More Than Meets the Eye: Addressing the Role of Telemedicine in Resident Education

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BACKGROUND

The landscape of health care delivery has significantly changed in a matter of months with the onset of the coronavirus disease 2019 (COVID-19) pandemic.[1] Given the continued potential for rapid spread of the virus,[2] many health care systems, independent hospitals, private practices, and urgent care clinics have adopted telemedicine as a means of providing care to patients while reducing the risk of exposure. This narrative review discusses the benefits of current telemedicine applications and proposes an operational framework, as well as recommendations for integrating telemedicine in resident physician training.

Telemedicine has been defined as "the process by which electronic, visual, and audio communications [are] used to (1) provide diagnostic and consultation support to practitioners at distant sites, (2) assist in or directly deliver medical care to patient sites, and (3) enhance the skills and knowledge of distant medical care providers."[3] Visits can occur synchronously (eg, telephone video), asynchronously (eg, patient portal messages, "e-consultations"), and through virtual agents (eg, chatbots).[4] Patients can even use wearable monitoring devices (eg, pulse oximeter, cardiac monitors) for home monitoring, providing additional information to the telemedicine practitioner.[4]

As of 2018, only 35 states and the District of Columbia had enacted parity laws (laws that determine reimbursement based on "equivalent treatment of analogous services" between in-person and telehealth services),[5] and approximately three quarters of health care facilities in the United States were treating patients by video or other virtual technology.[6] Now, clinicians are treating 50 to 175 times the number of patients through telehealth than they did before the pandemic.[7,8] Moreover, new guidelines from the Centers for Medicare & Medicaid Services that were approved for COVID-19 allowed for expanded Centers for Medicare & Medicaid Services reimbursement for services offered through telehealth, including emergency services.[9]

The biggest barriers include high-speed Internet access in rural areas; accessibility to technology and Internet or cellular service for low-income households, racial/ethnic minorities, older adults, and the homeless; and limited digital literacy or English proficiency.[10] To address these barriers, clinicians and administrators should "(1) proactively explore potential disparities in telemedicine access, (2) develop solutions to mitigate barriers to digital literacy and the resources needed for engagement in video visits, (3) remove health system-created barriers to accessing video visits, and (4) advocate for policies and infrastructure that facilitate equitable telemedicine access."[10] Launching a telehealth program also has initial limitations owing to the financial burdens and time needed for implementation. Significant costs are required to acquire the equipment, conduct training, and maintain the infrastructure with project management. Furthermore, it can take hundreds of work hours for information services analysts to create and build an operational strategy. In all, this requires dedication and buy-in from leadership.

However, the rapid and widespread expansion of telemedicine during the COVID-19 pandemic has demonstrated that the infrastructure for connectivity exists and can be scalable because of widespread Internet and cellular service and smart devices. The swift implementation has also shown that the logistics pertaining to training, staffing, and work flow can be promptly organized.[11]

As the telemedicine market expands, some experts have suggested the need for greater recognition and training during residency.[12] However, incorporating telemedicine into residency education requires focused training to develop unique skills for this environment. Therefore, it is important for emergency medicine residents and practicing physicians to be aware of and be trained in this modality.

BENEFITS OF TELEMEDICINE

With increasing annual emergency department (ED) visits, an aging population, and increasing health care costs, telemedicine offers an opportunity to increase patient access while reducing costs of care.[13]

Telemedicine availability gives patients an opportunity to access care for everything from minor injuries to acute conditions with minimal wait times. Additional benefits to patients include the convenience of having the visit conducted remotely and decreased cost to the patient.[14] For urgent care–type visits, the savings can be significant. According to a study by the Health Care Cost Institute, the average cost for a visit to the ED was $1,389 in 2017.[15] In comparison, one study found that for low-acuity complaints (eg, upper respiratory infections, rash, urinary tract infections) telehealth visits could save patients between $36 and $1,735, depending on whether they sought subsequent care at their primary care provider's office, an urgent care, a retail health clinic, or the ED.[16]

