Integrating Telemedicine Into Training: Adding Value to Graduate Medical Education Through Electronic Consultations

Michelle S. Lee, BA
Vinod Nambudiri, MD, MBA, FACP, FAAD

Lack of timely access to high-quality specialty care in the United States remains an enormous challenge, especially for uninsured and rural populations.[1] Over 70% of federally qualified health centers reported barriers to specialty care for their patients, leading to diagnostic delays and poor health outcomes.[2,3] A recent study found that 86% of referral coordinators in a community health center cited patient insurance as the most important driver of poor access to specialty care.[4] The increasing pressure for primary care clinicians to manage complex patients in shorter visits may also incentivize over-referrals: The US referral rates doubled from 1999 to 2009.[5] These trends, as well as an ongoing national emphasis on cost savings in health care, have led to a recent increase in the use of telemedicine.[6] Learning how to utilize telemedicine has become more relevant for trainees preparing to enter the physician workforce. Integrating telemedicine into graduate medical education (GME) curricula provides an important mechanism for improving trainee education on value-based care and increasing access to specialty care.

Electronic consultation allows primary care clinicians to submit electronic clinical referrals and inquiries to specialists and engage in virtual dialogue regarding patient management. Specialists communicate with the requesting clinician and either give clinical management recommendations or determine that an in-person specialist visit is required. Electronic consultation systems have helped increase access to specialty care by reducing unnecessary in-person visits and decreasing wait times.[7]

Such platforms have been implemented across academic and community-based settings, and early studies have demonstrated tremendous potential to increase specialty care access and help educate primary care clinicians.[8–11] Despite their clinical value, most medical schools, residency programs, and fellowships have not directly integrated methods of providing and requesting electronic consultations into training.[10,11] This presents an opportunity to better engage future clinicians in the management of their patients, improve coordination of care with specialists, and ultimately improve access to specialty care using technology.

Primary care clinicians who use electronic consultations have endorsed the technology's educational impact, recognizing its potential for inclusion in GME curricula.[10,11] Up to 90% of surveyed primary care physicians reported that electronic consultations enhanced their knowledge of new specialties and conditions and improved their clinical confidence when managing subsequent similar patients.[10,11] Electronic consultations may have the most educational benefit for those in the earliest stages of their careers. Nurse practitioners, physician assistants, trainee physicians, and primary care physicians with fewer than 10 years of clinical experience were more likely to report greater benefit, especially for such lab-based diagnosis and management as abnormal liver function tests and anemia.[10] These skills directly reflect multiple Accreditation Council for Graduate Medical Education (ACGME) core competencies, including systems-based practice and practice-based learning and improvement, which all GME trainees are expected to cultivate during their clinical training.[11]

Given the data supporting the educational impact of training on the use of electronic consultations,[10,12,13] those creating GME curricula should consider incorporating training on the appropriate request for and provision of electronic consultations. Electronic consultation questions associated with the highest rate of avoided referrals included those pertaining to diagnosis, nonspecific requests for direction, questions without specified interventions or outcomes, and questions concerning dermatology cases.[14] Additionally, as prior studies have suggested that the highest rate of avoided referrals stems from electronic consultations for dermatology, hematology, and endocrinology, specific curricula in these fields would help maximize the appropriateness of electronic consultation referrals.[14]

DOI: http://dx.doi.org/10.4300/JGME-D-18-00754.1

TABLE 1
ECONSULT Card: A Framework of Considerations When Approaching an Electronic Consult[a]

E	Evaluate: does the patient require an in-person visit with a specialist or can this be addressed by electronic consultation?
C	Clinical question: focused and direct question for consultant
O	Objective data: specific information relevant to clinical question
N	Narrative: subjective information relevant to clinical question
S	Strategies: diagnostic or treatment approaches that have already been tried relevant to the clinical question
U	Unique characteristics: patient or clinical features that might make this consultation unique
L	Length of time: provide a length of time for the consultant to reply to the electronic consult (urgent/acute versus less pressing)
T	Teamwork: identification of other relevant members in the patient's care team who may benefit from knowing the results of the electronic consultation

[a] Adapted from Podolosky et al.[15]

Electronic consultations offer additional benefits for instructing trainees on value-based care and systems-based practice. They help patients who live far from health care settings avoid long commute times and higher costs.[9] They also help trainees understand how a patient's insurance status and other potential barriers to specialty access influence whether they receive timely specialty input. Trainees can also learn about technical and policy barriers to electronic consultations, including which consults are covered by insurance, how reimbursements may differ for in-person versus remote consultations, and variations in state and national policies that shape the delivery of care.

Trainees should understand how to optimize effective communication and enhance care coordination within the confines of an electronic consultation. Electronic consultations can either strengthen the quality of communication with specialists or further complicate dialogue among physicians, underscoring the critical need for appropriate education.[12] Moreover, electronic consultation training will prepare trainees to incorporate time spent on telemedicine into their posttraining workflow.

