Incorporating Teamwork Strategies for Internal Medicine Residents in Training to Mitigate Hospital Utilization for High-Risk Patients

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ABSTRACT

Complex, high-risk patients experience poor health outcomes, and many utilize the emergency room for routine primary care in lieu of outpatient visits. In 2017, we created the Comprehensive Care Clinic (C3) at Brown University Health, Providence, Rhode Island to identify and address the factors responsible for excess emergency room and hospital utilization for patients identified as high utilizers. This study evaluated the outcomes of a group of 159 patients who participated in C3 during the time period of 2017–2019. Emergency Department (ED) and Inpatient (IP) utilization is measured before and after the index C3 visit and compared with our control group of similar patients who did not participate in the C3 visit. Assistance with point-of-care issues such as transportation, medications, and addressing health literacy and the provision of targeted health coaching are the major interventions. A reduction of 56% for combined ED and IP utilization was measured for a group of 159 patients compared with our control group. A team-based approach to the care of high-risk patients in a residency ambulatory clinic allows for targeted interventions that resulted in reduced ED use and IP admissions. Internal Medicine resident physicians also learn the benefits of team-based care.

KEYWORDS: hospital utilization; residency training; high-risk patients; team-based primary care

INTRODUCTION

Population health studies in the United States have identified high-risk patients as a relatively small group of complex patients that account for a large percentage of health care expenditures.[1-3] Inpatient hospital services and emergency department care account for a large proportion of these expenditures.[4,5] Common characteristics of high-risk patients include multiple medical problems, polypharmacy, being a person of color, and lack of adequate health insurance and other socioeconomic challenges. In addition, high-risk, complex patients tend to have disproportionate and un-met psychiatric needs that include substance use disorders.[6-9] Greater support and access to treatment is clearly needed for these patients. Physicians struggle to provide care for complex patients due to lack of time, the presence of multiple medical and social comorbidities and fragmented health care. Internal Medicine residents face additional challenges during their ambulatory clinic experience including lack of consistent patient continuity, administrative burdens and lack of familiarity with team-based care. These issues can lead to resident dissatisfaction with outpatient care. Comprehensive Care Clinic (C3) was created in 2017 to help our Internal Medicine residents identify and address the factors responsible for over utilization of hospital resources and give them additional assistance.

Our clinic is a Patient-Centered Medical Home (PCMH) that provides care for a mostly underserved population. We incorporate a nurse care manager model across care settings and are an integral partner in our Medicare Accountable Care Organization (ACO). The patient population we serve accounts for a large percentage of the most complex and costly patients in our healthcare system, many of which are frequent users of emergency department and inpatient services. We sought to leverage a team-based approach with a nurse care manager, social worker and pharmacist to help residents address the factors that account for utilization of the emergency room in lieu of our office for common health issues.

Internal Medicine residents provide care for the majority of the patients seen in our clinic. Many of the patients are underinsured, medically and socially complex and our no-show rate hovers in the 20% range. Residents don't have enough time to address these issues adequately during a typical 30-minute visit. A single primary care provider, especially one in training, can find it difficult to address transportation barriers, housing instability, and immigration forms in addition to the patient's actual medical issues. We hypothesized that our interdisciplinary team's structure and approach could help reduce emergency room utilization by identifying each patient's unique needs. Longer sessions (60 minutes) are critical for understanding a patient's priorities and allow for a deeper exploration of a patient's values and personal context. We hypothesized that hospital utilization, including ED visits and IP admissions, would decrease for C3 patients and remain unchanged for our control group (waitlist or general clinic patients who met the inclusion criteria but were not scheduled for C3). Additionally, we measured hemoglobin A1c (HbA1c) values in all three groups.

