Evaluation of an Innovative Transitional Care Clinic in an Interprofessional Teaching Practice

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Introduction

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Hospital discharge is a time of significant change for patients and providers (Manian, 1999).
The transitional period following hospital discharge can be a time of confusion and medical
vulnerability for many patients, especially those who are taking multiple medications (Ni et al.,
2018). Poor coordination of care decreases satisfaction, facilitates adverse events, and leads to
unnecessary health care utilization, including costly hospital readmissions (Bull et al., 2000;
Moore et al., 2003; Forster, Clark, Menard, & Dupuis, 2004; Forster, Murff, Peterson, et al.,
2003; Forster, Murff, Peterson, et al., 2005). After discharge, nearly half of patients experience
one or more medical error, 23% suffer an adverse event (half related to medication errors), and
more than 20% are preventably readmitted within 30 days, with rates exceeding 50% for specific
chronic conditions (Bull et al., 2000; More et al., 2003; Forster et al., 2004; Forster et al., 2003;,
Bernheim et al., 2010; Krumholz et al., 2009; Jencks et al., 2009; Joynt & Jha, 2012). Hospital
readmissions cost Medicare $17 billion annually (Zuckerman et al., 2016). As many as 76% of
primary care providers (PCP), and 50% of patients, report current transfer processes are
inadequate, and lack of timely follow-up with PCPs increases risk of readmission ten-fold (Uppal
et al., 2015; Misky et al., 2010). There have been increasing calls for greater focus on
transitional care, including PCP appointment within 7 to 14 days of discharge, phone calls, social
work involvement, medication management, and integration of care (Misky et al., 2015; Coller et
al., 2013; Kansagara et al., 2015; Kripalani et al., 2007; Li et al., 2015). Thorough evaluation of
innovative care models during times of transition has been lacking in the peer-reviewed
literature.

Utilizing strengths and weaknesses of the few published primary care transitions interventions, a
dedicated transitions of care clinic was developed in a family medicine practice that utilized an
interprofessional team model. This team included physicians, nurses, a clinical social worker, a
clinical pharmacist, and trainees. Once weekly, the team met to conference on all recently
discharged patients to review discharge information and develop a plan for the patient's follow-
up appointment. During the Interprofessional Transitions of Care (IPTC) appointment, each
member of the team interviewed and evaluated the patient. A nurse first met with the patient and
completed initial assessment, including monitoring of vital signs. A medication reconciliation
was completed by the clinical pharmacist, and a behavioral health assessment including offering
of resources and referrals was provided by the licensed clinical social worker. The physician
completed a physical assessment and interview. Following this, the team huddled to discuss any
new information and develop a plan. Finally, appropriate team members played a role in plan
execution, and patient and/or caregiver education took place.
After implementation of the IPTC clinic model, preliminary information quickly suggested some
positive outcomes related to patient readmission and patient satisfaction. Here, we present results
of a thorough assessment of the IPTC model.

Method

Study Population
The study used data from clinic and hospital health records from patients in a single academic
family medicine practice in the southeastern United States. The treatment group (TG) consisted

of the 501 patients that participated in the IPTC following hospitalization from the onset of the IPTC program (July 2014) to present day. The control group (CG) was comprised of 500 patients from the practice that were hospitalized and then attended a follow-clinic appointment in the four years prior to the onset of the IPTC.

Procedure
Patient clinic and hospital electronic health records were the primary data source for this retrospective study, along with a clinical tracking database maintained by the practice. All records were manually reviewed by a single research assistant who then entered the study data into an electronic spreadsheet. The study was approved by the affiliated university Institutional Review Board and the final data set was completely deidentified.

