

Care Processes

# Minding the Gaps: Assessing Communication Outcomes of Electronic Preconsultation Exchange

Erika Leemann Price, MD, MPH; Justin L. Sewell, MD, MPH; Alice Hm Chen, MD, MPH; Urmimala Sarkar, MD, MPH

The infrastructure of specialty referral systems in primary care is deeply flawed. Paper referral systems are unreliable, wait times can be long, and information flow is limited.<sup>1-3</sup> These shortcomings are increasingly recognized as safety problems leading to missed and delayed diagnoses.<sup>4-8</sup>

The need for improved access and communication is well established. In the United States, bundled payment models such as accountable care organizations (ACOs) change incentives for specialty care away from visit volume and toward efficient coordination with primary care. Meanwhile, new models of the primary-specialty provider relationship such as the Patient-Centered Medical Home Neighbor (PCMH-N) provide frameworks for implementing change.<sup>9-12</sup> Increased availability of health information technology (HIT) and incentivization of meaningful use make electronic referral platforms integral to these frameworks.<sup>13-22</sup>

Preconsultation exchange, advocated as a key component of the PCMH-N, refers to primary-specialty communication before, and sometimes instead of, a patient's visit to a specialist.<sup>23</sup> Preconsultation exchange is intended to prioritize and expedite specialty care by triaging urgency, streamlining previsit testing, and answering clinical questions without in-person visits.

Multiple settings have adopted electronic preconsultation exchange systems.<sup>24-26</sup> In resource-constrained safety-net systems, preconsultation exchange has particular appeal. At Zuckerberg San Francisco General (ZSFG; previously San Francisco General Hospital), an urban, safety-net health care setting, preconsultation exchange occurs through eReferral, a Web-based referral and consultation system integrated into the electronic health record (EHR)<sup>27</sup> that was piloted in 2005 for the gastroenterology clinic and then rolled out for medical and surgical specialties across the health care system (San Francisco Health Network). At present, all 42 adult and pediatric specialty services, except for two (the burn and infusion clinics) use the eReferral system. During the first six months following implementation, wait times for nonurgent visits in seven of eight medical specialty clinics decreased by up to 90%.<sup>27</sup> Surveys show improvement in primary care providers' overall satisfaction with the system and

## Article-at-a-Glance

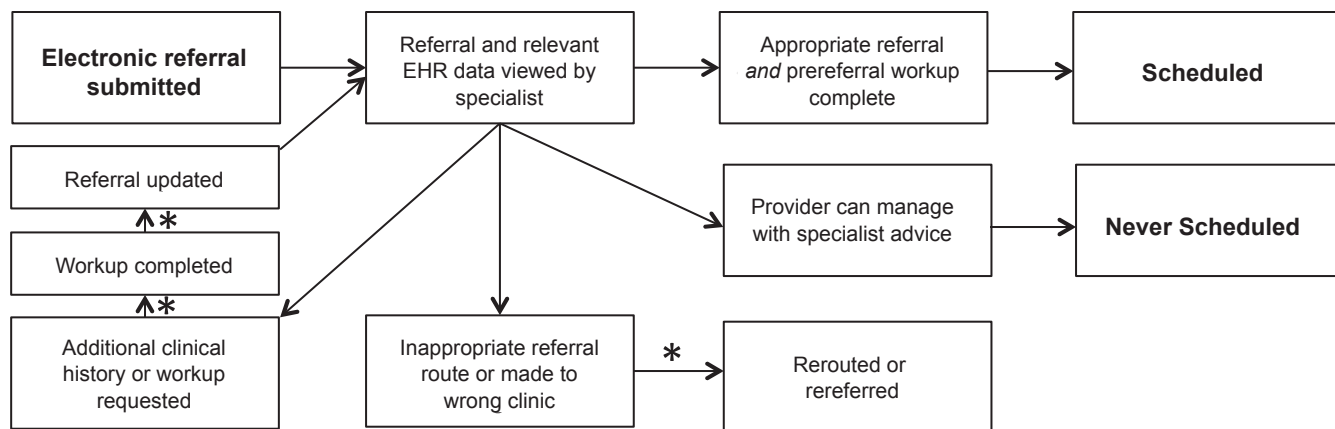
**Background:** Effective communication between referring and specialty providers is key to optimizing patient safety. Communication was assessed in an electronic referral system by review of referrals to a public urban health care system's gastroenterology clinic that were not scheduled for appointments.

**Methods:** All electronic referrals to a publicly funded, urban health care system's adult gastroenterology clinic from November 1, 2009, to November 30, 2010, were reviewed that did not result in scheduling of appointments. An assessment was made of whether in-person visits were unnecessary by preconsultation exchange or whether the referrals remained unscheduled for other reasons. For the latter group, reasons why the referrals remained unscheduled were examined, and medical records were reviewed for actual patient harm when sufficient information was present in the chart or for potential harm when no further information about the referral complaint was available.

**Results:** Eighty-six (32%) of 266 not-scheduled referrals were resolved via preconsultation exchange. For another 96 (36%), patients were not ultimately considered to require appointments or were scheduled via other routes. Nine patients received unplanned care while awaiting scheduling decisions, 5 of whom had harm that was related to referral complaints, although scheduling of appointments may not have avoided this harm. Of 75 patients for whom further information was not available about the referral complaints, most were not seen back in primary care, and 55 (73%) had potential for major harm.

**Conclusion:** Few adverse outcomes in electronic referrals not scheduled for in-person gastroenterology visits were found, and none were clearly due to communication lapses in the referral process. Contributors to the potential for harm in referrals that were unintentionally left unscheduled included discontinuity of care and lack of patient or provider follow-up.

Work Flow in Electronic Referrals System



**Figure 1.** The work flow in the electronic referrals system is shown. Referring providers entered relevant clinical information via an online interface linked with the electronic health record (EHR). Asterisks indicate potential gaps leading to lapsed referrals.

communication from the perspective of specialty providers.<sup>28–30</sup>

Preconsultation exchange systems should minimize lapses that can lead to referrals’ being left unscheduled unintentionally. In this retrospective study, we sought to assess this aspect of preconsultation exchange safety in our urban health care system.<sup>30</sup> Little is known about characteristics of referrals not scheduled for in-person appointments. Clinical questions may be answered without in-person specialist visits, or decisions to schedule appointments may be delayed pending results of recommended testing, but referrals may also be unintentionally left unscheduled, creating risk for patient harm.