Emergency physicians already have diverse training and expertise with managing a variety of conditions, ranging from nonemergency to emergency, which can be readily applied to the telemedicine environment. Furthermore, many lower-acuity visits can be completed with good history taking and do not require a full physical examination. In a National Health Interview Survey, it was found that 12% of adults aged 18 to 64 years resorted to visiting the ED because their physician's office was not open, and 7% visited because of lack of access to other providers.[17] Many of these visits could be avoided if there were greater access to care available for these patients. Telemedicine offers one potential solution to this, and implementing telemedicine for the ED may lessen the burden of ED utilization and cost.[18] A claims-based analysis by McKinsey & Company suggested that approximately 20% of ED visits could be avoided through virtual urgent care offerings.[19] Moreover, telemedicine has not been shown to reduce overall patient satisfaction. Press Ganey administered more than 3.5 million telemedicine surveys in less than 2 months and found that virtual visits were able to achieve patient experience ratings similar to those of in-person visits.[20]

In addition, telemedicine use could allow emergency physicians in high-risk groups (eg, older, immunosuppressed), those with child care responsibilities, and those who can no longer practice for medical reasons to work remotely in a less physical, lower-stress environment. It may also serve as a supplemental source of income for practicing physicians.

CURRENT APPLICATIONS OF TELEMEDICINE IN EMERGENCY MEDICINE

The relationship between emergency medicine and telemedicine dates back more than 40 years, with some of its earliest applications in the out-of-hospital setting.[21] A systematic review of the tele–emergency medicine literature described 3 main categories of applied tele–emergency medicine: telemedicine for general emergency medicine care, telemedicine for minor injuries or illnesses, and telemedicine for special patient populations.[22] Specific applications for general emergency medicine include connecting remote treatment clinics to larger EDs and providing remote consultation services.[22] Programs such as telestroke and teletrauma offer care for special patient populations, both onsite and remotely.[22] In the rural setting, patients and clinicians face significant barriers regarding accessibility of care, expertise, and technology, particularly when it comes to stroke and trauma care. The implementation of telestroke made significant improvements in stroke identification, treatment, and outcomes.[23] Teletrauma programs have bridged these gaps by providing trauma evaluations and specialized assessments for patients in remote areas.[24] Furthermore, owing to continued ED crowding, some EDs have used telemedicine to increase the number of clinicians during surges of patient in-person and at-home visits.[25] Implementing telescreening and forward triage in the ED to perform expeditious medical screening examinations may reduce the left-without-being-seen rate during surge times[25] and even decrease unnecessary ED utilization.[26] These processes assist in identifying patients with low- versus high-risk symptoms to expedite care and improve outcomes.[27]

OPERATIONAL FRAMEWORK

There are several examples of EDs effectively using telehealth to improve their service to their communities. New York–Presbyterian/Weill Cornell Medicine can serve as a good framework for implementing telemedicine in the ED to treat lower-acuity patients.[28] Patients with minor injuries or illnesses (eg, wound checks, upper respiratory infections, contusions, suture removals, simple rashes) who arrive to their ED are offered virtual visits through the Express Care Service.[28] Patients are triaged by a nurse, followed by a medical screening examination performed by an advanced practice provider. The patient is then brought to an examination room, where they are treated virtually by an attending emergency physician who is located remotely and then discharged with printed instructions and appropriate follow-up.[28] This program is staffed by emergency physicians and is open 16 hours a day, 7 days a

week. The length of stay for patients treated by the Express Care Service is 35 to 40 minutes (compared with 2.5 hours in the ED) and patient satisfaction scores have been in the 99th percentile.[28]

At Rush University Medical Center, an on-demand virtual care platform was first created in 2019, but as the COVID-19 pandemic surged, the platform was expanded to meet demand. Attending physicians, residents, and advance practice providers whose clinics were closed, whose rotations were cancelled, or who were quarantined were recruited and trained to conduct these visits. Emergency medicine residents conducted visits with patients whose chief complaint was concern for novel coronavirus. Attending physicians were able to treat a broader variety of patients, including those with minor injuries, rashes, headaches, and upper respiratory infections. A tutorial was created by providers that instructed patients about how to take their own temperature, measure pulse rate and respiratory rate, perform a throat examination, check neck range of motion, and palpate their abdomen. Residents staffed cases with attending physicians through the chat function in the electronic medical record, by telephone, or by adding them to the video encounter to staff cases. If patients needed in-person care, they were directed to the nearest ED and the charge nurse was notified to streamline care.

