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## Leveraging an electronic referral system to build a medical neighborhood<sup>☆</sup>

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### ABSTRACT

**Background:** Electronic referral and consultation systems are gaining popularity, but their contribution to the patient centered medical home–neighborhood framework of coordinated care delivery is not clear. We examined how specialists leverage an electronic referral and consultation system to deliver specialty care, identified determinants of high-quality electronic specialist communication and measured the impact of feedback to specialists on communication quality. **Methods:** Referral patterns were identified for 19 specialties using eReferral in the San Francisco public health care delivery system. Primary care provider (PCP) ratings of the quality (helpfulness and educational value) of consultative communication were measured. Using logistic regression, we identified determinants of high-quality specialist communication during pre-consultative exchange or virtual co-management. Predictors included: specialty and reviewer type, referral volume, percent of referrals never scheduled and time spent by reviewers on eReferral. A pre–post analysis examined the impact of feedback on communication quality. **Results:** The percentage of referrals immediately scheduled (27.2–82.8%) and never scheduled (7.7–59.3%) varied by specialty, with medical reviewers (vs. surgical and women's health) and physician reviewers (vs. nurse practitioners) scheduling fewer referrals immediately ( $p < 0.001$ ). Prevalence of high-quality communication was 71%, impacted by referral volume (adjusted odds ratio=0.78, 95%CI 0.68–0.88 for each additional 1000 referrals/year) and time spent per referral (1.18, 1.04–1.35 for each additional 3 min). **Conclusions:** Specialists can use electronic referral and consultation systems to enhance specialty care delivery with consultative communication that is highly rated by PCPs. **Implications:** These data can inform the structure and functionality of future electronic consultation systems to maximize care coordination. **Level of evidence:** III.

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### 1. Introduction

The traditional primary care–specialty care interface falls short with regards to provider-to-provider communication and care coordination.<sup>1–3</sup> Prior studies have highlighted the enormous task primary care providers (PCPs) face in overcoming the fragmentation inherent in the US health care system.<sup>2</sup> To promote integrated, coordinated care between primary and specialty care, the American College of Physicians has developed a patient centered medical home–neighborhood (PCMH–N) framework for care delivery.<sup>4,5</sup> Through care coordination agreements and mutually agreed upon expectations, the PCMH–N defines new roles and responsibilities for both primary care and specialty care providers. In particular, the PCMH–N codifies a range of clinical interactions between primary and specialty care providers that go beyond traditional face-to-face formal consultations, including pre-consultative exchange designed to expedite or prioritize care and a variety of co-management

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arrangements that formalize and expand the specialist role in delivering primary care colleagues.<sup>6</sup>

While the PCMH–N has tremendous potential to improve care delivery through enhanced communication among providers, there are little published data about how to implement the tenets of a PCMH–N. eReferral, an internet-based asynchronous electronic referral and consultation system developed at San Francisco General Hospital, is an example of a system that has operationalized new primary care and specialty care roles and relationships described in the PCMH–N model.<sup>7</sup> eReferral has increased access to and effectiveness of specialty care through pre-visit communication,<sup>8</sup> and both PCPs and specialists have expressed satisfaction with the system.<sup>9,10</sup> The quality of eReferral communication and its impact on specialty care delivery, however, has not been extensively explored.

Our goals with this study were to: (1) examine how different specialties leverage eReferral to engage in pre-consultative exchange and virtual co-management; (2) assess the quality, defined by helpfulness and educational value, of specialist consultative communication from the PCP perspective using a novel peer evaluation system; (3) identify determinants of high-quality specialist communication; and (4) determine whether individualized feedback to specialists could enhance the quality of consultative exchange. Given widespread electronic medical record adoption, the results can inform the structure and functionality of electronic referral and consultation systems to maximize the efficiency, safety and quality of specialty health care delivery within a modern medical neighborhood.

