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Interprofessional Collaboration to Improve Discharge from Skilled Nursing Facility to Home: Preliminary Data on Postdischarge Hospitalizations and Emergency Department Visits

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Abstract

An interprofessional collaborative practice model was established at Hennepin County Medical Center to improve discharge management from the transitional care unit of the skilled nursing facility (SNF) to home. The practice model involves a geriatrician, nurse practitioner, and pharmacist who care for individuals at a community-based SNF. Before SNF discharge, the pharmacist conducts a chart and in-person medication review and collaborates with the nurse practitioner to determine the discharge medication regimen. The pharmacist's review focuses on assessing the indication, safety, effectiveness, and convenience of medications. The pharmacist provides follow-up in-home or over the telephone 1 week after SNF discharge, focusing on reviewing medications and assessing adherence. Hospitalizations and emergency department (ED) visits 30 days after SNF discharge of individuals who received care from this model was compared with those of individuals who received usual care from a nurse practitioner and geriatrician. From October 2012 through December 2013, the intervention was delivered to 87 individuals, with 189 individuals serving as the control group. After adjusting for age, sex, race, and payor, those receiving the intervention had a lower risk of ED visits (odds ratio (OR) = 0.46, 95% confidence interval (CI) = 0.22–0.97), although there was no significant difference in hospitalizations (OR = 0.47, 95% CI = 0.21–1.08). The study suggests that an interprofessional approach involving a pharmacist may be beneficial in reducing ED visits 30 days after SNF discharge.

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Keywords

transitions of care; skilled nursing facility; medication-related problem

A skilled nursing facility (SNF) is a common discharge destination for individuals leaving the hospital who may not be ready to return home. Transitions between healthcare settings may be a vulnerable time for older adults with multiple comorbidities, complicated treatment regimens, or limited caregiver support.^{1,2} There are many evidence-based transitions of care models to guide care for transitions from hospital to home^{3–5} or from SNF to hospital,⁶ but few initiatives have been described for individuals discharged from a SNF to home. Successful practice models targeted at improving this transition have used discharge care plans⁷ and postdischarge clinics,⁸ but no models have explored the role of the pharmacist.

The access of an individual in a SNF to a pharmacist is typically limited to a consultant pharmacist, who is required to review medication regimens monthly.⁹ Individuals in SNFs with shorter lengths of stay may not have a consultant pharmacist review their medication regimens. Furthermore, the consultant pharmacist is not required to provide medication education or reconcile SNF medications with home or hospital regimens.^{10,11} Consequently, there are opportunities to develop practice models promoting safe and effective medication use for care transitions for individuals in SNFs discharged to the community.

The practice model described in this article involves collaboration among a pharmacist, nurse practitioner, and geriatrician at Hennepin Healthcare Systems, Inc. (HHS). This model was created in response to challenges that nurse practitioners and geriatricians face when reconciling medications before SNF discharge and ensuring appropriate medication use after SNF discharge. HHS believed that adding a pharmacist to the practice model would overcome these challenges and affect hospitalization and emergency department (ED) use after SNF discharge for individuals being discharged home to the community. This article describes the model and compares outcomes of individuals who received care according to the model and those who received usual care from the nurse practitioner and geriatrician.

METHODS

Description of the Intervention

Before SNF Discharge—One to 2 days before discharge, the pharmacist reviewed the Hennepin County Medical Center (HCMC) and SNF electronic health records (EHRs) to evaluate the indications for, effectiveness of, and safety of all prescription and over-the-counter medications and dietary supplements. The pharmacist ensured that medication changes made during the hospital and SNF stays were intentional and thereby explained in clinical documentation. Unexplained changes were resolved by consulting with the nurse practitioner. After reviewing the chart, the pharmacist met with the individual to review all medications and discuss changes made during the hospital and SNF stay. Strategies to ensure medication adherence, such as having a home care nurse or using a pillbox, were discussed. The pharmacist and the individual scheduled a time within 1 week of discharge for a home

visit to follow up on the SNF discharge. If an individual declined a home visit, telephone follow-up was scheduled.

Based on EHR review and the interview, the pharmacist shared recommendations for the discharge medication regimen with the nurse practitioner. The pharmacist's recommendations included starting or stopping medications, adjusting doses, or ensuring that necessary laboratory work was ordered. The pharmacist and nurse practitioner collaborated to determine the discharge medication regimen. The nurse practitioner also recommended items for the pharmacist to address at follow-up, such as monitoring for specific medication side effects and reminding individuals of follow-up appointments. Antihypertensive and antidiabetic medications were often titrated during the SNF stay, so monitoring for hypotension and hypoglycemia was often advised. The pharmacist reconciled medication lists in both EHRs and documented a note summarizing the medication review and medication-related problems (MRPs) in the health system EHR (Figure 1).

