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Using Informatics Framework in Immunosuppressed or Transplanted Patients for a Preferential Care Route at the Emergency Department

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Abstract

For immunosuppressed or transplanted patients, appropriate triage is a timely topic, especially in the Emergency Department (ED) of a high-volume referral center. We implemented a new Program called Rapid Clinical Care by Internal Medicine Specialists, as a preferential care route for these patients, which combines the proposed informatics framework in the field of total quality management in the healthcare units, as an example of digital technologies that can improve processes in the clinical routine. Our study aimed to describe waiting-time and attention-time in ED and to explore the effect on patients' clinical outcomes after discharge. Findings were: shortened waiting time (median of 8 minutes versus 21, p<0.001), improved ED on-call time (median of 2 hours compared to 4, p<0.001), and greater follow-up after discharge, measured as 1-week scheduled-visits rate (69% with 95%CI 63-75; compared to 43% with 95%CI 35-51; p<0.001).

Keywords:

Informatics Implementation, Healthcare Quality, Patient Safety.

Introduction

Emergency Department (ED) overcrowding, results from the imbalance between the simultaneous demand for health care and the ability of the system to respond [1], adversely affects patients' health, accessibility, and quality of healthcare systems for communities [2]. Several studies have addressed this issue and demonstrated that prolonged ED-stay prior to ICU admission is related to time-dependent complications and increased mortality [3]. Additionally, high provider continuity is associated with lower ED-use, that's why strategies to improve it may result in reduced health care costs [4].

ED plays a central role in the care of immunosuppressed patients, since 40% of solid organ transplanted patients visit the ED during the first post-transplant year [5]. It is known that these kinds of patients tend to present infectious and non-infectious complications that lead them to the ED, and they often need post-transplant hospital admissions [6]. Likewise, the classic presentation of common medical problems may be modified, and adverse effects of medications (immunosuppressants or chemotherapy) and/or drug interactions may appear [7]. In consequence, this specific group of patients requires distinctively complex care in the ED, as priority ED access, because complications are very different from the general population. This worldwide public health problem also occurs in Argentina [8]. To improve outcomes, appropriate triage is timely and important [9], especially in a high-volume referral center (450 daily visits) where delay-times could vary according to patient complexity, time of arrival or week-day [8].

For all of the above, in May 2019 we implemented a new Program called Rapid Clinical Care by Internal Medicine Specialists (in Spanish Rápida Atención Clínica por Especialistas), defined as a preferential care route for these patients. The throughput component of the "ED crowding model" highlights the need to look internally at ED care processes and modify them as needed to improve their efficiency and effectiveness, especially those that have the largest effect on length of stay and resource use in the ED [10]. The first phase includes triage, room placement, and the initial provider evaluation. The second phase includes diagnostic testing and ED treatment. Our new strategy was based on: (a) to identify early these patients during the triage process and to categorize them correctly, (b) to assign human resources for priority care (a physician was assigned with exclusive dedication, but only available between 8 and 16 hours exclusively on business days, due to feasibility and budget). After implementation, we aimed to describe waiting-time and attention-time in ED, as well to explore the effect on patients' clinical outcomes after discharge.

Methods

Setting

Our study took place at HIBA, a community-based tertiary care hospital located in Buenos Aires, Argentina. It has an ED that provides attention for unscheduled consultations 24 hours a day, 365 days a year. The infrastructure consists of four areas of care, differentiated according to complexity, which is defined by the patient's condition at admission. Patients on admission are evaluated by triage-trained personnel, who according to the baseline clinical condition classify them using a color code (green, yellow or red) according to increasing complexity, with different waiting times.

Design, Participants and Outcomes

We conducted a retrospective cohort which included all consecutive adult patients admitted to the ED between June and August 2019. We defined as exposed-group those admitted by the preferential care route for immunosuppressed or transplanted patients, and as a control-group, those patients categorized with yellow color at triage and evaluated during business hours, representing the traditional path of attention that they would have received prior to the new ongoing Program.

We used secondary databases to follow up patients from ED arrival time to the occurrence of any primary outcomes, defined as: waiting time, referral to a sector of greater complexity, or/and end of care in ED (as hospitalization or hospital discharge). Then, after ED discharge, patients were followed up until the occurrence of any secondary outcomes: re-consultation on ED, and/or first scheduled appointment for outpatient medical care (allows to ensure continuity of care).

Data collection and Integration with Hospital Information Systems

Eligible patients were captured by using secondary databases with administrative data sets containing time events to: arrival, triage process, initial provider examination, admission order, discharge order. We defined the waiting time as the time elapsed between arrival and first examination by a physician provider. We also used the patient's characteristics (gender, age, type of onco-hematologic disease), and administrative information after discharge such as consecutive re-consultation on ED, and first scheduled appointment for medical care as outpatient (allows to ensure continuity of care).

All patient health information is stored in a single Clinical Data Repository fed by the hospital electronic health record (EHR). The hospital health system has been evaluated by a recognized international organization (HIMSS, Level 7+) and accredited by the Joint Commission International. Ethics approval was obtained from the Institutional Review Board (CEPI#5205). Informed consent was not required.