Data Collected
The family medicine clinic electronic health record and tracking database were the primary data sources for background, medical, and IPTC service information for TG and CG patients. The hospital electronic health records were the primary source of hospital admission information, including length and type of stay, diagnoses, and care provided. For all patients involved in the study, data abstracted included: demographics (age, sex, race), payer source, discharge location, hospital admission diagnoses, hospital and clinic discharge diagnoses, length of hospitalization (in days), number of medications post clinic appointment, post discharge contact (days after discharge, success of contact), number of days to follow-up appointment, status of follow-up appointment, services received (medical, pharmacy, social work, nursing, laboratory, and referral), readmission status within 30 days, and number of days from discharge to readmission. For the TG, the timing of appointment post hospitalization (within seven or 14 days) was also assessed.

Additional data collected included disease states taken from hospital admission and hospital/ IPTC visit discharge diagnoses. These disease states were recorded for study purposes using International Classification of Diseases, 10th Revision, Clinical Modification (*ICD-10-CM)* codes. In some cases, the records contained International Classification of Diseases, 9th Revision, Clinical Modification (*ICD-9-CM)* codes which were converted to *ICD-10-CM* codes using a code converter application from the American Academy of Professional Coders. While all diagnoses pertinent to the reason for hospitalization were retained and recorded for use in the study, diagnoses hypothesized to be most commonly associated with hospital readmissions were also specifically recorded including diabetes mellitus type 1, diabetes mellitus type 2, chronic obstructive pulmonary disease, hypertension, heart disease, congestive heart failure (systolic, diastolic, and exacerbation recorded separately), respiratory failure (type 1 and type 2 recorded separately), cellulitis, chest pain, non-ST-elevation myocardial infarction, ST-elevation myocardial infarction, chronic kidney disease (CKD), depression, bipolar disorder, schizophrenia, and anxiety.

Statistical Analyses
Descriptive analyses were used to summarize study variables. To characterize differences between TG and CG, chi-squared tests were used for categorial variables, with t-tests used for continuous measures. For all analyses, $p < 0.05$ (two-sided) determined significance. Because TG and CG patients differed significantly on several hospitalization characteristics, logistic

regression analysis was performed predicting rehospitalization from study group, controlling for those significant factors.

Results

Participants
The final dataset contained 501 patients who were invited to participate in IPTC after an admission discharge, and 500 historical controls. Table 1 contains a comparison of the TG and CG patients on background and hospitalization variables. As can be seen, the two groups did not differ significantly on age, gender, race, or insurance status. However, CG patients had significantly more diagnoses at the end of their hospitalization, while TG patients had significantly longer hospital stays. In addition, the CG was significantly more likely to be diagnosed with hypertension, while the TG was more likely to have been diagnosed with respiratory failure. The two groups did not differ significantly on rates of any other medical conditions.

Table 1
Background and Hospitalization Characteristics by Study Group

	IPTC Group (*n* = 501)	Control Group (*n* = 500)	t/χ2	*p*
Background Characteristics				
Age (years)	52.7±18.1	50.9±19.7	1.54	.124
Gender (% male)	41.5%	38.4%	1.01	.314
Race (% white, non-Hispanic)	86.0%	84.0%	.81	.369
Insurance (% Medicaid)	63.9%	66.6%	.82	.365
Hospitalization Characteristics				
Number of diagnoses	6.0±2.6	7.4±2.8	8.06	<.001
Length of hospitalization (days)	5.2±8.6	3.5±4.0	3.84	<.001
Dx Type 1 diabetes	3.0%	3.0%	0.00	.996
Dx Type 2 diabetes	27.5%	30.6%	1.13	.287
Dx COPD	29.7%	26.4%	1.38	.240
Dx hypertension	57.7%	64.8%	5.34	.021
Dx heart disease	23.2%	23.8%	.06	.809
Dx congestive heart failure	12.8%	11.0%	.75	.386
Dx respiratory failure	4.4%	2.0%	4.62	.032
Dx cellulitis	3.4%	5.2%	1.99	.159
Dx chest pain	30.1%	25.8%	2.34	.126
Dx heart attack	6.6%	6.6%	0.00	.993
Dx chronic kidney disease	9.2%	7.4%	1.05	.307