After SNF Discharge—Within 1 week of SNF discharge, the pharmacist visited the individual at home to reconcile and review medications and reinforce the discharge plan of care. Any discontinued medications were disposed of with the individual's permission. If available and the individual consented, their caregiver participated in conversations related to the indication for, effectiveness of, and safety of medications. Adherence to medications was also discussed, and the pharmacist provided an accurate medication list at the end of the visit. The pharmacist updated the medication list and documented a summary of the home visit in the health system EHR. The updated medication list and summary note were communicated to the individual's community primary care provider (PCP) in the EHR or a fax. In rare cases in which an urgent communication was necessary, the PCP was paged, or the clinic was called (Figure 1).

Study Design and Setting

The study was an evaluation of a natural experiment that included an intervention group receiving care from the interprofessional collaborative practice model and a comparison group receiving usual care from a nurse practitioner and geriatrician. The intervention and comparison groups used the same geriatrician and nurse practitioners. Assignment to the intervention was based on what day of the week the individual was scheduled for discharge because the pharmacist worked with the nurse practitioner and geriatrician only 3 days each week. Data were collected retrospectively from the SNF and health system EHRs to evaluate whether the model reduced hospitalizations and ED visits during the 30 days after SNF discharge. In the intervention group, information was collected on the number and type of MRPs that the pharmacist identified before and after SNF discharge. MRPs were defined as "an event or circumstance involving drug treatment that actually or potentially interferes with the patient experiencing an optimum outcome of medical care."¹² The University of Minnesota and Minneapolis Medical Research Foundation institutional review boards approved the study.

HHS operates HCMC in downtown Minneapolis and primary care clinics throughout Hennepin County. The HCMC Extended Care Department includes nurse practitioners and

geriatricians who provide primary care to individuals residing in 20 community-based SNFs in the Minneapolis area. The study took place at one of these SNFs, Augustana Health Care Center, a nonprofit SNF with 60 transitional care unit beds.

Evaluation of the Model

The primary outcome was rate of hospitalizations and ED visits within 30 days of SNF discharge. Hospitalizations were defined as any hospital stay at least 24 hours in length initiated within 30 days of the SNF discharge; hospitalizations less than 24 hours were classified as ED visits. The health system EHR was queried for hospital and ED encounters. For individuals who received care according to the model, information was collected on the number and types of MRPs. MRPs were classified into four categories: indication, effectiveness, safety, and adherence.¹² Data were collected on age, sex, ethnicity, and insurance coverage from the EHRs of the SNF and health system from October 2012 through December 2013. Clinical comorbidity data were collected from the clinical problem list and encounter data from the health system EHR and assessed using the Quan modification of the Charlson Comorbidity Index.¹³ Multivariate analysis was completed using multivariate logistic regression to assess the primary outcomes of hospitalization and ED visits within 30 days of SNF discharge, with adjustments for demographic, payor, and comorbidity characteristics. Logistic regression was used to evaluate correlations between MRPs and ED visits and hospitalizations.

RESULTS

From October 2012 through December 2013, 87 individuals received care according to the model, and 189 individuals served as the comparison group. There were no significant differences between groups at baseline (Table 1). Of the 87 individuals in the intervention group, two were lost to follow-up; 10 refused a home visit and instead received telephone follow-up.

The hospitalization rate of individuals receiving care according to the model was 10.4 percentage points lower (9.2% vs 19.6%, $P = .02$) and a 12.3% lower their rate of ED visits was 12.3 percentage points lower (12.6% vs 24.9%, $P = .03$). After adjustment for age, sex, ethnicity, payor, and clinical comorbidities, there was not a significant difference in hospitalization rate (odds ratio (OR) = 0.47, 95% confidence interval (CI) = 0.21–1.08), but there was a significant difference in rate of ED visits (OR = 0.46, 95% CI = 0.22–0.97).

