



The Use of Telemedicine to Address Access and Physician Workforce Shortages

COMMITTEE ON PEDIATRIC WORKFORCE

abstract

The use of telemedicine technologies by primary care pediatricians, pediatric medical subspecialists, and pediatric surgical specialists (henceforth referred to as “pediatric physicians”) has the potential to transform the practice of pediatrics. The purpose of this policy statement is to describe the expected and potential impact that telemedicine will have on pediatric physicians’ efforts to improve access and physician workforce shortages. The policy statement also describes how the American Academy of Pediatrics can advocate for its members and their patients to best use telemedicine technologies to improve access to care, provide more patient- and family-centered care, increase efficiencies in practice, enhance the quality of care, and address projected shortages in the clinical workforce. As the use of telemedicine increases, it is likely to impact health care access, quality, and education and costs of care. Telemedicine technologies, applied to the medical home and its collaborating providers, have the potential to improve current models of care by increasing communication among clinicians, resulting in more efficient, higher quality, and less expensive care. Such a model can serve as a platform for providing more continuous care, linking primary and specialty care to support management of the needs of complex patients. In addition, telemedicine technologies can be used to efficiently provide pediatric physicians working in remote locations with ongoing medical education, increasing their ability to care for more complex patients in their community, reducing the burdens of travel on patients and families, and supporting the medical home. On the other hand, telemedicine technologies used for episodic care by nonmedical home providers have the potential to disrupt continuity of care and to create redundancy and imprudent use of health care resources. Fragmentation should be avoided, and telemedicine, like all primary and specialty services, should be coordinated through the medical home.

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Telemedicine is defined as the “the use of medical information exchanged from one site to another via electronic communications to

improve a patient's clinical health status.¹ The term "telemedicine" is typically limited to the use of these technologies when a provider delivers direct patient health services. The term "telehealth," although often used interchangeably with telemedicine, is a broader term that includes telemedicine, as well as other health-related services using electronic information and communications technologies, such as health information sharing, health profession and patient education, and remote or mobile patient monitoring.

In pediatrics, telemedicine can be used by pediatric physicians in a variety of ways to deliver health services to children.² The use of telemedicine is not typically considered a new or different type of care delivery; rather, telemedicine technologies are tools that can be used to deliver the same or enhanced care that is currently provided, only over a distance. Expanding the depth and breadth of the competency of the patient- and family-centered medical home is the result. Telemedicine is most commonly used to deliver subspecialty consultations, including mental and behavioral health, to children residing in rural communities; however, it can also be used when the geographic distance is relatively small. For example, it is common for infants, children, adolescents, and their families living in suburban and urban communities to face significant disparities in access and time-distance barriers, which could be partly alleviated by the use of telehealth. Although telemedicine technologies can be used to deliver care internationally as well, a discussion of international telemedicine is beyond the scope of this statement.

In this policy statement, the impact that the increased use of telemedicine technologies could have on the pediatric workforce is described and reviewed for each of the following capacities: patient access to care,

physician capacity, quality of care, efficiencies, costs, graduate medical education (GME), continuing medical education (CME), payment/funding, research, and current barriers to telemedicine.

PATIENT ACCESS TO CARE

There is significant disparity in the geographic distribution of pediatric physicians across the country, resulting in many underserved regions. Underserved communities are most commonly found in rural regions, but can include suburban and urban settings.³ This maldistribution of workforce results in differential access and is at least partly to blame for differential health outcomes between rural and nonrural populations, particularly for those children with special health care needs.⁴ The literature shows that access barriers related to distance can be partly addressed with the use of telemedicine technologies, which can also minimize burdens of parents and other caregivers missing work, children missing school, and costs and risks associated with travel.⁵⁻⁹

Telemedicine technologies and consultations may afford primary care physicians and patients in geographically isolated communities a mechanism by which care coordination can be improved. In many circumstances, care can be delivered locally through a physician-led medical home under the leadership of a general pediatrician, subspecialty pediatrician, and/or pediatric surgical specialist located at a distant site. This interdisciplinary model of care can increase care provided in the primary care physician's office in the patient's local community, resulting in improved communication and coordination between providers, supporting the physician-led medical home, particularly for children with special health care needs.^{10,11} This model facilitates all pediatric patients having access to a pediatric physician.