Among patients referred to the gastroenterology clinic during a 13-month period who were not scheduled for appointments, we determined whether appointments had been deemed unnecessary by the specialists reviewing the referrals. For the remainder, we reviewed medical records to determine other reasons why referrals were not scheduled and assessed actual and potential harm related to referral complaints. During the study period, eReferral was—and remains—the sole mechanism for scheduling new routine or expedited visits to gastroenterology.

**Methods**

**SETTING AND POPULATION**

ZSFG serves a network of hospital-based and community clinics with a diverse, underserved base comprising approximately 12% of San Francisco’s population. The hospital provides about 579,000 outpatient visits annually; approximately 35% are specialty visits, staffed by faculty and trainees of the University of California, San Francisco (UCSF). The adult gastroenterology clinic receives more than 5,000 referrals and provides more than

3,000 ambulatory patient visits and 4,000 endoscopic procedures annually. The Institutional Review Boards at UCSF and ZSFG approved this study.

**eREFERRAL**

Referring providers entered relevant clinical information via an online interface linked with the EHR. Each gastroenterology referral was evaluated by a salaried faculty gastroenterologist. Appropriate referrals with sufficient information were forwarded for scheduling. If a referral issue could be managed by the referring clinician with specialist guidance, the reviewer responded with appropriate advice. The reviewer could request additional clinical history or diagnostic testing before an appointment was made. The referring provider could then respond with the requested information, and the reviewer would then decide whether an appointment should be scheduled (Figure 1, above). Referrals to be scheduled were sent by the eReferral system to administrative staff for scheduling.

If a referral was better addressed by a different specialty, the reviewer requested that the referring provider redirect it. If a referral should be scheduled via a non-eReferral route, as for follow-up care for established patients (arranged through the clinic) or for patients referred from the inpatient setting (coordinated by the inpatient consult service), the reviewer requested appropriate rerouting by the referring provider. Although eReferral was designed for primary care providers, it was possible during the study period for any provider to refer from any care-delivery location, including specialty clinics, the emergency department (ED), and inpatient wards.

Urgency was not marked on the referrals for the gastroenter-

ology clinic. The reviewer could urgently schedule patients on the basis of information in the referral and/or discussion with the referring provider.

#### **DATA COLLECTION FOR STUDY PERIOD**

For the study period (November 1, 2009–November 30, 2010), we examined all referrals not forwarded to administrative staff for scheduling of adult gastroenterology clinic visits. We excluded referrals from community-based clinics, which did not consistently share the hospital's EHR, to ensure full access to medical records. We included referrals from the three adult primary care clinics physically based at the hospital and from other non–primary care sources at the hospital, such as other specialty providers, the urgent care clinic, the ED, and inpatient wards.

Given our focus on the electronic referral process itself rather than on issues with scheduling or follow-up for approved appointments, we included only referrals that were not forwarded to administrative staff for scheduling. Therefore, this study did not include referrals for which administrative staff were unable to contact patients for scheduling or scheduled appointments that patients failed to attend. We included referrals that were intentionally closed by providers and those that were automatically closed by the system after 180 days of inactivity.

As this was a descriptive study, we could not determine sample size. The investigators believed that a one-year period of referrals would provide an adequate sampling of the referral system and would be a realistic size for the detailed chart review required. Twelve months of data were requested from the eReferral system, but 13 months were received; the investigators reviewed all of the data obtained.

#### **DESIGN AND DATA COLLECTION**

For each referral, investigators recorded date; reason; patient demographics; referring clinic/provider characteristics; whether the response was viewed by the referring provider, by another provider, or not at all; and the reason why an appointment was not scheduled: “advice given/appointment not needed”; “additional clinical history/information requested”; “additional evaluation requested” (for example, laboratory tests or studies); “wrong clinic”; or “wrong referral route.”

If the gastroenterologist reviewing the referral had concluded that an appointment was not needed, we did not review the medical record. Our goal was to review the whether this referral system constitutes a sufficient *process* such that patients do not unintentionally remain unscheduled. Therefore, we focused on evaluating whether all referrals were appropriately considered and categorized but did not assess providers' clinical judgment.

#### **CHART REVIEW**

Referrals with clear decisions from the specialists in eReferral that appointments were not needed were classified as “advice given/appointment not needed,” and no further review was performed. For all others, medical records were reviewed, including all available inpatient and outpatient notes, as well as relevant orders and study results.

Some referrals were not scheduled because they should have been made to other clinics or via a route other than eReferral; for these, investigators reviewed records for documentation that the referrals were rerouted correctly. For referrals not scheduled because additional studies were requested, we looked for documentation that studies were ordered or completed.

We also evaluated whether medical records contained documented decisions not to pursue referrals further and whether patients received unscheduled care for their referral problems via emergency visits or hospitalizations, or died before the referral issues could be addressed.

Because some patients were referred from non–primary care settings, we also determined whether patients had primary care at a hospital-based clinic at the time of referral and whether patients were seen back in primary care within 180 days.

