Impact of Primary and Specialty Care Integration via Asynchronous Communication

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ABSTRACT

OBJECTIVES: To describe and evaluate the impact of primary and specialty care integration via asynchronous communication at a large integrated healthcare system.

STUDY DESIGN: In January 2014, Geisinger's primary care providers (PCPs) were given access to an asynchronous communication tool, Ask-a-Doc (AAD), that enabled direct communication with specialists in 14 medical specialties and 5 surgical specialties. Internal data were collected to assess PCPs' acceptance and use of the tool, as well as satisfaction. Insurance claims data were obtained to assess the impact on healthcare utilization and cost.

METHODS: A retrospective analysis of health plan claims data was conducted among those patients who had at least 1 specialist visit with 1 of the participating specialties between January 2014 and December 2016. A set of difference-in-differences multivariate linear regression models with patient fixed effects was estimated, in which those who were not exposed to AAD served as the comparison group.

RESULTS: Acceptance and use of AAD among PCPs gradually increased over time but varied by specialty. AAD was associated with an approximately 14% reduction in total cost of care during the first month of follow-up and a 20% reduction (P <.001) during the second month. These reductions in cost of care appeared to be driven by reductions in emergency department visits and physician office visits.

CONCLUSIONS: Geisinger's AAD experience suggests that the integration of primary and specialty care via the use of a highly reliable and efficient asynchronous communication system can potentially lead to reductions in avoidable care and more efficient use of specialty care.

Am J Manag Care. 2019;25(1):26-31

Healthcare is evolving, and new care models are being tested to improve quality while reducing costs. In 2007, the patient-centered medical home (PCMH) model was proposed, founded on the principles of primary care and patient-centered care combined with payment reform.[1-3] Although care coordination implied effective information exchange, it quickly became evident that effective electronic connectivity was extremely challenging.[2]

In 2008, Fisher et al introduced the concept of a medical home "neighborhood," where specialists could interact with the PCMH.[4,5] Two years later, the American College of Physicians published a comprehensive white paper outlining this concept in greater detail.[6] However, their tactical approach focused predominately on traditional face-to-face referral interactions,[7] rather than on electronic or other forms of communication. Additionally, even the most rudimentary form of communication (ie, sending basic patient information) was deemed unreliable.[8-10] In an attempt to improve communication between primary and specialty providers, other large healthcare systems have developed electronic consultation, or e-consult, programs.[11-14] These programs vary in their implementation, but most have demonstrated success in improving the quality of communication and access to care.[15-17] However, very little information is published with regard to their process reliability, effectiveness, and cost impact.[18-20]

This study describes a novel model of asynchronous communication between primary care providers (PCPs) and specialists, referred to as the Ask-a-Doc (AAD) program, developed and implemented by Geisinger. Geisinger is a large integrated healthcare delivery system located in central Pennsylvania serving more than 2 million patients; it has approximately 500 employed PCPs, who include physicians, nurse practitioners, and physician assistants, and 2000 employed specialists. This study also tests the hypothesis that implementation of AAD was associated with lower total cost of care and reductions in healthcare utilization due to improved primary care and specialist communication.

Background

In 2010, Geisinger senior leadership established a work group to improve the integration of primary and specialty care. The first step

was to analyze the existing relationships and interactions, which revealed 4 key areas for improvement: (1) trigger (when/why a specialist was consulted), (2) care pathway (what plan of care was selected by the specialist), (3) mode of care (face-to-face, phone call, other), and (4) communication (process and expectations). Table 1 describes these components in relation to AAD in detail.

An integration work group designed and tested the initial AAD program using PCP groups as "askers" and rheumatology and pulmonary medicine specialty groups as "answerers." To ask a question, the PCP clicked an AAD link within Geisinger's electronic health record (EHR) system, launching a web-based AAD tool. The PCP selected a specialty department and was then presented with an AAD form. The form was prefilled with information on the patient, PCP, and AAD specialist. The PCP then added their callback number, selected a time frame (1 hour, 1 business day, or 3 business days) and a mode (chart review or phone call), completed a formulated question, and clicked "send" to complete the process.