THE USE OF TELEMEDICINE TO INCREASE PHYSICIAN CAPACITY

The clinical benefits of using telemedicine technologies for consultations, case discussions, and ongoing clinical support in addition to the educational benefits of improved access to GME/CME can synergistically work to increase the expertise and efficiency of pediatric physicians. These benefits can result in pediatricians' ability to provide care to more children and their families, increasing physician capacity.^{12,13} Particularly for medical subspecialists/surgical specialists, improvements in the referral process and communications with primary care providers have been shown to reduce the frequency of and demand for subspecialty consultations.¹⁴ Combining models of care that use telemedicine to facilitate care and educate primary care providers in the care of patients with special health care needs can result in improved adherence to evidence-based guidelines and clinical outcomes.¹³ The use of telemedicine technologies, such as remote patient monitoring and the use of telemedicine to reach high-risk or otherwise difficult to reach patients, can also increase the efficiency, and therefore the capacity, of their practice.^{6,12,15-18} For example, school-based telemedicine programs have been shown to increase contact with children and adolescents not otherwise receiving primary care as well as provide an early means of evaluation and intervention for acutely ill patients, reducing the overall use of higher levels of care, including the emergency department.^{8,19}

Telemedicine technologies can be used for multidisciplinary care, interspecialty rounds, scheduled case conferences, and case discussions. This approach, involving primary care physicians, nonphysician clinicians, and even patients and families (community training), can result in more efficient use of existing

pediatric medical subspecialists and surgical specialists.^{17,20,21} Several clinical programs use telemedicine in these ways to increase both the overall number of patients cared for as well as the overall quality of care provided to patients with specific medical conditions.^{10,13}

QUALITY OF CARE

A number of studies have documented that the use of telemedicine technologies can result in more appropriate utilization of health care services.^{9,22-26} First, by increasing health care access for children, particularly for children living in rural communities, the use of telemedicine technologies can help reduce missed appointment rates, increase adherence to recommended therapies, and help ensure the appropriate frequency of recommended physician visits. Second, studies have shown that telemedicine can enhance both comfort and facility in managing specific medical subspecialty issues.^{13,27} Improved communication between the pediatric health care team and the patient has the potential to enhance disease management. Telemedicine technologies can also increase the overall quality and comprehensiveness of care delivered.^{28,29}

EFFICIENCIES OF CARE

The use of telemedicine technologies has the potential to increase efficiency surrounding care delivery. Previous research has revealed that the appropriateness of referrals to medical subspecialists/surgical specialists is increased and redundancies in evaluative and diagnostic studies are reduced when telemedicine is used.^{9,26,30,31} This situation may be particularly true for children, and especially children with special health care needs. The use of "eReferrals," where primary care providers use a Web-based referral and consultation program to discuss

a patient's case with a medical subspecialist/surgical specialist before an in-person referral, is another means by which these technologies can be used to increase efficiencies of care. It goes without saying that evaluating and/or treating a patient via telemedicine likely represents the establishment of a physician-patient relationship that carries certain ethical and legal responsibilities. Indeed, clinical recommendations obtained via telemedicine technology should be incorporated into the pediatric physician's health care decisions and documentation in the health care record, similar to those recommendations obtained through face-to-face contact. Analyses of eReferral programs have revealed increases in primary care provider knowledge and expertise with simultaneous reductions in the number of in-person referrals to medical subspecialists/surgical specialists.¹⁴ In this way, these technologies benefit primary care providers and pediatric medical subspecialists/surgical specialists, as well as the patients and parents, with a more effective and efficient referral process.

