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An Outpatient Transitions of Care Model for Heart Failure

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Abstract

Transitions of Care (TOC) programs have been shown to decrease readmissions and improve quality of life for those with heart failure. Advanced Practice Nurses (APN) play a central role in many successful TOC programs and there are few, if any studies examining the role of the Doctor of Nursing Practice (DNP)-prepared APN in TOC programs. This article describes a study that examined the need and readiness of a private practice-based TOC program for heart failure led by DNP-prepared APN's. Our findings provide encouraging support for the future implementation of a private practice-based TOC program for heart failure.

Keywords: Doctor of nursing practice; Heart failure; Hospital readmissions; Nurse practitioner; Private practice; Transitions of care.

Background

Heart failure is a global burden and its prevalence continues to increase throughout the world. Current projections indicate that the incidence of heart failure in the United States will increase by 46% from 2012-2030, resulting in greater than 8 million people 18 years of age or older with a heart failure diagnosis [1]. Heart failure is the leading cause of hospitalization for older adults [2] creating a significant financial burden for patients, families and our healthcare system. Total annual heart failure related costs approximated $32 billion in the year 2012 and are expected to increase almost 127%, to $69.7 billion, by the year 2030 [2,3]. These costs include direct care costs in the hospital setting. Contributing to these costs, almost 25% of heart failure patients are readmitted to the acute care setting within 30 days [3]. Consequently, preventing heart failure patient readmission would significantly impact this rising economic burden. Considering these statistics, the Centers for Medicare and Medicaid Services (CMS) began tracking 30-day readmission rates in 2009 as part of the Hospital Readmission Reduction Program of the Affordable Care Act [4]. Moreover, CMS began instituting stiff penalties on 30-day hospital readmissions that result from chronic illness, to include heart failure beginning on October 1, 2012 [4]. While hospital-based transitional care services have been shown to decrease hospital readmissions and the associated financial penalties, these services may also incur significant cost to the hospital [5]. As the ever-increasing number of heart failure patients requiring transitional care services may soon outpace resource-strapped hospitals, additional ways to ameliorate the existing burden of heart failure for individuals, caregivers and the health care system [1] need to be explored.

Transition of Care (TOC) includes an assortment of time-limited services intended to ensure healthcare continuity and prevent poor outcomes among at risk populations as they move from one level of care to another, among multiple health care team members, and across settings such as hospitals to homes [6-8]. In chronic diseases such as heart failure, diabetes and stroke, successful TOC enhances patient experiences, improves outcomes related to health and quality of life and represents prudent use of set resources [9]. Ideally, TOC begins at admission and continues through to discharge from the acute care setting [10]. It should be comprehensive, extend beyond hospital stay, and have the flexibility to respond to individual patient needs [11]. While hospital-based TOC programs are the most common, alternative settings include Skilled Nursing Facilities (SNF), patient centered medical homes, integrated health systems, home health aide services, and accountable care organizations [12]. Comprehensive TOC programs, while demonstrated to be successful, are expensive and require availability of qualified personnel i.e. (APN, physician, registered nurses, and pharmacist) [13]. Given the challenges of shifting hospital resources and workforce in the U.S., exploring additional ways to support existing hospital-based TOC hospital programs, or to provide TOC services where no hospital programs exist, is a reasonable endeavor.

Dr. Mary Naylor's pioneering work has focused on the development and testing of the Transitional Care Model (TCM) [9,14]. The TCM is widely known as a cost-effective APN-led model to improve the transitions of older adults who are navigating complex and often fragmented systems of care [8,9,15]. The TCM primarily focuses on interventions aimed at easing the transitions for older adults moving between hospital and home settings along with utilizing the APN as the patient's transitional care manager [8,16]. Years of research and testing of the TCM suggest that the components essential for program success are: patient engagement, setting goals, and communicating with families, providers, patients and caregivers [16]. The core components of success and instillation of the TCM are having the APN perform a pre-discharge patient assessment, and then collaborate with the hospital team to develop a transitional care plan [9]. The APN makes multiple home visits, uses telephone outreach throughout the transitional care period, and promotes information transfer between the acute-care and primary-care settings by accompanying the patient to the first primary care follow-up visit [6,9,16-18]. The APN helps identify early signs and symptoms to expedite intervention in order to prevent readmission to the hospital.