The AAD consult was received by a group of schedulers, who processed and retransmitted the message to the EHR AAD in-basket of the on-call specialist. They also text-paged that specialist if the requested time frame was 1 hour or 1 business day. The specialist reviewed the chart, called the PCP (if requested), documented their response in the EHR using the AAD structured response template, and routed the answer back to the requesting PCP. The process was tracked in a database that followed the process from start (form sent) to finish (answer routed). Any messages that failed to meet the requested time frame, failed to use the correct documentation tool, or were incorrectly routed would appear on a task management report that was addressed via a project manager. PCPs could ask a question 24/7, but the messages were processed only Monday through Friday, 8:30 AM to 4:30 PM.

Based on positive assessments from the pilot phase of the program, administrative approval was given to expand AAD across Geisinger. To further provider engagement, specialty directors received quarterly reports with physician-level detail about provider performance and time spent. There was no predefined incentive—financial or otherwise—for PCPs to use AAD. PCPs could use AAD at their discretion for any patient they deemed appropriate. For specialists, relative value units (RVUs) were assigned for the time spent on AAD requests but only for those answered completely and correctly (ie, answered within requested time frame, had correct documentation, and routed to the asker).

The program was officially rolled out (post pilot) on January 1, 2014. All PCPs (primary care physicians, physician assistants, and nurse practitioners) were trained to use AAD. Participating specialties included 14 medical specialties (addiction medicine, cardiology, comprehensive care clinic, dermatology, endocrinology, hematology, infectious disease, laboratory medicine, nephrology, neurology, palliative medicine, psychiatry, pulmonary medicine, and rheumatology) and 5 surgical specialties (orthopedics, thoracic surgery, transplant surgery, urology, and vascular surgery).

Chart review, rather than phone call, was the most commonly requested mode of consultation (87% vs 13%). Four percent of time frame requests were for 1 hour, 33% were for 1 business day, and 63% were for 3 business days. Scheduler turnaround time for processing an AAD consult averaged 3 minutes and 3 seconds. In terms of specialist performance, the average AAD consult took 11 minutes to complete, and the average specialty turnaround time to answer the question was 6 hours and 19 minutes. The specialist answered the question within the requested time frame 98% of the time, the documentation tool was used correctly 98% of the time, and the consult was correctly routed 95% of the time. A project manager helped providers correct the remaining process errors

TAKEAWAY POINTS

Poor communication between primary care and specialty care can lead to care gaps, avoidable care, and adverse patient outcomes. Such problems can be exacerbated by inadequate access to specialists.

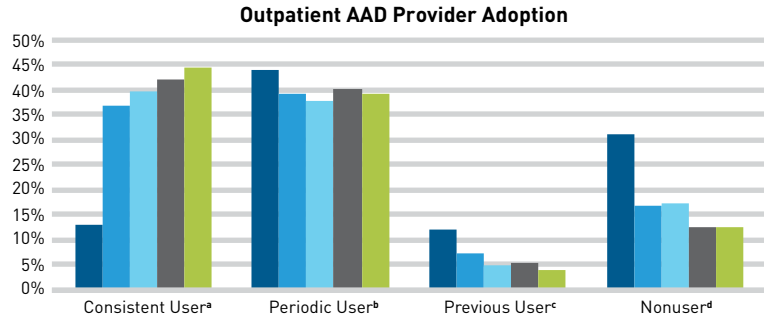
- Asynchronous communication and interaction between primary and specialty care providers, enabled by an efficient and reliable electronic communication tool embedded within a mature electronic health records system, can be a potential solution to these problems.
- The results of this study provide empirical evidence that such an intervention, as embodied by Geisinger's Ask-a-Doc program, can lead to more efficient care by reducing avoidable care and cost.

