Integrating Telemedicine in Urban Pediatric Primary Care: Provider Perspectives and Performance

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Abstract

Background: *Health-e-Access, an urban telemedicine service, enabled 6,511 acute-illness telemedicine visits over a 7-year period for children at 22 childcare and school sites in Rochester, NY.* ***Objectives:*** *The aims of this article were to (1) describe provider attitudes and perceptions about efficiency and effectiveness of Health-e-Access and (2) assess hypotheses that (a) providers will complete a large proportion of the telemedicine visits attempted and (b) high levels of continuity with the primary care practice will be achieved.* ***Design/Methods:*** *This descriptive study focused on the 24-month Primary Care Phase in the development of Health-e-Access, initiated by the participation of 10 primary care practices. Provider surveys addressed efficiency, effectiveness, and overall acceptability. Performance measures included completion of telemedicine visits and continuity of care with the medical home.* ***Results:*** *Among survey respondents, the 30 providers who had completed telemedicine visits perceived that decision-making required slightly less time and total time required was slightly greater than for in-person visits. Confidence in diagnosis was somewhat less for telemedicine visits. Providers were comfortable collaborating with telemedicine assistants and confident that communications met parent needs. Among the 2,554 consecutive telemedicine visits attempted during the Primary Care Phase, 2,475 (96.9%) were completed by 47 providers. For visits by children with a participating primary care practice, continuity averaged 83.2% among practices (range, 28.1–92.9%).* ***Conclusions:*** *Providers perceived little or no advantage in efficiency or effectiveness to their practice in using telemedicine to deliver care; yet they used it effectively in serving families, completing almost all telemedicine visits requested, providing high levels of continuity with the medical home, and believing they communicated adequately with parents.*

Key words: *telemedicine, acute illness, childcare, primary care, emergency department, low-income population*

Introduction

Health-e-Access, a telemedicine model designed to improve access for acute illness episodes, enables children in childcare and elementary schools to be seen remotely by providers from their own primary care practice. Beginning in May 2001, Health-e-Access had enabled 6,511 telemedicine visits through April 2008. A 63% reduction in absence from childcare because of illness and the high levels of parent satisfaction followed introduction of Health-e-Access in inner-city childcare centers.[1] In addition, children with access via telemedicine in childcare or elementary school had 22% fewer emergency department (ED) visits than those in a matched control group.[2]

Given compelling evidence that Health-e-Access serves interests of both patients and payers, widespread adoption of this telemedicine model depends primarily on acceptance by healthcare providers (physicians, nurse practitioners, and physician assistants). Providers are not simply a stakeholder in the process of adopting telemedicine; rather, as a necessary and scarce resource, providers exercise a dominant influence on adoption. This study assesses the acceptability of the Health-e-Access model from the perspective of providers who

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have used it, assessing provider perceptions of Health-e-Access in serving their incentives. Another objective was to determine how effectively this group of providers performed in using Health-e-Access by assessing hypotheses that (a) providers are able to complete a large proportion of telemedicine visits and (b) high levels of continuity with the primary care practice can be achieved. Along with access, continuity of care is a cardinal characteristic of high-quality medical home. The American Academy of Pediatrics emphasizes seven features of a medical home: accessible, continuous, comprehensive, coordinated, family-centered, compassionate, and culturally effective.[3,4] The first four are characteristics that have been linked with greater preventive care, fewer ED visits, lower health care costs, and better health outcomes.[5]

Primary goals of healthcare reform include cost reduction as well as more convenient access. Several observations highlight the relevance of Health-e-Access to these ends. Children under 15 years in the United States annually make an estimated 71 million office visits for acute illness.[6]

These visits account for 48.8% of all office visits for children and 30.0% of office visits for individuals of any age. In addition, children annually make an estimated 29 million ED visits,[7] a number that represents 27% of ED visits across the age spectrum. Childhood illness burdens families as well as the healthcare system. In a national representative survey of working women, 56% of respondents indicated that they would miss work or did not know what they would do the next time a child is sick.[8]

Although provider attitudes and perceptions about telemedicine have received substantial attention,[9–14] no prior reports were based on experience with a telemedicine model with the unique combination of attributes of Health-e-Access. These attributes include an urban setting, telemedicine access in neighborhood locations (childcare, schools), focus on acute childhood illness, and a cardinal objective of enabling service in the primary care medical home.

