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# Los Angeles Safety-Net Program eConsult System Was Rapidly Adopted And Decreased Wait Times To See Specialists

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**ABSTRACT** Lack of timely access to specialty care is a significant problem among disadvantaged populations, such as those served by the Los Angeles County Department of Health Services. In 2012 the department implemented an electronic system for the provision of specialty care called the eConsult system, in which all requests from primary care providers for specialty assistance were reviewed by specialists. In many cases, the specialist can address the primary care provider's question via an electronic dialogue, thereby eliminating the need for the patient to see a specialist in person. We observed rapid growth in the use of eConsult: By 2015 the system was in use by over 3,000 primary care providers, and 12,082 consultations were taking place per month, compared to 86 in the third quarter of 2012. The median time to an electronic response from a specialist was one day, and 25 percent of eConsults were resolved without a specialist visit. Three to four years after implementation, the median time to a specialist appointment decreased significantly, while the volume of visits remained stable. eConsult systems are a promising and sustainable intervention that could improve access to specialist care for underserved patients.

**L**ack of timely access to specialty care is a persistent challenge for vulnerable populations in the United States who have Medicaid coverage or are uninsured. Roughly a quarter of visits to community health centers require a specialty consultation.<sup>1</sup> Yet in one study, 71 percent of federally qualified health centers reported difficulty obtaining specialty care for their patients, while another study found that almost a third of specialist physicians across the United States were unwilling to accept new publicly insured patients in 2013.<sup>1,2</sup> There is a clear mismatch between supply and demand for specialty services for low-income patients.

This problem has also been a challenge for the Los Angeles County Department of Health Services (DHS)—the second-largest public health

system in the United States, which serves 670,000 patients annually across nineteen clinics, four hospitals, and dozens of community practices.<sup>3</sup> For example, an internal review conducted by two of the authors found that in 2011 a quarter of DHS patients referred to gastroenterology or urology specialists had to wait over nine months for an appointment. It was also common, they found, for primary care providers to become so frustrated with specialty access that they referred their patients to the emergency department in an attempt to expedite a specialist consultation.

To address this specialty access crisis, in 2012 DHS began the implementation of an electronic system called eConsult. In this system, primary care providers must request all nonemergency specialty assistance electronically. To do this,

providers submit an eConsult request to a given specialty, including the patient's clinical background, the nature of the problem, and images or other media when necessary. Each request is then read by the assigned reviewer for that specialty, who can engage in a secure, electronic, iterative dialogue with the provider. Depending on the clinical scenario, the reviewer either recommends that the patient see a specialist or resolves the eConsult request without a visit by providing relevant input on treatment or diagnosis through electronic dialogue.

The eConsult system could improve access to specialty input through multiple mechanisms. First, primary care providers receive expert specialist advice electronically within days or even hours, instead of after the weeks or months it can take before the patient can get an appointment with a specialist.<sup>4,5</sup> Second, because many eConsult requests are resolved without an in-person specialty visit, demand for such visits decreases, which may reduce waiting times for an in-person visit. Previous research has suggested that a substantial proportion of referrals to specialists are potentially avoidable.<sup>6,7</sup> Third, when visits do need to be scheduled, specialist reviewers who are part of the eConsult system can ensure that the patient sees the right specialist and has the appropriate previsit evaluation (for instance, ensuring that needed imaging or lab tests are done before the appointment). Reviewers can also triage the timing of visits according to clinical urgency.<sup>8</sup> eConsult shifts the role of specialists from providers of face-to-face, office-based visits for a small group of patients to rapidly responsive consultants for an entire population of patients.

In this study we examined the first four years of DHS's eConsult system to address three gaps in the growing literature on such systems.<sup>9-12</sup> First, given that previous literature has generally explored a short time window or involved systems with optional eConsult pathways that constitute a small fraction of total referral volume (such as at Mayo Clinic<sup>13</sup> or the Department of Veterans Affairs<sup>14</sup>), it is unclear whether eConsult systems can lead to sustainable long-term improvement in access.

Second, it is not known how providers' use of eConsult systems changes over time. Previous literature has suggested that the systems may increase primary care providers' ability to manage common specialty problems over time.<sup>15</sup> This could lead to decreased rates of eConsult use if primary care providers become comfortable managing a wider range of diagnoses themselves. Alternatively, easier access to specialists could release pent-up demand for specialist input, leading to higher rates of eConsult use

over time.