TABLE 1. Comparison of the Ideal Communication Process and the AAD Process

Ideal Communication Process	AAD Process
Easy to access/launch	Accessible within an office visit or telephone encounter with a single click.
Easy to ask a question	Automatically prefills with patient and asker identification. Input by asker is minimal and quick: Select specialty, callback number, time frame, and mode, and input formulated question.
All signal, no noise	AAD questions are sent to the specialist in their own EHR in-basket, separate from other messages and results. The in-basket is dynamic, appearing only if there is a question for that specialist.
Structured documentation	Structured documentation tool assures a clear, concise, and consistent answer, as well as assuring ownership and attribution.
Reliable	The tool automatically populates the correct AAD on-call specialist. The specialist is also notified via text page if there is a question for them to address.
Reconciled	The AAD process is tracked for time frame met, correct documentation tool used, and answer correctly routed. Failure of any of these parameters automatically generates an exception report that is managed to assure a 100% completion rate.

AAD indicates Ask-a-Doc; EHR, electronic health record.

FIGURE 1. Increase in Consistent and Periodic AAD Use by Primary Care Providers



	Consistent User[a]	Periodic User[b]	Previous User[c]	Nonuser[d]
2014 Q4	13%	44%	12%	31%
2017 Q4	37%	39%	7%	17%
2018 Q1	40%	38%	5%	17%
2018 Q2	42%	40%	5%	13%
2018 Q3	44%	39%	4%	13%

AAD indicates Ask-a-Doc.

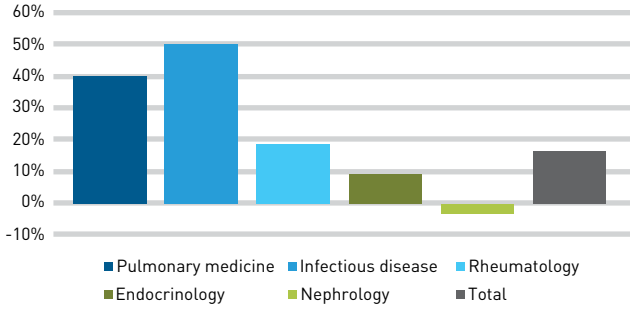
[a]At least 1 AAD request per quarter for the last 4 quarters.

[b]At least 1 AAD request per quarter for 3 of the last 4 quarters.

[c]At least 1 AAD request per quarter for 2 of the last 4 quarters.

[d]No AAD request for the last 4 quarters.

FIGURE 2. Improvement in Face-to-Face Specialty Access Measured by Percent Reduction in Average Wait Time for New Patients by Participating Specialty (before vs after AAD)



AAD indicates Ask-a-Doc.

for a consultation completion rate of 99.9%. Finally, the PCPs rated their satisfaction with the AAD service at 4.3 on a scale of 0 to 5, with 5 being excellent.

AAD use by PCPs increased steadily over time (**Figure 1**). In the most recent data available (third quarter of 2018), 84% of Geisinger's PCPs are either consistent (at least 1 question per quarter for the last 4 quarters) or periodic (at least 1 question per quarter for 3 of the last 4 quarters) users of AAD. Additionally, 10% of all primary care referrals to participating specialties are now AAD consults.

Access to specialty care also appears to have improved with AAD. The average time for a new patient to be seen face-to-face was compared pre-AAD and post AAD, controlling for the total amount of clinical time available to see new patients. With AAD, the time to new patient face-to-face visit (defined as days from referral placed to patient seen) improved more than 16% for the 5 specialties evaluated (**Figure 2**). There was wide variation noted among specialties, ranging from a 50% improvement in infectious disease to a 3% worsening in nephrology.

Data

To test the hypothesis that AAD was associated with reductions in total cost and care utilization, this study relied on a retrospective analysis of data obtained from Geisinger's EHR and the Geisinger Health Plan (GHP) claims database, comparing the intervention group (ie, patients who had been referred for AAD specialist consults) with a comparison group identified from the same claims database. This study was conducted as a part of Geisinger's quality improvement initiative and therefore was not subject to institutional review board oversight and review.

From the EHR, the complete list of patients for whom AAD specialty consults had been made at any point between January 1, 2014, and December 31, 2016, was obtained (N = 6434 patients). From that list, the subset of those patients who had GHP coverage during the same period was identified (2190 patients). Because AAD was available for all patients treated by Geisinger PCPs regardless of the patients' payer status, this subset represented approximately 34% of the patients included in the original list (2190 of 6434). These 2190 patients therefore constituted the intervention group.