Methods

This study describes experience with the Health-e-Access model in Rochester, NY, during a 24-month period that began on April 20, 2006, after all participating primary care practices had completed at least one telemedicine visit, and ended on April 30, 2008. We termed this period the Primary Care Phase because maturation of both the program and the technology provided an opportunity to evaluate success in integrating this telemedicine model in primary care office settings. During this phase, observations provided information about acceptability of Health-e-Access from the primary care provider's perspective and about its effectiveness in meeting generally accepted goals of primary care. The Health-e-Access program is ongoing. The end date for the Primary Care Phase was chosen to provide a substantial number of study observations over a finite, representative period.

Development of the Health-e-Access telemedicine program, beginning May 2001, included multiple stages prior to the Primary Care Phase. During initial stages, workflow processes were developed and feasibility and potential were assessed while five inner-city childcare programs were served. Subsequently, the Health-e-Access model was refined and expanded. In particular, software was refined to enable integration of telemedicine in busy office practices. Expansion added city and suburban childcare and elementary school sites, bringing the total to 22, and primary care practices, bringing the total to 10.

Events leading to a specific telemedicine visit began when staff at a childcare or school site, or a parent, identified a health problem and brought it to the attention of that site's telemedicine assistant. Parental consent was required for telemedicine visits. Details of the Health-e-Access telemedicine model, including technical features, workflow processes, and organizational architecture, are presented elsewhere.[1,15]

PROVIDERS

The 10 practices recruited for participation were approached because they provided primary care for a large proportion of the children served by childcare programs and elementary schools participating during the earlier phases of Health-e-Access. Participating practices (9 pediatric and 1 family medicine) included 47 providers, distributed among pediatricians (34), pediatric nurse practitioners (11), a physician assistant (1), and a family physician (1). Participating child sites during the Primary Care Phase included 10 childcare programs (6 cities and 4 suburbs) and 11 elementary schools (7 cities and 4 suburbs). Half the participating practices were located in the city of Rochester. Half had suburban locations. Following negotiations with all local insurance organizations, providers were paid for telemedicine visits at the same level as for office visits. Payment negotiations applied to visits covered by Medicaid Managed Care, Child Health Plus, and commercial payers.

MEASUREMENT

We chose provider survey items to address provider incentives in changing or maintaining practice work processes. We presumed that fundamental provider goals were improved efficiency and effectiveness of their services. Recognizing that these broad constructs have multiple dimensions and considering the potential impact of telemedicine, we operationalized them as follows: increasing conti-

nuity of care, personal satisfaction, and revenue; reducing provider effort or time and office resources per patient encounter; and improving quality, including earlier and more accurate diagnosis and earlier treatment.

Perceptions were elicited using a 30-item Web-based survey that was administered in February 2007, 10 months into the Primary Care Phase.

Visit completion and continuity of care were used as independent performance measures of provider effectiveness. Electronic records of telemedicine visits automatically captured these data. We defined visits completed by telemedicine as visits with diagnosis and management decisions made, and treatment implemented, based on the Health-e-Access telemedicine model alone, that is, without in-person physical examination, additional laboratory testing, or imaging. Before visits were scheduled, a Health-e-Access staff member, the Scheduler, was responsible for assessing appropriateness of visit requests. Additional Scheduler responsibilities were finding the appropriate provider to perform visits and ensuring quality of store-and-forward clinical information. Our rationale for choosing visit completion as an effectiveness index is that provider time spent on an activity that does not achieve its primary objective—in this case, diagnosis and management decisions and initiation of treatment—is not effective.

