

# Email-Based Care Transitions to Improve Patient Outcomes and Provider Work Experience in a Safety-Net Health System

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## ABSTRACT

**OBJECTIVES:** Optimal transitions of care involve team-based collaboration across inpatient and outpatient settings and have the potential to help achieve the Quadruple Aim. This article describes a quality improvement pilot implemented by a safety-net academic inpatient service and partner community-based health centers to improve patient outcomes and provider experience in the care of underserved hospitalized adults.

**METHODS:** Inefficient nonstandardized care coordination led to collaborative quality improvement between an inpatient service and partner primary care clinics in the San Francisco Health Network. Email-based care transitions were implemented to facilitate care team communication and improve linkage to primary care for hospitalized patients. Patient outcomes and provider work experience were assessed over 2 years.

**RESULTS:** Sustained improvements in care coordination among the intervention cohort were observed. Patients demonstrated a statistically significant 14% increase in attendance at follow-up appointments within 7 days of discharge. Across the health system, follow-up within 7 days of discharge reduced 30-day all-cause readmissions by 58% during the study period. A majority of providers reported that the intervention improved the ease and efficiency of care transitions and increased their ability to address patients' multidisciplinary needs. Among a survey cohort of outpatient providers involved in the pilot, 93% recommended that all hospital services adopt a similar care transitions system.

**CONCLUSIONS:** A pilot of e-mail-based care transitions increased linkage to primary care following hospitalization and improved providers' experience and satisfaction with care transitions. This process was recommended for systemwide use by over 90% of surveyed outpatient providers. An electronic health record-triggered care transitions system is in development for use by all hospital services.

*The American Journal of Accountable Care. 2017;5(4):e19-e22*

Over the past decade, team-based models of care have become a best practice in primary care<sup>1</sup> and inpatient care.<sup>2-4</sup> Care coordination among teams has been cited as a critical factor in achieving the Triple Aim.<sup>5</sup> As the numbers of tasks and care providers increase, timely and accurate communication becomes both more critical and more difficult to execute,<sup>6</sup> with potential negative effects on workforce satisfaction—the fourth component of the Quadruple Aim.<sup>7</sup>

Although recent study findings support the use of electronic care coordination<sup>8</sup> with standardized content,<sup>9,10</sup> electronic health record (EHR) "alert fatigue" has been described as a negative outcome among primary care providers (PCPs).<sup>11</sup> The importance of early postdischarge follow-up for high-risk patients has also been recently described.<sup>12</sup> We report on an email-based care transitions intervention that has improved linkage to primary care after discharge and providers' experiences across the inpatient and outpatient settings.

Our health system, the San Francisco Health Network (SFHN), cares for medically and socially vulnerable patients across a county-wide system of geographically and operationally diverse inpatient and outpatient settings.<sup>13</sup> The University of California San Francisco (UCSF) Family Medicine Inpatient Service (FMIS) is an academic medical inpatient service based at Zuckerberg San Francisco General Hospital (ZSFG), the acute care hospital of the SFHN. FMIS has an ongoing partnership with 6 SFHN primary care health centers and cares for more than 1500 socially vulnerable and medically complex inpatients each year. Thirty percent of inpatients have a primary admitting diagnosis of organ failure, more than 50% have at least 1 chronic organ failure, and nearly 100% are affected by 1 or more of the following: food insecurity, economic poverty, homelessness or housing instability, cognitive impairment, substance use disorders, severe mental illness, and community-level violence (UCSF FMIS, unpublished demographic data, FY2015-2016).

Prior to the intervention described in this article, there was no standard workflow for postdischarge linkage to primary care in SFHN or for communication between inpatient and outpatient providers during admission to ZSFG. Care transitions in SFHN are further complicated by different noninteroperable EHRs in the hospital and at primary care clinics, increased frequency of patient handoffs among hospital housestaff as a result of Accreditation Council for Graduate Medical Education duty hours reform, and a complex interrelation of providers from the academic and public health sides of the health network.