Integration of electronic consultation practices and other telemedicine services into GME curricula for fellows has already begun. McGovern Medical School at the University of Texas Health Science Center has implemented an 8-week formal telestroke rotation, which involves undergoing orientation to the platform and consultation process, shadowing attending physicians using telemedicine, and participating in telestroke case conferences.[16] Most stroke fellows felt that telemedicine improved access to acute stroke care in their region and that telemedicine training expanded their expertise as stroke neurologists. Of the participants, 81% agreed that telemedicine training should be required in a 1-year ACGME-accredited vascular neurology fellowship, and 71% recommended at least 3 to 4 weeks of a formal telemedicine rotation. Such curricula may serve as models for integrating electronic consultation education into other residency and training programs. We have adapted a framework to approach electronic consultations that can be used as a reference in training programs using the ECONSULT mnemonic (TABLE 1).

Asynchronous teledermatology programs (like electronic consultations) have also been implemented into curricula for specialist and primary care trainees. At the Denver Veterans Affairs Medical Center, dermatology residents review consults independently and subsequently with a faculty preceptor while medical students observe. Eighty-five percent of residents and 94% of medical students reported satisfaction with the applicability of teledermatology for the ACGME core competences of medical knowledge and practice-based learning and improvement.[11,17] In a survey of dermatology residency programs, 47% reported using telemedicine as part of their residency curriculum.[18]

Potential barriers to developing electronic consultation curricula may include a lack of standardized use across sites and multiple platforms of electronic consultations. An understanding of how clinicians in more remote locations use electronic consults, compared with those in urban environments, will also be needed as most academic centers are located in urban areas.[19] There may also be workflow limitations to implementing such programming as busy residents already have full educational curricula. It may be challenging for residency programs to identify appropriate experts to serve as instructors. TABLE 2 summarizes the barriers to implementing telemedicine.

As programs focus on integrating technology into various medical education curricula (such as the optimization of chronic care and care coordination[20]), investing resources in electronic consultation education will benefit not only learners but also educators, patients, and ultimately the health care system. A unique opportunity exists to help trainees provide high-quality care for their patients by building competence in requesting and providing electronic consultation.

TABLE 2
Telemedicine Interventions and Barriers in Medical Education

Intervention	Group Targeted	Format	Potential Barriers to Implementation
Telestroke curriculum[16]	Stroke neurology fellows	Shadowed 3–5 consultations, 10 cases with attending, 30 acute stroke consultations	▪ Lack of standardized methodology for training or evaluating competency in telestroke ▪ Limited access to telestroke services ▪ Licensing and credentialing of fellows could take several months and affect training ▪ Lack of measurable learning objectives
Teledermatology rotation[17]	Dermatology residents and medical students	During a clinical rotation, residents evaluated teledermatology cases then reviewed with faculty preceptor; medical students observed	▪ Inconsistent use of teledermatology across institutions ▪ Regional variation in telemedicine reimbursement laws
Teledermatology curriculum[21]	Internal medicine residents	Dermatology education provided via interactive videoconferencing from dermatology residents with 12 lectures and 10 case presentations	▪ Unknown effects on resident knowledge, skills, and behaviors
Teledermatology rotation[22]	Dermatology residents	Dermatology residents staffed urgent care clinic using teledermatology	▪ Equipment failures ▪ Resident dissatisfaction with the system, including slowness
Telemedicine elective[23]	Fourth-year medical students	Four-week elective course, including 2 online courses, site visits, and a written assignment	▪ Difficulty in introducing new topics into full medical school curriculum ▪ Offering the course as an elective serves small, self-selecting group of students