#### **HARM CLASSIFICATION**

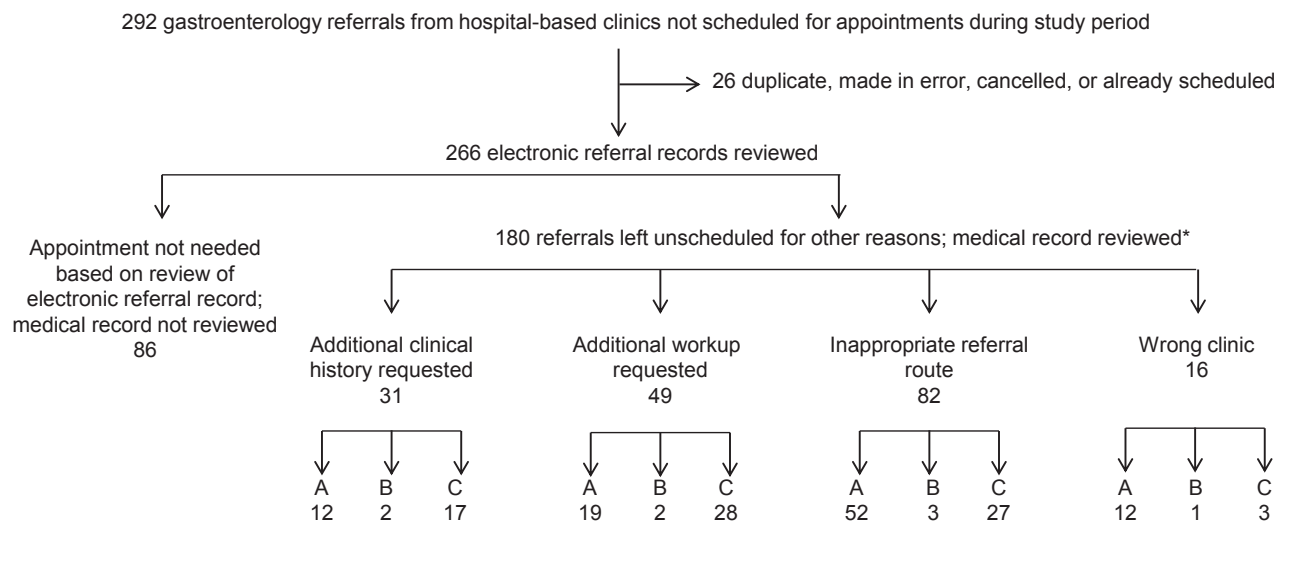
Investigators classified referrals for which charts were reviewed into categories of actual harm when sufficient information was present on chart review, or potential harm when information was not present. We adapted established scales for harm assessment from Gandhi et al.<sup>8</sup> and Singh et al.<sup>31,32</sup> We categorized harm as “no harm,” “inconvenience/minor harm,” “moderate harm,” and “major harm.”

Referrals for which medical records contained decisions not to further pursue gastroenterology visits were classified as “no harm,” as were all “wrong clinic” and “wrong referral route” referrals that were correctly rerouted.

Referrals with “inconvenience/minor harm” included those for minor symptoms without concern for serious underlying pathology, such as irritable bowel syndrome management. “Moderate harm” included substantial additional testing and treatment, including brief inpatient stays. “Major harm” included prolonged hospitalizations, permanent disability, delayed diagnosis of malignancy, and/or death.

For some referrals, medical record reviews did not reveal decisions not to pursue the referrals further or other evidence that the referral complaints resolved spontaneously or were addressed in some other way. These referrals were considered “unresolved,” and in these cases investigators assessed potential for

## Reasons for not Scheduling Referrals



- A: Decision not to schedule patient was apparent on chart review, or patient was scheduled care via another route or in another location (also includes patients who were instructed to call the clinic to schedule in the case of missed or follow-up appointments)
- B: Patient received unscheduled care via ED or hospital visit
- C: Resolution of referral issue unknown

\* Two referrals were left unscheduled because of reasons not shown. For one of these referrals, a decision was made not to schedule the patient. For the other, the patient had unscheduled care.

**Figure 2.** Of referrals made to the gastroenterology clinic during the study period, 1,304 were from sources included in this study. Some 1,012 (78%) of the 1,304 referrals were scheduled for appointments. Of the remaining 292 referrals, 26 were duplicates or were canceled, resulting in the inclusion of 266 referrals. ED, emergency department.

harm. The categories were “no harm potential,” “potential for inconvenience/minor harm,” “potential for moderate harm,” and “potential for major harm.”

We graded potential harm on severity rather than probability, because medical record review provides insufficient information to reliably assess probability of potential harm. For instance, a referral for a patient with intermittent rectal bleeding and a normal blood count would be classified as having potential for major harm, given concern for possible malignancy, although a benign explanation would be more likely.

Referrals and medical records were reviewed by an internal medicine physician [E.L.P.] and a ZSFG faculty gastroenterologist [J.L.S.], each of whom had advanced training in clinical research. The database was autopopulated with demographics fields, and additional objective data were manually entered. Both reviewers independently entered data regarding actual or potential patient harm. Discrepancies were resolved by discussion. When there was remaining disagreement, a third reviewer [U.S.] was asked to provide further input.

During the period studied, referrals were closed automatically after 180 days of inactivity. Therefore, we used a 180-day time horizon for all analysis.

### DATA ANALYSIS

Study data were collected and managed using REDCap (Research Electronic Data Capture) tools hosted at UCSF.<sup>33</sup> Analysis was performed using Microsoft Excel (Redmond, Washington) for Mac 2011 and Stata 11. (StataCorp 2009; Stata Statistical Software: Release 11; College Station, Texas: StataCorp LP.)

### Results

#### REFERRALS TO THE GASTROENTEROLOGY CLINIC

Between November 1, 2009, and November 30, 2010, 3,169 referrals were made to the gastroenterology clinic, of which 1,304 were from sources included in this study. Some 1,012 (78%) of the 1,304 referrals were scheduled for appointments. Of the remaining 292 referrals, 26 were duplicates or were canceled. Therefore, 266 referrals were included in this study (Figure 2, above).

While most (62%) of the referrals were from primary care clinics, 18% of the patients were referred from the inpatient setting or had recently been released from inpatient stays. Some 9% were referred from the ED, and 6% were referred from specialty clinics (Table 1, right).

Of the 266 referrals, specialty reviewers' responses were viewed by the referring providers in 184 (69%), and 30 (11%) were viewed by a different provider. Fifty-two reviewer responses (20%) were not viewed by providers at all; 40 (77%) of these originated from non-primary care providers.

**REASONS FOR NOT SCHEDULING REFERRALS**

For 86 (32%) of the 266 referrals, specialist advice in eReferral indicated no appointment was needed (Figure 2). Representative excerpts are in Appendix Table 1 (available in online article). Some 82 (31%) of the appointments were not scheduled because the referrals had been made via the wrong route. Another 16 (6%) of the referrals were more appropriate for another specialty. For 80 (30%) of the referrals, the specialty reviewer requested additional clinical history (31 referrals) or diagnostic studies (49 referrals) before scheduling, and this information was not provided.

One patient was not scheduled because the specialist planned to discuss the patient in an upcoming clinical conference; another was not scheduled because the specialist arranged for immediate hospitalization.