## 2. Methods

### 2.1. Setting

eReferral is an electronic referral and consultation system designed to optimize the efficient use of specialty resources within the San Francisco Health Network (SFHN), the integrated public health care delivery system that serves San Francisco's uninsured and underinsured residents (approximate  $N=123,000$ ). SFHN specialty services receive referrals from PCPs who work in hospital-based primary care clinics, primary care sites managed by the San Francisco Department of Public Health, and independently funded community health centers. To request a consultation, PCPs initiate an electronic referral and provide relevant history and physical exam findings. When pertinent, they also include patient preference for in-person vs. electronic consultation, as patients do not explicitly participate in the electronic referral and consultation process. Pertinent patient demographic information and laboratory data are automatically appended. Each specialty service generally has 1–2 designated specialty clinician reviewers, either physicians or nurse practitioners (NPs) who review and respond to each consultative request. These reviewers are chosen by the specialties, and while an emphasis is made on having an experienced clinician serve as reviewer, the decision is ultimately that of the specialty service. Physician reviewers receive a designated percentage of salary support for this role and NP reviewers are hired with this role as part of their job description.

### 2.2. eReferral use across specialties: volume, disposition and time spent

We examined referral patterns from January 1 to December 31, 2012 for 19 different subspecialties. Unique eReferral consultations are defined as a consultation for a specific problem that includes all back and forth communication for that problem. Typically these represent unique patients; uncommonly a given patient can have two unique consultations to the same specialist for different problems.

Reviewers consider each consultative request, and can immediately forward it for scheduling, respond with questions, request additional evaluation, or provide management suggestions. Referrals can be grouped into one of four categories: (1) those requiring additional diagnostic workup or history before clinical consultation, representing pre-consultative exchange; (2) those that can be managed by the referring clinician with guidance from the specialist without a face-to-face specialist appointment, representing clinical consultation or virtual co-management; (3) those requiring a specialist appointment that can wait for the next available appointment, representing routine referrals; and (4) those requiring an expedited appointment with a specialty provider, representing urgent referrals. This process may require multiple exchanges between the referring PCP and the specialist reviewer until they reach consensus on the best solution for the patient. Referrals that are not scheduled for an appointment are closed six months after the last exchange and are considered “never scheduled.” While most never scheduled appointments reflect a consensus by the PCP and specialist reviewer, some may also reflect resolution of the medical problem thus eliminating the need for a specialist consultation, or a patient being lost to follow-up in the health care system. Referral disposition for this study was broken into 3 distinct categories based upon the above outcomes: (a) percent of referrals initially scheduled, (b) percent of referrals scheduled after electronic communication between the referring and specialist provider, and (c) percent of referrals never scheduled for a face-to-face visit.

We also examined time spent by specialist reviewers per unique referral, calculated by the average number of minutes reviewers were logged on to the eReferral system per month, divided by the number of unique referrals/consultations, over a 7-month period (August 2012–February 2013).

### 2.3. Ratings

In June 2011, we embedded a bi-directional communication ratings system in eReferral, using a tool developed by 2 authors (AHC and EJM) with input from key informant PCPs and specialists. Specialty reviewers evaluated PCP referral requests on the clarity of their consultative question and the completeness of pre-referral workup (data not presented in this manuscript). PCPs assessed the quality (helpfulness and educational value) of specialist consultative communication with 2 questions with 5-point Likert scale responses: “How helpful was this response in guiding the evaluation or ongoing management of the patient?” and “How would you rate the educational value of the specialist reviewer's response”. PCPs rated specialist communication only for patients who were not initially scheduled for an appointment and were thus candidates for pre-consultative exchange or virtual co-management. One star represented the lowest value; 5 stars the highest. Ratings were dichotomized into “high quality” if they received 4–5 stars for either educational value or helpfulness or “low to average quality” if they received 1–3 stars for both educational value and helpfulness.