At baseline, FMIS housestaff were spending more than 2 hours per patient on basic care coordination tasks, including 30 to 45 minutes arranging a primary care follow-up appointment by phone (UCSF FMIS, unpublished service workflow data, July 2013). Inpatient and outpatient physicians consistently noted difficulty with real-time communication of feedback to the inpatient service medical directors. Consistently less than 40% of patients from the inpatient service attended follow-up visits after hospital discharge (ZSFG Care Transitions Taskforce, unpublished data, CY2013-2014).

## METHODS

To improve care transitions, a quality improvement process was initiated through key stakeholder interviews with inpatient, primary care, and health system leadership. Due to noninteroperable inpatient and outpatient EHR systems, secure team-based email was selected as the method of care coordination and follow-up scheduling. Care transitions emails are sent by the inpatient team at admission and discharge through a secure server, and the recipients include inpatient team members and primary care team members. Each primary care clinic selected its own recipient list, which included the PCP plus other designated staff (eg, clerical, nursing, behavioral health, etc).

The admission email ([eAppendix Figure 1](#) [eAppendices available at [ajmc.com](#)]) includes patient information (name and medical record number), brief history and plan of care, expected date of discharge, and recommendation for timing of primary care follow-up.<sup>13</sup> Primary care clinic staff, often in consultation with the PCP, reply to the admission email with a scheduled follow-up appointment based on the estimated date of discharge. This discharge email includes patient information, brief description of hospitalization, key medication changes,<sup>12</sup> and items for immediate provider follow-up.<sup>10</sup> Both emails contain inpatient providers' email addresses and pager numbers to allow outpatient teams the option of asynchronous or real-time communication about further details of care coordination.

Data on postdischarge follow-up and readmissions were extracted from the hospital EHR (Invision LCR; Siemens Corporation, Washington, DC). Statistical significance of the impact of standardized workflow on 7-day postdischarge follow-up was analyzed using  $\chi^2$  tests to show overall difference between pre- and postintervention groups and McNemar's test to show pre- and postintervention (in-

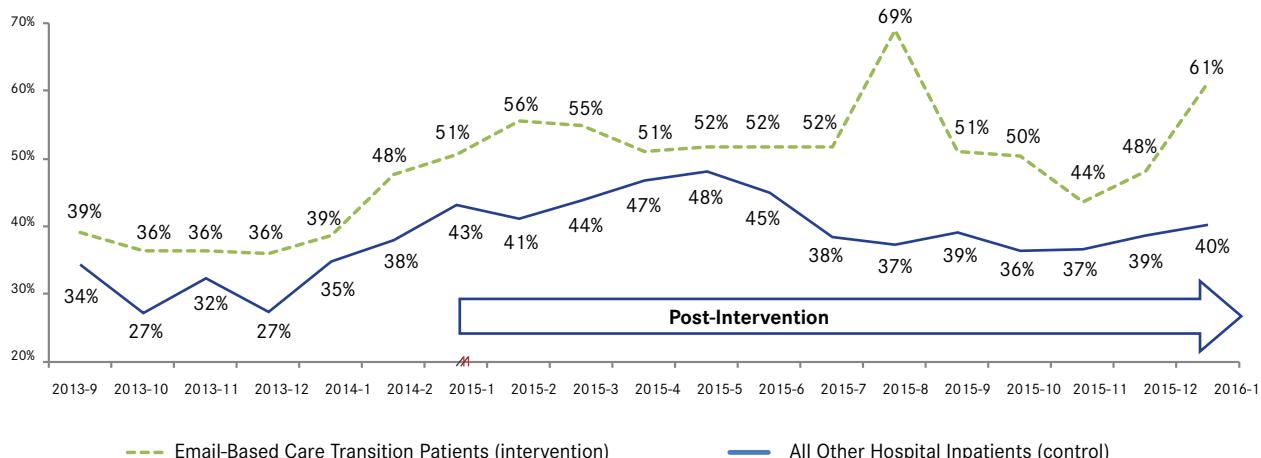
group) differences to emphasize the impact of the intervention. A voluntary electronic survey was conducted among outpatient PCPs and inpatient housestaff to assess impact on workflow, including questions on ease, efficiency, time spent, and provider experience related to transitions of care. The survey response rates and data are reported directly.