Third, because eConsult is an entirely new model of care delivery, clinicians are likely to vary greatly in their engagement with the approach. Identifying patterns of variation in use of eConsult across primary care providers and specialist reviewers could help guide efforts to improve the quality and consistency of the referral process.

## Study Data And Methods

**THE ECONSULT PROGRAM** DHS began implementing its eConsult system in 2012, based on a previous successful program that had been conceived by and led in part by one of the authors (Hal F. Yee Jr.).<sup>12,16</sup> The DHS eConsult system was rolled out on a staggered basis across primary care practice sites and specialties from 2012 through the end of 2015. There were two types of primary care sites that used eConsult: DHS practices and non-DHS affiliated community practices. DHS practices are staffed entirely by primary care providers who are salaried employees of DHS. For them, the eConsult system replaced all previous mechanisms for requesting specialty referrals (such as phone calls, e-mails, or faxes). The non-DHS affiliated community practices contracted with Los Angeles County to use eConsult only for patients who were not eligible for Medicaid and who otherwise did not have access to specialty care because they lacked health insurance (for example, undocumented immigrants). For these patients, DHS provided access to specialty care through eConsult as a safety-net program known as My Health LA.<sup>17</sup>

eConsult requests are entered into a web-based software platform by providers and directed to a specific specialty. Each specialty has a home page that describes the ideal information to include in an eConsult request and contains links to a library of guidelines for the most commonly addressed conditions. For each request, the primary care provider enters a brief description of the clinical problem requiring specialty input. All eConsult requests for the entire Los Angeles County health system are reviewed by a small set of specialist reviewers recruited by specialty department leadership within DHS.

Reviewers generally review all requests from an assigned group of practice sites for at least six months, and the majority of reviewers serve in that role for much longer. All reviewers are expected to respond to requests promptly and engage in a dialogue with providers if the request can be addressed without a specialist visit. If a visit is necessary, then the reviewer can forward the request to a DHS-wide scheduling service for appointment booking. Specialist reviewers are

not compensated separately for eConsult reviews, and primary care providers are not reimbursed for eConsult requests.

**STUDY DESIGN AND SAMPLE** We performed a retrospective observational analysis of the eConsult program using a database of all eConsult requests for the period 2012–15. The database captures the specialty requested, the date of the request, its disposition (visit to a specialist scheduled, resolved without a visit), the number of exchanges between the primary care provider and specialist reviewer, the date of a scheduled visit, and the names and practice sites of the primary care provider and reviewer.

We examined two separate study samples. The first sample (the entire DHS sample) was the entire universe of patients and physicians using eConsult, which consisted of 395,050 eConsult requests. This sample was used to examine the rate of adoption and use of eConsults across the entire Los Angeles County health system.

The second sample (the DHS-employed sample), which was used for the majority of the analyses presented in this article, focused on eConsult use in its third and fourth year of implementation (2014–15). This sample was limited to the 60,864 eConsult requests from DHS-employed primary care providers who were using the system before January 2014 for twelve specialties available on eConsult before 2014 (cardiology, endocrinology, ear/nose/throat, gastroenterology, gynecology, hematology/oncology, nephrology, neurology, ophthalmology, podiatry, rheumatology, and urology). Because the eConsult system was gradually adopted over a four-year period by increasing numbers of practice sites and specialties, we used this stable cohort to ensure that the changes we observed were not due to the changing mix of primary care providers using the system or the increasing number of specialties available for eConsult requests. There was no expansion of specialist staffing or specialist reviewers for these specialties in the period 2014–15.

**OUTCOMES** We first examined the volume of eConsult requests across the entire Los Angeles County health system. As a measure of access, we also calculated the time in days to a scheduled appointment from the date an eConsult request was resolved as requiring a specialist visit in 2015. Because eConsult can help appropriately triage a referral and some patients with nonurgent issues can appropriately wait for a visit, we also measured the proportion of patients with specialty appointments within thirty days or less in 2015 as a measure of the capacity for urgent access. We measured the time to a reviewer's first response to the eConsult request and the number of exchanges between the primary care provider

## The implementation of this system suggests that even in a large, underserved urban population, specialty access is not an intractable problem.

and reviewer (by definition, there was a minimum of two exchanges: the primary care provider's request and the initial response from the reviewer).