### 2.4. Intervention to enhance quality of specialist consultative communication

Ratings data from June 2011 to May 2012 were aggregated and presented to specialty reviewers during feedback sessions that took place between May and November 2012. These one-hour, individualized sessions were led by eReferral clinical champions (AHM, EJM) and were placed squarely in the context of eReferral quality improvement. Specialty reviewers were shown examples of their own highly rated and poorly rated communication exchanges, as well as highly rated communication exchanges from other specialists. Also, opportunities for enhanced communication

with PCPs were identified, as were best practices (i.e., provision of tailored vs. boilerplate language, inclusion of at least one evidence-based educational statement, use of concise prose or bullet points) and determinants of highly rated reviewers. Ratings were then collected for 6 months after each feedback session; the last ratings data were collected in May 2013. The institutional review board of the University of California, San Francisco approved the protocol.

### 2.5. Statistical analyses

Determinants of high-quality ratings were examined using chi-squared and Wilcoxon rank-sum tests. Predictors included: specialty type (medical, surgical, women's health) and reviewer type (physician, NP) as well as referral volume, percentage of referrals that were never-scheduled, and time spent on eReferral. Using a logistic regression, generalized estimating equations approach to account for repeated measures and clustering by PCP, we estimated the odds of receiving a high-quality rating by characteristic using univariate and multivariate models. We also estimated the prevalence of high-quality ratings by individual characteristic; for these analyses referral volume, referral disposition and time spent on eReferral were modeled as binary variables.

Using the same logistic regression but this time incorporating the interaction between specialty and pre/post-intervention, we examined differences in pre- and immediately post-intervention (0–3 months) ratings overall, and by the following pre-determined subgroups: medical vs. surgical vs. women's health specialty; physician vs. NP reviewer; low-volume vs. high-volume specialties; low vs. high-percent never scheduled; more vs. less time spent per consult. To assess sustainability, the same models were used to examine ratings immediately post-intervention (0–3 months) compared to ratings 3–6 months post-intervention.  $p$ -Values  $< 0.05$  were considered statistically significant; all tests were 2-sided.

Data were analyzed using STATA statistical software (STATA Corp, Version 11, College Station, Texas).

## 3. Results

### 3.1. eReferral across specialties

Of the 19 participating specialties, 12 were medical subspecialties, 5 were surgical subspecialties, and 2 were women's health specialties. Reviewers were either physicians ( $n=13$ ) or NPs ( $n=7$ ). Referral volume, referral management and time spent by each specialty reviewer differed substantially across the specialties (Table 1). Referral volume ranged from 123 (allergy) to 3493 (orthopedics) unique patient referrals per year.

The percentage of referrals immediately scheduled without any back and forth between specialist and requesting providers ranged from 27.2% to 82.8%. All surgical and women's health specialty reviewers scheduled more than 50% of referrals immediately (Fig. 1). Compared to their colleagues, medical specialty reviewers scheduled fewer referrals immediately, allowing for pre-consultative exchange or virtual co-management ( $p < 0.001$ ). Compared to physician reviewers, NP reviewers scheduled more face-to-face visits immediately ( $p < 0.001$ ). The percent of referrals never scheduled for a face-to-face specialist appointment ranged from 7.7% to 59.3%. All of the specialties with a never-scheduled prevalence of at least 30% were medical subspecialties, which tended to be the more laboratory-dependent specialties (allergy, endocrinology, hematology, hepatology, and nephrology) rather than the more exam-dependent or procedural specialties (pulmonology, gastroenterology, neurology, rheumatology).

The average time spent per unique referral by specialty reviewers ranged from 2.5 to 15.5 min (Table 1). Specialty reviewers who experienced high volumes of referrals spent less time responding to each consultative request ( $p < 0.001$ , Fig. 2a). Reviewers who had a

