HEALTHCARE >>>READY

TELEHEALTH'S APPLICATIONS FOR PREPAREDNESS AND RESPONSE

A Component of the *Resilient and Ready: Healthcare's Impact in Emergency Preparedness* Report

ACKNOWLEDGMENTS

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With demands on healthcare continuing to increase and funding for public health highly variable, Healthcare Ready is proud to research trends in healthcare that are strengthening preparedness and response. We are using this research to develop a report showcasing these trends – *Resilient and Ready: Healthcare's Impact in Emergency Preparedness*. This report will share the emerging technologies, forward-leaning policy changes, innovations, and best practices we are seeing and hearing about from partners in the public and private sectors that are strengthening resilience.

Resilient and Ready will examine several different areas in healthcare and public health. In an effort to encourage conversation around the challenges and opportunities of each trend or innovation, we will be releasing issue briefs and shorter issue snapshots to convey critical information and considerations for the preparedness and response community. This issue brief, *Telehealth's Applications for Preparedness and Resilience*, represents the first of these. Healthcare and public health preparedness is a dynamic space and we are eager to share what we are learning from leaders in different spaces within the field. More importantly, we are eager to hear your feedback and engage with our partners on these topics. It is our hope that these briefs, and ultimately the report, not only share innovative practices but also foster relationships and add new perspectives and considerations to preparedness and response conversations.

We chose to explore telehealth as the first topic area of the report due to its incredible potential. Technologies to support healthcare delivery and education are evolving at a rapid pace, and telehealth is on track to be a truly disruptive force in healthcare, ushering in dramatic changes in means of providing care and collecting and sharing health data. For many reasons, outlined in greater detail in this issue brief, telehealth is also a remarkable asset for healthcare and public health preparedness and response.

We hope this issue brief helps to highlight why and how telehealth is such an important trend in healthcare for emergency preparedness and response. While telehealth continues to face significant policy barriers, advances in technology are rendering it an increasingly indispensable resource. This document aims to summarize these challenges while also showcasing innovations and success stories.

So we are pleased to share this first issue brief, but even more excited for the conversations that follow. Healthcare and public health preparedness is an issue that affects us all. *Resilient and Ready: Healthcare's Impact on Emergency Preparedness* aims to prompt conversations and increase awareness of trends that can benefit us all and we look forward to engaging with you on it. We are eager to hear partners' thoughts on the different topics and receive input, so we encourage readers to reach out with their ideas and reflections.

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INTRODUCTION

It is no secret that technology has – and continues – to revolutionize the delivery of healthcare. Advances in technology have enabled countless innovations in patient care and increasingly, public health. As many studies suggest, and responses to real world events support, telehealth technologies have the potential to dramatically strengthen healthcare and public health emergency response. Telehealth is the application of information and telecommunications technologies to support healthcare delivery, education, and more.[1] It can take many forms, such as a video conference between a provider and patient, or a wearable device that obtains and transmits clinical information, or systems that allow providers to send images and patient information securely to specialists.

In oversimplified terms, telehealth makes it possible, provided certain criteria are met, to deliver or support healthcare delivery almost instantly, anywhere. This capability makes it a trend in healthcare that holds incredible potential for emergency response. In times of crisis, telehealth can act as a force multiplier, allowing virtual resources to support responders and enable real-time information sharing. Equally important, telehealth has the potential to bolster patient and healthcare facility preparedness. Mobile apps for tracking health can allow providers to know sooner if a patient requires additional care, potentially keeping them out of the emergency department, and text messaging can allow providers and public health to share information about events that impact health, for example.

Approximately 40-50% of all hospitals and 63% of US healthcare institutions offer some form of telehealth.[2] Over three quarters of Americans (77%) own a smartphone, with 95% of Americans owning a cell phone. In the US, the telehealth market was valued at $572 million in 2014 and is expected to reach $2.83 billion by 2022.[3] Statistics like these underscore the potential telehealth holds for preparedness and response, and suggest a compelling reason to build preparedness and response telehealth programs: telehealth is becoming an increasingly large component of routine healthcare, and growth in mobile devices is making patients available nearly any time.