We classified the outcomes of each eConsult request as either "visit to specialist scheduled," if the specialist reviewer decided that a specialist visit was necessary, or "resolved without visit." Across individual primary care providers and reviewers, we measured the variation in the percentages of "resolved without visit" eConsult requests.

One potential factor in determining whether an eConsult system succeeds is how engaged the specialist is in communicating and teaching.<sup>18</sup> Some eConsult reviewers may not engage with providers and instead clear their queues quickly by deciding that a specialist visit is necessary. To capture a specialist's level of engagement, we examined for each reviewer what percentage of eConsult requests that resulted in a specialist visit had at least three messages exchanged. This gave us the reviewer's score on an "engagement index" that ranged from 0 to 100. For example, an engagement index of 25 would indicate that for eConsults resulting in a specialist visit, a reviewer had three or more messages exchanged 25 percent of the time.

**COVARIATES** Primary care providers and specialists were classified by specialty, type of clinic, and whether or not the primary care practice was a teaching site for medical residents.

**STATISTICAL ANALYSES** Using data from the entire DHS sample, we first plotted trends in the average monthly volume of eConsult requests. For 2015 we also calculated the overall proportion of requests that were resolved without a visit and the mean associated number of exchanges between primary care providers and specialists. For the same year, for requests resulting in a visit, we also calculated the median time

to first response to the request, median time to the appointment, and the percentage of appointments made within thirty days. For all subsequent analyses, we used the DHS-employed sample.

In the DHS-employed sample, for each primary care provider and specialist reviewer with twenty or more eConsults, we estimated the proportion of eConsult requests that were resolved without a visit. We also compared each reviewer's score on the eConsult engagement index and the percentage of requests resolved without a visit. To identify the factors independently associated with an eConsult request being resolved without a visit, we used an eConsult-level logistic regression model to predict the likelihood that a request would be resolved without a visit, with a reviewer's score on the eConsult engagement index as the main predictor of interest. In addition, we controlled for a linear time trend and for specialty and primary care practice site as fixed effects.

**LIMITATIONS** Our study had several limitations. First, because of the limited information technology infrastructure within the Los Angeles County health system before the implementation of eConsult, we did not have access to pre-implementation data or results for a control group without eConsult that we could use in our analysis. This limited our ability to make definitive claims about the impact of eConsult on specialty access, though anecdotally the implementation has led to a radical change in that access.

Second, given that this was an observational study, we were unable to infer the causality of any associations that we observed.

Third, we lacked detailed clinical information on patients or individual eConsult requests beyond their specialty, which limited our ability to assess referral appropriateness.

Fourth, we were not able to easily compare overall eConsult utilization in this study to the use of similar electronic referral systems because of the wide range of methods and contexts (for instance, eConsult use among dermatologists only versus systemwide use) used for reporting rates in the literature.<sup>14,19-21</sup> Future research should focus on a shared set of metrics to enable comparisons across different eConsult implementations.

Lastly, this study focused on a single system's implementation in southern California, and our results might not be generalizable to other settings across the United States. However, the study analyzed what we believe is the largest implementation of an eConsult system with required specialist review in the country.<sup>9</sup>

## Study Results

The eConsult program was rolled out across forty-three DHS sites and over 200 affiliated non-DHS practices in the period 2012–15. The number of eConsult requests per month grew rapidly, from 86 in the third quarter of 2012 to 12,082 in the last quarter of 2015 (Exhibit 1)—an average monthly increase of 8 percent over four years ( $p < 0.001$ ) (data not shown). By the end of 2015, eConsult was in use by 3,060 primary care providers and 479 specialist reviewers across eighty-six specialty services.