**RESULTS OF MEDICAL RECORD REVIEW**

Of the 266 electronic referrals included, medical records were reviewed for all 180 in which specialist advice in eReferral did not clearly indicate no appointment was needed.

**Completion of Diagnostic Studies Requested by Reviewer.** Of the 49 referrals for which additional diagnostic studies were requested, the evaluation was completed but the eReferral system was not updated for 19 (39%) of the referrals, and evaluation had been ordered but not completed for another 10 (20%).

**Resolved Referrals.** Of the 180 referrals for which medical records were reviewed, the referral complaints were further addressed ("resolved") in 105 (58%)—of which 69 (66%) were later scheduled for specialist visits via other routes (Table 2, page 345). For another 27 of these 105 (26%), medical records indicated clear decisions not to further pursue the referrals on the basis of provider judgment or patient preference. For 9 referrals (9%), the referral problems were addressed via unscheduled ED or hospital care.

**Unresolved Referrals.** For 75 (42%) of the 180 referrals for which charts were reviewed, referral complaints were not

Patient Characteristics	n	%
<b>Age (years)</b>		
Under 40	54	20
40–59	116	44
60–79	91	34
80 or older	5	2
<b>Male Sex</b>	156	59
<b>Race</b>		
Hispanic	88	33
Asian	67	25
White	55	21
Black	36	14
Other	20	8
<b>Primary language</b>		
English	122	46
Spanish	64	24
Chinese	23	9
Other	57	21
<b>Primary care provider</b>		
Hospital-based clinic	202	76
Non-hospital-based clinic	42	16
No primary care provider found	22	8
<b>Referral Characteristics</b>	<b>n</b>	<b>%</b>
<b>Referring provider</b>		
Physician (attending or resident)	213	80
Physician assistant or nurse practitioner	53	20
<b>Referral source</b>		
Primary care clinic	166	62
Inpatient (recent or current)	49	18
Emergency department	24	9
Specialty clinic	16	6
Urgent care	7	3
OB-GYN	4	2
OB-GYN, obstetrics-gynecology.		

further addressed in the medical record. For 32 (43%) of the 75 referrals, medical records contained no documentation of visits to primary care or any other hospital-based locations during the 180-day review period (Table 3, page 345). For 34 (45%) of the 75 referrals, the patients did not have primary care at a hospital-based clinic, so investigators could not obtain access to primary care documentation. Of the remaining 41 referrals, 23 were seen back in primary care within 180 days, but medical records either did not further mention the



**Table 2. Results of Medical Record Review for 180 Referrals to the Gastroenterology Clinic Not Scheduled for Appointments, Classified by Reason for Not Scheduling on the Basis of Electronic Referral Record**

Reason for Not Scheduling Appointment on the Basis of Review of Electronic Referral Record: <i>n</i> (row %)	Outcome of Referral-Based Medical Record Review						
	Total	Incorrect route, rerouted correctly	Wrong clinic, redirected correctly	Decision made not to pursue further	Scheduled via other route	ED or hospital stay related to referral problem	Unknown outcome of referral
Incorrect route (e.g., from inpatient or ED)	82	44 (54)	n/a	7 (9)	1 (1)	3 (4)	27 (33)
Referral was made to wrong clinic	16	n/a	11 (69)	1 (6)	0	1 (6)	3 (19)
Additional clinical history requested and not provided	31	n/a	n/a	5 (16)	7 (23)	2 (6)	17 (55)
Additional workup requested	49	n/a	n/a	14 (29)	5 (10)	2 (4)	28 (57)
Other	2	n/a	n/a	0 (0)	1 (50)	1 (50)	0
Total	180	44 (24)	11 (6)	27 (15)	14 (8)	9 (5)	75 (42)

ED, emergency department; n/a, not applicable.

referral complaints (15 patients) or briefly mentioned the referral complaints but did not include clear decisions not to pursue the referrals (8).

**CATEGORIZATION OF PATIENT HARM AND POTENTIAL FOR HARM**

**Categorization of Harm: Resolved Referrals.** Of the 105 resolved referrals, 96 (91%) were categorized as having no patient harm from not having gastroenterology clinic visits scheduled via eReferral; the 96 patients included the patients scheduled via other routes and those for whom appointments were deemed unnecessary.

The remaining nine (9%) patients received unscheduled care for their referral complaints; four were categorized as having no harm; three, moderate harm; and two, major harm. The cases with major harm were an elderly patient referred for abdom-

inal pain who presented two weeks later with gastrointestinal bleeding and was found to have metastatic gastric cancer, and a patient who died of unknown cause while awaiting cardiac evaluation before gastroenterology evaluation for subacute gastrointestinal bleeding. Cases are detailed in Appendix Table 2 (available in online article).

**Categorization of Potential Harm: Unresolved Referrals.** For the referrals with no clear resolution, 55 (73%) had potential for major harm (Table 3).

**Discussion**

Preconsultation exchange has clear benefits in answering clinical questions without patient visits. For 68% of referrals in this study, patients were not ultimately felt to require in-person gastroenterology clinic appointments or were appropriately redirected for scheduling via other routes. About half of these

**Table 3. Primary Care Status and Potential for Harm From Not Being Scheduled for the Gastroenterology Clinic, for Never-Scheduled Electronic Referrals with Unknown Outcome (N = 75)**

Potential for Harm: <i>N</i> (row %)	Primary Care Status					
	Total	Primary care at a hospital-based clinic	No primary care, or primary care elsewhere	Seen in hospital-based primary care setting within 180 days	Seen only in hospital-based non-primary care setting within 180 days	Not seen at hospital-based setting within 180 days of referral
No harm potential	3	2 (67)	1 (33)	0	2 (67)	1 (33)
Potential for inconvenience/minor harm	9	3 (33)	6 (67)	4 (44)	1 (11)	4 (44)
Potential for moderate harm	8	3 (38)	5 (63)	4 (50)	3 (38)	1 (13)
Potential for major harm	55	26 (47)	29 (53)	15 (27)	14 (25)	26 (47)
Total	75	34 (45)	41 (55)	23 (31)	20 (27)	32 (43)

patients (32% of all referrals studied) were not scheduled because they were resolved via preconsultation exchange. Very few patients received emergency or hospital care while awaiting resolution of gastroenterology referrals (9 [3%] of 266).

