Impact of an individual plan of care for frequent and high utilizers in a large healthcare system ☆,☆☆

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ABSTRACT

Introduction: "Frequent or High Utilizers" are significant stressors to Emergency Departments (EDs) and Inpatient Units across the United States (US). These patients incur higher healthcare costs with ED visits and inpatient admissions. Our aims were to determine whether implementation of individualized care plans (ICPs) could 1) reduce costs, 2) reduce inpatient length of stay (LOS), and 3) reduce ED encounters throughout a large healthcare system.

Methods: 13 EDs were included including academic, community, Free-standing and pediatric EDs. Data was collected from January 1, 2014 through December 31, 2017. ICPs were created for high ED utilizers, as recommended by staff input through multidisciplinary care committees at each site. The ICP consisted of 1) specific symptom-related information with approaches in management, 2) recent assessment from specialists, 3) social work summary, and 4) psychiatry summary. A Best Practice Alert was placed in the electronic medical record that could be seen at all hospitals within the system. ICP's were updated annually.

Results: 626 ICPs were written; 452 initial ICPs and 174 updates. The 452 ICP patients accounted for 23,705 encounters during the four-year period; on average, an ICP patient visited the ED 52 times (14.75 encounters/year). Overall indirect and direct costs decreased 42% over first 6 months, inpatient LOS improved from 1.9 to 0.97 days/month, and ED encounters decreased from 1.96 to 1.14. All cost and LOS data significantly improved at 24 months post-ICP inception.

Conclusion: Implementation of individualized care plan can reduce cost, inpatient LOS, and ED encounters for high utilizers.

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1. Introduction

Frequent or high Emergency Department (ED) users are a significant stressor to Emergency Departments (EDs) and Inpatient Units across the United States (US) by disproportionately utilizing a high number of resources [1]. It has been reported that <1% of patients in the US account for 22% of US healthcare spending with a large percentage of costs related to preventable ED visits and repeated hospital admissions [2]. One review found that frequent ED utilizers account for 12–18% of all annual ED encounters and between 1 and 5% of the overall patient population [3].

Frequent utilizers have varying definitions in the literature with ranges between 3 and 10 visits within a 12 month period [4]. One large study defined *frequent users* as those with 4–7 encounters and *highly frequent users* as those with 8 or more encounters in one year [5,6]. These patients tend to have more psychosocial issues, chronic medical problems, and lower socioeconomic status associated with higher healthcare costs related to increased ED visits and inpatient admissions [7,8]. Various interventions have been reported that aim to create more appropriate utilization for this patient population and ultimately decrease total cost of care [9-11].

Suggested interventions to reduce overall healthcare costs have focused on care coordinators to help improve social and clinical outcomes around specific disease processes. Care coordination in many studies was implemented by multidisciplinary teams composed of nurses, physicians, social workers, and case managers [1,12,13]. Definitive evidence about the effectiveness of these

interventions is currently lacking and reducing ED utilization is an often elusive goal with limited success. We, therefore, primarily focused on reducing the cost of care and length of stay (LOS).

In this study, we sought to reduce variation of high utilizers across multiple EDs in our healthcare system. Our aims were to determine whether implementation of individualized care plans (ICPs) could 1) reduce costs associated with frequent ED utilizers, 2) reduce inpatient LOS, and 3) reduce ED encounters throughout the system.

2. Materials and methods

2.1. Study design

In a multicenter retrospective study, we reviewed patient encounters for identified frequent or high utilizers within a large, healthcare system of 13 EDs. Any patient with an ICP created through a hospital's multidisciplinary care committee was included. This study was approved by the Institutional Review Board of the healthcare system.

2.2. Setting

Nine multidisciplinary care committees were formed across the 13 EDs within the system. EDs were comprised of an urban academic quaternary care center, 5 urban community EDs, 3 suburban community EDs, 2 pediatric EDs, and 3 free-standing EDs. Free-standing EDs were paired with adjacent hospitals to facilitate access to ancillary staff such as social works; pediatric EDs were included in the general committee for their respective hospital. Data was collected from January 1, 2014, through December 31, 2017. All sites used the same electronic medical record (EMR) system allowing for common accessibility & data acquisition across the system.

2.3. Creation of individualized care plans

Each monthly committee meeting had a minimum quorum of an ED physician leader, care management liaison, and social worker. Representatives from Hospital Medicine, Nursing, Spiritual Care, Ombudsman, and Pain Management were represented as needed. Additional ad Hoc membership included Psychiatry, Pharmacy, Respiratory Therapy, Ethics, Wound Care, Dialysis, Security, and subspecialty care providers who had additional patient care knowledge. Staff who contributed to the ICP meetings did so as part of their routine administrative duties. Medical directors at respective sites who were the primary managers of the ICPS averaged about 1–2 h per month in preparation time for each ICP meeting. During this preparation, they would review upcoming ICP candidates and monitor ICPs that were ready for renewal. Administrative assistants kept a running list of ICP dates of creation in a main database and notified site directors when particular ICPs were ready to be examined for potential renewal.