METHODS

Our study included collected data on patients seen between 9/14/17 and 2/14/19 at the Center for Primary Care of Rhode Island. The report data we used was extracted from EPIC, our electronic health record. The nurse care manager (NCM) identified those patients with the highest utilization—defined as more than three ED visits or two hospitalizations in a single year. Patients were excluded if they had significant psychiatric illness (such as schizophrenia), were enrolled in hospice care or had a history of ongoing substance use disorder, such as chronic alcoholism. The C3 clinic did not have the expertise to adequately address these problems. We compared the outcomes of patients seen in C3 to an identical population on a waitlist for a C3 appointment. The patients on the waitlist meet our inclusion criteria but have not been given a C3 appointment during the data collection time frame. Our NCM coordinated the visits, scheduling patients with their respective resident PCP. Patients were asked to bring in all their medications for review and asked if they needed assistance with transportation prior to the visit. Charts were reviewed in advance of the visit by all members of the C3 team and a pre-visit huddle was conducted by our nurse care manager. This gave our group an opportunity to discuss the patient's needs and to identify potential barriers in advance. Screening for non-medical determinants and identifying medication-related problems and care gaps were key components for group discussion. This process allowed us to develop targeted, individualized interventions. Our primary outcomes were directed at mitigating hospital utilization, including ED, and IP admissions. Secondary goals included improving chronic disease management, with a focus on diabetes (HbA1c measurement). Our pharmacist completed a thorough medication reconciliation with each patient, identified barriers to adherence and affordability, counseled patients, and provided recommendations to the team to address medication-related problems [**Table 1**]. Working directly with a pharmacist allows for the immediate resolution of medication related problems prior to discharge. This novel, collaborative effort with the patient ensured a thorough and accurate medication reconciliation process. We collected social determinants data using REDCap[9] for the C3 group indicating that most have stable housing (75.1%), receive disability benefits (67.6%), do not have a college degree (81%), and very few have their own car (80.3%). Our social workers screened patients for these issues as well as behavioral issues, such as depression and anxiety during the index C3 visit. We did not formally track this information and it was limited to our C3 intervention group only.

Table 1. Pharmacist Interventions: access, adherence, and therapeutic omission. Access includes cost, lack of adequate insurance coverage and difficulty obtaining medications. Therapeutic omission is failure to use EBM guidelines.

	Medication access	Medication adherence	Therapeutic omission
Total interventions	14%	17%	17%
Number of unique patients	20%	25%	36%

Calculating the Treatment Window for Pre- and Post-Intervention Periods

For C3 patients, the first C3 clinic visit was used as the intervention point. For the waitlist and the general clinic patients, the first ever visit to the clinic was used as the intervention point. For all patients, a 12-month window—with six months pre-intervention and six months post-intervention—was defined as the intervention point.

Statistical Methods

As a rudimentary way to compare comorbidities status of the different clinical groups, a new variable was created summing the presence of high-risk comorbidities (Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), Hypertension (HTN) and Diabetes). This comorbidity count was then compared between the groups (generalized linear model for binomial). The percent of patients with each comorbidity, the mean age, the percent female, and the percent race composition were also calculated and presented by patient group [**Tables 2,3**].

A generalized linear model for a Poisson distribution was used to model number of visits per patient (ED and IP separately) by time (pre-post intervention) and by level of patient care (C3, C3 waitlist, general clinic patients). An interaction between time and level of patient care was included to allow for varying affects over time. Similarly, HbA1c values were modeled (log normal) for patients by time period and by level of patient care. An interaction term was included to allow for differences in HbA1c over time by group. From the models, estimated number of visits or HbA1C level was compared between pre- and post-intervention time periods for each level of patient care. All statistical models were run using Proc Glimmix (SAS Institute Inc., Cary, NC). Familywise alpha was maintained at 0.05 using the Holm adjustment. Repeated measures were accounted for using the random statement. We received Rhode Island Hospital Institutional Review Board approval to conduct this study.

Table 2. Percent of patients with comorbidities (CHF, COPD, HTN, and Diabetes) by patient group. These comorbidities are the constituent parts of the comorbidity score.

Comorbidity (% of group)	Group		
	C3	C3 Waitlist	General Clinic
CHF	33.96	22.22	0.93
COPD	30.82	21.8	0.86
HTN	79.25	77.89	34.39
Diabetes	59.12	49.69	17.16

Table 3. Percent of patients that identify by racial group, ethnicity and sex assigned at birth.