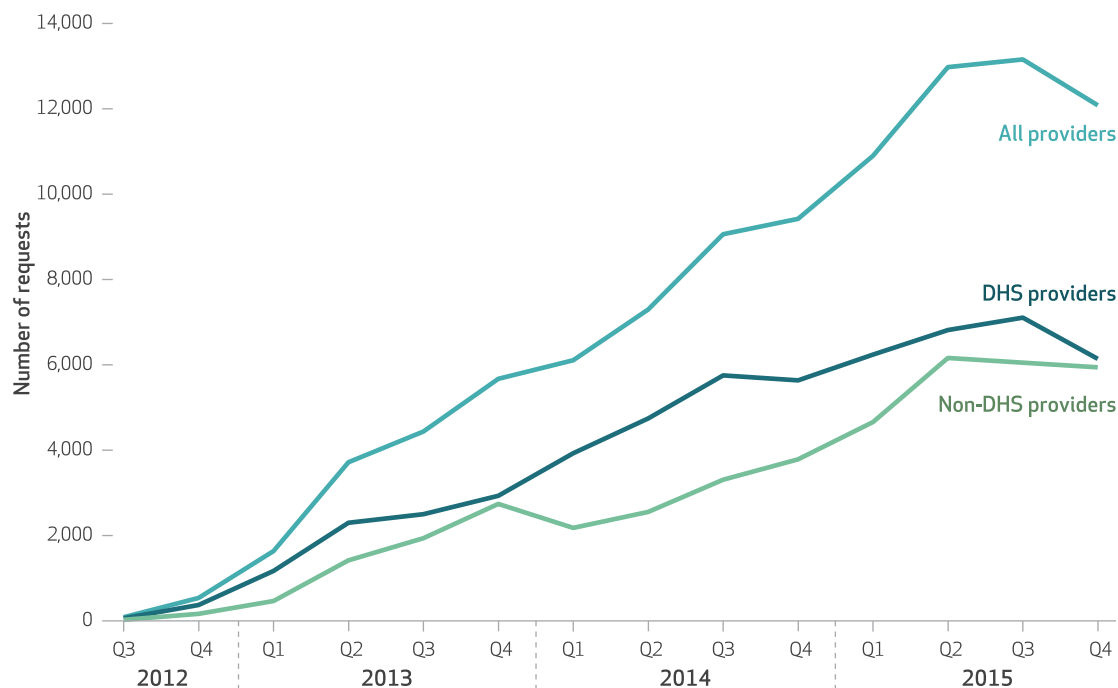
In 2015 the median time to first response for an eConsult request was slightly less than twenty-four hours (0.99 days), and 25.0 percent of the requests were resolved without a visit (data not shown). Among the requests resolved without a visit in 2015, there were an average of 3.6 exchanges between the primary care provider and reviewer. Between 2014 and 2015, among specialties available on eConsult before 2014, the median time to an appointment for any eConsult request that resulted in a visit to a specialist decreased 17.4 percent (from sixty-three to fifty-two days;  $p < 0.001$ ), and the percentage of appointments scheduled within thirty days increased from 24.0 percent to 30.2 percent ( $p < 0.001$ ) (for overall access results, see online Appendix Exhibit 1).<sup>22</sup> Changes from 2014 to 2015 in median time to appointment varied by specialty, ranging from a 15 percent increase for podiatry to a 39 percent decrease for the ear, nose, and throat specialty (for changes in access by specialties, see Appendix Exhibit 1).<sup>22</sup>

In the DHS-employed sample described above, we found no significant change in the average monthly number of eConsult requests that resulted in a specialist visit (Exhibit 2). In contrast, there was a significant decrease in the rate of eConsult requests resolved without a visit, from 570 per month (23.1 percent of all requests) in the first quarter of 2014 to 447 per month (19.3 percent) in the fourth quarter of 2015.

There was significant variability across both primary care providers and specialist reviewers in the outcomes of their eConsults. Rates of requests resolved without a visit for primary care providers ranged from 11.4 percent in the tenth percentile to 32.3 percent in the ninetieth percentile (data not shown). There was also variation both across the nineteen primary care practice sites and within the primary care providers at each site (for the rates of variation for each physician and practice site, see Appendix Exhibit 2).<sup>22</sup> When we controlled for specialty, we found that hospital-based practices and community primary care practices were more likely than multispecialty practices to resolve eConsult requests without a visit (adjusted odds ratio: 1.97