Patients were referred for plan development by any staff member who determined that a high utilizer or high resource user would be best served by a coordinated multidisciplinary ICP. Patients with <4 ED visits per calendar year were excluded as plan development was likely to be low yield. If there were no patient referrals in a given month, then the highest utilizer (annual ED visits) for that site was reviewed.

The ICP consisted of 1) specific symptom-related information with effective approaches including involvement of care providers, labs, and imaging modalities; 2) most recent assessment/plans from specialists; 3) social work summary; and 4) psychiatry summary (when applicable). ICP recommendations included both ED and inpatient recommendations. Final ICPs were accepted by group consensus and placed in the EMR with the date ICP was created. A Best Practice Alert (BPA) would then trigger when providers entered the patient's chart anywhere within the healthcare system. All ICPs were reviewed, edited and updated on an annual basis to ensure continued clinical relevance. The site initiating the original ICP assumed responsibility for revisions, unless at subsequent re-evaluation it was determined that the patient was primarily utilizing another facility within the system. If a patient frequented more than one site, the ED system administrator adjudicated which site would write the plan. Patients were notified of the plan by registered letter or phone call.

ICPs were retired when patients no longer met established criteria (reduced usage) or when patient goals were met.

2.4. Data collection

Data was exported from the EMR and hospital administrative databases using a standardized query. Patients retained the same medical record number (MRN) across sites which allowed for comparison. The patient's MRN was de-identified in the dataset and a new number created to avoid inadvertent disclosure of protected health information.

2.5. Primary data analysis

For each patient, utilization information was collected by calculating the average number of monthly ED encounters, number of monthly inpatient LOS in days, and average monthly technical costs. Technical costs were divided into direct and indirect costs. Direct costs were defined as costs related to providing patient care, as determined by the health system. Indirect costs were defined as all other costs not directly related to patient care; examples include overhead, facilities, or any other administrative costs not related to patient care.

For the above metrics, 6 months pre- and post-data from inception of ICP was first collected to compare the immediate effect of ICP creation on healthcare utilization. Second, equidistant data was reported to capture the effect of an ICP for as long as it was in existence. For example, if a plan was in place for 13 months, then data examined 13 months pre-ICP and 13 months post-ICP. Finally, patient utilization data was collected to 24 months post-ICP inception and compared with 6 months pre-ICP data to determine the long-standing effects of resource utilization over time. Data management and analysis were calculated using descriptive methods, with confidence intervals recorded using SAS Enterprise Guide 7.1 (SAS Institute, Cary, NC, USA).

3. Results

Between January 1, 2014 and December 31, 2017, there were 827,164 unique patients treated in our system, accounting for 2,147,010 encounters. A total of 626 ICPs were written; 452 initial ICPs and 174 updates. These 452 ICP patients accounted for 23,705 encounters during the four-year period; on average, an ICP patient visited the ED 52 times (14.75 encounters/year), while the non-ICP population visited the ED an average of 3 times (1.67 encounters/year). Fifty percent were female, 58% white, and 36% African American. Sixty percent reported that they were single. The mean age was 48 years old and median was 49. Insurance status varied: 48% Medicaid, 38% Medicare, 12% private, and 2% self-pay or uninsured.

In the year of plan creation, the average annual ED visits for ICP patients was 39.4 (2014), 20.6 (2015), 20 (2016), and 16.6 (2017). In contrast the average annual ED encounters for all ED patients

Table 1
Average monthly technical costs.

	Equidistant		Baseline comparison				
			"Pre" period	"Post" period			
	Pre-plan	Post-plan	−6 months	+6 months	+12 months	+18 months	+24 months
Average monthly Tech direct (for each plan), US $	2203	1289	2774	1613	1093	999	925
Tech direct Mean Difference		−913.6					−2154.1
Tech direct 95% CI		−1112.7 to −714.4					−2594.5 to −1713.8
Average monthly Tech indirect (for each plan), US $	1748	977	2127	1232	833	746	670
Tech indirect Mean Difference		−771.1					−1701.2
Tech indirect 95% CI		−935.3 to −606.9					−2062.5 to −1340.0
Direct and indirect cost reduction		−42.64%		−41.96%	−60.69%	−64.40%	−67.46%
Count of qualifying plans	452	452	452	452	434	318	185
Count of plans with technical costs	448	423	445	402	323	214	111

Table 2
Average monthly inpatient LOS.

	Equidistant		Baseline comparison				
			"Pre" period	"Post" period			
	Pre-plan	Post-plan	−6 months	+6 months	+12 months	+18 months	+24 months
Average monthly inpatient LOS (for each plan)	1.52	0.76	1.9	0.97	0.66	0.64	0.6
Count of qualifying plans	452	452	452	452	434	318	185
Count of plans with inpatient LOS	355	266	320	202	124	100	48
Mean Difference		−0.7596					−1.5414
95% CI		−0.9240 to −0.5952					−1.9462 to −1.1367

was 1.68 (2014), 1.71 (2015), 1.71 (2016), and 1.68 (2017). Of those with an ICP, 100% (2014), 73.91% (2015), 84.81% (2016), and 71.49% (2017) were highly frequent users >/=8 encounters per year. Over the study period, 22.7% of overall encounters to the emergency departments were made by high utilizers who had 4–7 visits in one year during the study period and 11.2% of encounters were by those who were highly frequent users at least one year during the study period.