References

1. Cook NL, Hicks LS, O'Malley AJ, Keegan T, Guadagnoli E, Landon BE. Access to specialty care and medical services in community health centers. *Health Aff (Millwood)*. 2007;26(5):1459–1468. doi:10.1377/hlthaff.26.5.1459.
2. Knudtson ML, Beanlands R, Brophy JM, Higginson L, Munt B, Rottger J. Treating the right patient at the right time: access to specialist consultation and non-invasive testing. *Can J Cardiol*. 2006;22(8):19–24.
3. Levin A. Consequences of late referral on patient outcomes. *Nephrol Dial Transplant*. 2000;15(suppl 3):8–13.
4. Ezeonwu MC. Specialty-care access for community health clinic patients: processes and barriers. *J Multidiscip Healthc*. 2018;11:109–119. doi:10.2147/JMDH.S152594.
5. Mehrotra A, Forrest CB, Lin CY. Dropping the baton: specialty referrals in the United States. *Milbank Q*. 2011;89(1):39–68. doi:10.1111/j.1468-0009.2011.00619.x.
6. Association of American Medical Colleges. Project CORE: Coordinating Optimal Referral Experiences. https://www.aamc.org/initiatives/core2/. Accessed April 5, 2019.
7. Barnett ML, Yee HF Jr, Mehrotra A, Giboney P. Los Angeles safety-net program eConsult system was rapidly adopted and decreased wait times to see specialists. *Health Aff (Millwood)*. 2017;36(3):492–499. doi:10.1377/hlthaff.2016.1283.
8. Malagrino GD, Chaudhry R, Gardner M, Kahn M, Speer L, Spurrier BR, et al. A study of 6,000 electronic specialty consultations for person-centered care at The Mayo Clinic. *Int J Person Centered Care*. 2012;2(3):458–466.
9. Kirsh S, Carey E, Aron DC, Cardenas O, Graham G, Jain R, et al. Impact of a national specialty e-consultation implementation project on access. *Am J Manag Care*. 2015;21(12):e648–e654.
10. Kwok J, Olayiwola JN, Knox M, Murphy EJ, Tuot DS. Electronic consultation system demonstrates educational benefit for primary care providers. *J Telemed Telecare*. 2018;24(7):465–472. doi:10.1177/1357633X17711822.
11. Accreditation Council for Graduate Medical Education. Common program requirements. 2017. www.acgme.org/Portals/0/PFAssets/ProgramRequirements/CPRs_2017-07-01.pdf. Accessed April 5, 2019.
12. Keely EJ, Archibald D, Tuot DS, Lochnan H, Liddy C. Unique educational opportunities for PCPs and specialists arising from electronic consultation services.

Acad Med. 2017;92(1):45–51. doi:10.1097/ACM.0000000000001472.
13. Lee MS, Ray KN, Mehrotra A, Giboney P, Yee HF Jr, Barnett ML. Primary care practitioners' perceptions of electronic consult systems: a qualitative analysis. *JAMA Intern Med*. 2018;178(6):782–789. doi:10.1001/jamainternmed.2018.0738.
14. Tran C, Liddy C, Pinto N, Keely E. Impact of question content on e-consultation outcomes. *Telemed J E Health*. 2016;22(3):216–222. doi:10.1089/tmj.2015.0081.
15. Podolsky A, Stern DT, Peccoralo L. The courteous consult: a CONSULT card and training to improve resident consults. *J Grad Med Educ*. 2015;7(1):113–117. doi:10.4300/JGME-D-14-00207.1.
16. Jagolino AL, Jia J, Gildersleeve K, Ankrom C, Cai C, Rahbar M, et al. A call for formal telemedicine training during stroke fellowship. *Neurology*. 2016;86(19):1827–1833. doi:10.1212/WNL.0000000000002568.
17. Boyers LN, Schultz A, Baceviciene R, Blaney S, Marvi N, Dellavalle RP, et al. Teledermatology as an educational tool for teaching dermatology to residents and medical students. *Telemed J E Health*. 2015;21(4):312–314. doi:10.1089/tmj.2014.0101.
18. Wanat K, Newman S, Finney KM, Kovarik CL, Lee I. Teledermatology education: current use of teledermatology in US residency programs. *J Grad Med Educ*. 2016;8(2):286–287. doi:10.4300/JGME-D-16-00041.1.
19. Ogbechie OA, Nambudiri VE, Vleugels RA. Teledermatology perception differences between urban primary care physicians and dermatologists. *JAMA Dermatol*. 2015;151(3):339–340. doi:10.1001/jamadermatol.2014.3331.
20. Shi CR, Nambudiri VE. Time for an acute focus on chronic care in undergraduate medical education. *Acad Med*. 2018;93(6):835–838. doi:10.1097/ACM.0000000000002177.
21. Williams CM, Kedar I, Smith L, Brandling-Bennett HA, Lugn N, Kvedar JC. Teledermatology education for internal medicine residents. *J Am Acad Dermatol*. 2005;52(6):1098–1099. doi:10.1016/j.jaad.2005.01.111.
22. Scheinfeld N. The use of teledermatology to supervise dermatology residents. *J Am Acad Dermatol*. 2005;52(2):378–380. doi:10.1016/j.jaad.2004.07.050.
23. Bulik RJ, Shokar GS. Integrating telemedicine instruction into the curriculum: expanding student perspectives of the scope of clinical practice. *J Telemed Telecare*. 2010;16(7):355–358. doi:10.1258/jtt.2010.090910.

Michelle S. Lee, BA, is a Second-Year Medical Student, Harvard Medical School; **Vinod Nambudiri, MD, MBA, FACP, FAAD,** is Assistant Professor of Dermatology, Department of Dermatology, Harvard Medical School and Brigham and Women's Hospital.

Corresponding author: Vinod Nambudiri, MD, MBA, FACP, FAAD, Brigham and Women's Hospital, Department of Dermatology, 221 Longwood Avenue, Boston, MA 02115, 617.732.4918, vnambudiri@bwh.harvard.edu