**Table 1**  
Characteristics of specialties and specialist reviewers using eReferral.

Specialty	Reviewer	Referral volume (unique referrals/year)	Referral management			Time spent on eReferral (min/unique consult)
			% Immediately scheduled	% Scheduled after pre-consultative exchange	% Pure electronic consultation	
<b>Medical</b>						
Allergy	MD	123	30.1	10.6	59.3	10.5
Cardiology	MD	1374	64.0	14.8	21.2	2.5
Pulmonary	MD	806	54.1	20.2	25.7	5.1
Diabetes	NP	945	52.3	34.5	13.0	9.7
Endocrinology	MD	704	27.2	34.8	37.9	15.5
Gastroenterology	MD	2494	50.9	19.6	29.5	7.9
Hematology	MD	542	44.2	14.0	41.7	12.3
Hepatology <sup>a</sup>	MD/NP	808	28.6	24.1	47.3	10.8
Nephrology	MD	543	39.8	27.8	32.4	6.2
Neurology	NP	1622	76.6	15.7	7.7	6.6
Oncology	MD	505	58.4	13.7	27.9	4.8
Rheumatology	MD	576	56.6	17.7	25.7	11.8
<b>Surgical</b>						
General surgery	NP	1930	69.5	11.0	19.5	6.4
Otolaryngology	NP	1952	82.8	7.4	9.8	4.1
Neurosurgery	NP	496	57.7	13.3	29.0	11.1
Orthopedics	NP	3493	57.2	20.3	22.5	5.7
Urology	MD	1853	67.2	18.2	14.5	7.0
<b>Women's health</b>						
Gynecology	MD	2206	64.7	20.0	15.2	6.8
Obstetrics	MD	387	53.7	17.8	28.4	7.8

All specialties have 1–2 designated reviewers, with the exception of Women's health. All faculty in Gynecology and Obstetrics act as eReferral reviewers during the week that they are on service.

<sup>a</sup> The hepatology eReferral service was shared equally by a physician (MD) and nurse practitioner (NP) reviewer.

high percentage of never-scheduled referrals spent more time on each referral ( $p < 0.001$ , Fig. 2b).

### 3.2. Determinants of high-quality specialist consultative exchange

Between June 2011 and May 2012, 586 PCPs rated the helpfulness and educational value of 2189 specialist reviewer communications for patients not initially scheduled for a face-to-face specialty appointment. Overall, 71% ( $n=1564/2189$ ) of baseline specialist communications for not initially scheduled referrals were considered high quality by PCPs, including high ratings for either helpfulness (70%, 1524/2189) or educational value (60%, 1308/2189).

Differences in estimated prevalence of high-quality ratings by characteristic are listed in Table 2. Quality of consultative exchange differed among the medical, surgical and women's health reviewers ( $p < 0.001$ ), with the highest percentage of high-quality ratings

achieved by women's health reviewers and the lowest by the surgical reviewers. Other characteristics associated with higher-quality ratings included: lower referral volume, physician reviewer (vs. NP reviewer), higher percentage never scheduled referrals, and more reviewer time spent per unique referral.

In the multivariate model, differences in high-quality ratings remained significant among high vs. low referral volumes, specialty types, and more vs. less time spent per referral. For each additional 1000 referrals processed per year, reviewers had 22% lower odds [adjusted odds ratio (AOR)=0.78, 95%CI 0.68–0.88] of receiving a high-quality rating on their communication, independent of specialty type, reviewer type, volume and referral disposition. We depict the estimated prevalence of high-quality ratings by volume for each specialty type in Fig. 3a. Independent of volume, women's health reviewers were estimated to receive the highest percentage of high-quality ratings, at 93.1% for their low volume

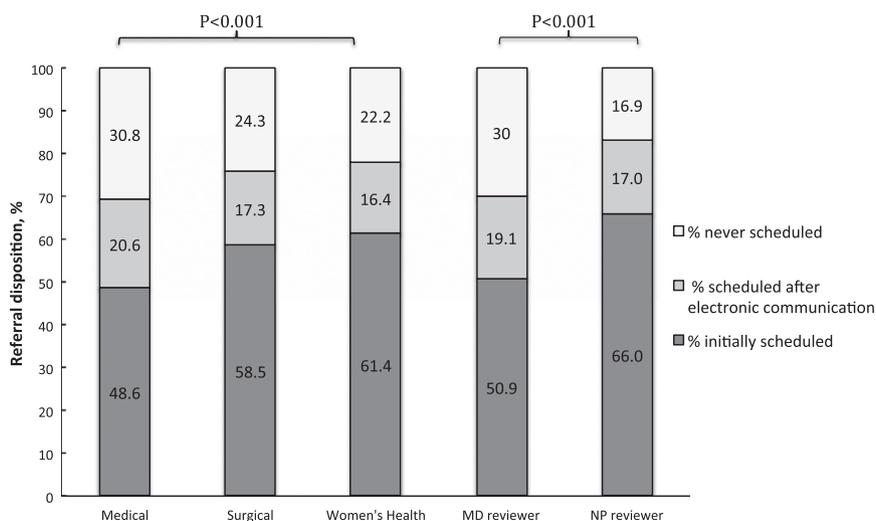


Fig. 1. Mean distribution of referral disposition by specialty and reviewer type.