Telehealth has been underutilized due to numerous policy, regulatory, legal, infrastructural, standard of care quality assurance, and even cultural hurdles, which are summarized later in this paper. Chief among these hurdles is limited reimbursement and coverage. Providers surveyed by the US Government Accountability Office (GAO)

Telehealth: Strengthening Preparedness and Response

- Allows for earlier interventions and delivery of care

- Potential to enhance situational awareness and support decision-making before and during incident response

- Ability to provide medical expertise from a distance or where it otherwise would not be available

- Cost-effective way of making care available, particularly in light of decreases in funding for preparedness at the federal and state levels

- Allows for equitable delivery of care

- Ability to educate, inform, and empower patients and caregivers

cited inadequate payment and coverage options as the principal barrier to adoption.[4]

Telehealth also faces distinct challenges in being applied to emergency preparedness and response efforts. For example, connectivity is essential for telehealth technologies, however, communications systems are often impacted during disasters. It is also important to note that telehealth is not appropriate in many aspects of disaster medical care, particularly in instances where the standard of care is at risk of being compromised

However, telehealth's potential to be a valuable asset in key areas of disaster responses and public health emergencies is only growing. While telehealth has been used in response efforts for decade, its full potential has not been realized.

With telehealth increasingly being integrated into routine healthcare, combined with the trend of decreased or flat funding for public health preparedness at the federal and state levels, it is vital that every effort is made to incorporate telehealth into preparedness and response, where appropriate.

This paper aims to highlight the potential telehealth holds for preparedness as well as response to two of the major threats to communities, natural disasters and disease outbreaks, by showcasing how it is already being used in these efforts. The paper also summarizes the challenges telehealth faces in each of these areas in an effort to foster continued conversation on identifying solutions and innovations around them.

TELEHEALTH'S POTENTIAL TO BE A VALUABLE ASSET IN KEY AREAS OF DISASTER RESPONSES AND PUBLIC HEALTH EMERGENCIES IS ONLY GROWING.

TELEHEALTH OVERVIEW

What is telehealth?

A uniform, commonly accepted definition of telehealth does not exist. Definitions vary across Federal agencies and states. Differences, though typically minor, are important because they impact how telehealth is understood, applied, and funded within agencies and states. Varying uses and regulations of telehealth can in turn impact its influence in emergency preparedness and response.

For the purposes of this paper, telehealth is understood as it is defined by the Health Resource Services Administration (HRSA), or "the use of electronic information and telecommunications technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration."[5] This commonly used definition embraces the Center for Connected Health Policy's definition of telehealth as a "collection of means and methods for enhancing healthcare, public health, and health education."[6]

Telehealth differs from telemedicine in that telemedicine has a narrower scope, referring to technologies used for clinical care purposes such as diagnosis and patient monitoring.[7] Importantly, telehealth includes telemedicine.

Distinctions between telehealth and telemedicine are important because differences in the definition can impact how telehealth is regulated and reimbursed within and across states.

Modalities of telehealth

While the definitions of telehealth may differ, the technology used in practicing telehealth largely does not. The four types of telehealth include:[8]

- **Live Videoconferencing or 'Synchronous':** Real-time interaction between a person (patient, caregiver or provider) and a healthcare provider using audiovisual technology.

- **Store-and-Forward or 'Asynchronous':** Transmission of health and medical information and data (such as images, pre-recorded videos, and other forms of data) through a secure electronic communications system to a practitioner. Asynchronous communications can include secure text messaging between providers and patients.

- **Remote Patient Monitoring (RPM):** Collection of personal health and medical data from a patient in one location transmitted to a provider in a different location.

- **Mobile Health (mHealth):** Provision of healthcare services, personal health data and public health education and practice through mobile devices, particularly smartphone apps

Examples of Telehealth

Synchronous or Video Conferencing: Direct-to-consumer consults via mobile app; telepsychiatric evaluations; provider to provider consults

Asynchronous or Store-and-Forward: X-rays, CT scans, EEG printouts transmitted for interpretation

Remote Patient Monitoring: Holter monitors, remote EKG recorders

mHealth: Mobile phone apps for collecting health data, entered manually or automatically; portable, wearable sensors that can collect health data

GOVERNANCE AND REGULATION

Advances in telehealth technology, in conjunction with increased adoption of telehealth, healthcare reform efforts, and the federal system of government in the US have combined to create a complex, constantly evolving regulatory arena for telehealth. With over 200 telehealth related bills introduced in 42 states in 2015, and over 150 introduced in 30 states in 2016, the telehealth policy landscape is constantly changing.[9,10]

Governance

- **Federal level**: At the federal level, the US Food and Drug Administration (FDA) is the lead agency for ensuring the safety and effectiveness of medical devices used for telehealth, including medical mobile apps that fall under the agency's definition of a mobile medical device.[11] Reimbursement policies for Medicare are set by the Center for Medicare and Medicaid Services (CMS).

