per patient in the pharmacy intervention group, compared to 1.69 errors per patient in the control group. This represented a 73 percent reduction in medication errors that "reached" the patient in the pharmacist intervention group.

ONE OF THE MOST CHALLENGING ASPECTS OF THE PROJECT INVOLVED ACCESSIBILITY OF OUTPATIENT MEDICAL RECORDS FOR REVIEW BY THE STUDY PHARMACIST.

- *The pharmacist intervention on patient-based medication errors*: The number of *pre-admission* adherence issues per patient was comparable between the intervention and control groups (0.75 vs. 0.76). Since these ratios represent adherence issues predating the hospital admission and pharmacist intervention, similarity between the two groups was expected. In contrast, the number of *post-discharge* patient adherence issues per patient in the pharmacist intervention group was about half that of the control group (0.06 vs. 1.31).

- *The pharmacist intervention on nurse or pharmacist-based medication errors*: In the intervention group, the study pharmacist detected 100 percent of the errors before they could affect the patient's medication regimen. In the control group, 50 percent of medication errors resulted in a preventable medication error, with 33 percent of these errors undetected at the time of the 2-week home visit or phone call.

- *The pharmacist intervention on preventable adverse drug events (ADEs)*: This could not be determined due to the small number (4). This was anticipated, given the one-year study timeline and, thus, beyond the scope of this project.

- On average, the study pharmacist performed 2.1 interventions per subject to clarify the discharge medication list or prevent medication errors, including drug/drug and drug/disease interactions.

- The study pharmacist spent 3.7 hours per patient reviewing and clarifying patient's complex medication lists and educating the patient on the purpose and use of his/her medications. Direct patient contact time averaged 0.78 hour(s) per patient.

Lessons Learned

The following four lessons were learned from this project:

1. It is important to get buy-in throughout the healthcare organization to successfully recruit patients for study in the acute hospital setting. This project had the endorsement of several key departments and committees before it was presented to physicians and hospital unit staff. These included Pharmacy and Therapeutics Committee, Medical Records Committee, DBC Physician Quality Committee chaired by the Physician Chief of Staff, and the Quality Resources and Pharmacy departments. The team subsequently met with hospital unit staff, discharge case managers, and physicians/department managers to educate them about the study and get physician approval to recruit their inpatients. This enabled staff nurses and pharmacist to focus on the project and avoid potential staff and physician confrontation.

2. One of the most challenging aspects of the project involved accessibility of outpatient medical records for review by the study pharmacist. Due to diffi-

Deaconess Billings Clinic

- Located in Billings, Montana
- The largest community-owned, not-for-profit medical foundation in the region, with a 210-physician multispecialty clinic, 272-bed hospital, and 1,011 healthcare professionals.
- Care is delivered at the main campus, 10 branch locations, and 9 affiliate locations.
- DBC serves more than 140,000 patients annually, with over 650,000 encounters.
- The hospital is a level 2 trauma center and offers services in 30 medical specialty areas.

Project Timeline

Months 1-2	The project pharmacist was hired and trained in the data collection and intervention protocols.
Months 1-2	Forms for data collection were completed and copied.
Months 1-2	All protocols for data collection and patient interactions were finalized.
Month 2	The intervention and data collection forms were finalized.
Months 3-11	Subjects were recruited into the program.
Months 3-11	The intervention and data collection were conducted.
Months 6-12	Data was entered into SPSS 11.5 as it was collected.
Months 10-12	Data was analyzed statistically.
Months 11-12	A final report was prepared, and an abstract submitted for presentation at a national conference (Western Institute of Nursing).
Month 13	Manuscript prepared and submitted to a peer reviewed journal.

culties accessing outpatient medical records on the hospital medical wards, the study pharmacist needed to use multiple computer workstations to obtain pertinent information concerning prescribed outpatient medications. This increased the amount of time the pharmacist spent on each patient. The problem was solved through the purchase of a notebook computer for the study pharmacist that enabled her to decrease the time spent trying to access the clinic computerized medical record system. A "mock" walk through of the pharmacist's role before starting the project would have detected this issue earlier.

3. Trying to reconcile patient medication lists at hospital discharge can be an arduous task. DBC did not realize how difficult it would be to determine the correct pre-admission and discharge medication lists. Medication lists from electronic medical records, patients, caregivers, and physicians often do not agree. Yet, for patient safety, it is important to maintain an accurate medication list for the patient and his/her healthcare providers.

4. It may be possible for existing unit-based pharmacists to incorporate "medication reconciliation" into their daily workload, rather than waiting until the patient is discharged to review the medication history. If the intervention starts on the day of admission, problems with physician admission orders could be detected and corrected earlier.

FIGURE 2
Study Population

	Intervention	Control
N	79	66
Mean Age (yr)	78 ± 7	81 ± 9
Gender (%) F/M	54/46	72/28
Number of Prescription Medications		
On Admission	7 ± 4	7 ± 3
At Discharge	9 ± 4	8 ± 4
Number of Over the Counter Medications		
On Admission	4 ± 4	2 ± 2
At Discharge	3 ± 4	1 ± 1
Number of Prescription Medications		
Stopped	1 ± 1	2 ± 2
Started	3 ± 2	2 ± 2
Doses of Changes	1 ± 1	1 ± 1
Length of Stay (Days)	9 ± 6	6 ± 3

Next Steps

The DBC Center on Aging subsequently received funding from the Office for the Advancement of Telehealth (OAT) to study the Effect of a Computerized Medical Decision Support System on "In-Patient and Post-Discharge Medication Administration Errors." The purpose of this study is to (1) determine systems irregularities at DBC Hospital that lead to increased medication administration errors among Medicare beneficiaries during their hospitalization and upon discharge home; and (2) to determine the effect of a computerized inpatient pharmacy system on these errors.

Medication errors and irregularities are an important aspect of the overall problem of medical errors and are a major cause of morbidity and mortality in this country. The estimated rate of medication errors in hospitalized patients is approximately one per patient per day.

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