Before discharge, the average number of MRPs per intervention patient was 2.1. The most frequent type (35%) of MRP was related to safety, and this was typically noted when medications required laboratory monitoring or when individuals were experiencing side effects. Of the 85 individuals who received post-SNF discharge follow-up, the average number of MRPs per individuals was 1.8, with the most common (46%) related to adherence. Adherence-related problems were identified when individuals were not taking medications as prescribed. In intervention participants, there were no associations between aggregate number or type of MRP and clinical outcomes. The number and type of MRPs in intervention participants are available in Appendix Table A1.

DISCUSSION

This study suggests that collaboration among a geriatrician, nurse practitioner, and pharmacist may be an effective means of decreasing hospitalizations and ED visits within 30 days after SNF discharge. The model had a trend toward a reduction in the rate of rehospitalizations within 30 days after SNF discharge.

The model in this study is unique because it includes a pharmacist who also provides in-home follow-up. It was decided to incorporate a pharmacist into the model because of the MRPs that occur during transitions of care^{14,15} and the success demonstrated by other transitions-of-care models incorporating pharmacist home visits.^{16,17} In some instances, the pharmacist identified problems in the home that might not have been identified with follow-up conducted over the telephone or in the clinic. For example, when participants returned home, they often resumed taking medications that had been discontinued during the hospital or SNF stay. Providing follow-up in the home led to the compilation of an accurate and comprehensive medication list and an assessment of environmental factors that may affect medication adherence.

The success of this model is due in part to the hand-offs that occurred between healthcare providers. In the SNF, the nurse practitioner recommended things that required follow-up after SNF discharge. After the follow-up visit, the pharmacist shared information related to medications and adherence with the community PCP. Communication among providers has been cited as an important component of successful transitions of care initiatives.¹⁸

Some of the MRPs identified before SNF discharge would have been better addressed sooner in the SNF stay. Changing medications at the time of discharge may be undesirable because of an inability to monitor the change and a chance of the change not being implemented accurately across the transition of care. Since this discovery, the model has been adapted so that a pharmacist reviews medications upon admission to the SNF in addition to before SNF discharge.

A challenge in replicating this model is justifying a pharmacist's salary to be part of the nurse practitioner–geriatrician team. This study suggests that including a pharmacist in the care of individuals in SNFs may contribute to better outcomes; as a result, in a capitated payment system, the payor or the health system could potentially justify a pharmacist salary based on possible cost avoidance with fewer ED visits and hospitalizations and potential Medicare-related reimbursement penalties. Completion of a cost–benefit assessment could be completed to assess the effect of the intervention on the cost of care to the healthcare system.

Limitations

There are limitations to this study because it examines one health system and one SNF and because participants were not randomized to the intervention or comparison group, but the data suggest that the groups had similar demographic and clinical characteristics at baseline. Because the same nurse practitioners delivered care to participants when the pharmacist was not at the SNF, there is a chance of diffusion of clinical practice, which would presumably

bias the results toward the null hypothesis of no intervention effect. Last, there are limitations to using the health system EHR for primary outcome ascertainment because this method does not account for hospitalization and ED visits occurring outside of the health system.

CONCLUSION

This study fills a clinical practice gap in the literature because there are few models to help manage the transition from SNF to home. Future studies should randomize participants or facilities and use evidence-based, interprofessional practice models to enhance care delivery.

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References

1. Coleman EA, Min SJ, Chomiak A, et al. Posthospital care transitions: Patterns, complications, and risk identification. *Health Serv Res.* 2004; 39:1449–1465. [PubMed: 15333117]
2. Naylor MD. A decade of transitional care research with vulnerable elders. *J Cardiovasc Nurs.* 2000; 14:1–14.
3. Jack BW, Chetty VK, Anthony D, et al. A reengineered hospital discharge program to decrease hospitalizations. *Ann Intern Med.* 2009; 150:178–187. [PubMed: 19189907]
4. Coleman EA, Parry C, Chalmers S, et al. The care transitions intervention: Results of a randomized controlled trial. *Arch Intern Med.* 2006; 166:1822–1828. [PubMed: 17000937]
5. Naylor MD, Broton D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders. *JAMA.* 1999; 281:613–620. [PubMed: 10029122]
6. Ouslander JG, Lamb G, Tappen R, et al. Interventions to reduce hospitalizations from nursing homes: Evaluation of the Interact II Collaborative Quality Improvement Project. *J Am Geriatr Soc.* 2011; 59:745–753. [PubMed: 21410447]
7. Berkowitz RE, Fang Z, Helfand BK, et al. Project reengineered discharged (RED) lowers hospital readmissions of patients discharged from skilled nursing facility. *J Am Med Dir Assoc.* 2013; 14:736–740. [PubMed: 23608528]
8. Park HK, Branch LG, Bulat T, et al. Influence of a transitional care clinic on subsequent 30-day hospitalizations and emergency department visits in individuals discharged from a skilled nursing facility. *J Am Geriatr Soc.* 2013; 61:137–142. [PubMed: 23205951]
9. Center for Medicare and Medicaid Services. [Accessed July 5, 2015] Review of Current Standards of Practice for Long-Term Care Pharmacy Services [on-line]. Available at <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/lewingroup.pdf>
10. American Society of Consultant Pharmacists. [Accessed July 5, 2015] Guidelines for Assessing the Quality of Drug Regimen Review in Long-Term Care Facilities [on-line]. <http://www.ascp.com/resources/policy/upload/Gui99-%20Quality%20DRR.pdf>
11. Hume AL, Kirwin J, et al. American College of Clinical Pharmacy. Improving care transitions: Current practice and future opportunities for pharmacists. *Pharmacotherapy.* 2012; 32:e326–e337. [PubMed: 23108810]
12. Cipolle, RJ., Strand, LM., Morley, PC. *Pharmaceutical Care Practice: The Clinician's Guide.* 2. New York: McGraw-Hill; 2004. p. 385-391.