COSTS OF CARE

Although the implementation of telemedicine technologies requires initial investments in equipment, telecommunications, and costs of technical and administrative personnel, a variety of cost analyses have found that models of care using telemedicine can result in long-term overall cost savings.^{30,32-37} Savings can be realized by a reduction in the duplication of medical tests and examinations, a reduction in the utilization of higher-cost tertiary care centers, and an increased efficiency in referrals and communication. Beyond these savings, there are many societal benefits, including the reduction in travel and patient transport, a reduction in the hours of missed

work by the parent/guardian, and a reduction in the frequency of missed school days.

GME AND CME

The use of telemedicine technologies to provide GME and CME has been increasing for years. Interactive educational sessions can be shared by using live videoconferencing or live Web-based streaming. In addition, educational sessions can be recorded and stored for later viewing using the Internet. As a result, telemedicine technologies can make it easier for pediatric physicians to participate in or remotely attend educational sessions. In this way, easier access to GME and CME could increase the level of participation and education of providers.³⁸⁻⁴⁰

Because of these benefits, topics related to telemedicine are increasingly becoming integrated into existing medical school and residency curricula, as well as CME programming, functioning not only as stand-alone topics but also as opportunities to enhance teaching of medical school and GME competencies. These topics include, but are not limited to, the adherence to professional practice standards, the preservation of the physician-patient relationship, and the confidentiality of patient information when transmitted through telehealth technologies.

PAYMENT/FUNDING OF CARE

There is significant variability in how care provided by using telemedicine is financed. Policies vary between health plans, counties, and states for public and private payers of health care.⁴¹ The Centers for Medicare and Medicaid Services (CMS) has telemedicine payment policies for Medicare, but these are often perceived as very restrictive.^{42,43} Nonetheless, CMS has taken steps that would allow enhanced access to telemedicine services: a proposed

rule released in December 2014 states that accountable care organizations (ACOs) have “flexibility to use telehealth services as they deem appropriate for their efforts to improve care and avoid unnecessary costs.”⁴⁴

Policies regarding Medicaid payment for telemedicine are left to the states, and currently half of the states pay for subspecialty medical and surgical pediatrician telemedicine consultations using modifications to Current Procedural Terminology consultation codes and Healthcare Common Procedure Coding System codes.⁴¹ States enjoy tremendous flexibility when developing innovative payment methodologies for services that incorporate telemedicine technology. This flexibility, however, can cause confusion when care is being delivered across state lines. Payments from state Medicaid programs also differ for the various types of telemedicine services, including live video, store-and-forward, and remote patient monitoring. Private insurers typically follow state Medicaid payment policies with regard to telemedicine, but there is substantial variability.⁴⁵ However, given the growing evidence that these technologies can improve satisfaction, increase quality of care and health outcomes, and reduce health care costs, states and payers are increasingly paying for telemedicine services.^{41,46,47}

A variety of future funding models could incentivize the use of these technologies to treat underserved populations. For example, consistent with current federal and state efforts, financial incentives could be offered to pediatric physicians who are willing to provide telemedicine consultations to patients and providers living in medically underserved areas. There are also opportunities to provide financial incentives to support the use of telemedicine because of the evidence

of increased patient-centered care. For example, some states have allowed the use of telemedicine technologies to be used to incentivize primary care offices to become certified by the National Committee for Quality Assurance as a patient-centered medical home (PCMH).^{15,48} When appropriate, incentives for implementation of telemedicine services should extend beyond tax credits and other, more traditional models to include loan forgiveness programs and technology investment grants. Demonstrated improvements in the medical home with simultaneous improvements in the availability of pediatric physicians would do much to improve the delivery of high-quality care in underserved areas and should be encouraged.

Payment changes are coming to health care, with “value based” care replacing “volume based” care. In light of these changes, it is likely that the use of telemedicine technologies will increase. Relatedly, many ACOs or other non-ACO health plans covering rural populations do not offer the spectrum of pediatric services required by the set of essential health benefits included in the Affordable Care Act.⁴⁹ Telemedicine technologies may provide some solutions whereby pediatric physicians can be made available to these pediatric populations, although certainly not all ACOs will have the technological infrastructure to support telemedicine applications. Many ACOs and non-ACO health plans are incorporating pediatric physician services using telemedicine as a means of complying with the essential health benefits and supporting network adequacy.

