Digital disparities: designing telemedicine systems with a health equity aim

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ABSTRACT
The use of telemedicine has grown immensely during the COVID-19 pandemic. Telemedicine provides a means to deliver clinical care while limiting patient and provider exposure to the COVID-19. As such, telemedicine is finding applications in a variety of clinical environments including primary care and the acute care setting and the array of patient populations who use telemedicine continues to grow. Yet as telehealth becomes ubiquitous, it is critical to consider its potential to exacerbate disparities in care. Challenges accessing technology and digital literacy, for example, disproportionately impact older patients and those living in poverty. When implemented with the consideration of health disparities, telemedicine provides an opportunity to address these inequities. This manuscript explores potential mechanisms by which telemedicine may play a role in exacerbating or ameliorating disparities in care. We further describe a framework and suggested strategies with which to implement telemedicine systems to improve health equity.

INTRODUCTION
The use of telemedicine for healthcare delivery has been steadily growing, and recently skyrocketed in the setting of the COVID-19 pandemic.[1] Changes in compensation for virtual visits and efforts to decrease patients' and providers' risk of exposure to the virus have led to exponential growth in adoption of telemedicine and innovations in applications of use.[1–3] Yet, barriers to telehealth implementation remain including costs, technical challenges and patient preferences.[4 5]

Concerns have been raised about the potential for telemedicine to exacerbate existing disparities in care. Health disparities have been defined as differences among population groups as a result of social, economic, racial or ethnic characteristics, among others.[6] Limiting health disparities is one component of achieving health equity, which is the 'attainment of the highest level of health for all people… valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and healthcare disparities.'[7] Challenges accessing technology, digital literacy and unequal distribution of internet coverage[8] create barriers to accessing telemedicine that disproportionately impact communities of colour and those with low socioeconomic status.[9 10]

But telemedicine does not have to only exacerbate existing disparities. There are many potential targets for telemedicine to narrow disparity gaps including improving health literacy, technology adoption and access to care. Addressing health literacy includes addressing the structural, social and environmental barriers to understanding and using health information.[11 12] Telemedicine has the potential to address these foundations of health literacy with more personalised communication and ability to additionally overcome transportation and other societal barriers to care. As such, some telemedicine programmes have begun to focus on addressing disparities. For example, multiple studies have suggested applying telemedicine to improve access for rural populations.[13 14] An additional collaboration among public and private organisations led to the creation of a digital health model to address health disparities among an underserved, predominantly African American rural community.[15] Preliminary data from these studies included improved satisfaction among providers and patients as well as increased access to care. If designed with equity as a priority, the transition to virtual care has the potential to improve both quality and equity of the care.

The appropriate strategies for developing equitable care systems will differ depending on the type of telehealth programme involved. In fact, studies have shown that telehealth adoption may be dependent on multiple factors including the social support needs of end-users and individual attributes.[16] Consideration of the various categories of telehealth programmes may thus inform tailored strategies to optimise use and ultimately reduce disparities. This perspective provides a framework to aid institutions in developing telehealth systems with consideration of health disparities.

FRAMEWORK
The variety of telehealth programme types presents a challenge towards developing modalities with an equity focus. Some programmes involve direct interaction of a provider with the patient at home (eg, virtual urgent care or primary care visits), others involve the provider interacting with the patient on-site (eg, inpatient and emergency visits)[17] and still others involve provider-to-provider contacts (eg, subspecialty consultation). Some systems, such as most tele-stroke programmes, involve a combination of these interactions, including complex networks between multiple providers and patients.

We have developed a framework stratified by the interaction involved and have described ways in which telemedicine may both exacerbate and ameliorate health disparities. We have also suggested strategies for implementation that prioritise equity (table 1).

Table 1 Telemedicine types and potential disparities implications

Telemedicine type	Exacerbate disparities	Ameliorate disparities	Suggested strategies
Provider-to-patient (at home)	▶ Digital access (device, wifi) ▶ Digital literacy ▶ Ease of interpreter incorporation ▶ Patient portal accessibility	▶ Less need to take time off for appointment ▶ Overcome transportation barriers ▶ Potential to build in automatic interpretation access ▶ Auditory translation for limited health literacy	▶ Leverage public assistance programmes to improve digital access for patients with low SES ▶ Implement telemedicine programmes with automatic interpretation access ▶ Provide access to private telemedicine care in community settings (eg, 'telemedicine booths')
Provider-to-patient (on-site)	▶ Interpreter access ▶ Interpreter quality ▶ Stigma and perceived bias around choice to avoid in-person exam[20]	▶ Interpreter access ▶ Reducing time-to-provider (some studies show longer waiting times in disparities populations)[21]	▶ Design on-site telemedicine programmes with interpretation access ▶ Acknowledge stigma and perceived biases with patients
Provider-to-provider	Under-resourced hospitals unable to access telemedicine services and consultation	Bring high-quality specialist care to hospitals that may not otherwise have access[27]	Support grant programmes for less-resourced hospitals to invest in tele-consulting technologies

SES, socioeconomic status.