We defined continuity visits as performed by a provider who worked with the patient's primary care practice. Continuity of care with the medical home is widely endorsed as a cardinal feature of primary care.[16,17] Although continuity within family-provider relationship is ideal, continuity within the medical home is a more appropriate index for assessing Health-e-Access effectiveness because this program, as a form of communication infrastructure, does not control practice staffing patterns or work allocation. Practice managers, not the telemedicine infrastructure, determined which provider handled a particular visit.

Situations sometimes arose where child sites identified a health problem and proposed a telemedicine visit, but the problem was never brought to the attention of a telemedicine provider. Termed "abandoned visits," these were not considered in determining visit completion rates. Occurrence and reasons for abandoned visits were monitored through logs kept by Health-e-Access staff.

Results

Altogether, 6,511 telemedicine visits were completed via Health-e-Access by the end of the Primary Care Phase. Analysis assessing visit completion and continuity focused on the 2,554 visits of this phase, comprising 39.2% of all visits as of April 30, 2008.

Among Primary Care Phase visits, 82.0% were for children with a practice located in the city and 18.0% were for children with a practice located in the suburbs. Altogether, 61.1% of visits were for children whose practice was participating. Thus, 61.1% (1,560) was the proportion of visits with potential to be continuity visits. This proportion differed greatly by location of child's practice. For children with a city practice, 70.5% of telemedicine visits could have been continuity visits, whereas for children with a practice in the suburbs, this proportion was 19.1%. Insurance for the 2,554 Primary Care Phase visits included Medicaid Managed Care, 47.1%; fee-for-service Medicaid, 27.6%; commercial, 15.7; Child Health Plus, 4.2%; and uninsured or missing insurance information, 5.5%.

VISITS COMPLETED

Among the 2,554 telemedicine visits attempted, 2,475 (96.9%) were completed by 47 providers from the 10 participating practices, leaving 79 (3.1% of attempted) not completed. Reasons for noncompletion might be useful information for quality improvement and replication initiatives. These reasons were categorized based on (1) an explicit response to a standard query in the Health-e-Access electronic medical record (EMR) or on (2) record review by provider-investigators experienced in telemedicine (K.M., C.t.H.). When a provider indicated in the telemedicine software that the visit was not completed (e.g., sent to ED, sent to office), a pop-up window presented several response options that might explain why. Most commonly (72.2%, *Table 1*), providers attributed noncompletion to limitations of the Health-e-Access model, including a need for hands-on physical examination (29.1%), a need for treatment that could not be provided at a patient site (29.1%), and need for tests or imaging that were not included in the model (13.9%). Suboptimal performance of the Health-e-Access model (images not adequate, technical failure, stethoscope sounds inadequate, history inadequate) accounted for 17.7% of visits not completed. For the five noncompleted visits in which the provider failed to specify a reason, provider-investigators judged that they would have been confident in diagnosis and treatment decisions.

VISITS ABANDONED

In addition to the 2,554 telemedicine visits attempted during the Primary Care Phase, 91 health problems came to the attention of the Health-e-Access Scheduler but were not attempted (i.e., were abandoned). Thus, among 2,645 potential visits (2,554 plus 91) during this phase, 3.4% were abandoned. Among abandoned visits, reasons included: parent picked up the child before telemedicine assistant completed information capture, 25.0%; telemedicine assistant unable

Table 1. Reasons for Noncompletion of Visits

REASON[a]	*N*	%
Needed hands-on physical examination	23	29.1
Needed treatment that could be provided at patient site	23	29.1
Needed test (blood, urine, culture) or imaging	11	13.9
Image(s) not adequate	8	10.1
Clinician required in-person visit, reason not specified or apparent in record review	5	6.3
Child site or parent decision prevented clinician from seeing child	3	3.8
Technical failure prevented completion	3	3.8
Stethoscope sounds obtained, judged not adequate	2	2.5
History not adequate	1	1.3
	79	100.0

[a]Reasons were categorized based on (1) an explicit response to a standard query in the Health-e-Access electronic medical record when the clinician recorded that a visit could not be completed (e.g., sent to office to obtain urine culture) or (2) record review by an experienced clinician.

to acquire some necessary clinical information (e.g., unable to remove cerumen, child uncooperative), 15%; administrative problem (e.g., unable to contact parent for consent), 13.3%; technical problem, 11.7%; Health-e-Access Scheduler determined that problem was beyond capacity of model, 10.0%; parent indicated problem already being treated, 6.6%; and five other categories, 18.3%.