For the five referrals categorized as having moderate or major harm, the patients likely would have required ED or hospital care even had they been scheduled immediately for gastroenterology visits. For the two patients with major harm in particular, poor outcomes may have been more related to rapid progression of underlying illness than to lapses in the referral process. However, we did identify gaps in referral processes related to provider and patient factors; 31% of specialty reviewer responses to electronic referrals in this study were not viewed by referring providers. Although this may have been partially due to referrals from non-primary care settings, handoffs between providers in academic primary care settings create discontinuity that may contribute to lapses in responding to specialists' requests for additional information.<sup>34</sup>

The number of referrals left unscheduled after gastroenterologist reviewers requested additional clinical history or test results (30%) was also likely due in part to high loss to follow-up in this low-income, uninsured, or publicly insured population. Of the 75 unresolved referrals in our study, only 23 (31%) of the patients were seen in a primary care clinic within 180 days of referral. For nearly half of the referrals not scheduled because of requested additional diagnostic testing, studies were not completed or were not conveyed back to the specialist reviewer, suggesting that patients either did not complete testing or did not return to the clinic.

No established benchmarks exist for unscheduled care following electronic referrals or for acceptable risk for patient harm due to lack of specialty visit. A recent systematic review of the electronic consultation literature conducted through August 2014 found no studies that evaluated emergency room visits or hospitalizations.<sup>26</sup> A subsequent study of electronic consultations at ZSFG's academic affiliate, where referring providers specifically choose between electronic consultations (eConsults) and referrals for in-person visits, found that 6% of gastroenterology/hepatology eConsults and 11% of all eConsults reviewed had ED visits in the 180 days following submission.<sup>35</sup> In our study, of the electronic referrals not scheduled for visits, only 3% of the patients received unscheduled care. Although the two referral systems, patient populations, and study designs differ, the results suggest the relative safety of our electronic referral and consultation system. Very few studies have specifically examined missed or delayed diagnoses for patients not scheduled for specialty appointments. DeBoer et al. studied the "natural

history" of declined gastroenterology referrals (sent via fax and not integrated into the EHR) in a Canadian hospital system; for 9.1% of the declined patients, clinically important diagnoses were made within 12 months after referral.<sup>36</sup> Differences in setting and methodology make direct comparison impossible, but incidence of known harm in our study is much lower, again suggesting a relatively low rate of missed or delayed diagnoses in our system.

Our approach to evaluating potential patient harm distinguishes between the likelihood of potential harm, which we could not reliably assess on the basis of available information, and the magnitude of potential harm, which we addressed on the basis of the presenting complaint. Previous studies have found a low likelihood of potential harm from unscheduled electronic referrals. For example, in a study of referrals to multiple specialty clinics in the US Department of Veterans Affairs health care system, Singh et al. found an overall likelihood of harm of 1.7 on a 7-point scale.<sup>31</sup> In assessing the magnitude of potential harm, we found that most (73%) of the 75 referrals for which no further information about the referral complaint was found had potential for severe harm. Although this finding merits attention, we also acknowledge that our estimates of magnitude of potential harm were always much higher than the actual harm encountered, as each reviewed referral in this group was given the most serious, but often not the most likely, potential outcome associated with the referral problem.

The eReferral system has several safeguards in place to facilitate handoffs. In general, ZSFG policy is that the responsibility for following up on a referral lies with the referring provider. Unresolved eReferrals remain on the referring provider's worklist until they are manually removed. If trainee (resident) providers do not open and address eReferrals, their designated attending providers receive e-mail reminders until the eReferrals are addressed. When a subspecialist acts on an eReferral, the primary care provider receives an e-mail notification.

Our findings led to changes in the eReferral system. To address discontinuity of care between trainees in resident clinic, quarterly reports are now sent to attending providers alerting them to their unscheduled unopened referrals. To address risk for lapses in communication due to referrals from non-primary care settings, referrals from the ED have now been blocked for many services, and non-primary care providers are encouraged not to submit referrals. Each specialty clinic can determine whether to permit referrals from the inpatient and ED settings. Urgent/emergent referrals continue to be arranged via telephone communication with referring providers.

In our health system, electronic consultation has significantly

improved access to subspecialty physicians; our results provide reassurance that the system itself is safe from the perspective of actual patient harm. We acknowledge concern about the quality of clinical decisions on the basis of primary-to-specialty provider discussion of patients compared to in-person evaluation,<sup>37</sup> and this represents an important area for future research.

### LIMITATIONS

We relied on medical record review for harm assessments, but patients may have had resolution of referral complaints without clear chart documentation. Because we included only referrals from sources based at the hospital who practice in proximity, there may be more coordination than in the community; therefore, generalizability to the community setting may be limited.

We chose to examine the safety of the *process* by which patients are referred in this electronic referral system. Therefore, we did not address other important components of safety in referral processes, such as the quality of clinical judgment of the referring provider or reviewing specialist, or issues related to the scheduling process itself or patient attendance to appointments. These remain important topics for ongoing study.

### Conclusion

In our safety-net health system with limited specialist access, we identified few adverse outcomes in electronic referrals of patients not scheduled for in-person gastroenterology visits, and none that were clearly attributable to lapses in the referral process. Contributors to unintentionally unscheduled referrals included lack of continuing engagement in electronic referrals from providers in non-primary care settings, discontinuity of care in primary care settings, and patient loss to follow-up. As demand for electronic consultation and referral platforms increases, it is vital that close attention be paid to these aspects of preconsultation exchange to optimize patient safety. **J**

**Erika Leemann Price, MD, MPH**, is Hospitalist, San Francisco Veterans Affairs Medical Center (SFVAMC); Assistant Clinical Professor of Medicine, University of California, San Francisco (UCSF); Director, Quality Improvement, Anticoagulation/Thrombosis Service, and Co-Director of Quality Improvement, Medical Service, SFVAMC. **Justin L. Sewell, MD, MPH**, is Assistant Professor of Medicine, UCSF. **Alice Hm Chen, MD, MPH**, is Chief Medical Officer, San Francisco Health Network, and Professor of Medicine, UCSF. **Urmimala Sarkar, MD, MPH**, is Associate Professor of Medicine in Residence, Division of General Internal Medicine, UCSF Center for Vulnerable Populations, Department of General Internal Medicine, Zuckerberg San Francisco General; and Member, Editorial Advisory Board, *The Joint Commission Journal on Quality and Patient and Safety*. Please address correspondence to Erika Leemann Price, Erika.Price@ucsf.edu.