A recent study revealed that organizations typically do not implement all of the essential components of Naylor's TCM [12]. The most common adaptions of the TOC programs were to substitute alternative staff members in the place of the APN. For example bachelor's prepared RNs were substituted 78% of the time, followed by social workers at 36%, and discharge planners or case managers at 28% [12]. Overall, only 45% of respondents used APN's to deliver TOC services [12]. Although authors from one study conclude that adaptations of the TCM are ubiquitous [12], few studies have explored or discussed the effect of these adaptations on desired outcomes.

One of the most critical times for heart failure patients is the transition from the acute care setting to home or other community settings and Gheorghiade et al. described the immediate post-discharge period as the "vulnerable phase" of heart failure [19]. Earlier studies demonstrated that patients with heart failure often lacked significant support from hospital and healthcare providers when transitioning from the hospital setting to the community setting [18,20,21]. In a landmark randomized clinical trial, Naylor et al. demonstrated the efficacy and effectiveness of a TOC versus standard care to reduce heart failure readmissions and lower mean total costs [22,23].

APNs were critical in leading and managing TOC in the heart failure population as they were able to diagnose and treat the patient in the early phase of heart failure symptoms prior to the symptoms becoming too difficult to treat as an outpatient thus creating a hospital readmission [22,23]. In the outpatient setting, an RN-led interdisciplinary team facilitating TOC and assisted patients with outreach and problem solving [24]. Li et al. determined that an APN-led outpatient TOC program was effective and highlighted the pivotal role that APN's provide to this type of program along with the value this type of program has in providing care access for low income populations and for patients with less access to care [25].

The Doctor of Nursing Practice (DNP)-prepared APN is trained and prepared at the highest level of advanced nursing practice. In addition to demonstrating practice expertise, specialized knowledge, and expanded responsibility and accountability in the care and management of individuals and families [26], DNP-prepared APNs are educated to integrate nursing science with nursing practice to form the highest level of evidence based practice [26]. Further, the DNP-prepared APN is also trained in cultivating and assessing care delivery approaches that meet current and future needs of patient populations based on scientific findings in nursing and other clinical sciences [26]. Lastly, DNP training emphasizes to the application of knowledge to improve health outcomes by integrating current research and state-of-the-art quality improvement programs to result in innovative practice [26]. While APN plays a central role in many successful TOC programs, to include heart failure [22], the added value that the Doctorate of Nursing Practice (DNP) prepared APN can provide to TOC programs for heart failure has not been explored. As a first step, our objectives were to describe the heart failure patient population of a southwestern private cardiology clinical practice, to evaluate the need for an outpatient private practice-based TOC program for this heart failure population, and to determine the readiness for an outpatient-based TOC program to be led by DNP-prepared APNs.

Methods

In this study, outpatient private-practice based program was defined as a program that is independent of any hospital or academic center affiliation and whose resources are accounted for by the work of a provider who are able to bill for and adhere to CMS guidelines for transitional care services. The private cardiology practice was located in an urban southwest city with a population of roughly 1 million people [27]. A descriptive study design was used meet the study objectives and study approval was obtained from the Institutional Review Boards at the University of Arizona and Pima Heart Physicians, P.C.

The number of patients diagnosed with any form of heart failure, via ICD-10 codes, was collected as deidentified data from the electronic medical record system of the cardiology practice. Data were collected from the first day of ICD-10 coding initiation (Oct 1, 2015 through May 31, 2017). Patient age and gender were collected; however, we were unable to query the database for comorbid conditions. A Qualtrics™ survey was sent to physicians, APNs (masters and DNP prepared), and physician assistants at the cardiology practice to evaluate 1) the perceived need for a TOC program and 2) providers' readiness for an DNP-APN led heart failure TOC program. Survey questions were formulated to included topics that were pertinent to the standard of care for heart failure and to TOC program success, as described by Naylor [9,15,22].