Race	Group		
	C3	C3 Waitlist	General Clinic
American Indian or Alaska Native	0.00%	0.57%	0.37%
Asian	1.18%	1.61%	2.6%
Black or African American	27.60%	25.65%	23.50%
Native Hawaiian or Other Pacific Islander	0.00%	0.26%	0.40%
Unknown/Refused/ Other	38.40%	36.57%	42.34%
Caucasian	30.18%	35.32%	30.67%
Total Patients	159	1922	6161
Ethnicity	**Group**		
	C3	**C3 Waitlist**	**General Clinic**
Hispanic or Latinx	42.76%	40.16%	46.11%
Not Hispanic or Latinx	57.23%	59.41%	52.42%
Patient Refused	0.00%	0.026%	0.74%
Unknown	0.00%	0.20%	0.71%
Total Patients	159	1922	6161
Gender	**Group**		
	C3	**C3 Waitlist**	**General Clinic**
Female	54.08%	45.05%	52.73%
Male	45.91%	54.94%	47.26%
Total Patients	159	1922	6161

RESULTS

Demographics

Our study analyzed visits for a total of 8,242 patients from 9/14/2017 until 2/14/2019. The C3 group included 159 patients, the C3 waitlist included 1,922 patients and the general clinic included 6,161 patients. The mean age for the C3, the C3 waitlist, and the general clinic patient groups was 60.0 [51.3, 68.9], 58.5 [49.6, 66.8], and 48.1 [34.0, 61.0], respectively. The mean percent female for the C3 group, the C3 waitlist group, and the general clinic patient group was 54.1%, 45.1%, and 52.7%, respectively. The mean comorbidity count for the C3, waitlist, and general clinic patient groups was 2.03 [1.88, 2.19], 1.72 [1.67, 1.76], and 0.53 [0.52, 0.55] comorbidities, respectively. Co-morbidity differences between all groups was significant (p<0.0001). The make-up of comorbidities by group can be seen in **Table 2**. The racial, ethnic and sex assigned at birth composition of each group can be seen in **Table 3**.

Patient Group Comparisons Pre- and Post-Intervention

The following results were obtained from our data collection time frame; 9/14/17 to 2/14/19. The C3 group saw a significant decrease in mean number of ED visits (2.17 [1.89, 2.5] to 1.27 [1.01, 1.6], p<0.0001). General clinic patients saw a decrease as well, but not significant (0.91 [0.84, 0.99] to 0.87 [0.83, 0.92], p=0.4228). Conversely, the waitlist patients saw a significant increase in ED usage (1.32 [1.08, 1.6] to 1.85 [1.55, 2.19], p<0.0001) [**Figure 1**]. The C3 group saw a significant decrease in mean number of inpatient visits per patient (1.71 [1.39, 2.09] to 1.28 [1, 1.65], p=0.0372). The general clinic patients also saw a significant decrease in inpatient visits (0.87 [0.83, 0.92] to 0.59 [0.54, 0.66], p<0.0001). The waitlist patients saw no detectable change in inpatient visits (0.93 [0.85, 1.02] to 0.95 [0.84, 1.08], p=0.7572) [**Figure 2**]. The C3 group saw a decrease in mean HbA1c values although

Figure 1. Mean number of ED visits per patient per time period and patient group. Blue and red dots represent the mean number of visits per patient; bars represent 95% confidence intervals.

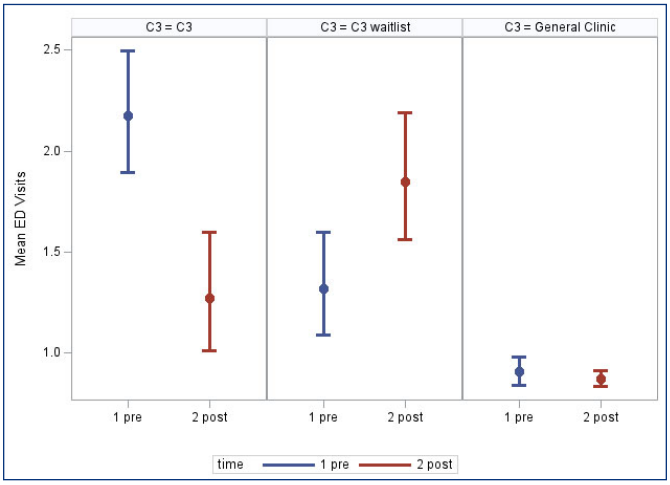


Figure 2. Mean number of Inpatient visits per patient per time period and patient group. Blue and red dots represent the mean number of visits per patient; bars represent 95% confidence intervals.