The ability to secure federal incentives for telemedicine will be critical to furthering the growth in the remote delivery of pediatric health care services. An example of such financial incentives for telemedicine services could be a link to some of the

Medicare and Medicaid programs’ most costly services, such as hospital readmissions and labor and pre- and postdelivery services. Pediatric physicians supported by these financial incentives could create innovative service delivery lines for existing and new patients, potentially improving access and outcomes, while providing more efficient and less costly care.

SUPPORTING THE PCMH

Telemedicine technologies and consultations, as stated previously, can increase care provided in the primary care physician’s office in the patient’s local community, resulting in improved communication and coordination between providers, supporting the physician-led PCMH model of care, particularly for children with special health care needs.^{15,48} Although quality telemedicine care promises to increase access to pediatric medical subspecialty and surgical specialty care for patients in underserved urban and rural areas, and at the same time curtail unnecessary emergency department and hospital care, this must be done in support of and integrated with the PCMH, not in place of it. The use of telemedicine care by virtual health care providers, such as those linked to retail-based clinics, entrepreneurs, or insurers whose business model is to provide health care services to patients via smart phone, laptop, or video-consult kiosk without a previous physician-patient relationship, previous medical history, or hands-on physical examination (other than what can be accessed via the technology), can undermine the basic principles of the PCMH model.

In isolation, the use of virtual telemedicine care represents the antithesis of the medical home model of quality pediatric care: care that is patient-centered, comprehensive, team-based, coordinated, accessible, and focused on quality and safety.

Virtual health care services are provided episodically and are lacking the essentials of the patient's medical record. Increasing fragmentation of care is the result, which leads to incomplete or redundant services and wastes health care dollars. More importantly, virtual telemedicine care in isolation does not provide timely and comprehensive follow-up with the patient and the medical home. Finally, it does not provide the same level of care that would be provided in a hands-on visit (eg, physical examination, necessary laboratory tests, etc), and therefore the patient receives suboptimal care. Although such novelty care appeals to parents because it can be faster, more convenient, and more affordable than an office visit, the loss of continuity of care, quality of care, and patient safety shows why this telemedicine care model should not be embraced.⁵⁰⁻⁵²

RESEARCH ON TELEMEDICINE

A common weakness in evaluations of telemedicine has been the lack of clearly defined reference and control groups. The control should be the standard or level of care (or the communication/education standard) that would be provided in the absence of the telemedicine intervention. Telemedicine research comparisons have often relied on historical controls, which may only be sufficient if the prevailing conditions have not changed over time and if the relationship between usual care and the outcomes of interest has remained constant.

The published medical literature on telemedicine has been positive with regard to patient and parent satisfaction, provider satisfaction, feasibility, and the equivalence of telemedicine encounters to in-person encounters.^{53,54} However, these benefits have resulted from an ever-evolving portfolio of technologies and applications. Future evaluations of these tools must consider the impact

of applications that may not have been foreseen during the initial design and application. In comparative studies involving telemedicine, the use of randomized designs is preferable and, to date, underutilized; it may be appropriate under certain circumstances to randomize one or more of patients, physicians, or delivery sites.⁵⁵⁻⁵⁷

CURRENT BARRIERS TO TELEMEDICINE

The implementation of telemedicine requires an initial financial investment in equipment, software, and telecommunications. There are often ongoing costs associated with maintenance of technology and personnel costs associated with training and technical support. These costs can represent a significant barrier for pediatric physicians and other clinicians who care for children. The underserved practices and locations most likely to benefit from telemedicine are probably those least likely to afford the initial financial investment or ongoing maintenance. However, these practices and locations often have existing relationships with distant academic pediatric medical centers to whom patients are referred for evaluation and care; many, if not most, offer telemedicine services.^{13,58}

In addition, despite the increasing evidence and potential promise of how telemedicine technologies can help address some of the access, quality, and pediatric workforce issues faced by children, many current state and federal policies, including those addressing licensure and payment, create barriers for pediatric physicians. All physicians practicing intra- and interstate telemedicine must comply with state licensing and other practice rules in every state in which they practice, in person and via telemedicine.⁵⁹ In addition, hospital- and practice-based credentialing and privileging policies often do not consider the delivery of care using telemedicine technologies.