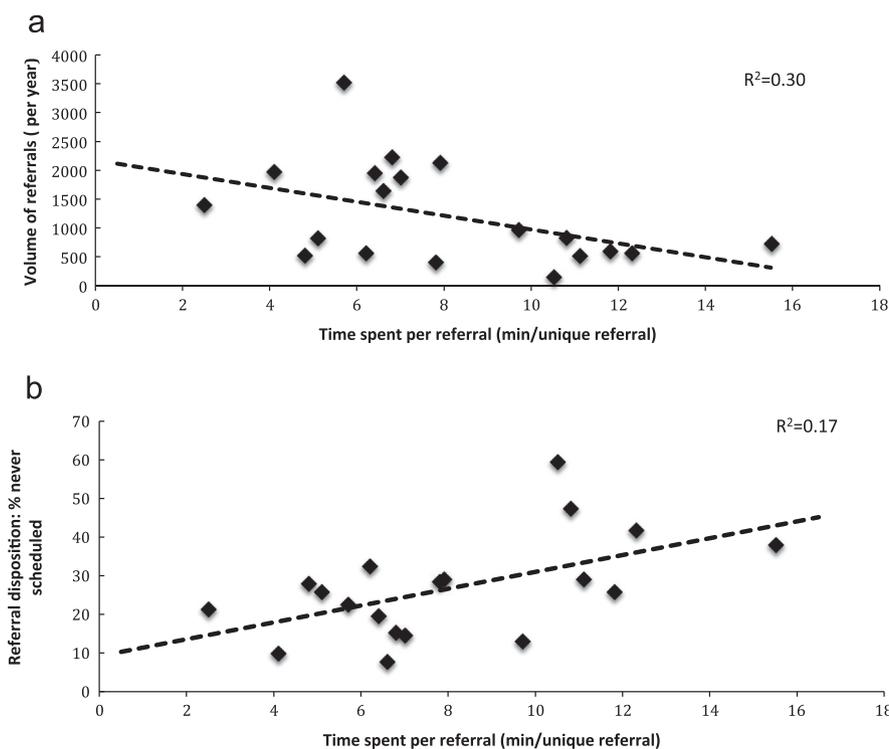
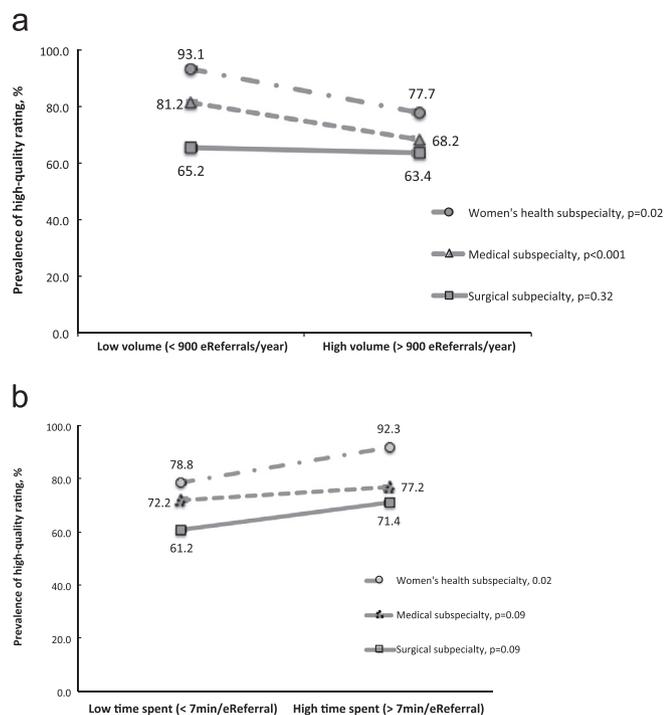


Fig. 2. (a and b) Associations between referral volume and referral disposition with time spent per referral ( $p < 0.001$  for both comparisons).