**EXHIBIT 1**

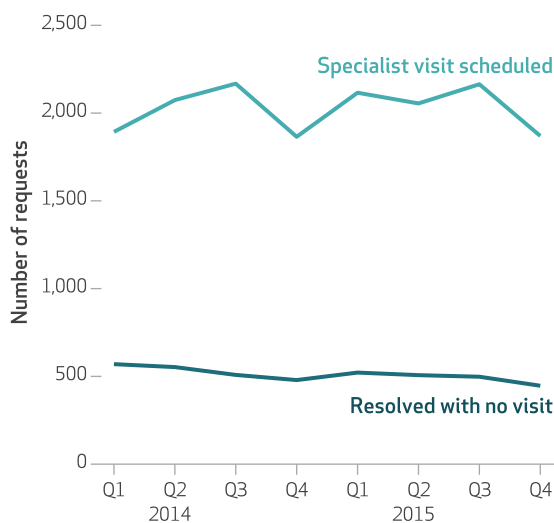
**Monthly eConsult requests by primary care providers, by quarter, 2012-15**



**SOURCE** Authors' analysis of data for 2012-15 from the Los Angeles County Department of Health Services (DHS) eConsult database. **NOTES** "Non-DHS" refers to primary care providers who have contracted with DHS to provide specialty care through eConsult for their uninsured populations in the My Health LA program. "DHS" refers to primary care providers who are salaried employees of DHS and request all of their patients' specialty care through eConsult.

**EXHIBIT 2**

**Monthly dispositions of primary care providers' eConsult requests, by quarter, 2014-15**

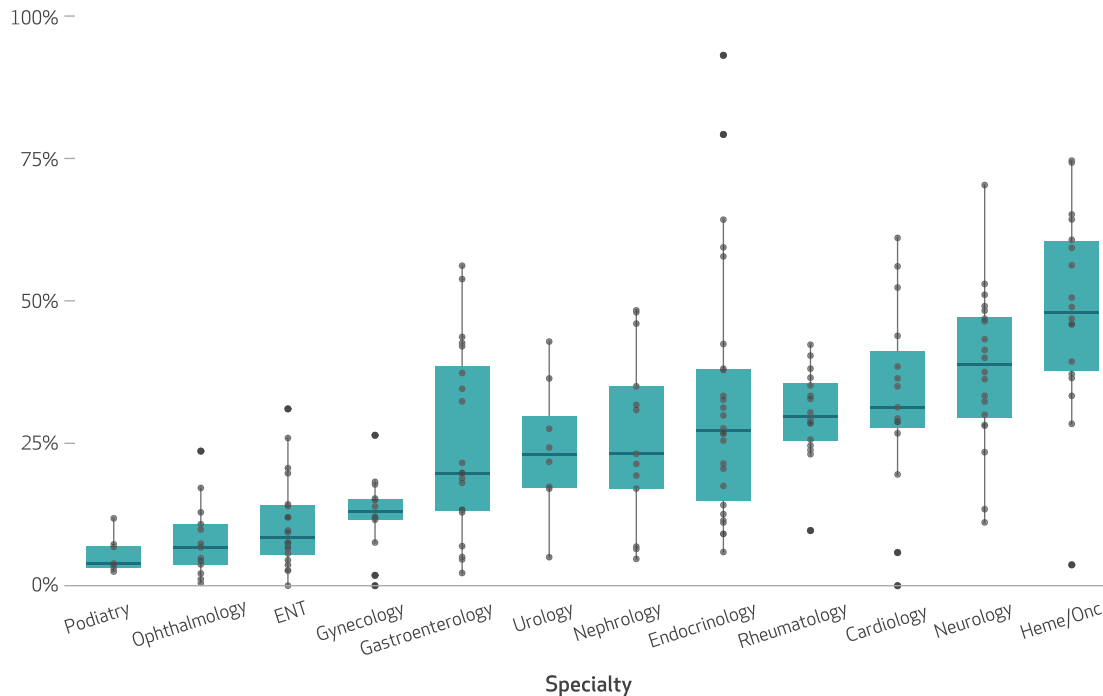


**SOURCE** Authors' analysis of data for 2014-15 from the Los Angeles County Department of Health Services (DHS) eConsult database. **NOTES** The exhibit shows trends in whether eConsult requests from DHS providers (explained in the Notes to Exhibit 1) resulted in the scheduling of a visit to a specialist ( $p = 0.90$  for linear trend) or were resolved without a visit ( $p = 0.003$  for linear trend). This analysis used the DHS-employed sample described in the text.