Not all states currently pay for telemedicine services or recognize CMS and Joint Commission rules on privileging by proxy for telemedicine providers.^{41,60}

Another potential barrier with additional costs associated with care delivery with the use of telemedicine is related to malpractice insurance. Malpractice insurance most often covers in-person care and should cover care delivered to patients in remote health care facilities and possibly in other states. Physicians should review their current malpractice policy to be certain that the appropriate malpractice coverage that includes the treatment of patients using telemedicine is included.

In conclusion, the Committee on Pediatric Workforce maintains that when used appropriately, telemedicine can be used to connect patients to needed, yet otherwise inaccessible, high-quality care, and therefore supports the following.

RECOMMENDATIONS

1. The American Academy of Pediatrics and its chapters should advocate for the reduction in barriers to telemedicine to extend the reach of and the access to pediatric physicians as they strive to offer care for all children.
2. Physicians who deliver health care services through telemedicine, as well as referring clinicians and participating facilities, should receive equitable payment for their services to increase the availability of pediatric health care services for all children.
3. Use of telemedicine services for episodic care should be done within the context of the medical home, because such care offers continuity, efficiency, and the prudent use of health care resources. Fragmented care

delivered outside the medical home model must be avoided.

4. Stable funding mechanisms should be developed by both public and private payers to support the continued development, expansion, and maintenance of telemedicine to improve patient access and quality of care and meet workforce needs.
5. Ongoing and future research, including demonstration projects, to study the effectiveness of telemedicine to address workforce needs, expand patient access to care, improve quality of care, reduce health care costs, and ensure patient/family and pediatric physician satisfaction, should be increased and financially supported.
6. Financial incentives (eg, tax credits, loan forgiveness programs, and technology investment grants) should be offered to physicians, practices, and health systems that can demonstrate an improvement in health care access and outcomes, administrative efficiency, cost reduction, and other performance indicators through the implementation of telemedicine and other technological innovations.
7. Providers of educational programming should be encouraged to use telemedicine technologies to provide education to remote members of the health care team and clinical sites, such as Area Health Education Centers and Rural Health Clinics.
8. Topics related to telemedicine, including ongoing quality assurance and training in the uses of such technologies, should be expeditiously integrated into existing medical school and residency curricula, as well as CME programming.
9. Regulatory and licensing authorities should partner with medical

organizations and other health care stakeholders to overcome administrative, financial, and legislative barriers to implement telemedicine and expand patient access to health care.

10. Efforts to facilitate interstate licensure for the purpose of increasing accessibility of pediatric physicians to children living in underserved states and communities should be supported. State and local governments should develop appropriate licensing structures to support the practice of telemedicine across jurisdictions.

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ABBREVIATIONS

ACO: accountable care organization
CME: continuing medical education
CMS: Centers for Medicare and Medicaid Services
GME: graduate medical education
PCMH: patient-centered medical home