Statistical analysis

Regarding descriptive statistics, quantitative variables are presented as median and interquartile range (IQR), according to distribution; categorical variables are presented as relative frequencies and percentages, with their respective 95% confidence intervals (95%CI). Waiting times and on-call attention were reported as medians with their IQRs. Waiting and on-call care times were compared (between 2 groups) through the Mann-Whitney-Wilcoxon Test, considering a statistical p-value<0.05. The frequency of ED-reconsultations was expressed as a proportion within 48 hours, 72 hours and 1-week after the index ED-visit. The cumulative incidence of outpatient visits were compared with a test of two proportions. We used R software for statistical analysis.

Results

Informatic development

Some new functionalities or modifications within the EHR were required to accommodate for the process implementation of a preferential care route. First, we incorporated a new specific worklist in order to quickly and easily identify this type of patient. We added a new locker, which allowed physicians to visualize the patient location and facilitate communication and collaborative work. It also guaranteed detailed patient´s information, within and outside the ED. Second, we created a specific evolution sheet (structured clinical note) because the medical data is a major issue for both patient care and biomedical research. Finally, we updated our dashboard with indicators as control charts.

Clinical outcomes

During the study period we included 344 consecutive visits of patients evaluated through the preferential care route. Regarding basal characteristics: 50.73% were men with a median age of 60 years (IQR 43-71), 56% had active onco-hematologic disease. We included a median of six patients per day (IQR 5-8), 63% were referred for on-call assessment by outpatient medical specialists (35.86% hematology, 20.99% oncology, 18.37% nephrology, 5.25% hepatology), the rest came spontaneously (assigned by triage). Only 5% were re-triaged to a more complex sector of ED and 28% (95%CI 23-33) required hospitalization. Meanwhile, the control group included 585 patients: 41.54% male, with a median age of 64 years (IQR 44-78), 25.81% (95%CI 22-29) ended in hospital admissions.

During the first trimester of this Program ongoing, we observed a reduction of the waiting times between the preferential care route (median of 8.48 minutes) and the control group (median of 21.63 minutes), with statistically significant difference (p<0.001). There was also a reduction in the time on discharge from ED (p<0.001) and an increment in the rate of patients attending as outpatients within 1-week from discharge (p<0.001), as shown in **Table 1**. Meanwhile, there was no statistically significant difference regarding ED-visits after discharge (re-consultations).

Table 1. *Primary and secondary outcomes (comparison between groups)*

	Preferential care route (n: 344)	Control group (n: 585)	p value
During first ED encounter			
Waiting time*, (in minutes)	8.48 (12.7)	21.63 (36.42)	<0.001^
Time on discharge from ED*, (in hours)	2.09 (3.26)	4.25 (3.62)	<0.001^
After ED discharge (re-consultations, rate)			
48 hours ED-visit	7.3% (95%CI 4.8-11.1)	6.03% (95%CI 4.98-7.27)	N/A
72 hours ED-visit	9.56% (95%CI 6.6-13.7)	8.89% (95%CI 7.62-10.35)	N/A
1 week ED-visit	15.80% (95%CI 12.0-20.6)	15.03% (95%CI 13.40-16.83)	N/A
After ED discharge (outpatient visit, rate)			
1 week outpatient visit	69% (95%CI 63-75)	43% (95%CI 35-51)	<0.001#

* Median (interquartile range)
^ p-value was calculated by using Mann-Whitney-Wilcoxon
# p-value was calculated by using test of two proportions

Discussion

The new preferential care route was associated with: shortened waiting time, improved ED on-call time, and greater rates of scheduled follow-up after discharge. There are only 344 observations, although these observed trends give us nice insights and should be seen as the beginning of an investigation.

These findings represent a huge success of boarding at the ED setting, a critical indicator of quality of care for hospitals [11]. Health quality constructs in these vulnerable patients consist of two fundamental elements: continuity and coordination of care [12]. Continuity of care is essential to avoid fragmentation, to agree on decision-making criteria, and to reduce variability in behaviors of involved health professionals. Coordination is constituted as a fundamental tool to improve care [13] and avoid overuse of the health system, especially ED-reconsultation [14], an important topic in the wake of COVID-19 [15]. Unfortunately, the ED-visits after discharge remained similar between groups. It will be interesting, in future studies,

to explore long-term effects or other clinical outcomes of interest.

Our major limitation was based on a small sample of a single center, but we have to mention important strengths: (a) we used secondary databases with exact times, the EHR has the ability to generate a complete record of a clinical patient encounter [16]; (b) it represents a clear example of data warehousing used to analyze patterns of clinical data to improve quality of care, patient safety, and care delivery efficiency [17]. Lessons learned should be shared globally due the project combines the proposed informatics framework in the field of total quality management (TQM) in the healthcare units, as an example of digital technologies that can improve processes in the clinical routine. This particular experience used a suitable network, continuous application development, an implementation strategy, and the cooperation of all staff involved as a collaborative and interdisciplinary team.

Conclusions

Our local experience (or program) represents a new service delivery model for immunosuppressed or transplanted patients, which combines the proposed informatics framework in the field of total quality management in the healthcare units, as an example of digital technologies that can improve processes in the clinical routine. This experience with only 344 observations demonstrated that the preferential care route was associated with: shortened waiting time, improved ED on-call time, and greater rates of scheduled follow-up after discharge.

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