**Table 2**

Estimated prevalence of high-quality ratings for non-visit eReferral communication, pre-intervention.

	Estimated prevalence of high-quality rating (%)	p-Value
Subspecialty		$p < 0.001$
Women's health (n=2)	79.7	
Medical subspecialty (n=12)	75.8	
Surgical (n=5)	64.1	
Volume		$p < 0.001$
Low volume, < 900/year (n=10)	80.0	
High volume, > 901/year (n=9)	66.7	
Reviewer type		$p < 0.001$
Physician (n=13)	76.5	
Nurse practitioner (n=5)	65.1	
eReferral management		$p < 0.001$
High % electronic consultation, $\geq 26\%$ (n=9)	77.9	
Low % electronic consultation, < 26% (n=10)	69.1	
Time spent (min/consult)		$p < 0.001$
More time spent, $\geq 7$ min/consult (n=10)	77.0	
Less time spent, < 7 min/consult (n=9)	68.7	



**Fig. 3.** (a) Estimated prevalence of high-quality ratings pre-intervention, by volume of referral. Adjusted for all characteristics. (b) Estimated prevalence of high-quality ratings pre-intervention, by time spent per referral. Adjusted for all characteristics.

subspecialty (obstetrics) and 77.7% for their high-volume subspecialty (gynecology). Surgical subspecialty reviewers had the lowest estimated prevalence of high-quality ratings, without significant difference by volume status. Reviewers who spent more time on each unique referral compared to those who spent less time were also more likely to receive high-quality ratings (AOR for each additional 3 min per consult=1.18, 1.04–1.35), independent of

other characteristics. Estimated prevalence of high-quality ratings by time spent on each unique referral for each specialty type is depicted in Fig. 3b. Reviewers achieved higher prevalence of high-quality ratings when spending more (vs. less) time per referral, regardless of specialty type. Trends towards greater odds of receiving high-quality ratings among physicians compared to NPs (AOR=1.25, 0.88–1.46) and among reviewers with higher percentages of never scheduled visits (AOR for each additional 10% never-scheduled=1.09, 0.95–1.27) were noted, however, these trends were not statistically significant in the multivariate model.

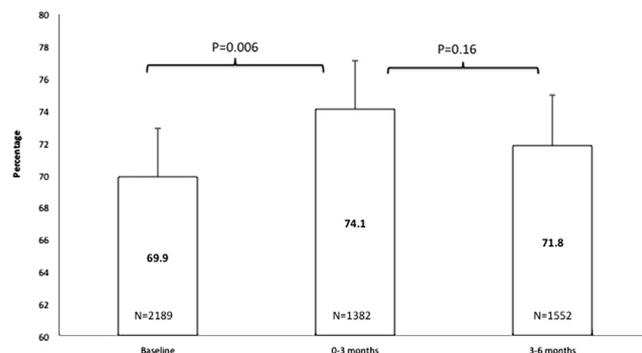
Estimated prevalence of high-quality communication increased immediately post-intervention from 69.9% to 74.1% and decreased slightly in the 3–6 months post-intervention to 71.8% (Fig. 4). Physician reviewers were more influenced by the intervention than NP reviewers, with higher adjusted odds of receiving high-quality ratings post- compared to pre-intervention ( $p=0.01$ ). The intervention affected other subgroups of providers similarly: surgical vs. medical vs. women's health; high vs. low-volume; high vs. low percent never scheduled, and more vs. less time spent per referral (data not shown). As with the overall analyses, all differences among subgroups (or lack thereof) were sustained 3–6 months post-intervention.