Provider-to-patient (at home)

For systems that focus on connecting providers to patients at home, digital access (both devices and internet broadband), digital literacy and accessibility of the patient portal are critical to consider, as well as the ease of interpreter incorporation. At the same time, telehealth systems can reduce transportation and time-related barriers to care that may be particularly challenging for patients with limited transportation access and less flexible jobs. In addition, for patients with limited English proficiency, the use of video systems at baseline allows for video interpretation as the standard of care, which has been shown to improve comprehension as compared with telephonic audio-only interpretation.[18] Such systems could also provide auditory 'read-alouds' of written materials for patients with limited health literacy. Public interventions may also provide innovative solutions for improving access. For example, the creation of 'telemedicine booths' in shelters and libraries may provide a private space with internet access.

Provider-to-patient (on-site)

A separate set of considerations arises with respect to the on-site use of telemedicine as a strategy to facilitate provider-to-patient contacts. This is particularly seen in settings with a need to preserve personal protective equipment. It is critical to focus on issues of interpreter access and quality in these scenarios. Perhaps less-recognised, but equally important, is the need to examine stigma and perceived bias around choice to avoid in-person examination.[19] Perceived discrimination may otherwise contribute to negative healthcare experiences and lead to delays or avoidance of future healthcare.[20] Potential gains with this approach include the possibility of improved interpreter access, as well as reducing time-to-provider for patient encounters. This may help reduce disparities as studies have shown longer wait times for non-Hispanic black and Hispanic patients as compared with non-Hispanic white patients.[21]

Provider-to-provider

Finally, with respect to provider-to-provider telemedicine, many of the equity challenges centre around differences in where patients seek care and the resources of those hospitals. Given that minority and other vulnerable populations more often receive care at hospitals with lower performance and quality,[22] it is not unlikely that these same hospitals are less able to afford technologies to enable virtual consultations. However, if this barrier is overcome, these tele-consultation services have the potential to bring specialty evaluations (eg, neurology, paediatric emergency medicine) to environments that may otherwise have lacked access.

IMPLICATIONS FOR PRACTICE AND RESEARCH

An equity-focused approach to the development of telemedicine systems has several important implications for both practice and research. Practice implications include designing language interpretation into systems from the beginning as well as ensuring that evaluation of telemedicine services with diverse user groups such as those with limited English proficiency. This may also include addressing inequalities for patients with other health impairments, such as those with mobility restrictions and those who are deaf. In addition, novel strategies are needed to reduce barriers to entry. This could include offering services on a diverse set of platforms (as many existing portals are in English only or require providing a significant amount of identifying information to access), offering both audio and video options and considering opportunities to embed digital access in existing community resources (eg, shelters).

How the COVID-19 pandemic may impact health equity as it relates to telemedicine also warrants consideration. Historically, pandemics have highlighted previously existing health disparities. For example, wide variation in health outcomes among socioeconomic classes and neighbourhoods[23] was described in both the 1918 Spanish Influenza and H1N1 outbreak in 2009; similar differences in health outcomes have emerged during the COVID-19 pandemic.[24] Regarding the use of telemedicine to address these disparities, preliminary studies have demonstrated that telemedicine has the potential to further exacerbate or ameliorate health disparities.[25 26] As such, additional research is needed to assess the impact of telemedicine programmes on health disparities during the pandemic.

Other opportunities for research include understanding the reductions in time and transportation barriers to appointments, developing best practices for interpretation in telemedicine (including American Sign Language) and using patient perspectives to develop improved implementation strategies and outcome measures for telemedicine. As the use of telemedicine experiences exponential growth in our healthcare system, we have a unique opportunity to both ensure that the growing pains of this transition in care delivery are not felt disproportionately by our vulnerable patients and use the development of new technological systems to reduce existing disparities in care.