The comparison group was identified from the GHP claims data based on the following criteria: those who (1) had not been exposed to the AAD program during the same period (January 1, 2014, through December 31, 2016), (2) were attributed to 1 of Geisinger's PCPs, and (3) made at least 1 specialist visit with 1 or more of the specialties included in the AAD program. The claims data were aggregated to a per-member-per-month level to capture total cost of care (with and without prescription drug costs) and care utilization (rates of acute hospitalization, emergency department [ED] visits, and physician office visits) during the first, second, and third months after the index AAD consult. For the comparison group, the index date was defined as the first month of the observation period during which the patient had at least 1 primary care visit and at least 2 specialist visits, in which at least 1 of the specialist visits was to an AAD-participating specialty. Those instances in which there was only 1 specialist visit in a given month were specifically not considered as index dates for the comparison group because such situations likely reflect routine follow-up specialist visits that would not be subject to the AAD impact.

Total cost of care was defined as total allowed amount (ie, GHP's payment to providers plus any out-of-pocket expenses paid to the providers by the member). For those patients who had prescription drug coverage through GHP, the total cost of care included allowed amounts for all prescription drugs purchased by the patient during each month of observation. Approximately 90% of the patients included in the study sample had prescription drug coverage through GHP.

METHODS

To estimate the AAD program's impact on care utilization and total cost, a difference-in-differences (DID) approach was used via a set of multivariate linear regression models with patient fixed effects. The key explanatory variables in each regression model were the binary indicator for whether the patient was in the AAD intervention group or not and a set of indicator variables for the postintervention period (ie, 0, 1, 2, and 3 months after the index date), as well as a set of interaction terms between these 2 sets of indicator variables. The coefficient on the interaction term represents the DID estimate of the AAD impact on the dependent variable. The effect of the AAD intervention was then represented via differences between the regression-adjusted "observed" and "expected" values of the dependent variables. Expected values were obtained by setting the coefficient on the interaction term to zero and recalculating the regression-adjusted values.

Other covariates included patient age (18-45, 46-60, 61-70, and ≥71 years), sex, count of selected comorbid conditions (up to 9: chronic kidney disease, diabetes, asthma, congestive heart failure, chronic obstructive pulmonary disease, coronary artery disease, hypertension, cancer, and depression), insurance type (commercial, Medicaid, or Medicare), length of time the patient's PCP had been part of a PCMH (because PCMHs have been shown to be associated with lower cost and acute care utilization[21,22]), and case management status. Also included were indicators for whether the patient had prescription drug coverage through GHP and for each calendar year in the sample; these covariates accounted for any confounding effects due to prescription drug coverage and yearly inflation in healthcare prices. Also, a set of interaction terms between sex and age categories were included as covariates to further capture any nonlinear interaction effects between age and gender.

The inclusion of patient fixed effects in the regression models accounted for any time-invariant patient characteristics that may confound the estimates.[23] This implied that the AAD binary indicator variable was perfectly collinear with the patient fixed-effect term and its coefficient was therefore not separately identified in the regression model. Nevertheless, because the main coefficients of interest were the coefficients on the interaction terms, this did not pose any issue for the purposes of this study. Similarly, although the patient fixed-effects terms were perfectly collinear with the sex indicator variable and its coefficient was therefore not separately identified, the age–sex interaction effects were identified in the model.

TABLE 2. Baseline Descriptive Statistics for Care Utilization and Cost Analysis

Variables	AAD (n = 2190)	Comparison (n = 19,758)	*P*
Mean number of chronic conditions	1.8	1.7	.078
Chronic conditions			
CKD	16.3%	16.1%	.877
Diabetes	21.9%	21.3%	.544
Asthma	19.2%	17.0%	.011
CHF	8.2%	6.6%	.010
COPD	10.0%	9.3%	.298
CAD	21.7%	22.7%	.273
Hypertension	48.5%	49.5%	.349
Cancer	11.8%	13.0%	.085
Depression	23.2%	18.4%	<.001
Mean age, years	58.3	63.7	<.001
Female	63.1%	58.8%	.001
Plan type			
Commercial	36.5%	33.6%	.019
Medicare	43.9%	57.0%	<.001
Medicaid	19.6%	9.4%	<.001
GHP pharmacy coverage	90.9%	87.3%	<.001
Total cost ($, PMPM)	1193	1064	.005
Medical cost ($, PMPM)	948	848	.006
Acute IP admits[a]	23	17	.006
ED visits[a]	63	39	<.001
PCP visits[a]	368	308	<.001
Specialist visits[a]	308	300	.347