- **State level:** State legislatures, through state medical boards, establish operating definitions of telehealth and/or telemedicine and related standards of care and may develop legislation to govern their use. Definitions are important as they influence reimbursement and regulatory processes. The Center for Connected Health Policy maintains an interactive map of all pending and current laws and regulations at the state level. Reimbursement policies for Medicaid are set by each state.

Regulation

Much of telehealth practice is determined by state legislatures and regulated by state medical boards. This can often create a barrier to wider adoption, particularly in the context of preparedness and response, where healthcare operations often cross states.

- **Licensing:** Licenses to practice medicine and provide healthcare are controlled and issued by state medical boards. This is important as the point of care during telehealth encounters is the location of the patient, even if the provider is located in another state. This requires that telehealth providers be licensed where they are as well as where the patient is. Obtaining multiple licenses is often burdensome for providers and can take a significant amount of time.

Providers have attempted to address the burden associated with obtaining multiple licenses with compacts. In April of 2017 the Federation of State Medical Boards (FSMB) launched an Interstate Medical Licensure Compact (IMLC).[12] The Compact creates an expedited process for qualified physicians to obtain a license in states that are a member of the compact.[13] Currently, eighteen states have adopted the Compact and eight states, plus the District of Columbia, have introduced legislation in support of a path to licensure portability.[14]

The Nurse Licensure Compact was created in 2000 and allows nurses to obtain one multistate license that allows for practices in a nurse's home state and other compact states. Twenty five states have adopted the compact. Physical therapists, psychologists, and other professions are also pursuing multi-state compacts that would allow for reciprocity of licensure.[15]

State-level control of licensure leads to a complex environment in the event of a disaster or public health emergency. While many states suspend licensing requirements during emergencies declared by the President or the state governor, this is not universally true and does not alleviate challenges during smaller-scale events. Mechanisms for licensure verification and reciprocity in

the event of a declared disaster have been created. Chief among these are the Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP), Emergency Management Assistance Compact (EMAC), and Uniform Emergency Volunteer Health Practitioners Act (UEVHPA.)

Though progress is being made in reducing the burden associated with obtaining multiple licenses, limited awareness and adoption of these regulations continues to render licensing a significant barrier to telehealth adoption. Slow development of regulations is not keeping up with technology, which in turn limits the potential telehealth has to be used more widely, and in a more uniform fashion.

This is significant for emergency preparedness and response as it prevents providers, patients, and systems from implementing and becoming familiar with telehealth processes and systems that could benefit them in the event of a crisis.

- **Credentialing and Privileging:** CMS regulations allow hospitals and critical access hospitals to credential by proxy. In this process, patient sites (the 'originating' site) contracts with a hospital or critical access hospital (the 'distant' site) for the distant site to provide telehealth services and credential those providers. Under Joint Commission requirements, practitioners providing care through live interactive systems are subject to credentialing and privileging of the location of the patient.

HISTORY OF ORGANIZED EFFORTS TO INCORPORATE TELEHEALTH INTO PREPAREDNESS AND RESPONSE

Federal agencies have been active in telehealth for decades. Early pioneers in the field included NASA and the military. By nature of their mission, NASA implemented programs in the 1960s aimed at monitoring health from a distance.[16],[17],[18] Due both to the nature of the department's work (e.g. deployments) and a defined patient population, the Department of Defense continues to be active and innovative in telehealth efforts, including the creation of Telemedicine and Advanced Technology Research Center within the US Army.[19],[20] The Department of Veterans Affairs (VA) serves as another leader in telehealth. The VA operates the largest integrated healthcare system in the US and has cited the 'mission-critical' role telehealth plays in enabling the agency to provide access to care to all veterans, particularly the estimated 30% that live in rural areas. [21] The department has implemented telehealth in over 900 VA sites of care and is available for over 50 specialty areas of care.