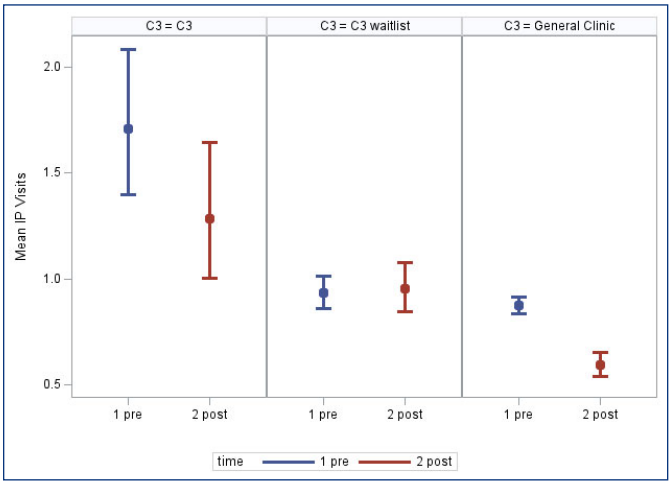
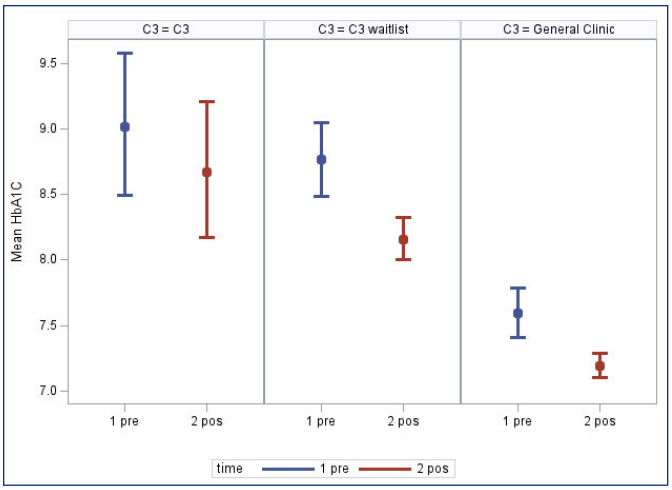


Figure 3. Mean HbA1c values per patient per time period and patient group. Blue and red dots represent the mean number of visits per patient; bars represent 95% confidence intervals.



this difference did not reach significance (9.02 [8.48, 9.59] to 8.67 [8.16, 9.22], p=0.1112). The general clinic patients saw a significant decrease in HbA1c values (7.6 [7.4, 7.8] to 7.2 [7.1, 7.3], p<0.0001). The waitlist patients saw a significant decrease in A1C values (8.76 [8.48, 9.06] to 8.16 [7.99, 8.33], p<0.0001) [**Figure 3**].

DISCUSSION

The C3 clinic was successful in reducing ED and IP admissions by 56% for a cohort of 159 complex patients seen in our facility between September 2017 and February 2019. These patients were compared with other complex patients who met our inclusion criteria but were not yet scheduled for C3 (C3 waitlist) and the rest of our clinic population seen during that same time period. Complex patients on the waitlist had an increased number of ED visits and no change in their IP utilization. For ED visits alone, the C3 patient average decrease was 0.9 (2.17–1.27), while those on the C3 waitlist saw an increase of 0.53 (1.32–1.85). All three groups had improvement in their HbA1c values, due to the fact that they were receiving attention for diabetic care. Patient scheduling was limited by patient and primary care resident availability since our clinic took place on Thursday mornings only.

The team-based organization of our group included input from the primary care resident physician, attending physician, social worker, pharmacist and nurse care manager. The nature of our clinic experience included pre-visit and post-visit chart huddles. These group discussions allowed for shared strategies tailored for the needs of each patient. The group was able to identify barriers to good care in most situations that resulted in action plans. These plans took the form of either immediate or long-term assistance. Immediate (point-of-care) assistance was provided for barriers such as transportation, help with medications and addressing care gaps such as immunizations, HbA1c testing and others. Our group filled our forms onsite for patients who qualified for special transportation programs. Taxi vouchers were provided for a limited number of patients who were overdue for a visit and had no other means of transportation; we would not have been able to see them otherwise. These interventions made it easier for C3 patients to be seen in clinic (rather than the ED) while those on the waitlist did not have these same resources.