Telemedicine can also be used for physician-to-physician consultations, obtaining consent, discussing results with patients, calling other physicians about admissions, or for coordinating transfers. Recently, the Rush University Medical Center ED expanded the use of tablet devices to conduct virtual consultations; this was an initiative already in place for inpatients. Currently, infectious disease, cardiology, palliative care, neurology (outside of telestroke care), and nephrology are using this service. A consultation order is placed through the electronic medical record, and the emergency physician can choose the priority for the consultation (ie, routine, pending discharge, or urgent), choose details of the consultation need, and specify whether a virtual consultation may be appropriate. If a virtual consultation is agreed on by the emergency physician, consultant, and patient, they are connected virtually.

EXISTING RESIDENT TRAINING ON TELEMEDICINE

Although interest in telemedicine programs has generated numerous peer-reviewed articles, few of these have explicitly discussed telemedicine as a learning opportunity for physicians in training. In fact, one study of 104 specialty-specific resident milestones found that only one (child and adolescent psychiatry) mentioned

telehealth.[29] A 2017 systematic review of telemedicine applications in acute care or ED settings identified 480 full-text articles but none that explicitly discussed residency training programs' involvement.[30]

One ED-based study analyzed third-year emergency medicine residents at Thomas Jefferson University, where they integrated telehealth into their clinical activities for 1 year, focusing on follow-up visits with ED patients.[12] Seventy percent of the residents found the experience valuable for their education.[12] Moreover, patients believed the follow-up visits were helpful in understanding their care and rated the experience 8.2 of 10.[12] This model may also assist with reassessing patients postdischarge and addressing any subsequent patient questions. A similar study was conducted with critical care residents, assessing their perceptions of telehealth on patient care and their training.[31] In this study, 95% percent of respondents thought telehealth benefited their patient care.[31] However, 43% of residents thought that their autonomy was diminished with telehealth.[31] In the outpatient setting, neurology residents favorably reviewed a 1-month required teleneurology curriculum.[32] After a 2-week focused telemedicine rotation that included telemedicine training modules, neurology residents' impression of video visits improved with respect to their ability to take a focused history, formulate an assessment and plan, communicate recommendations, and provide overall care.[32] The most significant change occurred regarding perceived reduction in caregiver burden, which was rated as a major benefit of telemedicine by 91% of participants. [32]

STRATEGIES FOR INTEGRATION INTO RESIDENT EDUCATION

On March 18, 2020, the Accreditation Council for Graduate Medical Education issued guidance for residency programs regarding operations conducted during the COVID-19 pandemic, including telemedicine care.[33,34] The requirements for supervision were amended to allow direct supervision, even when the attending physician and resident were not occupying the same work space. This form of virtual direct supervision, in which clinicians were using the same electronic workspace concurrently in different locations, formalized a trainee supervision process and allowed programs to expand their telemedicine care to physicians in training.

Many residents starting their first year of postgraduate training are unlikely to have been exposed to telehealth training before graduating from medical school. One study from 2014 to 2019 found that only half of medical schools provide telemedicine training.[29] Ideally, clinical rotations should integrate telemedicine in medical school to provide

Figure. Recommendations for integration of telemedicine into resident education.

- Introduction to telemedicine through simulated patient encounters for resident physicians early in their training, with the use of simulated patients
- Supervised clinical training during early training years, with graded responsibility for senior-level resident physicians, with actual patients and attending physician supervision
- Incorporating telemedicine into multiple visit types (eg, initial triage/medical screening examination, low-acuity visits, subspecialist consultations, patient follow-up)
- Real-time feedback from attending physicians and patients at the end of the virtual visit

a base for residencies to expand on. Pourmand et al[29] provided insight into the lack of telehealth exposure during medical school and its effects. They stated that by not performing this training early, residents and attending physicians may not acquire valuable skills in their ability to consult with and treat patients remotely.[29]

The Accreditation Council for Graduate Medical Education guidance also allowed programs to develop telemedicine processes that were flexible and could adapt to a rapidly changing clinical environment. They recognized the necessity for telemedicine during the COVID-19 pandemic as a means to decrease the burden on clinicians.[34] At certain institutions, including our own residency program, senior-level residents provide telemedicine care to patients as part of their training.

One of the challenges with teaching these telemedicine techniques is the oversight required by an attending physician during the visits. The study at Thomas Jefferson required supervision for one quarter of interactions. The Accreditation Council for Graduate Medical Education guidance now considers the availability of remote attending physician supervision to meet the guidelines.[34] However, most medical specialties have yet to write specific milestone language for telemedicine into their standard postgraduate training requirements.[12] Owing to these recent changes, few if any observational tools and competency assessment techniques exist to grade resident physicians on their ability to provide care in this setting.[35] There is a strong need to create assessment tools for these skills, and we believe early integration with competency-based assessment is vital for resident success (Figure).

