

Medicine without borders: telemedicine opportunities in Haiti

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Abstract: *With the worst health indicators in the Americas, inadequate healthcare budget and weak infrastructure, a critical shortage of healthcare professionals and limited access to primary and specialty medical services, Haiti stands very far from meeting the healthcare needs of its ever-growing population. We applaud the efforts of the Haitian Health Ministry and its partners in expanding the vaccination coverage nationwide and curbing the epidemics of HIV/AIDS, tuberculosis and cholera. Meanwhile, we recognize the tremendous challenges posed by the rising incidence and prevalence of cardiovascular diseases and diabetes in Haiti: excess morbidity and mortality from stroke, ischemic heart disease, cardiac and renal failure, peripheral vascular insufficiency, blindness, and serious infections. Under these dreadful circumstances, the exploration of telemedicine as an innovative solution to mitigate the workforce shortage, bridge the gaps in healthcare access and improve health outcomes in Haiti, clearly deserves our utmost consideration.*

REZIME: *Ayiti lwen, byen lwen pou li genyen tout sa li ta bezwen pou li bay yon popilasyon ki pa sispann ogmante bon jan swen lasante. Tout paramèt pou mezire lasante an Ayiti an degraba. Pa genyen ase lajan disponib nan bidjè Leta a pou lasante. Pa genyen sifizamman pwofesyonèl nan domèn lasante. Sèvis medikal debaz yo limite epi moun pa vrèman rive genyen yo soul amen. Nou bat bravo pou minis lasante a ansanm ak patnè li yo ki deside elaji sèvis vaksinasyon nan tout peyi a pou yo ralanti epidemi kou SIDA (HIV/AIDS), malady tebe (tibèkiloz), ak kolera. Antretan, nou konsyan genyen yon gwo defi pou Leta leve akoz prezans epi ogmantasyon maladi kè, maladi dyabèt nan peyi a. Genyen yon gwo ogmantasyon san parèy maladi kou: estwok, ensifzans kadyak, pwoblèm renal, ensifzans vaskilè, avèg, ak enfeksyon grav. Anba sikonstans terib sa yo, eksplorasyon telemedicine kòm yon solisyon inovatè pou resoud mank pwofesyonèl swen sante yo, pwoblèm aksè swen medikal ak amelyore lasante nan peyi Ayiti merite anpil konsiderasyon.*



BACKGROUND

Data from the Haitian Ministry of Health illustrate shocking disparities in the distribution of public healthcare professionals (physicians, nurses and midwives) between urban and rural areas (1). While Haiti allocates 80 % of its public health workforce to urban areas, half of the population lives in the countryside. At 6.3 per 10,000 population, Haiti exhibits the lowest density of health professionals in the Americas, nearly four-fold lower than the minimum recommended by World Health Organization (WHO), and with a healthcare budget far below 15 % of the overall annual State budget as recommended by WHO. On a positive note, Haiti has established a productive and exemplary private-partnership model to control the major epidemics of HIV/AIDS, tuberculosis and cholera and achieved a successful vaccination campaign notwithstanding the recurrent natural disasters and chronic political instability. Nowadays, hypertension and diabetes account for the majority of outpatient visits. Nevertheless, annual utilization of health care services in Haiti remains low, averaging 31.3 % between 2014 and 2016.

About 60 % of Haiti's population subscribes to mobile phones (2). According to the 2016-2017 "Enquête Mortalité, Morbidité et Utilisation des Services" (EMMUS VI), the daily utilization of internet service in urban and rural areas is nearly similar (25.0 % vs 29.2 %) although access to electricity remains disparate, 76 % vs 17 % (3). An embryo of telemedicine already exists in Haiti, limited to just some rare spots of telestroke, telesurgery, teleradiology, and telepathology, representing less than 1 % use. By comparison, in Latin America, data from the 2015 WHO Global Survey on eHealth and the 2017 survey of hospitals across 9 diverse countries show a

range of telemedicine use from 25 % of hospitals in Colombia to 65 % in Chile (4).

TELEMEDICINE TECHNOLOGY

The terms telemedicine and telehealth are not interchangeable. Telehealth encompasses a broad range of remote healthcare technology applications, including patient education, administration and collaboration, as well as telemedicine. Depending on the settings, conditions and populations, telemedicine comprises various modalities: real-time service via live video, voice and data conferencing; store and forward, involving data capture in digital files on a computer or mobile device followed by secure transmission for later analysis and interpretation. A third modality consists in remote monitoring via patient data collection from wearable sensors and other devices, and subsequent transmission to monitoring systems and health care professionals to track patient health. This paper focuses on telemedicine. Network performance is essential to any successful telemedicine program, especially when using real-time video and voice. Network reliability, resiliency and diversity are especially important to ensure the delivery of quality care in an increasingly connected environment. Selection of the right internet and Wide Area Network (WAN) service provider is crucial. Internet and WAN connections that offer high bandwidth and availability as well as minimal latency is critical. Expressed in Mbps or Gbps, bandwidth represents the measure of both the capacity of data connection and the amount of data delivered through it. Many cloud-based high-definition videoconference platforms function fully on a modest bandwidth of just 1.5Mbps, 6 % of the 25-Mbps FCC standard. In fact, Zoom video software requires only

1.5 Mbps (5), as do other widely used videoconferencing platforms, such as Webex (Cisco Systems) and GoToMeeting (LogMeIn). In fact, effective high-definition communication is possible by using smartphones and laptops over land and wireless connections, and over a range of bandwidths. The U.S. Federal Communications Commission recommends a broadband connection of 10 Mbps for a small practice and 100 Mbps to one Gbps for a large one (6). Measured in milliseconds, latency describes the lag time for a data packet to travel to a destination either one way or round trip. High-quality videoconferencing usually requires a latency of 150 milliseconds. Additionally, high availability and robust security are critical for telemedicine applications to support compliance with security, privacy and confidentiality (7, 8, 9, and 10).