Concepts

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REFERENCES

1 Hollander JE, Carr BG. Virtually perfect? Telemedicine for Covid-19. *N Engl J Med* 2020;382:1679–81.
2 Berwick DM. Choices for the "New Normal". *JAMA* 2020;323:2125–6.
3 State Data and Policy Actions to Address Coronavirus. Kaiser family Foundation. Available: https://www.kff.org/coronavirus-covid-19/issue-brief/state-data-andpolicy-actions-to-address-coronavirus/ [Accessed 24 Sep 2020].
4 Scott Kruse C, Karem P, Shifflett K, *et al*. Evaluating barriers to adopting telemedicine worldwide: a systematic review. *J Telemed Telecare* 2018;24:4–12.
5 Zachrison KS, Boggs KM, Hayden EM, *et al*. Understanding barriers to telemedicine implementation in rural emergency departments. *Ann Emerg Med* 2020;75:392–9.
6 Carter-Pokras O, Baquet C. What is a "health disparity"? *Public Health Rep* 2002;117:426–34.
7 US Department of Health and Human Services, Office of Minority Health. National partnership for action to end health disparities. The National plan for action draft as of February 17, 2010. Available: http://www.healthypeople.gov/2020/about/foundation-health-measures/Disparities [Accessed 2 Jan 2020].
8 Velasquez D, Mehrotra A. Ensuring the growth of telehealth during COVID-19 does not exacerbate disparities in care. *Health Affairs Blog* 2020.
9 Roberts ET, Mehrotra A. Assessment of disparities in digital access among Medicare beneficiaries and implications for telemedicine. *JAMA Intern Med* 2020;180:1386.
10 Walker DM, Hefner JL, Fareed N, *et al*. Exploring the digital divide: age and race disparities in use of an inpatient portal. *Telemed J E Health* 2020;26:603–13.
11 Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot Int* 2000;15:259–67.
12 Sørensen K, Van den Broucke S, Fullam J, *et al*. Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health* 2012;12:80.
13 Khairat S, Haithcoat T, Liu S, *et al*. Advancing health equity and access using telemedicine: a geospatial assessment. *J Am Med Inform Assoc* 2019;26:796–805.
14 Marcin JP, Ellis J, Mawis R, *et al*. Using telemedicine to provide pediatric subspecialty care to children with special health care needs in an underserved rural community. *Pediatrics* 2004;113:1–6.
15 Leath BA, Dunn LW, Alsobrook A, *et al*. Enhancing rural population health care access and outcomes through the telehealth EcoSystem™ model. *Online J Public Health Inform* 2018;10:e218.
16 Harst L, Lantzsch H, Scheibe M. Theories predicting end-user acceptance of telemedicine use: systematic review. *J Med Internet Res* 2019;21:e13117.
17 Turer RW, Jones I, Rosenbloom ST, *et al*. Electronic personal protective equipment: a strategy to protect emergency department providers in the age of COVID-19. *J Am Med Inform Assoc* 2020;27:967–71.
18 Lion KC, Brown JC, Ebel BE, *et al*. Effect of telephone vs video interpretation on parent comprehension, communication, and utilization in the pediatric emergency department: a randomized clinical trial. *JAMA Pediatr* 2015;169:1117–9.
19 Halevy A. Aids, surgery, and the Americans with disabilities act. *Arch Surg* 2000;135:51–4.
20 Benjamins MR, Middleton M. Perceived discrimination in medical settings and perceived quality of care: a population-based study in Chicago. *PLoS One* 2019;14:e0215976.
21 James CA, Bourgeois FT, Shannon MW. Association of race/ethnicity with emergency department wait times. *Pediatrics* 2005;115:e310–5.
22 Dimick J, Ruhter J, Sarrazin MV, *et al*. Black patients more likely than whites to undergo surgery at low-quality hospitals in segregated regions. *Health Aff* 2013;32:1046–53.
23 Bambra C, Riordan R, Ford J, *et al*. The COVID-19 pandemic and health inequalities. *J Epidemiol Community Health* 2020;74:964–8.
24 Chen JT, Krieger N. Revealing the unequal burden of COVID-19 by income, Race/Ethnicity, and household crowding: US County versus ZIP code analyses. *J Public Health Manag Pract* 2021;27 Suppl 1, COVID-19 and Public Health: Looking Back, Moving Forward:S43–56.
25 Katzow MW, Steinway C, Jan S. Telemedicine and health disparities during COVID-19. *Pediatrics* 2020;146:e20201586.
26 Sarah N, Khoong Elaine C, Lyles Courtney R. Addressing equity in telemedicine for chronic disease management during the Covid-19 pandemic | Catalyst non-issue content [Accessed 11 Dec 2020].
27 Coustasse A, Sarkar R, Abodunde B, *et al*. Use of teledermatology to improve dermatological access in rural areas. *Telemed J E Health* 2019;25:1022–32.