### Online Only Content

<http://www.ingentaconnect.com/content/jcaho/jcjqqs>

See the online version of this article for

Appendix Table 1. Excerpts from Representative Exchanges from eReferral in Which Presenting Complaint Was Managed with Specialist Reviewer Advice and No Appointment Was Scheduled

Appendix Table 2. Case Descriptions for Nine Patients Who Had Unscheduled Emergency Room Care or Inpatient Admission Following Referral to the Gastroenterology Clinic Before Referral Was Otherwise Resolved

Appendix Figure 1. eReferral System Interface

Appendix Figure 2. Representative E-Mail Notification to Referring Providers Regarding eReferral Status

Appendix Figure 3. Representative Notification to Referring Provider Regarding Appropriate eReferral Sources for Gastroenterology Clinic Visits

### References

1. Mehrotra A, Forrest CB, Lin CY. Dropping the baton: Specialty referrals in the United States. *Milbank Q*. 2011;89:39–68.
2. O'Malley AS, Reschovsky JD. Referral and consultation communication between primary care and specialist physicians: Finding common ground. *Arch Intern Med*. 2011 Jan 10;171:56–65.
3. Bodenheimer T. Coordinating care: A major (unreimbursed) task of primary care. *Ann Intern Med*. 2007 Nov 20;147:730–731.
4. Singh H, et al. Reducing referral delays in colorectal cancer diagnosis: Is it about how you ask? *Qual Saf Health Care*. 2010;19:e27.
5. Sarkar U, et al. Challenges of making a diagnosis in the outpatient setting: A multi-site survey of primary care physicians. *BMJ Qual Saf*. 2012;21:641–648.
6. Smith PC, et al. Missing clinical information during primary care visits. *JAMA*. 2005 Feb 2;293:565–571.
7. West DR, et al. Relationship between patient harm and reported medical errors in primary care: A report from the ASIPS Collaborative. In Henriksen K, et al., editors: *Advances in Patient Safety: New Directions and Alternative Approaches*, vol. 1: *Assessment*. Rockville, MD: Agency for Healthcare Research and Quality, 2008. Accessed Jun 28, 2016. <http://www.ncbi.nlm.nih.gov/books/NBK43641/>.
8. Gandhi TK, et al. Missed and delayed diagnoses in the ambulatory setting: A study of closed malpractice claims. *Ann Intern Med*. 2006 Oct 3;145:488–496.
9. US Office of the Legislative Council. *Compilation of Patient Protection and Affordable Care Act*. May 2010. Accessed Jun 28, 2016. <http://housedocs.house.gov/energycommerce/ppacacon.pdf>.
10. Kocher R, Emanuel EJ, DeParle NA. The Affordable Care Act and the future of clinical medicine: The opportunities and challenges. *Ann Intern Med*. 2010 Oct 19;153:536–569.
11. Kirschner N, Greenlee CM. *The Patient-Centered Medical Home Neighbor: The Interface of the Patient-Centered Medical Home with Specialty/Subspecialty Practices*. Philadelphia: American College of Physicians, 2010.
12. Yee HF Jr. The patient-centered medical home neighbor: A subspecialty physician's view. *Ann Intern Med*. 2011 Jan 4;154:63–64.
13. Grimshaw JM, et al. Interventions to improve outpatient referrals from primary care to secondary care. *Cochrane Database Syst Rev*. 2005 Jul 20: CD005471.
14. Forrest CB. A typology of specialists' clinical roles. *Arch Intern Med*. 2009 Jun 8;169:1062–1068.



15. Grumbach K. Redesign of the health care delivery system: A Bauhaus “form follows function” approach. *JAMA*. 2009 Dec 2;302:2363–2364.
16. Linzer M, et al. Exploring the generalist-subspecialist interface in internal medicine. *Am J Med*. 2006;119:528–537.
17. Chen AH, Yee HF Jr. Improving the primary care-specialty care interface: Getting from here to there. *Arch Intern Med*. 2009 Jun 8;169:1024–1026.
18. eReferral: Connecting primary and specialty care. *Frontiers of Medicine: News from the UCSF Department of Medicine*. 2009;(8):1, 4–5.
19. Bindman AB, et al. Healthcare reform with a safety net: Lessons from San Francisco. *Am J Manag Care*. 2009;15:747–750.
20. Horner K, Wagner E, Tufano J. Electronic consultations between primary and specialty care clinicians: Early insights. *Issue Brief (Commonw Fund)*. 2011;23:1–14.
21. Stoves J, et al. Electronic consultation as an alternative to hospital referral for patients with chronic kidney disease: A novel application for networked electronic health records to improve the accessibility and efficiency of healthcare. *Qual Saf Health Care*. 2010;19:e54.
22. Audet AM, Squires D, Doty MM. Where are we on the diffusion curve? Trends and drivers of primary care physicians’ use of health information technology. *Health Serv Res*. 2014;49:347–360.
23. Kirschner N, Barr MS. Specialists/subspecialists and the patient-centered medical home. *Chest*. 2010;137:200–204.
24. Walsh C, et al. Provider-to-provider electronic communication in the era of meaningful use: A review of the evidence. *J Hosp Med*. 2013;8:589–597.
25. Palen TE, et al. Comparing virtual consults to traditional consults using an electronic health record: An observational case-control study. *BMC Med Inform Decis Mak*. 2012 Jul 8;12:65.
26. Liddy C, Drosinis P, Keely E. Electronic consultation systems: Worldwide prevalence and their impact on patient care—A systematic review. *Fam Pract*. Epub 2016 Apr 13.
27. Chen AH, et al. Practice profile. A safety-net system gains efficiencies through ‘eReferrals’ to specialists. *Health Aff (Millwood)*. 2010;29:969–971.
28. Kim Y, et al. Not perfect, but better: Primary care providers’ experiences with electronic referrals in a safety net health system. *J Gen Intern Med*. 2009;24:614–619.
29. Kim-Hwang JE, et al. Evaluating electronic referrals for specialty care at a public hospital. *J Gen Intern Med*. 2010;25:1123–1128.
30. Chen AH, Murphy EJ, Yee HF Jr. eReferral—A new model for integrated care. *N Engl J Med*. 2013 Jun 27;368:2450–2453.
31. Singh H, et al. Follow-up actions on electronic referral communication in a multispecialty outpatient setting. *J Gen Intern Med*. 2011;26:64–69.
32. Singh H, et al. Prescription errors and outcomes related to inconsistent information transmitted through computerized order entry: A prospective study. *Arch Intern Med*. 2009 May 25;169:982–989.
33. Harris PA, et al. Research Electronic Data Capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42:377–381.
34. Singh H, et al. Types and origins of diagnostic errors in primary care settings. *JAMA Intern Med*. 2013 Mar 25;173:418–425.
35. Wrenn K, et al. Analysis of an electronic consultation program at an academic medical centre: Primary care provider questions, specialist responses, and primary care provider actions. *J Telemed Telecare*. Epub 2016 Mar 3.
36. de Boer EM, Pincock D, van Zanten SV. The ‘natural history’ of declined outpatient gastroenterology referrals. *Can J Gastroenterol*. 2012;26:785–790.
37. Burden M, et al. Prospective comparison of curbside versus formal consultations. *J Hosp Med*. 2013;8:31–35.