Outcomes
Table 2 shows differences in post-hospitalization follow-up care received of those who kept their appointment for the IPTC patients compared to control patients. As can be seen, the control group was significantly more likely to receive nursing services (100%) compared to the IPTC

group (98%). However, the IPTC group was significantly more likely to receive social work (66.9%) and pharmacy services (71.1%) versus the CG (0.2% each). The IPTC group was also more likely to receive laboratory services (45.8%) than the CG (38.2%). The two groups did not differ on the percentage receiving referrals. The IPTC group did have significantly fewer prescribed medications after the follow-up visit compared to controls. Finally, the IPTC patients were seen for follow-up in significantly fewer days (almost 2 weeks sooner), than were control group patients.

Table 2
Differences in Post-Hospitalization Follow-up Care by Study Group

	IPTC Group (n=360)	Control Group (n=498)	t/χ2	p
Services Received				
Physician	99.7%	99.8%	.05	.818
Nursing	98.1%	100.0%	9.76	.002
Social work	66.9%	.2%	460.0	<.001
Clinical pharmacist	71.1%	.2%	500.8	<.001
Laboratory	45.8%	38.2%	5.08	.024
Referrals	20.6%	17.7%	1.14	.287
Number of prescribed medications	7.4±7.6	9.3±6.9	4.04	<.001
Days to follow-up appointment	7.7±4.7	19.7±31.0	8.58	<.001

For the primary patient outcome, 30-day rehospitalization, patients offered participation in the IPTC clinic were significantly less likely to be rehospitalized (10.5%) compared with control group patients (16.2%; $\chi2 = 6.86$, $p = .009$). An additional analysis was performed that included only the IPTC patients who actually kept their appointment ($n = 360$, 72.9%). For this subgroup, the rehospitalization rate was 9.6%, compared to 16.2% for the control group patients ($\chi2 = 7.43$, $p = .006$). Because the IPTC and control group patients differed significantly on several hospitalization characteristics, logistic regression analysis was performed predicting rehospitalization from study group, controlling for those significant factors. Being offered participation in an IPTC clinic reduced the chances of being rehospitalized within 30 days by 37% (adjusted odds ratio = .63, 95% confidence interval = .42-.94). When only those who kept their IPTC clinic appointment were included, the chance of being rehospitalized compared to standard care was reduced by 48% (adjusted odds ratio = .52, 95% CI = .33-.82).
To determine whether there were patient characteristics that predisposed specific patients to benefit more from IPTC participation in terms of avoiding rehospitalization, different patient groups were compared on readmission rates. As seen in Table 3, comparing CG and TG patients, those who participated in IPTC had lower readmission rates across all background and all but one medical characteristic. In addition, patients with congestive heart failure and cellulitis particularly benefitted from IPTC. Patients with these conditions had double the readmission rates of those who did not when they did not participate in IPTC. However, patients with these conditions who participated in IPTC not only had two to three times lower readmission rates, they also did not differ significantly in readmission rates from those who did not have the conditions and who also participated in IPTC. Interestingly, patients with chronic kidney disease (CKD) did not benefit from IPTC participation, with readmission rates three times higher than those without CKD who also participated in IPTC, and readmission rates nearly double those with CKD who did not participate in IPTC.