Federal government interest and resultant policy addressing the potential telehealth holds for improving and enhancing preparedness, response, and recovery to events impacting public health surged following Hurricane Katrina. The Pandemic and All Hazards Preparedness Act of 2006 (PAHPA) included a provision that called for HHS/ ASPR to examine the state of telehealth in emergency responses, identify challenges and barriers, and develop recommendations.[22] The report developed in response to this charge concluded that while progress was being made, telehealth technologies were still underutilized during public health emergencies and disaster medical responses and a National Telehealth Strategy could help coordinate and align efforts.[23] In 2009, the National Institutes of Health conference on the future of telehealth included a breakout session on telehealth tools for public health, emergency, and disaster preparedness and response.[24] While this group identified research priorities and recommendations, including the formation of a telehealth advisory board, it appears little follow up action was taken. The American Telemedicine Association (ATA) had an Emergency Preparedness and Response Special Interest Group for a number of years that produced white papers and fostered discussion on the topic among members, though the group no longer exists.

More recently, the 2015-2018 National Health Security Strategy and Implementation Plan included a provision to explore how existing telemedicine programs and technologies can be used to increase access in impacted areas, address surge, and overall enhance incident response and risk reduction.[25] Additionally, the Office of the National Coordinator for Health Information Technology (ONC), as the federal agency designated with coordinating nationwide efforts to implement and use advanced health information technology and electronic information sharing, leads a number of telehealth-related initiatives and has developed a Federal Telehealth Compendium cataloging telehealth activities and resources across the Federal interagency.[26]

Spacebridge to Armenia

One of the earliest uses of telemedicine to support disaster response and recovery was by NASA in 1988. Following a catastrophic earthquake in Armenia, NASA and international partners used telecommunications technology to connect hospitals in the US to the disaster zone to support diagnoses and care through telemedicine.

As one of the foremost uses of telemedicine during an emergency, a significant body of literature exists on the effort and its influence on telemedicine and disasters today.

Source: Doarn, Charles R., and Ronald C. Merrell. "Spacebridge to Armenia: a look back at its impact on telemedicine in disaster response." Telemedicine and e-Health 17.7 (2011): 546-552.

Patient Unified Lookup System for Emergencies (PULSE): Collaboration for Health Information during a Disaster

First responders often do not have access to patient medical records during a response, which can serve as a challenge when providing care. ONC partnered with HHS/ASPR, HHS's Chief Technology Officer, and the State of California to develop a program EMS and responders could use during declared emergencies that would allow them to query health information exchanges, health systems, and hospitals for current health records. This program, the Patient Unified Lookup System for Emergencies (PULSE), stands to protect patients and strengthen healthcare by enabling timely information exchange through a system available statewide.

Source: ONC and Making Personal Health Data Available During an Emergency: HHS Ventures Fund Alumni Making Data Available When and Where it's Needed

CHALLENGES AND BARRIERS

While advances in technology have contributed to an increased demand for telehealth and expanded uses and applications of telehealth, major barriers remain. In addition to the regulatory challenges highlighted above, telehealth also faces a number of other challenges and barriers.

- **Reimbursement:** Reimbursement is widely considered the largest barrier for telehealth. Medicare includes strict limitations on reimbursing by location (i.e. for rural facilities only), type of provider, and type of service. Between 2014 and 2016, less than one percent of Medicare beneficiaries used telehealth services.[27] Medicaid

> ## BETWEEN 2014 AND 2016, LESS THAN ONE PERCENT OF MEDICARE BENEFICIARIES USED TELEHEALTH SERVICES.

reimbursement, though more inclusive, varies widely by state. Private payers similarly vary widely, with differences in types of services reimbursement and amount reimbursed for telehealth vs. in-person. Varied policies across Medicare, Medicaid, and private payers are also constantly evolving, compounding challenges in understanding reimbursement for telehealth.

Within programs that do reimburse telehealth services, it is often reimbursed at a lower rate. The absence of reimbursement, or limited and inconsistent reimbursement, is a major factor in telehealth use and has cascading effects. When providers are not reimbursed for telehealth in the same way they are for traditional services, they are less likely to provide it. Accordingly, patients may not be exposed to telehealth technologies that could improve their own care or be familiar with technologies that could benefit them in the event of a disaster. Similarly, healthcare facilities may be missing out on opportunities to implement telehealth technologies that could improve their own preparedness posture and response capabilities.

- **Malpractice Liability & Insurance:** The number of malpractice liability cases involving telehealth to date is low, and uncertainty remains how these cases would play out in an emergency context. Additionally, not all carriers provide malpractice coverage for telehealth and coverage may not carry over to another state.