REFERENCES

1. American Telemedicine Association. What is telemedicine? Available at: www.americantelemed.org/about-telemedicine/what-is-telemedicine#. VSKdNfnF98E. Accessed April 6, 2015
2. Herendeen NE, Schaefer GB. Practical applications of telemedicine for pediatricians. *Pediatr Ann*. 2009;38(10):567–569
3. Randolph GD, Pathman DE. Trends in the rural-urban distribution of general pediatricians. *Pediatrics*. 2001;107(2). Available at: www.pediatrics.org/cgi/content/full/107/2/E18
4. Skinner AC, Slifkin RT. Rural/urban differences in barriers to and burden of care for children with special health care needs. *J Rural Health*. 2007;23(2):150–157
5. Uscher-Pines L, Mehrotra A. Analysis of Teladoc use seems to indicate expanded access to care for patients without prior connection to a provider. *Health Aff (Millwood)*. 2014;33(2):258–264
6. McConnochie KM. Potential of telemedicine in pediatric primary care. *Pediatr Rev*. 2006;27(9):e58–e65
7. McConnochie KM, Wood NE, Herendeen NE, ten Hoopen CB, Roghmann KJ. Telemedicine in urban and suburban childcare and elementary schools lightens family burdens. *Telemed J E Health*. 2010;16(5):533–542
8. McConnochie KM, Wood NE, Kitzman HJ, Herendeen NE, Roy J, Roghmann KJ. Telemedicine reduces absence resulting from illness in urban child care: evaluation of an innovation. *Pediatrics*. 2005;115(5):1273–1282
9. Marcin JP, Ellis J, Mawis R, Nagrampa E, Nesbitt TS, Dimand RJ. Using telemedicine to provide pediatric subspecialty care to children with special health care needs in an underserved rural community. *Pediatrics*. 2004;113(1 pt 1):1–6
10. The Robert Wood Johnson Foundation. *To Improve Health and Health Care, 1997: The Robert Wood Johnson Foundation Anthology*. San Francisco, CA: Jossey-Bass; 1997
11. Marcin JP, Trujano J, Sadorra C, Dharmar M. Telemedicine in rural pediatric care: the fundamentals. *Pediatr Ann*. 2009;38(4):224–226