Descriptive statistics for the patient sample were reported as counts and percentages for categorical variables. Age, which was found to have a left-skewed distribution for this patient sample, was described in terms of median and range. Comparisons by sex were made using two-sample tests of proportions, and the Mann-Whitney Rank Sum test using Stata software (version 15.0).

Results

Our data revealed that this southwestern cardiology private practice included 3,175 heart failure patients from October 1, 2015 to May 31, 2017, a slight majority of which were female (53.4%). (Table 1) describes this sample in terms of age and ICD-10 code, the definitions for which are provided in (Table 2). The most common ICD-10 code in the entire sample was [I50.32] Chronic Diastolic Congestive Heart Failure. In addition to ICD-10 code [I50.32] being the most frequent diagnosis used, we need to also mention the majority distribution of the diagnosis falls in the diastolic congestive heart failure series [I50.30-I50.33] (N=2275). The next largest distribution was Unspecified Systolic Congestive Heart Failure [I50.20] (N=464) followed by Congestive Heart Failure due to Hypertension [I11.0] (N=288).

	All Subjects (N = 3175)	Female (N = 1696)	Male (N = 1479)	
	median (min, max)	median (min, max)	median (min, max)	P-val*
Age	80 (27, 105)	81 (27, 105)	79 (30, 100)	<0.001
ICD10 Code	n (%)	n (%)	n (%)	P-val**
I11.00	288 (9.1)	163 (9.6)	125 (8.5)	0.3
I50.20	464 (14.6)	201 (11.9)	263 (17.8)	<0001*
I50.21	25 (0.8)	13 (0.8)	12 (0.8)	0.9
I50.22	39 (1.2)	32 (1.9)	7 (0.5)	0.0003*
I50.23	13 (0.4)	7 (0.4)	6 (0.4)	1
I50.30	469 (14.8)	237 (14.0)	232 (15.7)	0.2
I50.31	395 (12.4)	240 (14.2)	155 (10.5)	0.0018*
I50.32	1138 (35.8)	632 (37.3)	506 (34.2)	0.07
I50.33	273 (8.6)	133 (7.8)	140 (9.5)	0.1
I50.40	14 (0.4)	7 (0.4)	7 (0.5)	0.8
I50.41	19 (0.6)	11 (0.6)	8 (0.5)	0.7
I50.42	21 (0.7)	12 (0.7)	9 (0.6)	0.7
I50.43	17 (0.5)	8 (0.5)	9 (0.6)	0.6

*Assessed by Mann-Whitney Rank-Sum test.
**Assessed by two sample test of proportions (two-sided) within each ICD-10 Code. Starred p-values indicate comparisons considered to be statistically significant by a Bonferroni adjusted alpha, which for 13 comparisons = 0.05/13 = 0.00385.

Table 1: Characterization of 3175 heart failure patients from a southwestern cardiology private practice, from October 1, 2015 to May 31, 2017. Median age and ICD-10 Code distributions are shown for all patients and stratified by sex.

ICD-10 Code	Definition
I 11.0	Congestive Heart Failure Due to Hypertension
I 50.20	Unspecified Systolic Congestive Heart Failure
I 50.21	Acute Systolic Congestive Heart Failure
I 50.22	Chronic Systolic Congestive Heart Failure
I 50.23	Acute on Chronic Systolic Congetsive Heart Failure
I 50.30	Unspecified Diastolic Congetsive Heart Failure
I 50.31	Acute Diastolic Congestive Heart Failure
I 50.32	Chronic Diastolic Congestive Heart Failure
I 50.33	Acute on Chronic Diastolic Congestive Heart Failure
I 50.40	Unspecified Combined Congestive Heart Failure
I 50.41	Acute Combined Congestive Heart Failure
I 50.42	Chronic Combined Congestive Heart Failure
I 50.43	Acute on Chronic Combined Congetsive Heart Failure

Table 2: Heart Failure ICD-10 Codes Defined.