POTENTIAL APPLICATIONS OF TELEMEDICINE IN HAITI

Telemedicine could alleviate the physician workforce shortage and clinic overcrowding, enhance continuity care, and streamline health information management. Program implementation should strive to overcome several types of barriers: technical, operational, human, procedural, and financial (Table 1).

Technical barriers: One of the initial steps would be to secure appropriate space in a designated health center with reliable access to electricity and internet service to establish broadband connection and store the telemedicine equipment: high-resolution monitor, desktop computer, high-definition camera, microphone, as well as digital stethoscopes, otoscopes, ophthalmoscopes, and hand-held ultrasound. Electricity and internet access constitute the greatest roadblocks. If we can use green technology to bypass electrical energy, we depend on an internet service provider for access.

Operational barriers: Patients' charts should be readily accessible and basic laboratory and pharmacy preferably available on site. We could seize this opportunity to develop a robust database of patients' electronic health records (EHR). The chosen space should preserve patients' privacy and confidentiality and safeguard telemedicine equipment.

Human barriers: Leadership engagement will depend on the local health center strategic plan, awareness and motivation of stakeholders. Identifying a telemedicine champion to spearhead a campaign is highly recommended. Patient education and engagement will be a determining factor. Outcome-driven incentives may serve as powerful enablers.

Procedural barriers: To the best of our knowledge, no legislation exists in Haïti to regulate the practice and promote the use of telemedicine. This shortcoming underscores the importance of memoranda of agreement (MOA) between the remote providers and local Haitian healthcare organizations, development of mutually agreed upon manual of standard operating procedures and clinical protocols. The channels of communication between the partners should remain widely open. Providers should have the opportunity to review patients' charts at least 24 hours prior to the telemedicine session. Encrypted e-mail with two-level authentication is highly desirable. Patients would need to sign informed consent and

Table 1 Major Barriers to Telemedicine in Haiti

Technical	Inadequate electrification Unreliable internet service Low broadband penetration
Operational	Poorly organized patients' charts Space constraint
Human	Insufficient leadership engagement Lack of motivation of medical providers Patients' resistance
Procedural	Absence of rules and regulations Absence of standard operating procedures
Financial	Inappropriate funding Frequent payment interruptions of services and personnel

providers would have to sign confidentiality agreement in order to establish a patient-provider relationship. Locally, a physician or a nurse should present the clinical case and perform a brief physical exam as necessary. The consultants should use the opportunity to educate patients, providers, and stakeholders. They should send their final reports, including teaching points, within 24–48 hours.

Financial barriers: Based on the technology adopted and the intervention used, the cost of a telemedicine program varies substantially. However, in a country strapped for cash, entangled in foreign debt, and overwhelmed with priorities, any new disbursement could be problematic. Nonetheless, cost savings from reduced emergency department visits and hospital admissions, prevention of comorbidities and death may be substantial.

MODALITIES AND DOMAINS

Consolidation and expansion: The primary task would be to consolidate and expand current telemedicine initiatives such as telestroke, telesurgery, teleradiology, and telepathology. Telestroke services can help determine if a patient is a candidate for thrombolytic treatment or neurosurgery. Telesurgery enables a surgeon to perform robotic surgery remotely and can eliminate the barriers of distance in the delivery of high-quality surgical care. Teleradiology allows us to share digital imaging and interpretation remotely. Telepathology consists in the transfer of high-resolution microscopic pictures for reading and diagnosis. Teleradiology and telepathology can apply machine learning (ML) and artificial intelligence (AI) to refine our clinical decision-making capacity based on predictive analytics.

Implementation and upscaling: Implementation and upscaling emphasize chronic disease management: asthma, hypertension, and hyperlipidemia, diabetes mellitus, and mental illness. These programs should incorporate disease prevention and health promotion: diet and weight management, personal hygiene and

accident/injury prevention, smoking and drinking cessation, responsible sexual behavior and contraceptive methods.

Tele mental health is generally equivalent to in-person care for assessment and treatment of diverse mental health conditions, including attention deficit hyperactivity disorder (ADHD), autism, major depressive disorder, and post-traumatic disorder (PTSD) (11-13). It can facilitate service utilization and reduce stigmatization of mental illnesses, a specialty facing a gigantic shortage in professional providers in Haiti.

CONCLUSION

Telemedicine offers an affordable alternative for patients who lack access to healthcare. It can improve chronic disease management, health education and health outcomes. The Association of Haitian Physicians Abroad, better known under its French acronym, AMHE or Association des Médecins Haïtiens à l'Étranger, could play a key role in a telemedicine initiative between North America and Haiti by leveraging the resources of its big chapters, such as New York, New Jersey, Florida, and Quebec. For example, AMHE could start by creating a pool of active and retired volunteers. Then, they would form a steering committee to develop one or two pilot projects. In the long term, full program implementation can generate a sizable return on investment and affect many lives in Haiti through Medicine without Borders. ■

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Table 2 High-Impact Applications of Telemedicine in Haiti

GOAL	MODALITY	DOMAIN
Consolidation and expansion	Teleconsultation	<ul style="list-style-type: none"> • Telestroke • Telesurgery • Teleradiology • Telepathology
Implementation and upscaling	Continuity Clinic	<ul style="list-style-type: none"> • Asthma: • Hypertension: • Hyperlipidemia: • Diabetes mellitus: • Mental illnesses • Preventive medicine

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