**Appendix Table 1. Excerpts from Representative Exchanges from eReferral in Which Presenting Complaint Was Managed with Specialist Reviewer Advice and No Appointment Was Scheduled**

Referral Issue	Referral Question	Exchange in eReferral
Abdominal pain	77-year-old female with recurrence of abdominal pain after prior gastroenterologic workup and treatment in 2006. . . . [description of prior evaluation]. . . . My questions are: Can a duodenal diverticulum or gallbladder polyp account for any of these symptoms? Do any of the findings from her prior diagnostic studies warrant any repeat testing given her recurrence of symptoms, or any specific therapeutic trials, or should I just manage her symptomatically as best as possible for non-specific dyspepsia and abdominal pain?	<p><b>Reviewer:</b> Gallbladder polyps are rarely a cause of biliary or other abdominal pain syndromes and rarely are malignant. The patient's pain pattern does not suggest a biliary etiology. However, a repeat abdominal ultrasound to compare with the previous one may be helpful. Duodenal diverticuli are not a usual cause of pain, but can in certain instances, and depending on location cause symptoms. Diverticuli near the papilla may be associated with biliary pain, and those elsewhere may be associated with inflammation and/or bleeding. Intraluminal diverticuli in the second portion of duodenum may cause intermittent obstruction. Her <i>H. [Helicobacter] pylori</i> status can be checked with a stool antigen, with the patient off proton pump inhibitors for 1–2 weeks. If treatment of any <i>H. pylori</i> recurrence does not help, will be glad to see her in clinic.</p> <p><b>Referring provider:</b> Thanks for the helpful advice. Will proceed as recommended.</p> <p><b>Reviewer:</b> Would be interested in a follow-up.</p> <p><b>Referring provider:</b> Follow-up note for GI consultant: Stool <i>H. pylori</i> antigen was negative after a period off her PPI [proton pump inhibitor] and her symptoms are a bit better, so I am comfortable just managing her symptomatically and suspect her fluctuating symptoms are related to life stresses and other factors.</p> <p><b>Reviewer:</b> Thanks for the follow-up.</p>
Irritable bowel syndrome (IBS)	43-year-old male . . . complaining of diarrhea/constipation off and on for 6 months. [Description of symptoms, exam, and laboratory findings]. Have discussed with patient that this is likely IBS, continuing to talk to patient about dietary changes, is also on Effexor for depression. Patient requesting gastroenterology consult, any recommendations that you may have?	<p><b>Reviewer:</b> From your reason for consult request it appears that your patient may have irritable bowel syndrome. If this is high in your differential diagnosis, I am wondering if you have read the following very valuable article: [link to irritable bowel syndrome review]. This article provides an excellent and brief review of diagnosis and management of IBS. If after reading this article you still feel a gastroenterology clinic appointment is needed, please resubmit this and I will schedule your patient for an appointment to see us.</p>
Timing of colonoscopy follow-up	57-year-old woman underwent colonoscopy . . . for blood per rectum . . . found to have 3 benign appearing rectal and recto-sigmoid polyps on colonoscopy. Biopsy showed that one of the rectosigmoid polyps was a tubular adenoma and one of the rectal polyps was a hyperplastic polyp. Two questions: 1. When do I refer the patient back for repeat colonoscopy? 2. Does she need follow-up in the gastroenterology clinic to discuss these results?	<p><b>Reviewer:</b> The patient should have routinely gotten a follow-up appointment for the results. But reviewing the report, she had only one diminutive adenomatous polyp and doesn't need repeat study for 5 years. Please contact us at that time.</p>
Treatment recommendations in advance of appointment	27-year-old man with epigastric pain . . . [description of symptoms and prior evaluation] . . . interfering with ability to sleep, function, eat without discomfort. Trial of amitriptyline titration for possible IBS without symptomatic improvement. Recently also diagnosed with major depressive disorder and part of precipitant is abdominal pain. I am aware of [upcoming gastroenterology follow-up] appointment. Would appreciate further recommendations around testing/treatment in advance of that visit or earlier scheduled visit.	<p><b>Reviewer:</b> Would be interested if [treatment] for depression helps his abdominal pain. In view of [computed tomography] findings, would suggest gastric emptying study, as this may contribute or cause epigastric pain.</p>

**Appendix Table 2. Case Descriptions for Nine Patients Who Had Unscheduled Emergency Room Care or Inpatient Admission Following Referral to the Gastroenterology Clinic Before Referral Was Otherwise Resolved**