Table 3

Patient Characteristics that Predict Rehospitalization Separately for IPTC and Control Patients

	IPTC Percentage Rehospitalized	Control Percentage Rehospitalized
Age		
< 60 years	7.5%	15.7%
60 years +	12.2%	17.1%
Gender		
Male	8.6%	16.9%
Female	10.2%	15.7%
Race		
White non-Hispanic	9.8%	16.9%
Minority	7.8%	12.2%
Insurance		
Medicaid/uninsured	10.2%	14.8%
Private/medicare	8.5%	16.8%
Diagnosed with type 1 diabetes		
No	9.6%	16.3%
Yes	8.3%	13.3%
Diagnosed with type 2 diabetes		
No	8.5%	17.2%
Yes	11.9%	14.0%
Diagnosed with COPD		
No	9.6%	16.3%
Yes	8.3%	13.3%
Diagnosed with hypertension		
No	6.5%	16.7%
Yes	11.5%	15.9%
Diagnosed with heart disease		
No	7.9%	14.7%
Yes	14.4%	20.7%
Diagnosed with congestive heart failure		
No	9.0%	14.3%
Yes	13.0%	30.9%*
Diagnosed with respiratory failure		
No	9.7%	16.3%
Yes	6.7%	11.1%
Diagnosed with cellulitis		
No	9.6%	15.5%*
Yes	9.1%	29.2%
Diagnosed with chest pain		
No	8.8%	17.7%
Yes	11.0%	12.0%
Diagnosed with heart attack		
No	10.1%	16.4%
Yes	3.6%	12.9%
Diagnosed with chronic kidney disease		
No	7.8%*	16.2%

Yes	25.7%	16.2%

p < .05. **p* < .01. *** *p* < .001.

Discussion

As quality-based practice and payment models are being developed, a need for innovation in care models exists, specifically in high cost areas of health care. These results demonstrate that an interprofessional approach to transitions in care is an effective way to address this high risk for error and high cost time in the continuum of care.

After controlling for confounding factors, patients who were evaluated and treated by an interprofessional team were nearly half as likely to be readmitted within 30 days. While there have been criticisms of the use of 30-day readmission as a quality measure (Joynt & Jha, 2012), it is a widely utilized quality measure by many payers, including the Centers for Medicare and Medicaid Services.

A decrease in hospitalization was observed in patients who were offered IPTC and, to a greater extent, those who completed that appointment. As IPTC clinic was implemented, documentation of all post-hospitalization appointments was updated to prompt the practice professionals to assess medication changes, behavior health needs and social needs. The practice has continued to integrate behavioral health professionals and clinical pharmacists in all care delivered, not only dedicated interprofessional clinics. The regular utilization of a team-based care model in addition to improved transitional care processes and documentation could explain reduction in readmission even in patients who did not complete an IPTC appointment.

Retaining several professions within a practice does have associated benefits as well as costs. Previous literature has established benefits to the providers, and their practices, when working in an interprofessional model (Drummond et al., 2012). The Family Medicine practice studied here is an academic residency program, allowing resources to be made available more easily. While this could limit immediate generalizability, introduction of evidence of improved outcomes and quality measures, such as those described here, make a stronger case for cost offset by payers.

The current study is not without limitations. Due to the retrospective design of this study, documentation of some specific patient characteristics or information was not uniformly recorded. For example, non-physician members of the team who were involved in the care of a patient in the control group might not have been documented. This could have decreased validity related to our findings regarding services received. Additionally, the control group was comprised of patients hospitalized in the four years prior to the start of the IPTC clinic. It is possible other systems changes could have impacted patient outcomes. However, patients were similar in terms of background characteristics such as age, gender, and insurance status. The few noted differences in comorbid conditions and hospital stay were controlled for through logistic regression. Finally, other information not recorded in the patient's primary care electronic health record could obviously not be analyzed in this study. While this did limit our ability to fully evaluate a patient's information in some cases, this limitation did highlight a challenge in transitions of care in general. The sharing of patient information is a current issue facing the entire United States healthcare system and impacts not only our ability to evaluate transitional care innovations, but impacts our ability to take care of patients that are experiencing a transition in care.

In conclusion, the utilization of an interprofessional transitions of care clinic significantly reduced 30-day readmissions. Additional analysis of cost to the health system, team member satisfaction and improved patient experience would be beneficial to demonstrate the true impact an interprofessional transitions of care clinic may have.

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