## RESULTS

The email-based care transitions system was rolled out on March 3, 2014. Rates of attendance at postdischarge follow-up visits for the intervention cohort (FMIS patients; email-based care transitions) and the control cohort (all other hospital inpatient services; no email-based care transitions) were compared. Following implementation, more than 94% of patients in the intervention cohort were provided with a scheduled primary or specialty care follow-up appointment prior to discharge. During the second year of implementation, mean rates of patient attendance at follow-up within 7 days of discharge had increased to 53% from a baseline of 39% in the intervention cohort ( $n = 1301$ ) ([Figure](#)). Rates of follow-up in the control cohort ( $n = 5322$ ) were 32% at baseline and 38% during the intervention period. Using the  $\chi^2$  method, email-based care transitions were associated with a statistically significant improvement in 7-day postdischarge follow-up ( $P = .015$ ;  $\chi^2 = 5.95$  with  $df = 1$ ). The difference between cohorts during the pre-intervention period was not significant ( $P = .134$ ;  $\chi^2 = 2.25$ ). McNemar's test showed a statistically significant difference between the pre- and post intervention groups of patients in the intervention cohort ( $P = .02$ ; 95% CI, 1.002-1.8) but not in the control cohort ( $P = 0.11$ ; 95% CI, 0.9-1.6). A systemwide analysis of all-cause 30-day readmission rates during the intervention period showed that patients who followed up with primary care within 7 days of discharge had 58% fewer readmissions compared with those who did not (5% vs 12%).

Surveys were performed to assess the workflow and experience of inpatient housestaff ( $n = 7$  respondents of 19 surveys sent) and outpatient providers ( $n = 30$  respondents of 84 surveys sent) caring for patients in the intervention cohort with email-based care transitions. Inpatient residents used the system more than 80% of the time during the first month and gradually increased their usage to 97% with training and reminders. They reported improvements in ability to give the patient specific follow-up information (86%), communication with the outpatient team (67%), and ease of scheduling (80%) and a 50% decrease in time spent on care coordination.

Eighty-six percent of outpatient PCPs reported receiving communication about admission and discharge within 1 to 2 days of each event. Primary care team members reported improvements in ease of communication with the inpatient team (82%), scheduling of follow-up appointments (72%), and ability to meet patients' multidisciplinary needs (73%). Ninety-three percent of outpatient providers recommended that all inpatient services adopt this system of communication.

**Figure.** Rates of Attendance at Follow-Up Visits Within 7 Days of Discharge

## DISCUSSION

Following integration of email-based care transitions, we observed improvements in patient outcomes and provider work experience. Using standardized care transitions communication beginning at admission, inpatient providers were able to collaborate with primary care teams to create postdischarge plans, including follow-up appointments, and provide patients with a specific follow-up plan prior to discharge. This inpatient–outpatient collaboration resulted in a statistically significant improvement in attendance rates at postdischarge follow-up, which has a considerable potential impact on readmissions. During the intervention period, a separate analysis showed that SFHN patients with an established PCP who attended follow-up within 7 days of discharge had a 58% decreased rate of all-cause 30-day readmission (5% vs 12.3%).

The use of this system also improved work efficiency and provider satisfaction related to care transitions among both inpatient and outpatient teams. A majority of inpatient and outpatient providers reported improvements in care coordination and in their ability to contact colleagues across the health system and a decrease in the amount of time spent doing this work. These gains may be of particular importance in health systems where distributed multidisciplinary teams collaborate to care for complex patients. We hypothesize that the improvements in ease and efficiency account for the high rate of uptake: the process incentivizes participation. Further investigation is needed to assess how efficiency gains in team-based care coordination might improve provider satisfaction and reduce burnout.