Another strategy is to model the visits similar to in-person ED encounters. The resident would evaluate the patient, make a plan, and discuss the case with the attending physician. The attending physician would then perform his or her own evaluation and discuss the assessment and plan with the resident. In this way, multiple residents could work under one attending physician, increasing the number of patients treated remotely while ensuring adequate supervision and teaching.

Developing a robust system for telehealth training during residency training will provide residents with many ancillary benefits in their careers. These include flexible work schedules during times of planned leaves, improvement of work-life balance, and increased marketability in an ever-changing job market.

CONCLUSIONS AND FUTURE DIRECTIONS

Telemedicine has significant benefits regarding access to care and health care cost savings. The COVID-19 pandemic forced clinicians to implement new strategies to reach more patients while limiting patient and clinician exposure. We used existing frameworks to build a robust telemedicine presence and, with continual improvement in technology, believe these methods will provide access to care for individuals facing health care disparities. Despite this, telemedicine is infrequently taught during medical training. In this article, we proposed dedicated telemedicine training during residency with a combination of didactic content, simulation experiences, and supervised telemedicine shifts. Given the paucity of literature on this, future studies should evaluate educational strategies for telemedicine and the ideal frequency and structure of resident telemedicine shifts. With the increasing growth of telemedicine, training during residency will be vital for the future attending physicians in emergency medicine.