and 1.33, respectively;  $p < 0.001$ ) (for the adjusted association between practice site characteristics and eConsults resolved without a visit, see Appendix Exhibit 3).<sup>22</sup>

There was similar variation across specialties and specialist reviewers. Because of clinical differences between the conditions treated by individual specialties, some variation was expected. However, even within a given specialty, there was a broad range in the rate of requests resolved without a visit across individual reviewers. For instance, within endocrinology, rates ranged from 5.9 percent to 93.1 percent across twenty-six reviewers (Exhibit 3), with an average of 159 eConsults per reviewer (data not shown).

Given this wide variability within specialties, we examined whether specialists' score on the eConsult engagement index was associated with the rate of requests resolved without a visit. We observed a moderate correlation between reviewers' patterns of eConsult resolution and their score (Exhibit 4)—that is, a significant proportion of the variation in reviewers' patterns of eConsult resolution could be explained by their score (Spearman rho = 0.59;  $p < 0.001$ ). It is important to note that this is an association and does not necessarily imply a causal relationship between reviewer engagement and eConsult

**EXHIBIT 3****Variation in percentages of eConsult requests resolved without a visit to a specialist, by specialty and individual specialist reviewers, 2014–15**

**SOURCE** Authors' analysis of data for 2014–15 from the Los Angeles County Department of Health Services (DHS) eConsult database.  
**NOTES** This analysis used the DHS-employed sample described in the text. Each box plot shows the interquartile range (25th–75th percentile). The bold line shows the median. The whiskers represent 1.5 times the interquartile range. Each point represents an individual specialist reviewing eConsult requests (excluding those reviewing fewer than twenty eConsult requests in the period 2014–15). ENT is ear, nose, and throat. Heme/Onc is hematology/oncology.

resolution. This association was significant ( $p < 0.001$ ) after adjustment for time trend, practice site, and specialty.

## Discussion

These findings illustrate the successful adoption of an eConsult system that covered all referral requests for a large disadvantaged population with historically poor access to specialty care. Despite the size and complexity of the system's implementation across thousands of physicians and dozens of specialty services, four years after its initial implementation, the median response time to an eConsult request was less than one day, and a quarter of the requests were resolved without a specialist visit. These response times and rates of resolved eConsult requests compare favorably to reports in the literature of those of other, smaller eConsult systems, whose reported response times are in the range of <1–3 days and whose resolution rates without a visit are generally around 20 percent or higher.<sup>4,13,16</sup> In addition, median time to appointment decreased over the study period without any increase in

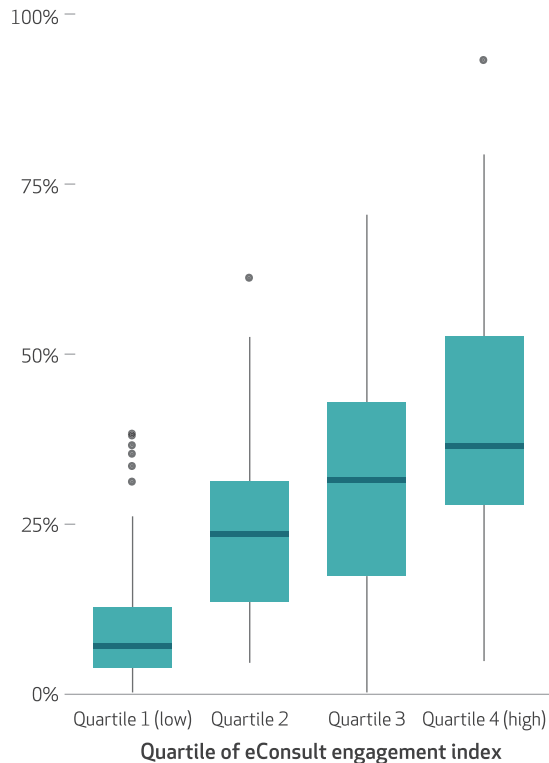
specialist staffing, which implies that deployment of DHS's eConsult system decreased the backlog of patients waiting for appointments.