(Table 1) also includes a description of age and ICD-10 code diagnosis by sex. The median age of females in our sample was significantly greater than that of men, and females were more likely than men to be diagnosed with ICD-10 codes of I50.22 (Chronic Systolic Congestive Heart Failure) and I50.31 (Acute Diastolic Congestive Heart Failure). In contrast, men were significantly more likely than women to be diagnosed with code I50.21 (Acute Systolic Congestive Heart Failure). A complete picture of the distributions of age by ICD-10 codes of sex are depicted in (Figure 1).

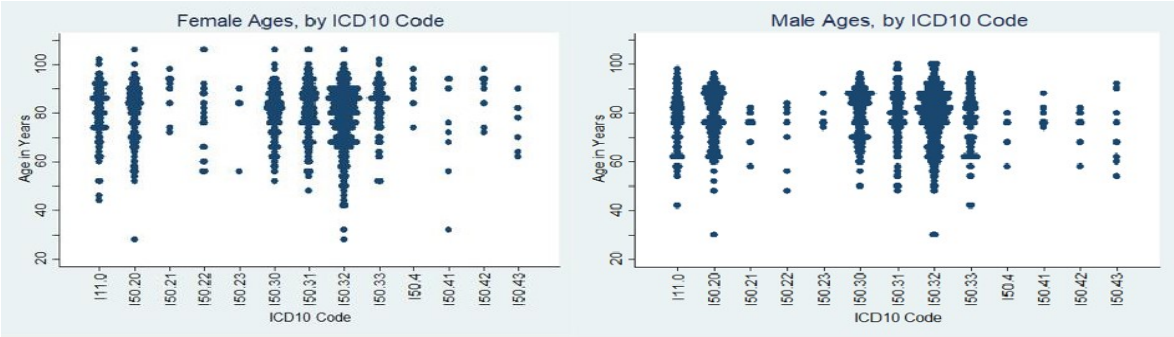

Figure 1: Distribution of Age by ICD-10 Codes and Sex.

Of the 23 providers querried in this practice, 60% completed the heart failure transitions of care survey (N = 14). Responses to the survery questions are summarized in (Table 3). Notably, 35% of the providers acknowledge that they never document heart failure readmissions in the practice electronic medical record system. Nearly 65% of survey respondents indicated that they "strongly agree," that HF patients discharged from the hospital require a specific plan of care, while 86% of providers (N=12) indicated that they either "somewhat agree" or "strongly agree" in the need for a TOC program for heart failure patients within their cardiology practice. Over 71% (N=10) of the providers "strongly agree" that they would support a DNP-prepared APN led outpatient-based TOC program for heart failure.