### 3.3. Impact of individualized feedback on quality of consultative exchange

Estimated prevalence of high-quality communication increased immediately post-intervention from 69.9% to 74.1% and decreased slightly in the 3–6 months post-intervention to 71.8% (Fig. 4). Physician reviewers were more influenced by the intervention than NP reviewers, with higher adjusted odds of receiving high-quality ratings post- compared to pre-intervention ( $p=0.01$ ). The intervention affected other subgroups of providers similarly: surgical vs. medical vs. women's health; high vs. low-volume; high vs. low percent never scheduled, and more vs. less time spent per referral (data not shown). As with the overall analyses, all differences among subgroups (or lack thereof) were sustained 3–6 months post-intervention.

## 4. Discussion

With this study, we describe how specialists can leverage electronic referral and consultation systems such as eReferral, to operationalize the tenets of a PCMH–N model of specialty care delivery. While this study provides an in-depth analysis of one delivery system's experience, given the rapid adoption of electronic medical record systems,<sup>11</sup> our findings are generalizable to a wide array of organizations. In particular, a growing number of health care organizations are moving beyond the ability to submit



**Fig. 4.** Estimated prevalence of high quality ratings for consultative communication pre- and post-individualized feedback to specialist reviewers.

an electronic referral, to leveraging technology to provide electronic pre-consultations and virtual co-management.<sup>12,13</sup>

PCP satisfaction with electronic referral and consultation systems have been previously documented by our group<sup>9</sup> and others.<sup>12</sup> In particular, PCPs appreciate an enhanced ability to track referrals, decreased wait times for face-to-face specialty clinic visits and electronic referral programs' ability to improve patient access to specialty expertise. This study adds to these prior data by demonstrating that PCPs also find the majority of electronic specialist communication for non-scheduled patients helpful and educational. This suggests that high-quality pre-consultative exchange and virtual co-management between PCPs and specialists may serve as an acceptable alternative to in-person specialty appointments in a way that is constructive for PCPs as well as efficient for the entire health care system. Similar findings have been demonstrated with a tele-pulmonology program in the Netherlands<sup>14</sup> and a virtual consultation program in the Kaiser Permanente Colorado system.<sup>13</sup> These data are timely, as the need for specialty expertise will continue to increase as millions of Americans newly eligible for insurance under the Affordable Care Act seek care. Having an efficient system embraced by PCPs that enhances access to specialty expertise and supports primary care providers in delivering comprehensive longitudinal care over a broad range of conditions in the medical home is crucial to meeting the anticipated demand.

Independent determinants of high-quality communication in our study included lower referral volume and more time spent per consultative exchange. In this study, we also noted a correlation between lower referral volume and more time spent on the eReferral system. This correlation may be in part due to our system of providing designated salary support (e.g. 10% FTE or 4 h/week) for physician specialist reviewers based on historic (lower) referral volumes rather than payment based on concurrent referral volume. Alternatively, this correlation may be specific to the specialist reviewers who see high volumes in our system. Behavioral economics would suggest that volume of referrals may be a less of a driver of communication quality in systems where the specialist consultant is paid on a fee-for-service basis and is thus incentivized to provide high-quality, value-added electronic consultations to PCPs to ensure ongoing referrals. As electronic referral and consultation programs are being implemented across the United States and Canada, a variety of payment models are being considered, including care coordination fees to participate in electronic consultation systems or per member per month allocations based on a population of shared patients. We have limited understanding of how these global payment models can affect specialist willingness to provide virtual consultation.<sup>15</sup> Additional research in this area of behavioral economics is warranted.

With respect to time spent per referral, we present substantial variation by specialty. One should be cautioned against assuming these times are representative of optimal care or should necessarily be a benchmark for reimbursement. These times are a known underestimate of specialist reviewer effort as they do not include time spent reviewing diagnostic studies, discussing clinical cases with colleagues, or educating themselves prior to answering a specific consultative question. These data do emphasize, however, the importance of protected time for specialists to contribute meaningfully to the PCMH–N through high-quality consultative communication.