Throughout the study period, there was ongoing work across all SFHN primary care clinics to improve visit attendance, particularly for patients following discharge. The effect of such interventions should be seen for all patients and appear to be reflected in the overall trend toward improvement in both the intervention and control groups seen in the Figure. The statistically significant improvement in the intervention cohort likely reflects the impact of email-based

care transitions. This is supported by the fact that statistically significant differences were observed 1) between control and intervention groups in the postintervention period and 2) between the cohorts of patients on the FMIS in the pre- and postintervention periods, but not between observed groups in the pre-intervention period, nor cohorts of patients in the control services before and during the intervention.

Potential advantages of this system include privacy, information access, and cost. Existing email servers provided secure institutional email in compliance with Health Insurance Portability and Accountability Act regulations. Email as a method is ubiquitous and provides an electronic record, which providers can return to after the hospitalization. Perhaps most importantly, this intervention succeeded for highly vulnerable patients in a large, geographically distributed public safety-net health system without an enterprise EHR system and did not require the multiple years or many millions of dollars required to fully implement such a system.

Potential disadvantages of this system include the lack of direct integration into the EHR and the potential for “inbox fatigue” among providers. Lack of EHR integration was a motivating factor in creating this intervention, due to the use of separate noninteroperable EHRs in the inpatient and outpatient settings—and may be a common issue, especially in resource-limited systems that do not yet have an enterprise EHR. Although we did not directly assess provider burnout, and it would be useful to do so in future analyses, over 90% of responding outpatient providers recommended adopting this care transitions intervention systemwide, signaling a high level of satisfaction.

## Limitations

Limitations of this pilot analysis include the lack of analysis and comparison of readmission rates among patients in the intervention and control cohorts. On multiple occasions during the study period, the SFHN conducted an inpatient repatriation program to ZSFG for patients hospitalized at out-of-network facilities. This program was

not implemented consistently across patient cohorts and thus skewed readmission rates in a wide variation during multiple noncontiguous time periods, making it very difficult to control for effects. A future analysis should include readmission rates. An additional limitation of this initial pilot is the lack of assessment of more complex outcomes of care coordination, such as content of conversations between PCPs and inpatient teams, measures of trust between providers, presence of burnout symptoms, and overall job satisfaction. These would be useful areas for future investigation into the impact of this type of intervention. A third potential limitation is the lack of patient satisfaction or patient experience data, which may be relevant in assessing the impact of team communication on the inpatient care plan and robust follow-up from patients' points of view.

## CONCLUSIONS

A structured multidisciplinary email-based care transitions system was associated with multiple positive outcomes, including a statistically significant improvement in attendance at follow-up within 7 days of hospital discharge, improved provider-reported ease and efficiency of care team communication, and greater provider satisfaction with care coordination for hospitalized patients. Based on the success of this pilot, we have led the effort to integrate this workflow into the inpatient EHR, allowing providers across San Francisco's safety-net medical community to participate in this communication system regardless of their home EHR (**eAppendix Figure 2**). We believe that the practical application of cost-effective technology to care coordination has the potential to help the US healthcare system better achieve the Quadruple Aim of improving patient experience, increasing population health, improving the work experience of healthcare professionals, and reducing costs.

## Acknowledgments

The authors wish to thank Dr. Danielle Hessler Jones for reviewing the statistical methods used in this article.

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**Source of Funding:** No external funding was used in the creation of this article or in the quality improvement process described.

**Author Disclosures:** Ms Oza receives salary support from Gilead Sciences for projects unrelated to the subject matter of this article. The remaining authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

**Authorship Information:** Concept and design (JC, SG); acquisition of data (JC, KO); analysis and interpretation of data (JC, KO); drafting of the manuscript (JC); critical revision of the manuscript for important intellectual content (JC, KO); statistical analysis (JC); administrative, technical, or logistic support (JC, SG); and supervision (SG).

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**eAppendix Figure 1.** Sample Care Transitions Admission E-mail

**UCSF Family Medicine Inpatient Service**  
Zuckerberg San Francisco General Hospital  
Building 5 (Main Hospital) Office 4F53  
Office Phone 415-206-xxxx / Fax 415-206-xxxx

**HOSPITAL ADMISSION NOTICE**

Dear **Dr. Provider**,

Your patient **John Smith MRN 01234567** was admitted for **ESLD/cirrhosis and complications**.