Survey Questions	Answer Choices	Respondent Answers
Which type of professional degree do you hold?	A) MD	A) (N=7; 50%)
	B) DO	B) (N=0)
	C) DNP	C) (N=3; 21.4%)
	D) MS/MSN	D) (N=4; 28.6%)
How many years have you practiced cardiology?	A) 0-5 years	A) (N=4; 28.6%)
	B) 5-10 years	B) (N=2; 14.3%)
	C) 11-20 years	C) (N=5; 35.7%)
	D) 20+ years	D) (N=3; 21.4%)
What percentage of your practice is dedicated to heart failure?	A) 0-5%	A) (N=2; 14.3%)
	B) 6-10%	B) (N=2; 14.3%)
	C) 11-20%	C) (N=2; 14.3%)
	D) 21-30%	D) (N=1; 7.1%)
	E) 30%+	E) (N=7; 50%)
How often do you document heart failure readmissions in your EMR?	A) Always	A) (N=1; 7.1%)
	B) 75% of the time	B) (N=4; 28.6%)
	C) 50% of the time	C) (N=4; 28.6%)
	D) 25% of the time	D) (N=1; 7.1%)
	E) Never	E) (N=4; 28.6%)
How often do your heart failure patients get readmitted to the hospital?	A) 0-5% of the time	A) (N=7; 50%)
	B) 6-10% of the time	B) (N=6; 42.9%)
	C) 11-20% of the time	C) (N=1; 7.1%)
	D) 21-30% of the time	D) (N=0)
	E) More than 30% of the time	E) (N=0)
Do you believe in a specific plan of care for heart failure patients post hospital discharge?	A) Strongly agree	A) (N=9; 64.3%)
	B) Agree	B) (N=3; 21.4%)
	C) Somewhat agree	C) (N=2; 14.3%)
	D) Neither agree or disagree	D) (N=0)
	E) Disagree	E) (N=0)
	F) Strongly disagree	F) (N=0)
Do you believe there is a need for a transitional care program for patients with heart failure?	A) Strongly agree	A) (N=5; 35.7%)
	B) Agree	B) (N=3; 21.4%)
	C) Somewhat agree	C) (N=4; 28.6%)
	D) Neither agree or disagree	D) (N=2; 14.3%)
	E) Disagree	E) (N=0)
	F) Strongly disagree	F) (N=0)
Which areas of heart failure transitions of care do you feel is important in order to prevent hospital readmissions and achieve the most favorable patient outcomes? (Select all that apply)	A) Patient engagement	A) (N=13; 92.9%)
	B) Caregiver engagement	B) (N=11; 78.6%)
	C) Complexity of medication management	C) (N=11; 78.6%)
	D) Patient education	D) (N=14; 100%)
	E) Caregiver education	E) (N=9; 64.3%)
	F) Continuity of care	F) (N=14; 100%)
	G) Accountability (clinician, team and/or organizational)	G) (N=10; 71.4%)
	H) Patient well-being	H) (N=9; 64.3%)
	I) Caregiver well-being	I) (N=5; 35.7%)
Would you support the implementation of a transition of care program for heart failure patients within your practice versus a hospital-based transition of care program?	A) Strongly support	A) (N=9; 64.3%)
	B) Somewhat support	B) (N=3; 21.4%)
	C) Neutral	C) (N=2; 14.3%)
	D) Somewhat opposed	D) (N=0)
	E) Strongly opposed	E) (N=0)
Would you support a DNP-prepared nurse practitioner lead transition of care program for heart failure patients as part of your practice?	A) Strongly support	A) (N=10; 71.4%)
	B) Somewhat support	B) (N=2; 14.3%)
	C) Neutral	C) (N=1; 7.1%)
	D) Somewhat opposed	D) (N=1; 7.1%)
	E) Strongly opposed	E) (N=0)

Table 3: Heart Failure Transitions of Care Survey.

Discussion

As suggested by quality improvement research, a necessary first step toward developing and implementing a new program is to identify the need and readiness of the system and the stakeholders, thereby identifying barriers and challenges to program development [3,21,24,28]. Using this approach, several important practice implications arose from our study. First, we were reminded that the electronic medical record is a powerful tool that has the potential to provide rich data to track program outcomes; in our study, over 3,000 patient records were accessed from a single practice over a 19-month period. Our findings indicated that while heart failure diagnosis by ICD-10 code was similar between men and women, there were more women than men in the entire sample, particularly between the ages of 70-79 years. Our observation of gender differences in this heart failure population will drive evidence-based practice for future TOC program implementation and the data suggests that the needs of heart failure patients may vary by gender and the possibility of this difference should be considered in the planning of TOC programs.

Although we were unable to collect data regarding comorbid conditions, recent data suggest that diastolic congestive heart failure patients have an average of one additional comorbid condition such as diabetes or hypertension compared to those with systolic congestive heart failure [2,29,30]. With that said, patients with diastolic congestive heart failure often get classified into two sub groups; one being primary diastolic congestive heart failure and the other being secondary diastolic congestive heart failure [31]. The primary group typically consists of patients with hypertension, diabetes, obesity, and metabolic syndrome and is a more common diagnosis in females [31]. The secondary group consists of patients with diastolic heart failure caused by valvular heart disease, cardiomyopathies, pericardial disease, and cardiac rhythm abnormalities [31]. This is important regarding our data considering the third largest diagnosis grouping (I11.0 Congestive Heart Failure due to Hypertension), could have easily been classified into the diastolic heart failure series [I50.30-I50.33], adding more volume to the largest grouping of patients. Identifying these differences in heart failure diagnosis and classification could impact care outcomes and should be considered when developing TOC programs.

