Resident Inbox Task Completion Is Improved with a Single Electronic Health Record (EHR) System

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INTRODUCTION

Internal medicine (IM) residents find it challenging to complete outpatient tasks during inpatient rotations. Efforts to ameliorate this problem through innovations in scheduling models and the introduction of increasingly sophisticated electronic health records (EHRs) have met with limited success.^{1–3} A primary barrier to completing outpatient tasks while on inpatient rotations rests in checking the EHR's outpatient-inbox. Tasks generated by a provider-panel collect there and some may require significant effort to address. This barrier is increased when a separate EHR for the outpatient setting needs to be opened to access and complete these tasks. We hypothesized that such difficulties might be mitigated by implementation of a single EHR that integrates inpatient/outpatient functionality. A transition from separate outpatient and inpatient EHRs to a single platform at our facility allowed us to test this hypothesis.

METHODS

Research Setting and Participants

In 2016, our institution implemented a single EHR which unified previously separate platforms. We conducted a prospective study of outpatient task completion by 146 IM residents in a large, urban, training program before and after the single EHR was implemented. Residents rotating through 2-week outpatient blocks, flanked by 6-week inpatient blocks, were expected to check their inbox during inpatient and outpatient rotations. Tasks included addressing test results, reviewing patient requests, and contacting patients (Table 1). This study was approved by the Internal Review Board of Montefiore Medical Center, Bronx, NY.

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Survey

A confidential, anonymous survey was distributed to participants 6 months before and 6 months after the intervention. The survey included 9 items related to training level, clinic assignment, outpatient-inbox checks, note and task completion, methods of communication, and perceptions relating to quality of life (QOL) (Table 2). Outcomes were self-reported frequency of inbox checking, methods of communicating results, timeliness of outpatient note completion, and attitudes towards use of a single EHR. Results before and after single-EHR implementation were compared using chi-square or Fisher's exact tests. Significance was accepted for $p < 0.05$.

RESULTS

Survey response rates before and after implementation were overall, 66/146 (45%) and 77/146 (53%), respectively. Greater proportions of residents reported checking their outpatient-inbox on inpatient rotations (7/64, 11% vs 20/77, 26%; $p = 0.19$), using letters to communicate results (23/52, 44% vs 53/74, 72%; $p = 0.002$), checking the inbox during work hours (26/62, 42% vs 52/77, 68%; $p = 0.003$), and completing notes within 2 days (47/65, 72% vs 69/77, 90%; $p = 0.008$) or (if not within 2 days) within 1 week (26/33, 79% vs 18/20, 90%; $p = 0.292$) after single-EHR implementation. Residents rated the impact on quality of life after single-EHR implementation as: positive (17/64, 27%), 55% (35/64) no change, or 19% (12/64) negative (Table 2). When asked about implementing an inbox coverage system (outpatient residents cover inboxes of inpatient residents), 29% (19/65) responded affirmatively before and 18% (14/77) after the intervention ($p = 0.111$).

DISCUSSION

In this study, we observed several improvements in resident-reported outpatient inbox management following introduction of a single EHR. The significant increase in task completion during inpatient rotations (inbox checking, phone calls to patients, clinic note completion) and during work hours may have resulted from the single-EHR's usability enhancements.

**Table 1 Summary of the Intervention (Single EHR).
Implementation of Epic EHR**

Type of EHR platform used for inbox management*	Before implementation		After implementation
	Inpatient	Outpatient	Inpatient/outpatient
	CareCast (IDX Systems);	Centricity EHR, General Electric	Epic
Facilities using system	Montefiore Hospital	CHCC, CFCC, FCC	Montefiore Hospital and CHCC, CFCC, FCC
Type of imaging system	Image Viewer	Image Viewer	Epic
Platforms in use	3		1
Ambulatory inbox			
Inpatient services			
Imaging			
Steps/systems to manage inpatient assignment tasks together with outpatient-inbox tasks			
Number of logins*	2		1
Remote access to clinic notes*	Not available		Available
Number of software systems needed to gather information relevant to inbox item*	2+		1
Anticipated relative burden before and after Epic implementation			
Log in burden	++		+
Information access burden	++		+
Navigation burden	++		+
Cognitive burden	++		+
Order entry burden	++		+
Key burden/strokes needed per task	++		+