12. McConnochie K, Wood N, Herendeen N, ten Hoopen C, Denk L, Neuderfer J. Integrating telemedicine in urban pediatric primary care: provider perspectives and performance. *Telemed J E Health*. 2010;16(3):280–288
13. Arora S, Thornton K, Murata G, et al. Outcomes of treatment for hepatitis C virus infection by primary care providers. *N Engl J Med*. 2011;364(23):2199–2207
14. Chen AH, Murphy EJ, Yee HF Jr. eReferral—a new model for integrated care. *N Engl J Med*. 2013;368(26):2450–2453
15. Herendeen N, Deshpande P. Telemedicine and the patient-centered medical home. *Pediatr Ann*. 2014;43(2):e28–e32
16. Ellis DA, Naar-King S, Chen X, Moltz K, Cunningham PB, Idalski-Carcone A. Multisystemic therapy compared to telephone support for youth with poorly controlled diabetes: findings from a randomized controlled trial. *Ann Behav Med*. 2012;44(2):207–215
17. Kim EW, Teague-Ross TJ, Greenfield WW, Keith Williams D, Kuo D, Hall RW. Telemedicine collaboration improves perinatal regionalization and lowers statewide infant mortality. *J Perinatol*. 2013;33(9):725–730
18. McConnochie KM, Conners GP, Brayer AF, et al. Effectiveness of telemedicine in replacing in-person evaluation for acute childhood illness in office settings. *Telemed J E Health*. 2006;12(3):308–316
19. McConnochie KM, Wood NE, Herendeen NE, et al. Acute illness care patterns change with use of telemedicine. *Pediatrics*. 2009;123(6). Available at: www.pediatrics.org/cgi/content/full/123/6/e989
20. Labarbera JM, Ellenby MS, Bouressa P, Burrell J, Flori HR, Marcin JP. The impact of telemedicine intensivist support and a pediatric hospitalist program on a community hospital. *Telemed J E Health*. 2013;19(10):760–766
21. Hall-Barrow J, Hall RW, Burke BL Jr. Telemedicine and neonatal regionalization of care—ensuring that the right baby gets to the right nursery. *Pediatr Ann*. 2009;38(10):557–561
22. Sable C. Digital echocardiography and telemedicine applications in pediatric cardiology. *Pediatr Cardiol*. 2002;23(3):358–369
23. Desai S, Williams ML, Smith AC. Teleconsultation from a secondary hospital for paediatric emergencies occurring at rural hospitals in Queensland. *J Telemed Telecare*. 2013;19(7):405–410
24. Farmer JE, Muhlenbruck L. Telehealth for children with special health care needs: promoting comprehensive systems of care. *Clin Pediatr (Phila)*. 2001;40(2):93–98
25. Miyamoto S, Dharmar M, Boyle C, et al. Impact of telemedicine on the quality of forensic sexual abuse examinations in rural communities. *Child Abuse Negl*. 2014;38(9):1533–1539
26. Yang NH, Dharmar M, Kuppermann N, et al. Appropriateness of disposition following telemedicine consultations in rural emergency departments. *Pediatr Crit Care Med*. 2015;16(3):e59–e64
27. Wootton R. Twenty years of telemedicine in chronic disease management—an evidence synthesis. *J Telemed Telecare*. 2012;18(4):211–220
28. Dharmar M, Romano PS, Kuppermann N, et al. Impact of critical care telemedicine consultations on children in rural emergency departments. *Crit Care Med*. 2013;41(10):2388–2395
29. Dharmar M, Kuppermann N, Romano PS, et al. Telemedicine consultations and medication errors in rural emergency departments. *Pediatrics*. 2013;132(6):1090–1097
30. Mahnke CB, Jordan CP, Bergvall E, Person DA, Pinsker JE. The Pacific Asynchronous TeleHealth (PATH) system: review of 1,000 pediatric teleconsultations. *Telemed J E Health*. 2011;17(1):35–39
31. Gans DBM, Ramirez M, Cabezas L, Pourat N. *Assuring Children's Access to Pediatric Subspecialty Care in California*. Los Angeles, CA: UCLA Center for Health Policy Research; 2013
32. Marcin JP, Nesbitt TS, Struve S, Traugott C, Dimand RJ. Financial benefits of a pediatric intensive care unit-based telemedicine program to a rural adult intensive care unit: impact of keeping acutely ill and injured children in their local community. *Telemed J E Health*. 2004;10(Suppl 2):1–5
33. Spaulding R, Belz N, DeLurgio S, Williams AR. Cost savings of telemedicine utilization for child psychiatry in a rural Kansas community. *Telemed J E Health*. 2010;16(8):867–871
34. Doolittle GC, Williams AR, Cook DJ. An estimation of costs of a pediatric telemedicine practice in public schools. *Med Care*. 2003;41(1):100–109
35. Le Goff-Pronost M, Sicotte C. The added value of thorough economic evaluation of telemedicine networks. *Eur J Health Econ*. 2010;11(1):45–55
36. Smith AC, Scuffham P, Wootton R. The costs and potential savings of a novel telepaediatric service in Queensland. *BMC Health Serv Res*. 2007;7:35
37. Jackson KM, Scott KE, Graff Zivin J, et al. Cost-utility analysis of telemedicine and ophthalmoscopy for retinopathy of prematurity management. *Arch Ophthalmol*. 2008;126(4):493–499
38. Callas PW, Ricci MA, Caputo MP. Improved rural provider access to continuing medical education through interactive videoconferencing. *Telemed J E Health*. 2000;6(4):393–399
39. González-Espada WJ, Hall-Barrow J, Hall RW, Burke BL, Smith CE. Achieving success connecting academic and practicing clinicians through telemedicine. *Pediatrics*. 2009;123(3). Available at: www.pediatrics.org/cgi/content/full/123/3/e476
40. González-Espada WJ, Hall-Barrow J, Hall RW, Burke BL, Smith CE. Peds PLACE: quality continuing medical education in Arkansas. *J Ark Med Soc*. 2009;105(9):211–213
41. Center for Connected Health Policy. State telehealth laws and reimbursement policies: a comprehensive scan of the 50 states and the District of Columbia. February 2015. Available at: <http://cchpca.org/sites/default/files/resources/State%20Laws%20and%20Reimbursement%20Policies%20Report%20Feb%202015.pdf>. Accessed March 2, 2015
42. US Department of Health and Human Services; Centers for Medicare and Medicaid Services. Telehealth services. December 2014. Available at: www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/TelehealthSrvcsfctsht.pdf. Accessed March 2, 2015