Technical fees associated with "high utilizers" showed significant cost reduction over the study period. Direct and indirect costs showed a 41.96% reduction over the initial 6-month implementation, 42.64% reduction over equidistant points, and 67.46% over 24 months (Table 1).

The average inpatient LOS also showed significant reduction over time. The 6-month pre/post data decreased from 1.9 to 0.97 days/month. When measuring inpatient LOS for as long as the ICP was in place, the equidistant data demonstrated a reduction from 1.52 to 0.76 days/month (Mean Difference: −0.7596;

95% CI: −0.9240 to −0.5952). Baseline comparison to 24 months shows an overall reduction to 0.6 days/month, (Mean Difference: −1.5414; 95% CI: −1.9462 to −1.1367) (Table 2).

The average monthly ED encounters of an ICP holder decreased from 1.96 to 1.14 during the first 6 months (Mean Difference: −0.8249; 95% CI: −0.9639 to −0.6858). Using the equidistant data, it improved from 1.52 to 0.93 visits, (Mean Difference: −0.5867; 95% CI: −0.6994 to −0.4741). When comparing the post-period to 24 months, average monthly ED encounters decreased from 1.96 to 0.42 visits (Mean Difference: −1.7820; 95% CI: −2.0759 to −1.4881) (Table 3).

4. Discussion

The creation of ICPs within a large healthcare system demonstrated a reduction in cost, inpatient LOS, and ED encounters for high utilizers. The uniqueness of our intervention and analysis is strengthened by the fact that inclusion was based solely on utiliza-

Table 3
Average monthly ED encounters.

	Equidistant		Baseline comparison				
			"Pre" period	"Post" period			
	Pre-plan	Post-plan	−6 months	+6 months	+12 months	+18 months	+24 months
Average monthly ED encounters (for each plan)	1.52	0.93	1.96	1.14	0.78	0.69	0.42
Count of qualifying plans	452	452	452	452	434	318	185
Count of plans with ED encounters	448	414	443	381	295	195	100
Mean Difference		−0.5867		−0.8249			−1.7820
95% CI		−0.6994 to −0.4741		−0.9639 to −0.6858			−2.0759 to −1.4881

tion. While there is often underlying psychiatric or psychosocial dysfunction underlying ED usage, these patients are a heterogeneous group. No patient was excluded for any medical problems or psychosocial issues. Consequently, our intervention was truly individualized to the patient's needs with the unifying theme of the study being the presence of an ICP and its associated EMR alert. This may have led to more success than a disease-based intervention. An ICP encourages a more efficient ED encounter for patients and providers with the potential for reduced testing, interventions, and admissions by standardizing care across multiple sites within a large healthcare system.

While labor intensive, the formation of the committee is paramount to the success of ICPs. We minimized cost of development and integration by requesting that medical directors monitor the ICP program as part of their administration and academic contribution. Additionally, BPA alerts were already in place in our EMR system so utilizing the BPA system to prompt ICP plan review upon opening of the patient's chart had no external costs. Multidisciplinary participation improves success across the system. Likewise, local ownership of the plan and annual plan maintenance is best placed in the ED where the patient utilizes the most resources. As demonstrated, there are diminishing returns with each plan's successful implementation. Committee goals may evolve to focus on the maintenance of current ICPs as opposed to the creation of new ICPs.

Our data did not allow us to categorize the nature of the patients' complaints and whether their utilization was primarily driven by medical or psychiatric needs. However, we view this potential limitation as a strength as this analysis is not diseased-based but is instead focused on utilization of healthcare resources. We were also unable to account for deceased patients, patients that moved, or patient who switched to a competing health system. If an ICP was not renewed, we also did not examine whether the patient had an increase in visits after expiration of the ICP.

We intentionally left inclusion criteria as broad as possible with only exclusion being <4 ED visits in one calendar year. Staff referral was used as method to identify highly frequent users or high resource utilizers. Although the criteria were broad and could be considered a limitation, we believe that we captured a significant portion of this patient population by utilizing referrals from front-line caregivers. This was demonstrated in our findings which show that 20% of the patients from 2014 to 2017 had 4 or more visits and were represented by ICP creation. Additionally, with our criteria, we show a reduction in cost and ED encounters which demonstrate that this approach was successful.

Last, cost data was reported as allocated by the individual site/hospital. This does not consider billed charges, insurance negotiation, or payments received.

5. Conclusion

The implementation of a committee based ICP is associated with reduced cost, inpatient LOS and ED encounters for ED high utilizers. Further studies should examine the benefits of these plans in settings beyond the ED.

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