Due to inherent disadvantages of dictation as the source of data entry and the lack of an advanced sorting feature of this particular electronic medical record, it was not possible to obtain hospital readmission data, patient comorbid conditions and other such variables that are known to be present in heart failure patients and critical to TOC programs [1,3,19,22,32,33]. This hurdle must be overcome for future data collection and future research on TOC program implementation and effectiveness [24,28].

We used a survey to assess the need and readiness for the practice adopting a TOC program for heart failure. The provider survey gave us a clear picture on the need and readiness of a private practice-based TOC program for heart failure. The survey results gave us an idea of their feelings on what the potential facilitators and barriers are to implementing a private practice TOC program and reflect the provider knowledge of the importance of the core transitional care components described by Naylor [9,12]. Third, the survey responses indicated that providers supported a clinic-based TOC heart failure program with a DNP-prepared nurse practitioner leading its implementation and operation. Future studies might evaluate whether the DNP-APN prepared nurse leader serving in this unique role will improve health outcomes of patients with heart failure.

Conclusion

The success of TOC programs in diverse populations have been widely reported [12,22,34,35]. It is well known how debilitating heart failure can be from a physical, emotional, and mental standpoint. Currently, there are substantial gaps in the heart failure patient's transition from the hospital to the community setting due in part to the complexity of our health care system as well as the complexity of heart failure management. Considering the shrinking resources for hospital- based TOC services, the advent of outpatient TOC reimbursements and promising data from several non-hospital based TOC programs for heart failure, there is an incentive and perhaps a responsibility to fully understand the value of novel outpatient private-practice based TOC program to support the growing population of those with heart failure.

Our quality improvement study, while not generalizable, demonstrated the feasibility of a private-practice based DNP-led TOC program for heart failure. Our study not only demonstrated support for a program that included transitional care components known to support program success [9,12] but also indicated support from the practice for DNP-led program. We believe that a DNP practitioner-scholar is thoroughly prepared to take the lead in designing, implementing, and evaluating a TOC program for heart failure within a private practice setting. In addition, we learned that the development of TOC programs can be tailored to the specific practice, considering factors such as gender and frequency of ICD-10 codes. Finally, future quality improvement and research studies are needed to fully evaluate novel models of private practice or other outpatient-based DNP led TOC models in order to improve care for the burgeoning population of those with heart failure.

Highlights

- Heart failure is a significant and growing burden on healthcare worldwide
- Transitions of care (TOC) programs have been shown to decrease hospital readmissions

- Nurse practitioners (NP) play a key role in the success of TOC programs
- Hospital-based TOC programs are not enough and novel outpatient models of TOC programs are needed
- Doctor of Nursing Practice (DNP) prepared NPs are prepared to lead in designing, implementing, and evaluating novel TOC programs in the outpatient, private practice setting

Conflict of Interest Statement

There is no conflict of interest associated with the authors or this manuscript.