AAD indicates Ask-a-Doc; CAD, coronary artery disease; CHF, congestive heart failure; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; ED, emergency department; GHP, Geisinger Health Plan; IP, inpatient; PCP, primary care provider; PMPM, per member per month.

[a]Per 1000 members per month.

RESULTS

Table 2 suggests that the AAD intervention group and the comparison group differed from each other on several key characteristics at baseline. First, the AAD intervention group was younger and more likely to be female, more likely to have Medicaid, and less likely to have Medicare. However, the AAD intervention group had greater frequencies of acute inpatient admissions and ED visits, leading to a slightly higher average total cost of care at the baseline. Also, the AAD intervention group had a higher rate of primary care visits, whereas it had a comparable rate of specialist visits. In addition, asthma, congestive heart failure, and depression were significantly more prevalent among the AAD intervention group.

Table 3 shows the AAD impact on total cost of care, acute care utilization, and physician office visits. AAD was associated with an approximately 14% reduction in total cost, including prescription drugs, during the first month of follow-up and a 20% reduction during the second month, relative to the comparison group. Similar magnitudes of reductions were observed in terms of total medical

TABLE 3. AAD Impact on Care Utilization and Cost

Postintervention Period	Member-Month Observations	Total Cost ($, PMPM)					Total Medical Cost ($, PMPM)				
		Observed	Expected	Difference	% Difference	*P*	Observed	Expected	Difference	% Difference	*P*
Month 1	1983	2573	2990	−416	−14%	<.001	2263	2648	−385	−15%	<.001
Month 2	1900	1931	2421	−489	−20%	<.001	1621	2105	−485	−23%	<.001
Month 3	1797	1944	1958	−14	−1%	.897	1640	1648	−8	−1%	.936
Postintervention Period	**Member-Month Observations**	**Acute Inpatient Admits (per 1000 per month)**					**ED Visits (per 1000 per month)**				
		Observed	Expected	Difference	% Difference	*P*	Observed	Expected	Difference	% Difference	*P*
Month 1	1983	61	54	8	14%	.057	139	156	−17	−11%	.005
Month 2	1900	38	41	−4	−9%	.366	67	63	4	6%	.536
Month 3	1797	37	35	2	6%	.625	43	54	−11	−20%	.097
Postintervention Period	**Member-Month Observations**	**Primary Care Visits (per 1000 per month)**					**Specialty Visits (per 1000 per month)**				
		Observed	Expected	Difference	% Difference	*P*	Observed	Expected	Difference	% Difference	*P*
Month 1	1983	1034	1140	−106	−9%	<.001	557	2176	−1619	−74%	<.001
Month 2	1900	351	312	39	13%	.011	602	560	43	8%	.008
Month 3	1797	333	332	1	0%	.964	500	508	−8	−2%	.644

AAD indicates Ask-a-Doc; ED, emergency department; PMPM, per member per month.

cost, excluding prescription drugs (15% and 23%, respectively). These reductions in cost appeared to be driven by reductions in ED visits (11% during the first month), primary care visits (10%), and specialist visits (74%) during the same period, relative to the comparison group. However, there was no statistically significant association between acute inpatient admission rates and AAD program exposure. Also, during the second month of follow-up, some statistically significant increases in the physician office visit rates were observed (13% for primary care visits and 8% for specialist visits). In all cases, however, by the third month of follow-up, there was no statistically significant AAD effect relative to the comparison group.

DISCUSSION

Poor communication between primary care and specialty care can lead to care gaps, avoidable care, and, ultimately, adverse patient outcomes.[24,25] Also, in markets where there is limited supply of specialty care, a lack of access can further contribute to worse patient outcomes.[26,27] Asynchronous communication and interaction between primary care and specialty care, enabled by an efficient and reliable electronic communication tool, can potentially be a solution to such problems. This study provides empirical evidence that such a system—in this case, AAD—was associated with reductions in ED and physician visits, which also appeared to have led to significant total cost reductions. To our knowledge, this is the first study that has shown such evidence using a large cohort of patients across multiple specialties.