Harm Category	Case Description
No harm	Specialty reviewer arranged inpatient admission.
No harm	Admitted to hospital for non-gastroenterologic reason, but gastroenterology referral complaint incidentally addressed.
No harm	Admitted to hospital for non-gastroenterologic reason, but gastroenterology referral complaint incidentally addressed.
No harm	Referred from psychiatric inpatient setting but evaluated by gastroenterology service while still inpatient, obviating need for outpatient gastroenterology care.
Moderate harm	Referred from urgent care with history of vomiting and abdominal pain of unclear cause following prior evaluations elsewhere. Reviewer requested further diagnostic studies. Before these were completed, the patient was hospitalized for the same symptoms and evaluated by the inpatient gastroenterology service. Imaging and upper endoscopy were not revealing of significant pathology. Symptoms had resolved on postdischarge follow-up.
Moderate harm	Referred for endoscopic retrograde cholangiopancreatography (ERCP) after hospitalization for gallstone pancreatitis. The reviewer recommended the referring provider contact the inpatient gastroenterology fellow familiar with the case to arrange follow-up. Six days after referral, the patient was admitted with jaundice and had an inpatient ERCP.
Moderate harm	Referred from the ED [emergency department] with a history of inflammatory bowel disease, presenting with bloody bowel movements and abdominal pain. The patient had been lost to care for several years; laboratory studies were unremarkable. The reviewer requested additional clinical history which was not provided. The patient then re-presented with the same symptoms and was hospitalized and treated by the gastroenterology service as an inpatient, with plans for close follow-up after discharge.
Major harm	Elderly patient new to clinic, referred with epigastric pain unresponsive to previous <i>H. [Helicobacter] pylori</i> therapy. Additional history was requested by the reviewer. Two weeks later the patient presented again in a decompensated state with gastrointestinal bleeding; he was hospitalized and found to have metastatic gastric cancer.
Major harm	Elderly patient referred with chest discomfort. The reviewer recommended cardiac evaluation prior to a gastroenterology appointment. The patient was admitted to the hospital one day after referral submission with chest pain and gastrointestinal bleeding. The inpatient gastroenterology consulting service felt the bleeding was a slow process and recommended outpatient endoscopy; however, the patient died within one month of unknown cause.

Appendix Figure 1. eReferral System Interface

SF HEALTH NETWORK eReferral  
Gastroenterology Clinic

<-Back Close Form

Save as Draft Submit Request  
Current Status: New Submission  
Gastroenterology Clinic

Patient and Provider information can be up to 24hrs old. Corrections to this information must be made in the LCR.

Patient Information	Referring Provider Information
Name: Phone: ID: Insurance: Demog: Address: City/State:	Name: eMail: Pager: Fax: Ref Loc:
Attending Provider Information	Primary Care Provider Information
The Referring Provider is an Attending. You are the Attending.	Name: eMail: Pager: Fax: PCC Loc:

All Communication will become part of the Electronic Medical Record (LCR)  
Reason for Consultation  
Include pertinent history, physical laboratory findings, and medications.

Please enter below any special scheduling considerations for this patient.

inc\_ConultHeaderUsers

Online Only Content 

Appendix Figure 2. Representative E-Mail Notification to Referring Providers Regarding eReferral Status



---

Patient [REDACTED] MRN: [REDACTED] whom you referred to TB Clinic, has NOT been scheduled for an appointment at this time. Please note that this does not necessarily mean that the specialty reviewer thinks your patient is inappropriate for a specialty clinic visit, but that additional information or clarification may be needed. Please check your eReferral Worklist for further details.

Thank you for using the eReferral System.

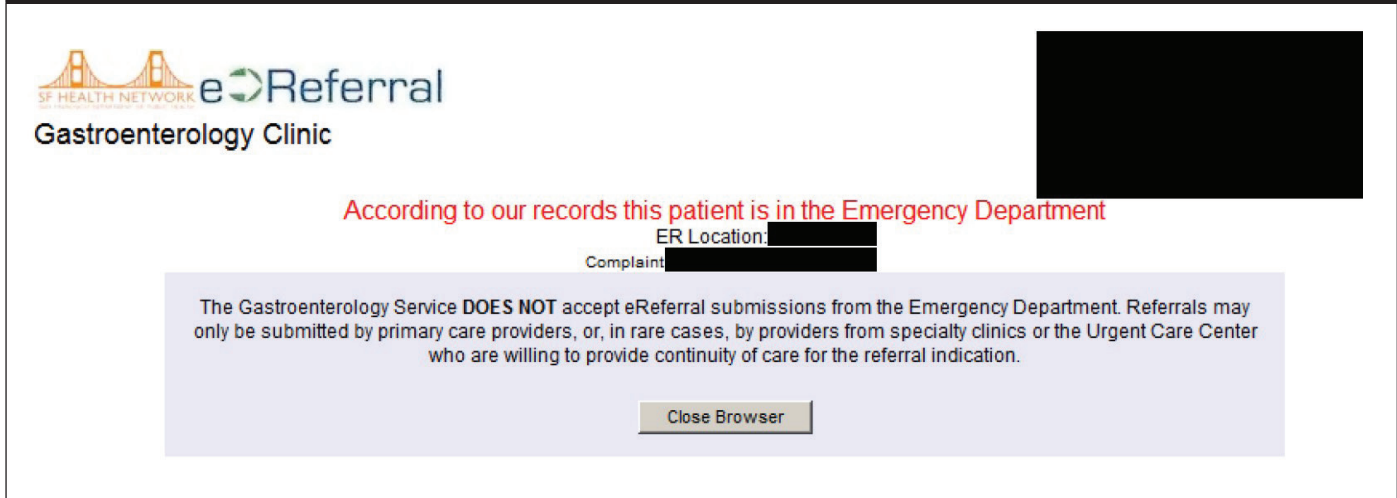
---

This is a system generated eMail. Please do not reply.



**Online Only Content** 

**Appendix Figure 3. Representative Notification to Referring Provider Regarding Appropriate eReferral Sources for Gastroenterology Clinic Visits**



**SF HEALTH NETWORK eReferral**  
**Gastroenterology Clinic**

**According to our records this patient is in the Emergency Department**

ER Location: [REDACTED]  
Complaint: [REDACTED]

The Gastroenterology Service **DOES NOT** accept eReferral submissions from the Emergency Department. Referrals may only be submitted by primary care providers, or, in rare cases, by providers from specialty clinics or the Urgent Care Center who are willing to provide continuity of care for the referral indication.

[Close Browser](#)