Our results provide some of the first evidence on population-level patterns of specialist utilization in a health system with a mature, large-scale eConsult system. The implementation of this system suggests that even in a large, underserved urban population, specialty access is not an intractable problem, and that a shift in the model for specialty care can provide rapid electronic input for thousands of patients in need.

Other eConsult systems have demonstrated improved times to appointment, though the diversity of implementations makes direct comparisons with the DHS experience difficult.<sup>7,21</sup> For example, two small randomized trials of dermatology and cardiology eConsults in a Veterans Affairs hospital found a reduction in time to specialty input from 127 to 41 days, while another trial of cardiology eConsults in a community health center found a reduction in time to specialty input from 24 to 5 days.<sup>11,23</sup> We did not measure patient satisfaction associated with eConsult implementation, but in other systems

## EXHIBIT 4

**Variation in percentages of eConsult requests resolved without a visit to a specialist, by quartile of reviewers' eConsult engagement, 2014–15**



**SOURCE** Authors' analysis of data for 2014–15 from the Los Angeles County Department of Health Services (DHS) eConsult database. **NOTES** Each box plot shows the interquartile range (25th–75th percentile) of the percentages of individual specialist reviewers' eConsult requests resolved without a visit. The bold line shows the median. The whiskers represent 1.5 times the interquartile range. The box plots are stratified by reviewers' quartile on the eConsult engagement index (described in detail in the "Study Data And Methods" section), which is a proxy measure for the typical effort exerted by a reviewer to understand a request even if it results in a referral. Each point represents an outlying individual specialist reviewer (reviewers with fewer than twenty eConsult requests in the period 2014–15 were excluded).

with similar improvements, patient satisfaction was uniformly high.<sup>21</sup>

One question was how primary care providers would respond to the eConsult system over the long term. Given that the monthly volume of specialist visits was stable in the period 2014–15, we found no evidence that there was a significant amount of pent-up demand for specialty care or that primary care providers began to refer patients to specialty care more frequently.

Another potential benefit of eConsult is that it facilitates the education of primary care providers through eConsult discussions. Over time, there could be less need for primary care providers to send eConsult requests for easily manageable issues. Consistent with this idea, we ob-

served a decrease of eConsult requests resolved without a visit during the study period. This could reflect a "learning effect" of eConsult over time, though our data were not detailed enough for us to determine this. Another explanation for the decrease of requests resolved without a visit could be that specialist reviewers become less engaged over time and route more patients to specialist visits to save time. Future research should examine changes in the clinical questions asked in eConsult over time and specialists' responses to them.

The results presented here are encouraging, but they also show significant room for improvement. For example, even though wait times for a specialist visit are a crude measure of access, a median wait time of fifty-two days is still high. One way to drive further improvement could be to address the wide variation in the rate of eConsult requests resolved without a visit across specialist reviewers.

The importance of specialist reviewer practice style was supported by the threefold variation in requests resolved without a visit (data not shown) and the association we observed between reviewers' score on the eConsult engagement index and the likelihood of an eConsult being resolved without a referral (Exhibit 4). This association is consistent with previous literature that showed a positive relationship between the time specialist reviewers spend on eConsults and the likelihood of resolution without a visit.<sup>18</sup> To the extent that a score on the eConsult engagement index captures this level of effort, it suggests that an eConsult system may realize its true potential only with engaged specialist reviewers who are willing to engage primary care providers in dialogue.

## Conclusion

eConsult implementation in the DHS demonstrates the capacity for a large public health system to use technology-assisted communication between primary care providers and specialists to reduce the key gap in access to timely specialty care for the underserved. eConsult adoption was rapid, without creating additional strain on specialty access because of pent-up demand. We also observed wide variation among specialist reviewers in the rate of requests they resolved without a visit, some of which may be attributable to reviewers' engagement in the eConsult model.

While our study focused on a large safety-net health system, these results are likely relevant to any health system with significant constraints on specialty supply and access. eConsult may be particularly promising in large, integrated delivery systems where there are deep existing rela-

tionships between primary care providers and specialists. These results should be encouraging to health systems interested in investing in eConsult systems and suggest that efforts to optimize specialist reviewers' use of eConsult may lead to even greater efficiency in specialty care delivery. ■

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