- **Privacy:** Developing and selecting the technology best suited for telehealth services comes with several related challenges and barriers, including privacy concerns and the ability to meet HIPAA requirements. HIPAA does not have distinct requirements for service delivered via telehealth, which requires telehealth providers to meet the same requirements as if the services were delivered in person. When services are provided with telehealth, providers must ensure that both the technology used meets the standard and providers take any additional steps needed to ensure compliance. [28]

- **Varying Laws:** Laws governing telehealth vary between states, from licensing, to privacy and security requirements, to standards of care. Taken together, these varying legal environments pose a significant challenge to wider adoption of telehealth and could factor into disaster responses for events across state lines. These challenges can be even further compounded in the event of an international emergency.

- **Medical Specialty Standards:** As telehealth continues to expand across medical specialties, some specialty providers are wary of adopting telehealth as equivalent to in-person care due to concerns about the limitations of telehealth data and resolution.

- **Interoperability:** Ensuring health information technology (HIT) and telehealth platforms across agencies and healthcare systems can share information can be difficult but is important in ensuring providers and responders alike can access electronic health records and share information. These capabilities are vital for patient continuity of care during a disaster response.

- **Health IT Infrastructure:** Telehealth requires certain IT infrastructure requirements to be in place or implemented in order to be practiced. An important component of this infrastructure is back-up capabilities, such as cloud storage.

- **Leadership Buy-in and Funding:** Introducing telehealth to healthcare systems and practice typically requires significant financial investment, willingness to innovate, and openness to new technologies and uses for healthcare.

At the state and federal levels, many practitioners and thought leaders in the field cite a dearth of strategic leadership and vision as a primary barrier to wider adoption of telehealth.

Telehealth programs often require a measure of sustainable funding (e.g. for technology maintenance, upgrades, etc.). This can create a challenge for public health departments in particular that rely on grant funding that can vary from year to year.

- **Education:** Telehealth thought leaders cite the minimal availability of formalized telehealth training in medical and public health schools as an indirect barrier to the underutilization of telehealth. In recognition of this fact, the American Medical Association (AMA) adopted a policy in 2016 aimed at encouraging the teaching of telemedicine in clinical practice.[29]

USES IN ROUTINE CARE

Telehealth is being woven into day-to-day healthcare operations in new ways practically every day. Some of the more common uses include telehealth for chronic disease management, teleradiology, tele-icus (e-ICU), telepathology, telepharmacy, video consultations, remote monitoring, teledermatology, telepsychiatry, and physical rehabilitation, to name but a few. While this is not a comprehensive list and uses continue to grow, several applications of telehealth are particularly relevant to strengthening communities and enhancing the preparedness posture and response capabilities of healthcare systems and public health.

Emergency Medicine and the Prehospital Arena

Emergency medical services (EMS) and paramedics have employed various forms of telehealth for decades, calling emergency rooms when patients are in route to deliver status updates and seek guidance. Recently, telehealth is being used to deliver more advanced care in the prehospital arena, as well as prevent unnecessary trips to

> TELEHEALTH IS BEING USED TO DELIVER MORE ADVANCED CARE IN THE PREHOSPITAL ARENA, AS WELL AS PREVENT UNNECESSARY TRIPS TO THE EMERGENCY DEPARTMENT.

Portable Telemedicine Kits

In recognition of the fact that telehealth devices in the field depend on connectivity, companies continue to develop equipment with increasingly advanced technology designed to allow devices to perform even in areas with low bandwidth. These technologies play an important role in providing care in remote areas as well as during critical transport of patients.

These 'backpacks' and kits are equipped with redundancies and antennas designed to protect connectivity, long-lasting batteries (some with solar panels), diagnostic tools, and more.

the emergency department and keep low-acuity patients out of hospitals. Studies have shown telehealth technologies can deliver safe, feasible, and reliable care in the prehospital arena.[30] EMS providers and ambulances equipped with laptops or other devices connected to dedicated telehealth platforms are able to conduct video consults, complete electronic reporting, and issue notifications to hospitals.