Comparing the baseline statistics (Table 2) with the postintervention statistics, particularly those in month 1 (Table 3), reveals that there appear to be large jumps in total cost and care utilization that coincided with the AAD consult. Similar patterns were observed among the comparison group (as indicated by the expected values in Table 3). This suggests that AAD consults might have been used by PCPs in response to some major clinical events requiring quick input from specialists.

PCPs may have used AAD either to address clinical urgencies or simply to obtain specialist input in routine encounters without formal referrals. The reductions in ED and specialist visits during month 1 relative to the expected values (based on the comparison group), coupled with the observation that AAD consults appear to have coincided with large jumps in cost and utilization relative to the baseline period, are consistent with PCPs using AAD for the former purposes rather than the latter. Alternatively, it may be that the reductions in cost and utilization are detectable only when AAD is used for the former purposes rather than the latter. Further research is necessary to explore this mechanism.

One potential criticism of programs such as AAD is that they may simply "delay the inevitable"—that is, rather than causing actual reductions in inefficient care, they merely delay care to later periods. The results of this study confirm that at least some of this might be true: There appear to be small but statistically significant increases in both primary care and specialty care visits during the second month of follow-up. However, these increases are more than offset by the decreases during the first month of follow-up. Moreover, there is no statistically significant difference by the third month, suggesting that there is no long-term impact of the AAD program beyond the first 2 months.

AAD is designed to be scalable in other health systems with mature EHR capabilities. On the asker side (primary care), it allows

timely, reliable, and documented assistance from specialists that is easy to invoke and is costless to their patients. On the answerer side (specialty), it is configured to reward providers for their service via RVUs while improving access by effectively increasing the specialist's capacity. AAD therefore provides benefits for all the key stakeholders, including not only the physicians but also the patients and the payers. Even for other health systems not structured similarly to Geisinger (eg, those that do not have their own health plans), the findings from this study imply financial justifications for AAD from the third-party payer's perspective.

Limitations

This study is subject to several limitations. First, because this study relied on observational data, a causal link cannot be established. As shown in Table 2, the AAD intervention group appears to be sicker and costlier than the comparison group at the baseline. Therefore, these results are likely to be conservative estimates of the true effect. Second, it is not possible to determine how much of the reductions in care utilization reflect care that was avoidable or unnecessary. Future research may examine the appropriateness of such reductions in care utilization and cost. Third, the AAD impacts may be different depending on the severity and acuity of the patients' conditions (ie, there may exist interaction effects between AAD and patient characteristics). In addition, there may be differential AAD impacts across the participating specialties, as well as those that have not yet participated. Although the current study did not explicitly examine such interaction effects and specialty-specific impacts, they are topics of future inquiry.

CONCLUSIONS

Geisinger's AAD program was associated with reduced ED visits and physician visits, leading to significantly lower total cost of care. This suggests that a reliable and efficient asynchronous communication system between primary care and specialty care providers can potentially lead to reductions in acute care and more efficient use of specialty care. ■

Acknowledgments

The authors would like to thank the Medlink Scheduling Team for their excellence in message processing, Wayne Swink for AAD software development, and Jesse Chubb for database and dashboard development.

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Source of Funding: None; all work related to this study was done as a part of the authors' employment with Geisinger.

Author Disclosures: Dr Maeng was an employee of Geisinger at the time this study was conducted. The remaining authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (EDN, PFS, CMC, DDM); acquisition of data (EDN, PFS, SMV, CMC, DDM); analysis and interpretation of data (EDN, PFS, SMV, CMC, DDM); drafting of the manuscript (EDN, DDM); critical revision of the manuscript for important intellectual content (EDN, PFS, CMC); statistical analysis (SMV, CMC, DDM); provision of patients or study materials (EDN, PFS, CMC); administrative, technical, or logistic support (EDN, CMC); and supervision (EDN).

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