CONTINUITY VISITS

For the 1,557 telemedicine visits by children with a participating provider, continuity averaged 83.2% among the 10 practices (range, 28.1–92.9%). Continuity for the five city practices averaged 85.2% (range, 41.2–92.9%), whereas that for the five suburban practices averaged only 49.4% (range, 28.1–92.3%). Continuity correlated strongly with the number of visits provided; city practices averaged 294 visits (range, 77–551), whereas suburban practices averaged 17 (range, 5–32).

For the 16.8% ($n = 261$) of visits not seen by a continuity provider, the Scheduler documented reasons (*Table 2*) why no provider from the child's own practice saw the child for 243. The most prevalent (96, 39.5%) reason was that a provider designated by the practice to provide telemedicine visits was not available. For 41 of these 96 noncontinuity visits, the Scheduler used unavailability (e.g., vacation) of the University of Rochester Medical Center nurse practitioner as an opportunity to involve other primary care practices in doing telemedicine visits. Other common reasons were as follows: practice indicated it was too busy (19.3%); practice refused because the child's insurance did not pay for telemedicine visits or the child had no insurance (17.7%); time of the visit request was beyond the end-of-day cutoff chosen by the practice (11.1%); and technical problems at the provider site (7.0%). All but one practice provided telemedicine visits regardless of insurance type.

SURVEY OF PROVIDER PERCEPTIONS AND OPINIONS

The mean (±standard deviation) number of visits managed per provider was 53.2 (± 149.6), 24 providers managed 10 or more visits, and 12 managed 50 or more. Among the 47 providers in the 10 participating primary care practices, 40 responded to the provider survey. Most survey items applied only to the 30 (23 pediatricians, 6 pediatric nurse practitioners, and 1 physician assistant) that had completed at least one telemedicine visit at the time the survey was distributed (February 1, 2007).

EFFICIENCY

As shown in *Table 3*, providers generally found the telemedicine software easy to learn (mean score was 3.8, with 5 indicating "very easy"). Technical problems interfered with completion of telemedicine visits less often than "sometimes" (mean, 2.4). Providers estimated the mean time required for decision making with telemedicine visits was 10.3 min, a period that they thought was slightly less (mean was 2.9, with a value of 3 indicating "about the same") than for similar office visits. In contrast, they estimated a mean total time for completing the entire visit via telemedicine (including documentation and contacts with pharmacy, parents and telemedicine assistants) of 19.8 min. Providers thought that total time was longer (mean was 3.5, with 3 indicating "about the same"). Among the six providers who had completed 50 or more telemedicine visits, mean estimates for time involved in decision making and total time were 7.2 and 15 min, respectively. The mean score regarding ability of the practice to use telemedicine to reduce time to complete illness visits (2.7) indicated a consensus of no timesavings.

EFFECTIVENESS

Although providers generally believed that they received information that was complete enough, and they generally felt comfortable

Table 2. Reasons for Noncontinuity[a] Visits

	N	%
Clinician(s) designated to do telemedicine visits out of office, within-practice coverage not arranged	96	39.5
Primary care practice indicated they were too busy to provide telemedicine visit	47	19.3
Child's insurance did not reimburse (43, all FFS Medicaid) or child had no insurance	43	17.7
Visit requested later than practice accepts them (4:00 PM)[b]	27	11.1
Technical problem at clinician site	17	7.0
Error in recording of primary care practice, wrong practice contacted about	6	2.5
Primary care practice unable to complete visit within available time (e.g., parent picked up child)	4	1.6
Child site requested another opinion	1	0.4
Family had unpaid bill, practice refused to do visit	1	0.4
Practice indicated they were not the child's primary care practice	1	0.4
	243	100.0

[a]Continuity was measured for the 1,557 visits during the Primary Care Phase that were made by children with a participating primary care practice. For these visits, continuity was 83.2%. Reason was not recorded for 18 of the 261 total noncontinuity visits, leaving the 243 visits that were classified as above.