43. Institute of Medicine. The role of telehealth in an evolving health care environment: workshop summary. Available at: www.iom.edu/Reports/2012/The-Role-of-Telehealth-in-an-Evolving-Health-Care-Environment.aspx. Accessed March 2, 2015
44. Medicare Shared Savings Program: Accountable Care Organizations; Proposed Rule. 79 Fed. Reg. 72779 (proposed Dec. 8, 2014). Available at <http://www.gpo.gov/fdsys/pkg/FR-2014-12-08/pdf/FR-2014-12-08.pdf>. Accessed May 12, 2015
45. Antonioti NM, Drude KP, Rowe N. Private payer telehealth reimbursement in the United States. *Telemed J E Health*. 2014;20(6):539–543
46. Brannon JA, Brown J. Bottom line: telepractice reimbursement on the rise. Available at: www.asha.org/Publications/leader/2012/121009/Bottom-Line-Telepractice-Reimbursement-on-the-Rise.htm. Accessed March 2, 2015
47. McCue MJ, Palsbo SE. Making the business case for telemedicine: an interactive spreadsheet. *Telemed J E Health*. 2006;12(2):99–106
48. North SW, McElligot J, Douglas G, Martin A. Improving access to care through the patient-centered medical home. *Pediatr Ann*. 2014;43(2):e33–e38
49. Grace AM, Noonan KG, Cheng TL, et al. The ACA's pediatric essential health benefit has resulted in a state-by-state patchwork of coverage with exclusions. *Health Aff (Millwood)*. 2014;33(12):2136–2143
50. Mehrotra A, Paone S, Martich GD, Albert SM, Shevchik GJ. Characteristics of patients who seek care via eVisits instead of office visits. *Telemed J E Health*. 2013;19(7):515–519
51. Mehrotra A, Paone S, Martich GD, Albert SM, Shevchik GJ. A comparison of care at e-visits and physician office visits for sinusitis and urinary tract infection. *JAMA Intern Med*. 2013;173(1):72–74
52. Hickson R, Talbert J, Thornbury WC, Perin NR, Goodin AJ. Online medical care: the current state of “eVisits” in acute primary care delivery. *Telemed J E Health*. 2015;21(2):90–96
53. Mair F, Whitten P. Systematic review of studies of patient satisfaction with telemedicine. *BMJ*. 2000;320(7248):1517–1520
54. Ekeland AG, Bowes A, Flottorp S. Effectiveness of telemedicine: a systematic review of reviews. *Int J Med Inform*. 2010;79(11):736–771
55. Whitten P, Johannessen LK, Soerensen T, Gammon D, Mackert M. A systematic review of research methodology in telemedicine studies. *J Telemed Telecare*. 2007;13(5):230–235
56. Ekeland AG, Bowes A, Flottorp S. Methodologies for assessing telemedicine: a systematic review of reviews. *Int J Med Inform*. 2012;81(1):1–11
57. Mistry H, Garnvwa H, Oppong R. Critical appraisal of published systematic reviews assessing the cost-effectiveness of telemedicine studies. *Telemed J E Health*. 2014;20(7):609–618
58. Whitten P, Holtz B, Laplante C, Alverson D, Krupinski E. An independent investigation into the deployment of the federal communications commissions' rural health care pilot program. *Telemed J E Health*. 2010;16(10):1005–1011
59. Hansen MB, Klatt T. The interstate medical licensure compact: what physicians should know. *S D Med*. 2015;68(2):81
60. McSwain SD, Marcin JP. Telemedicine for the care of children in the hospital setting. *Pediatr Ann*. 2014;43(2):e44–e49

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