Importantly, percentage of patients never scheduled for a face-to-face specialty visit was not a significant driver of PCP ratings. Specialist reviewers that achieved the highest percentage of high-quality communication ratings, those from hematology and endocrinology, for example, also had high rates of never scheduled patients (41.7% and 37.9%, respectively). These data suggest that electronic referral and consultation systems can support the

PCMH–N framework of care delivery, with specialist guidance supporting primary care providers in delivering quality care for appropriate conditions in the medical home. This practice could lead to increased complexity of patients seen by specialty providers. While not assessed in this study, change in patient complexity among patients scheduled for a visit is an important metric to examine the impact of electronic referral and consultation systems on specialty care delivery.

Providing non-visit consultative communication requires non-traditional specialist expertise, which has implications for both medical liability and training. At the present time, very little information exists on the extent of liability in this area. However, the role of the eReferral reviewer has been deemed by our hospital risk management department to be covered within the specialists' usual scope of practice. While some individuals are likely better suited for this role than others, most specialists receive no formal training or guidance in how to provide non-visit-based consultations.<sup>16</sup> Data from interviews with eReferral stakeholders and end-users suggest that highly-rated reviewers are experienced clinicians, as they can better anticipate problems and more aptly decipher the underlying consult question in a poorly worded referral request, enjoy educating colleagues, have respect for PCPs and are attuned to their overall responsibility of providing specialty care within the context of a resource-constrained system (unpublished data). Even these reviewers need feedback and ongoing training to ensure high-quality communication via electronic referral and co-management systems. Our communication quality rating system, which leverages the electronic nature of eReferral, is an innovative and expeditious way to capture relevant data for quality improvement. We demonstrate that a brief, one-time intervention with feedback and review of best practices can enhance the quality of non-visit consultative exchange. This type of granular feedback about communication is rarely given to specialty providers. Our data suggest that such feedback should be incorporated into practice. With the tenets of quality improvement in mind, however, a one-time feedback intervention will not likely suffice for sustained improvement. Moving forward, our goal is to provide routine feedback for specialist reviewers.

This study is not without its limitations. Helpfulness and educational value of non-visit consultative exchange were determined by a subjective PCP survey. Given our goal of keeping patients in their primary medical home, increasing PCP capacity to care for specialty issues with helpful and educational specialist communication is key to maintaining a thriving clinical enterprise. Importantly, ratings only applied to specialist communications for patients not initially scheduled for a face-to-face specialty visit. There is heterogeneity across reviewers/specialties in eReferral disposition, which could introduce bias. Also, our measure of time spent on referral communication was obtained directly from the eReferral system and is an underestimate. Our data emerge from one integrated academic safety-net system, which may not be representative of other health care delivery systems. Lastly, quality of consultative exchange is an intermediate outcome. A more robust examination of how high-quality non-visit electronic consultative communication impacts clinical outcomes was out of the scope of this study, but remains a key next step to evaluate the overall impact of the new specialist role on health care delivery.

In summary, we demonstrate that electronic referral and consultation systems such as eReferral expand the specialist role in a way that PCPs find helpful and educational. Highly rated specialist communication comes from specialist reviewers who individually manage a modest volume of referrals, and thus can spend the time necessary to properly educate their colleagues through high-quality pre-visit consultative exchange or virtual co-management. In turn, this allows for a high never-scheduled referral disposition strategy, furthering the tenets of patient-centered care. Many questions remain about these

systems, including those that pertain to reimbursement and medical liability. Nonetheless, we demonstrate that individualized feedback encourages specialists not previously trained for this role to enhance the quality of their consultative communication, though the duration of this improvement is not clear. Incorporating peer-rating systems into existing and future electronic consultation systems can engage specialists in optimizing care coordination and efficiency of health care delivery within a patient-centered medical neighborhood.

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## Conflict of interest disclosure statement

This statement accompanies the article “Leveraging an electronic referral system to build a medical neighborhood,” was authored (co-authored) by “Delphine Tuot” (Elizabeth J. Murphy, Charles E. McCulloch, Kiren Leeds, Evelyn Chan, Alice Hm Chen) and submitted to Health care as an original article.

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