[b]The Health-e-Access Scheduler and most participating practices accepted requests for visits that were made before 4:30 PM.

FFS, fee-for-service.

collaborating with telehealth assistants, on average they did not feel as confident in diagnoses made via telemedicine as with usual care (mean, 2.4). Overall, however, 46.3% of providers were at least as confident of diagnoses made via telemedicine. And among the six providers who had completed 50 or more telemedicine visits, 83.3% were at least as confident of diagnoses made via telemedicine as in person.

Interestingly, although providers interacted directly with parents either via telemedicine or telephone for only 9.8% of the completed visits, confidence that provider communication met parent needs was relatively high (mean, 3.7). Providers had no strong opinions on their ability to use Health-e-Access to reduce their costs (mean, 2.8).

OVERALL ACCEPTABILITY

Likewise, providers had no strong opinions on the level of interest in telemedicine by their practice colleagues (mean, 3.0). Providers believed that fair reimbursement for telemedicine visits was the same as for usual visits (mean, 3.0), and that fair payment to the originating site for their part in completing a telemedicine visit was $11.50 (or 26% of an assumed total reimbursement of $45). Moreover, most (76.3%) believed that it would be fair if payment to the originating site reduced their own reimbursement commensurately.

Discussion

Providers perceived little or no efficiency or effectiveness advantage to their practice in using telemedicine as a process to deliver care; yet they used it effectively in serving families, completing almost all telemedicine visits requested, providing high levels of continuity with the medical home, and believing they communicated adequately with parents. Given hard evidence that many of these telemedicine visits replaced ED visits, which inherently lack continuity, the achieved continuity rate (83%) represents a distinct improvement.

LIMITATIONS

We report on a substantial case study in a single community. Feasibility and acceptability of innovations reflect many factors in addition to design of the technology and organization of the infrastructure such as Health-e-Access. Thus, although the technology is commercially available and the organization of Health-e-Access program should be readily generalizable to other communities, execution depends significantly on community-specific attributes. Total time required to complete visits has probably diminished since the provider survey was conducted. Software was upgraded in June 2007 to allow easier navigation and documentation and to allow prescriptions to be faxed directly to pharmacies.

IMPLICATIONS

Based on a recent synthesis of strategies to improve access,[18] authors concluded, "We should aim to develop systems of care that are timely rather than delayed, with a personal provider rather than a 'doctor on call,' and in the medical home rather than in other settings such as urgent care centers or emergency departments." Health-e-Access, which defines its mission as enabling healthcare when and

Table 3. Provider Survey Responses

	RESPONDENTS[a]	UNITS	VISITS DONE						
			NONE	<20	20–49	50–99	100–199	200–500	>500
Experience with telemedicine									
About how many visits has your practice done?	40	%	0.0	32.5	2.5	10.0	7.5	10.0	27.5
About how many visits have you done, yourself?	40	%	25.0	32.5	27.5	2.5	0.0	5.0	7.5
	RESPONDENTS	UNITS	MEAN	MEDIAN	SD	LIKERT SCALE ANCHOR POINTS			
Efficiency									
How hard would you say it is to learn to use the telemedicine software?	30	Score	3.8	4	1.10	1, very difficult; 5, very easy			
How often do technical problems interfere with ability to do visits?	30	Score	2.4	2	1.10	1, rarely; 3, sometimes; 5, every visit			
Time required for medical decision making	25	Min	10.3	10	5.44				
Total time for telemedicine visit	23	Min	19.8	20	5.11				
Telemedicine vs. in-person: time for medical decision making	28	Score	2.9	3	1.18	1, less; 3, same; 5, more			
Telemedicine vs. in-person: total time for visit	29	Score	3.5	4	1.15	1, less; 3, same; 5, more			
Our practice can use this telemedicine application to reduce clinician time required for visits	39	Score	2.7	3	1.05	1, strongly disagree; 3, neither agree nor disagree; 5, strongly agree			
Effectiveness									
Information provided by telemedicine assistants is usually complete enough	30	Score	3.4	4	0.90	1, strongly disagree; 3, neither agree nor disagree; 5, strongly agree			
Overall, I feel comfortable collaborating with telehealth assistants	30	Score	4.1	5	1.17	1, strongly disagree; 3, neither agree nor disagree; 5, strongly agree			
Telemedicine vs. in-person: confidence in diagnosis	30	Score	2.4	2	0.94	1, much less; 3, about same; 5, much more			
Confident with telemedicine that communication with parents meets their needs	30	Score	3.7	4	1.09	1, strongly disagree; 3, neither agree nor disagree; 5, strongly agree			
We know how we could use a telemedicine application like this to reduce our costs in doing illness visits	39	Score	2.8	3	1.11	1, strongly disagree; 3, neither agree nor disagree; 5, strongly agree			