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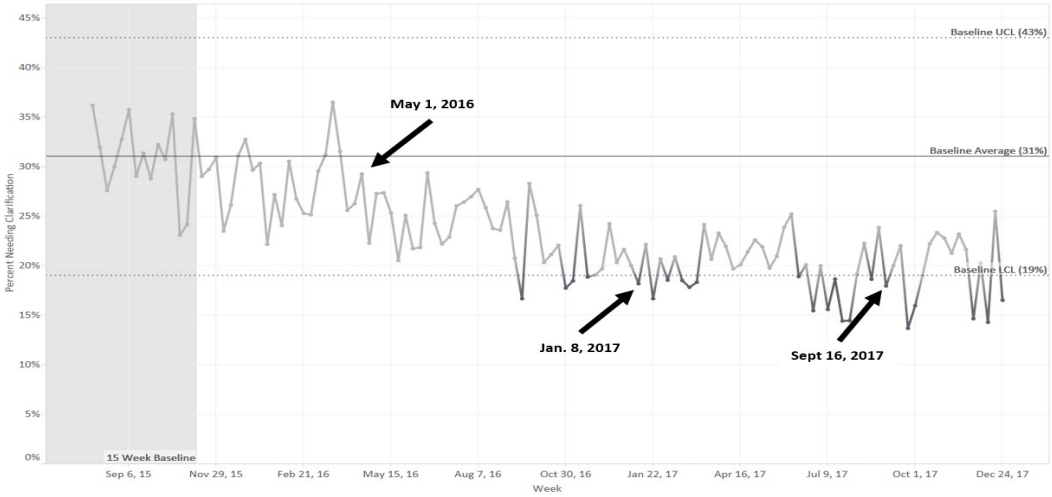

Figure 1: Control Chart: Weekly Percent of Patients Needing Medication Clarification. Week 1-15 were used to calculate control limits. Dark grey points indicate points greater than three standard deviations below center line (average percentage of 15-week baseline period). Starting with week 36 (May 1, 2016), all data points are below the center line, indicating a downward shift in the data.

This project not only reduced pADEs but saved the health care system over 2,750 hours of medical staff time. This finding is based upon our assumption that it takes 75 minutes to correct a pADE. This assumption is based upon the following:

- Registered Nurse (RN) or Licensed Practical Nurse (LPN) identification of pADE
- RN/LPN determination of corrective action (may need to research issue)
- Telephone call placed to medical provider for clarification
- Medical provider reviews request
- Medical provider calls RN/LPN
- RN/LPN writes telephone order (introduces another possibility of a pADE)
- RN/LPN enters new order into the electronic health record
- RN/LPN sends new order to pharmacy

Assuming a RN in the U.S. is paid $32 per hour [8], and a general practitioner (GP) is paid $110 per hour [9], each pADE may cost up to $59.50, based on an 80/20 RN to GP cost division. As such, the activities associated with the identification and correction of pADEs saved approximately $163,625 in health care related costs.

Discussion

This quality improvement initiative reduced the aggregate probability of a pADEs by 36% between participating hospitals and SNFs. Extrapolating this reduction, approximately 2,200 pADEs were prevented. This resulted in a reduction in ADEs, but to quantify this reduction is difficult, as not all pADEs result in an ADE. Identifying and correcting pADEs before administering medications is one method to prevent an ADE from occurring.

Using data to identify factors potentially leading to an undesired event (e.g., ADE) presents potential ethical implications and responsibilities. These results were discussed during quarterly meetings with three separate community groups that included hospitals and SNFs. Data use and sharing agreements allowed for discussion among all participants. Prior to disclosures, all participants were reminded of agreements and given the ability to withdraw from the discussion. No agency, provider or participant withdrew consent. Agreements were updated annually. No personal identifying data were collected to avoid any HIPAA conflicts and/or violations.

The results of these types of community group discussions have a positive impact upon the relationships between hospitals and SNFs and facilitate additional interventions that further reduce the number of medications needing clarification. For example, the findings associated with diabetic agents have critical patient safety issues and several local communities are exploring interventions.

Limitations

Medications identified as pADEs were categorized into five types. No interrater reliability testing was performed to determine if proper categorization occurred. The “other” category also represents a disproportionate number of identified pADEs. To address this, future activities may involve the utilization of representative sampling to determine which medications are in this category and to look for patterns that may lead to additional interventions.

Conclusion

Reducing pADEs can improve patient safety and outcomes. An active medication reconciliation process during transition of care can improve medication safety and reduce ADEs. A systematic approach to these reconciliations, including processes associated with INTERACT or other quality improvement projects, must be in place to ensure they are conducted in a consistent manner. Documenting reconciliation outcomes and using findings in community-based health care settings can reduce adverse drug events.

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