Montefiore Clinics: CHCC Comprehensive Health Care Center, CFCC Comprehensive Family Care Center, FCC Family Care Center

*Residents switched between inpatient and outpatient systems prior to I-EHR

We believe improved clinic note turnaround time has important quality/safety implications, given that these notes inform discharge instructions and subsequent care, and promote an accurate medical record. Our finding that residents were more likely to check their outpatient-inbox during work hours also relates importantly to physician wellness. Off-hours work has become increasingly common and is believed to contribute to burnout and negative health consequences for physicians.⁴ Conversely, restricting work hours has reduced residents' emotional exhaustion.⁵ Nearly 30% of our residents reported a positive QOL effect following implementation of a single EHR; however, over half also reported no change. It is possible that further improvements in QOL and overall inbox management could be achieved through interventions such as a team-based coverage. Our residents did not favor this; however, given literature that generally supports processes that

Table 2 Survey Results

Survey questions		Before column %, (N = 66)	After column %, (N = 77)	p value
1 (ambulatory)	I check my Inbox and respond to patient calls/ prescriptions on average with the following frequency when on ambulatory block ... (daily vs less frequently)	77% (51/66)	65% (50/77)	0.106
2 (inpatient)	I check my Inbox and respond to patient calls/ prescriptions on average with the following frequency when on floors/ units/not on ambulatory block ... (at least every other day vs less frequently)	11% (7/64)	26% (20/77)	0.019
3	I complete patient notes within 2 days after completing a clinic visit ... (always vs less frequently)	0% (0)	68% (53)	-
4	... (often/always vs all others)	72% (47/65)	90% (69/77)	0.008
	If no, then in which time-frame?	79% (26/33)	90% (18/20)	0.292
5	When reviewing and managing NORMAL labs and imaging, I typically:			
	- Call the patient	48% (25/52)	27% (20/74)	0.015
	- Send a letter	44% (23/52)	72% (53/74)	0.002
	- Ask RN to call	8% (4/52)	1% (1/74)	0.073*
6 (inpatient)	What time of the day do you typically check your inbox when not on ambulatory block? ... (during vs after work hours)	42% (26/62)	68% (52/77)	0.003
7	If you typically check your inbox after work hours, then where do you typically complete this work?			
	At home	X	- 49% (26/53)	
	Clinic/Hospital	X	- 51% (27/53)	
8	I would want to participate in a system of resident coverage while I am not in clinic ... (yes/no)	29% (19/65)	18% (14/77)	0.111
9	Since Epic implementation, do you feel that your	X	- Yes 27% (17/64) - No 19% (12/64)	

(continued on next page)

Table 2. (continued)

Survey questions	Before column %, (N = 66)	After column %, (N = 77)	p value
inbox management has had a positive impact on your quality of life? ... (yes/no/unchanged)		- Unchanged 55% (35/64)	

Total numbers of surveyed residents are provided in row one. Numbers in other rows vary due to respondent completion patterns
Before, before implementation of single electronic health record; After, after implementation of single electronic health record

*Fisher's exact test used when measure included an $N < 5$

reduce tension between inpatient and outpatient duties, this merits further study.⁶

CONCLUSION

The transition from separate inpatient/outpatient electronic health records to a single platform was associated with improved resident inbox management. In the context of graduate medical education, implementation of a new health care platform should be considered in relation to impact on patient care and resident quality of life.

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Compliance with Ethical Standards:

This study was approved by the Internal Review Board of Montefiore Medical Center, Bronx, NY.

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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