continued →

Table 3. Provider Survey Responses *continued*

	RESPONDENTS	UNITS	MEAN	MEDIAN	SD	LIKERT SCALE ANCHOR POINTS
Overall Acceptability						
How would you describe the attitude or level of interest in Health-e-Access by other clinicians in your practice?	29	Score	30	3	1.25	1-very negative, 5-very positive
Compared with an in-person visit, what level of reimbursement do you think is fair for telemedicine visits?	39	Score	3.0	3	0.36	1-much less, 3-about the same, 5-much more
Would it be fair for some of the total reimbursement to go to the originating site?	38	%	No 23.7	Yes 76.3		
If yes (reimbursement fair): Assuming that total insurance company payment for a telemedicine visit were $45, how much of that would be fair to pay the originating site for their contribution to the visit?	27	$	11.5	10.0	8.4	

[a]Responses to queries about efficiency and effectiveness were relevant only for the 30 providers (nurse practitioners, physician assistants, physicians) who had performed at least one telemedicine visit, rather than the 40 total respondents.

SD, standard deviation.

where you need it, by providers you know and trust, aims to do that precisely.

Findings indicate a high level of fidelity to this mission. High rates of completion indicate that providers almost always had the information they need to make diagnosis and management decisions about problems emerging in childcare and school settings. Completion also indicates success of the entire system in completing several component work processes, including (1) recognition by people at the child site and by the Health-e-Access Scheduler that the problem was within the scope of the Health-e-Access model; (2) timely, effective information capture and conduct of the visit work by the telehealth assistant; (3) performance of the technology; and (4) collaboration of provider and child-site personnel in identifying treatment that can be implemented on site or in the child's home.

Continuity reflects both effectiveness of the Health-e-Access system and provider commitment to convenient care for their patients. The wide variability in continuity observed among practices underscores the fact that providers can use telemedicine to vastly improve continuity, should they choose. When presented with a request for a telemedicine visit, providers and practice managers, not the telemedicine infrastructure, determined whether the practice would handle a particular visit, and which provider would do so.

Great demand exists for convenient access to care for acute problems. Evidence on the proportion of children's ED visits for nonemergency problems, with values ranging between 20% and 70%,[19–21] indicates that many costly ED visits occur because of barriers to more appropriate access. Inefficient, costly, and impersonal care results from the mismatch between ED resources and the resources required for optimal care of nonemergencies. Although compelling reasons to use telemedicine to replace non-ED visits are obvious to patients and payers, findings indicate that incentives in efficiency or effectiveness advantages for primary care providers to

adopt telemedicine are weak. This mirrors the situation for adoption of EMR, which only 28% of U.S. physicians had adopted in 2006.[22] As recently observed regarding EMR adoption, "This is really not a technology problem. It's a matter of incentives and market failure."[23] Study findings suggest the Health-e-Access telemedicine model, as with EMRs, will attain its full potential only after greater attention is directed to provider incentives. Solid evidence suggests that policy encouraging providers to adopt telemedicine would benefit families, reduce healthcare costs, and reduce burdens of acute childhood illness to society.

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