13. Quan H, Li B, Couris CM, et al. Updating and validating the Charlson Comorbidity Index and score for risk adjustment in hospital discharge abstracts using data from 6 countries. *Am J Epidemiol.* 2011; 173:676–682. [PubMed: 21330339]
14. Sinvani LD, Beizer J, Akerman M, et al. Medication reconciliation in continuum of care transitions: A moving target. *J Am Med Dir Assoc.* 2013; 14:668–672. [PubMed: 23608529]
15. Tjia J, Bonner A, Briesacher A, et al. Medication discrepancies upon hospital to skilled nursing facility transitions. *J Gen Intern Med.* 2009; 24:630–635. [PubMed: 19291332]
16. Reidt S, Larson T, Hadsall R, et al. Integrating a pharmacist into a home healthcare agency model: Impact on hospitalizations and emergency room visits. *Home Healthc Nurse.* 2014; 32:146–152. [PubMed: 24584311]
17. Novak CJ, Hastanan S, Moradi M, et al. Reducing unnecessary hospital readmissions: The pharmacist's role in care transitions. *Consult Pharm.* 2012; 27:174–179. [PubMed: 22421517]
18. Rutherford, P., Nielsen, GA., Taylor, J., et al. *How-to Guide: Improving Transitions from the Hospital to Community Settings to Reduce Avoidable Rehospitalizations.* Cambridge, MA: Institute for Healthcare Improvement; 2013. [on-line]. Available at www.IHI.org [Accessed April 24, 2015]

APPENDIX

Table A1

Number and Type of Medication-Related Problems of Participants Receiving Care from Pharmacist Collaboration

Time Period	Type of Medication Related Problem, n (%)			
	Indication	Effectiveness	Safety	Adherence
Before SNF discharge (n = 87)	55 (31)	38 (21)	62 (35)	24 (13)
After SNF discharge (n = 85) ^a	26 (18)	24 (15)	35 (23)	72 (46)

^aTwo participants were lost to follow-up.

SNF = skilled nursing facility.

Figure 1.

Pharmacist workflow process before and after skilled nursing facility (SNF) discharge. EHR = electronic health record; NP = nurse practitioner; PCP = primary care provider.

Table 1

Demographic Characteristics of Individuals Discharged from a Skilled Nursing Facility (SNF) to Home with and without Pharmacist Collaboration

Characteristic	Intervention (n = 87)	Control, (n = 189)	P-Value
Age, average	70.8	69.7	.54
Female, %	57	60	.72
Race, n (%)			.65
White	56 (64.4)	117 (61.9)	
Black	26 (29.9)	55 (29.1)	
Other	5 (5.8)	17 (9.0)	
Insurance, n (%)			.28
Medicare	52 (59.8)	107 (56.6)	
Medicaid	8 (9.2)	25 (13.2)	
Dual eligible	15 (17.2)	30 (15.9)	
Commercial	3 (3.4)	14 (7.4)	
Self-pay	1 (1.1)	3 (1.6)	
Other	8 (9.2)	10 (5.3)	
SNF length of stay, days, average	29.3	35.4	.14
Charlson Comorbidity Index, average	1.0	1.3	.18