The pharmacist intervention provided direct, point-of-care intervention covering a host of medication issues. Over 80% of the C3 patients experienced polypharmacy, defined as >8 medications. The other medication-related issues encountered were access (cost or lack of reliable transportation) (20%), adherence (25%) and omission (36%). Direct patient assistance from our pharmacist came in the form of education, provision of affordable alternatives, and improved access. The provision of low-cost medications, the elimination of medications that were no longer needed, home delivery and blister packs were key interventions in some cases.

Longer visits gave the primary care residents more time to explore the patient's personal needs on a deeper level. Only 19% of our cohort had a college degree or higher, and a little over 67% were receiving disability and/or Supplemental Nutrition Assistance Program (SNAP) benefits. A little less than 20% of our patients had their own car. Understanding the patient's life challenges allowed the resident more time to develop targeted care plans. The first question posed to the patient (using our C3 visit EPIC smart phrase) was "What's the most important health concern for you right now?" This question was asked to gain an understanding of the patient's perspective as we tried our best to align our goals with those of the patient.

The post-clinic huddle was utilized to summarize each case and generate targeted long-term assistance. Follow-up visits were scheduled in a timely manner with a NCM, social work, and pharmacist team members, with the patient sometimes seeing all three if needed. The follow-up educational sessions (coaching) with our nurse care manager were extremely beneficial for patients struggling with health literacy. Care plans were developed that met the specific needs of each patient. Patients were given the direct phone number to the NCM for any follow up concerns and patients were followed until their care goals were met.

Patients were given timely follow-up with their PCP resident physician to capture the momentum of the C3 intervention. Challenges with resident and patient scheduling impact continuity in our clinic and can have adverse consequences for chronic disease management. We made sure patients had timely follow up with their PCP to review the

recommendations of the C3 team. Although a formal survey was not conducted, resident-physicians expressed joy and satisfaction with these appointments through personal communication with Dr. Messina.

The Patient-Centered Medical Home (PCMH) model in Rhode Island (where this study was conducted) has demonstrated statistically significant reductions in utilization.[11] Properly organized and funded primary care practices are well poised to offer help to address the needs of high-risk patients. Studies have shown that decreased utilization and cost of care with improved health outcomes is possible when the proper care elements are in place. Programs with well-trained NCMs have been successful in reducing readmission and associated costs. Continuity with the same NCM, help with medication management, in-person encounters, and patient education (coaching) are elements associated with success decreasing utilization.[12-15] Intensive care management programs that address psychosocial problems have been able to decrease ED use and save money through a collaborative approach with the ED, inpatient (IP) and primary care providers.[16] When queried, complex patients valued care management that helped them manage their medical problems and medications and provided guidance with unmet social needs.[17] Trust between patients and their healthcare system is a difficult variable to measure; however, when present, it can positively affect cost. Patients and their families who trust their providers had lower costs for care for low-acuity medical problems.[9,14,15] Trust between patients and their providers can also increase patient activation (patient's ability to self-manage) and avoid overuse of the ED.[16]

Care coordination is a core element of a patient-centered medical home. To be successful, care coordination should be integrated across services and settings and personalized. A search of the medical literature found that not all care management approaches were successful in achieving their stated goals with respect to addressing readmissions and over-utilization. The characteristics that were associated with success included the following: continuity of care between the nurse care manager and patient; face-to-face patient contact between the nurse care manager and patient; physician engagement; and medication management.[12,18,19] Our clinic had these elements. Surveys of high-needs patients indicate that, with improved access and good patient-provider communication, patients are less likely to visit the ED.[20] Addressing and acting on Social Determinants of Health (SDH) is a major part of our C3 effort. Targeted interventions with active ED case management have also been shown to decrease ED utilization.[16] Going forward, we would like to expand our NCM numbers and open our inclusion criteria to include more patients with behavioral needs that include substance use disorders.

Limitations

Our clinic is only open one morning per week for residents on their block rotation. The patients selected for inclusion were based on nurse care manager discretion and patient/provider availability and are thus subject to selection bias and limited to one hospital system. It is likely that an analysis with pre-selected inclusion criteria would not yield the same degree of reduced utilization achieved here. It is likely that our results may reflect regression to the mean, as seen on other similar efforts,[20] based on our sampling error, making the case for following our patients' progress for a longer time frame.

CONCLUSIONS

Interprofessional approaches to complex patient care that address social determinants, medication issues, health literacy and care gaps can help decrease hospital utilization when coordination of care and continuity are provided. Residents in training learn the benefits of team-based care.

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Disclosures

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