At admission, we found that **he had increased abdominal pain, distention and subjective fever for 2 days**. We plan to **evaluate for potential infection, including spontaneous bacterial peritonitis. If he has ascites on ultrasound, we will perform a paracentesis**.

We estimate that the patient will be discharged on: **9/9/2016**

**Primary care follow-up** – we recommend a **follow-up appointment within 7 days** after the expected discharge date and a **pharmacist or medication reconciliation visit if available**. Please reply to this email with dates & times of these visits.

All our notes, including admission & daily progress notes, and discharge summaries can be found in the LCR Reports/Notes section.

To communicate with us, please (1) reply to the inpatient team members by email **and/or** (2) page us.

Sincerely,  
The FMIS team

**Family Medicine Inpatient Service Team**

Intern/medical student	<b>PGY1Resident@ucsf.edu;</b>
Senior resident	<b>PGY2/3Resident@ucsf.edu;</b>
Attending physician	<b>AttendingMD@ucsf.edu;</b>
Patient navigator	<b>FMISPatientNavigator@ucsf.edu;</b>

**Outpatient Primary Care Team**

Primary care provider	<b>PrimaryCareMD@sfdph.org;</b>
PCMH staff	<b>Family Health Center: FHCDischarge@sfdph.org;</b> <b>FHCpharmacist@ucsf.edu;</b>

**UCSF Family Medicine Resident Pager List (415-443-\_\_\_\_), if no response please call cross-cover pager at 415-443-xxxx**

**eAppendix Figure 2.** EHR Care Transitions Orderset

Patient: Zzztest,Eve4      User: CPOE2 ★ Log Off

\*\*\*\*Main Menu\*\*\*\*\*

- MRN Search
- Inpt Units
- EMA
- Patient Index**
- Update Clinical Alerts
- Pt Summary/Clinical Alerts
- View eMAR
- Patient Overview**
- RESULTS**
- Reports/Notes
- Team Notes\_TEST
- Team Notes\_Help
- ALLERGIES/ADRs**
- Problem List**
- Menu**
- CPOE Help
- Write/ View Orders**
- Insulin Orders
- Transfer / Post Op / Comfort Care
- Post Op Orders
- Orders
- InPt Fxns
- Medication Reconciliation
- Discharge Process
- OutPt Meds
- OutPt Fxns

**ZZZTEST ,EVE4**  
Age: 46 Y DOB: 1/1/1970 Sex: F Where Am I?  
MR#: 01902176 Attn: GOLDMAN,SETH

**New Order** \* Required

**Care Transitions Orderset**

This order will send an email to alert community providers of the circumstances at admission and facilitate post-discharge follow-up appointment scheduling. Please fill out the text boxes below and estimate the date of discharge. If primary care provider information is incorrect, please forward the email to the appropriate PCP and correct the patients primary care data after completing your orders.

**SPECIFY SERVICE/CALL # INFO**

<b>Attending Name:</b>	CHASE,JORDAN
<b>Service:</b>	FAMILY MEDICINE A
<b>Sr Resident:</b>	SMITH
<b>First Contact #:</b>	443-XXXX
<b>Second Contact #:</b>	443-XXXX

**Primary Care Provider:** GOLDMAN,SETH  
**Primary Care Clinic:**  
**Date of Admission:** 3/1/2016  
**Estimated Date of Discharge:** 11/8/2017

**Brief history at admission and plan of care:**

MS. ZZZTEST IS ADMITTED FOR COMMUNITY ACQUIRED PNEUMONIA, SEPSIS AND SEVERE DELERIUM. WE ARE TREATING WITH BROAD SPECTRUM ANTIBIOTICS, IV FLUIDS AND SUPPORTIVE CARE.

**Specific questions or message to PCP:**

DOES MS. ZZZTEST HAVE A SURROGATE DECISION MAKER OR DPOA WHO CAN ASSIST WITH MEDICAL DECISIONS AND CARE PLANNING?