of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

REFERENCES

1. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382:1708-1720.
2. Sanche S, Lin YT, Xu C, et al. High contagiousness and rapid spread of severe acute respiratory syndrome coronavirus 2. *Emerg Infect Dis*. 2020;26:1470-1477.
3. Lambrecht CJ. Emergency physicians' roles in a clinical telemedicine network. *Ann Emerg Med*. 1997;30:670-674.
4. Wosik J, Fudim M, Cameron B, et al. Telehealth transformation: COVID-19 and the rise of virtual care. *J Am Med Inform Assoc*. 2020;27:957-962.
5. Yang T. Health policy brief: telehealth parity laws. Available at: https://www.healthaffairs.org/do/10.1377/hpb20160815.244795/full/. Accessed August 13, 2020.
6. American Hospital Association. Fact sheet: telehealth. Available at: http://www.aha.org/factsheet/telehealth. Accessed August 1, 2020.
7. Erickson M. Stanford Medicine increases use of televisits to help prevent spread of coronavirus. Available at: https://med.stanford.edu/news/all-news/2020/03/stanford-increases-use-of-telemedicine.html. Accessed November 1, 2020.
8. Palo Alto Medical Foundation. Video visits and COVID-19 response. Available at: https://www.sutterhealth.org/patient-stories/video-visits-covid-19-response. Accessed November 1, 2020.
9. Centers for Medicare & Medicaid Services. Trump administration makes sweeping regulatory changes to help US healthcare system address COVID-19 patient surge. Available at: https://www.cms.gov/newsroom/press-releases/trump-administration-makes-sweeping-regulatory-changes-help-us-healthcare-system-address-covid-19. Accessed August 1, 2020.
10. Nouri S, Khoong E, Lyles C, et al. Addressing equity in telemedicine for chronic disease management during the Covid-19 pandemic. Available at: https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0123. Accessed November 1, 2020.
11. Bashshur R, Doarn CR, Frenk JM, et al. Telemedicine and the COVID-19 pandemic, lessons for the future. *Telemed J E Health*. 2020;26:571-573.
12. Papanagnou D, Stone D, Chandra S, et al. Integrating telehealth emergency department follow-up visits into residency training. *Cureus*. 2018;10:e2433.
13. Donelan K, Barreto EA, Sossong S, et al. Patient and clinician experiences with telehealth for patient follow-up care. *Am J Manag Care*. 2019;25:40-44.
14. Qiu C, Joshi A. Telemedicine. Available at: https://www.emra.org/emresident/article/telemedicine/. Accessed August 1, 2020.
15. Health Care Cost Institute. HCCI releases 2017 health care cost and utilization report. Available at: https://healthcostinstitute.org/in-the-news/2017-hccur. Accessed August 13, 2020.
16. Gordon AS, Adamson WC, DeVries AR. Virtual visits for acute, nonurgent care: a claims analysis of episode-level utilization. *J Med Internet Res*. 2017;19:e35.
17. Gindi RM, Black LI, Cohen RA. Reasons for emergency room use among US adults aged 18-64: National Health Interview Survey, 2013 and 2014. *Natl Health Stat Rep*. 2016;(90):1-16.
18. Langabeer JR 2nd, Champagne-Langabeer T, Alqusairi D, et al. Cost-benefit analysis of telehealth in pre-hospital care. *J Telemed Telecare*. 2017;23:747-751.
19. Bestsennyy O, Gilbert G, Harris A, et al. Telehealth: a quarter-trillion-dollar post-COVID-19 reality?. Available at: https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality. Accessed November 1, 2020.
20. Ganey Press. The rapid transition to telemedicine: insights and early trends whitepaper. Available at: https://www.pressganey.com/resources/white-papers/the-rapid-transition-to-telemedicine-insights-and-early-trends. Accessed August 1, 2020.
21. Sikka N, Paradise S, Shu M. Telehealth in emergency medicine: a primer. Available at: https://www.acep.org/globalassets/uploads/uploaded-files/acep/membership/sections-of-membership/telemd/acep-telemedicine-primer.pdf. Accessed August 1, 2020.
22. Ward MM, Jaana M, Natafgi N. Systematic review of telemedicine applications in emergency rooms. *Int J Med Inform*. 2015;84:601-616.
23. Witrick B, Zhang D, Switzer JA, et al. The association between stroke mortality and time of admission and participation in a telestroke network. *J Stroke Cerebrovasc Dis*. 2020;29:104480.
24. Prabhakaran K, Lombardo G, Latifi R. Telemedicine for trauma and emergency management: an overview. *Curr Trauma Rep*. 2016;2:115-123.
25. Rademacher NJ, Cole G, Psoter KJ, et al. Use of telemedicine to screen patients in the emergency department: matched cohort study evaluating efficiency and patient safety of telemedicine. *JMIR Med Inform*. 2019;7:e11233.
26. Shaheen E, Guyette F, Sikka N. Review of telehealth literature whitepaper. Available at: https://www.acep.org/globalassets/sites/acep/blocks/section-blocks/telemd/final-whitepaper---sans-definition-8-7-19.pdf. Accessed August 1, 2020.
27. Love RA, Murphy JA, Lietz TE, et al. The effectiveness of a provider in triage in the emergency department: a quality improvement initiative to improve patient flow. *Adv Emerg Nurs J*. 2012;34:65-74.
28. Sharma R, Fleischut P, Barchi D. Telemedicine and its transformation of emergency care: a case study of one of the largest US integrated healthcare delivery systems. *Int J Emerg Med*. 2017;10:21.
29. Pourmand A, Ghassemi M, Sumon K, et al. Lack of telemedicine training in academic medicine: are we preparing the next generation? *Telemed J E Health*. 2021;27:62-67.
30. Sharma R, Clark S, Torres-Lavoro J, et al. Telemedicine in the emergency department: a novel, academic approach to optimizing operational metrics and patient experience. *Ann Emerg Med*. 2017;70:S128.
31. Dang B, Taylor B, Moore K, et al. The effect of ICU telemedicine on resident perceptions of education, autonomy, and patient care. *Crit Care Med*. 2018;46:S391.
32. Afshari M, Witek NP, Galifianakis NB. Education research: an experiential outpatient teleneurology curriculum for residents. *Neurology*. 2019;93:170-175.
33. Nasca TJ. ACGME response to the coronavirus (COVID-19). Available at: https://acgme.org/Newsroom/Newsroom-Details/ArticleID/10111/ACGME-Response-to-the-Coronavirus-COVID-19. Accessed August 1, 2020.
34. Accreditation Council for Graduate Medical Education. ACGME response to COVID-19: clarification regarding telemedicine and ACGME surveys. Available at: https://www.acgme.org/Newsroom/Blog/Details/ArticleID/10125/ACGME-Response-to-COVID-19-Clarification-regarding-Telemedicine-and-ACGME-Surveys. Accessed August 1, 2020.
35. Gottlieb M, Jordan J, Siegelman J, et al. Direct observation tools in emergency medicine: a systematic review of the literature. AEM Educ Train. doi:10.1002/aet2.10519.