A particularly successful program is Project ETHAN (Emergency TeleHealth and Navigation) within the Houston Fire Department. The program connects first responders with a call center that is staffed with emergency medicine physicians. When paramedics are responding to a call and need the assistance of a physician, the ETHAN platform allows them to connect to a physician in the call center. The physician then, through a video chat on the responder's ETHAN tablet, can assist in evaluating the patient, accessing medical records, and determining if transportation is required.[31] Studies designed to compare the effectiveness of the ETHAN model with traditional EMS delivery found the use of telehealth in EMS to be effective and successful at reducing unnecessary emergency department visits (by 56%) and increasing EMS productivity by allowing units to return to service quicker.[32]

Applications of telehealth within the emergency department are assisting emergency physicians and emergency department staff particularly in rural areas where patients are less likely to be treated at a trauma center and more likely to suffer fatal injuries.[33] In rural healthcare facilities that do not have certified emergency medicine physicians on staff, synchronous and asynchronous forms of telehealth provide access to emergency medicine physicians, trauma surgeons, and other specialists for timely consultations for trauma cases. This access and decision-making support can greatly improve the level and quality of care patients receive, no matter their location. The availability of telehealth in emergency departments has also been demonstrated to improve the recruitment and retention of healthcare providers in rural areas.[34] In addition to teletrauma consultations, telestroke programs, teleradiology, and telepsychiatry and telemental health platforms are contributing to improving emergency medicine care.

Chronic Disease Management

Managing and treating chronic diseases continues to dominate healthcare spending in the US, accounting for 86% of spending, while the prevalence of these costly conditions continues to increase.[35] By 2030, the number of people with three or more chronic diseases is predicted to climb to 83.4 million, nearly triple the number of people with three or more chronic diseases in 2015 at 30.8 million.[36]

In the face of growing prevalence and surging costs of managing chronic disease, in addition to an aging, less mobile patient population, telehealth has proven to be a valuable tool in chronic disease management. This value can be attributed largely to the benefits remote patient monitoring (RPM) creates in data collection and information sharing. RPM technologies allow data to be collected and shared more frequently between the patient and providers and the healthcare team and also allows providers to monitor medications, improve medication adherence through alerts

BlueStar App

BlueStar is the first prescription-only app for managing chronic disease. Developed by WellDoc for patients with Type 2 diabetes and approved by the FDA in 2010 after a clinical trial demonstrated improved patient outcomes, BlueStar analyzes data entered by the patient, developing tailored coaching and guidance and allowing patients to track and engage in their treatment. The app also sends data back to healthcare providers.

Source: https://www2.bluestardiabetes.com

and reminders, and help effectively educate patients, among other benefits.[37] RPM platforms and methods include wearable devices that can automatically collect and transmit data such as watches and Holter monitors, as well as apps that allow patients to review collected data, manually enter data, and possibly communicate with healthcare providers through secure messaging systems. Virtual visits through video platforms on phone can also facilitate more routine, convenient check-ins.

Applications for Emergency Preparedness and Response

Many of the commonly cited benefits of supporting chronic disease management with telehealth applications apply to healthcare preparedness and resilience. Telehealth reduces the number of hospitalizations and emergency department visits, potentially saving hospitals and health systems unnecessary costs while improving patient quality of life. It also allows for elderly patients and those with access and functional needs to remain at home and still receive care.

Managing chronic diseases with telehealth technologies has distinct benefits for healthcare preparedness and resilience as well. For example, healthcare preparedness leaders cite the ability

Telepharmacy

Telepharmacies are increasing access to pharmacy services, particularly in rural areas. Generally, telepharmacy allows a licensed pharmacists to remotely monitor and supervise a pharmacy technician in providing full-service pharmacy operations. Supervision is accomplished through store-and-forward technology, with images of pills, labels, and bottles all sent to pharmacists for review and approval. Patients then have a video or audio consultation with the remote pharmacist when picking up their prescription. Telepharmacies could serve as import resources during a natural disaster when roads are closed and full-service, in-person staffed pharmacies may not be accessible for patients with critical needs.

RPM platforms and other telehealth technologies have to allow patient care and access to providers to remain more stable during an event in which healthcare infrastructure or transportation is impacted. Since care and communication would ideally already have a foundation of being delivered virtually, those virtual communication lines would already be established and thoroughly tested in the event of an emergency and could continue to be relied upon.

Additionally, RPM data could potentially aid in identifying patients that require expedient care during an emergency. Hospitals and healthcare facilities and providers receiving transmitted data could alert responding agencies of patients whose data appears abnormal.

Telehealth can also help reduce exacerbations of chronic conditions that can be brought on during an emergency with its ability to help restore and renew prescriptions. Patients can refill prescriptions through apps on their phone. During the response to Hurricane Katrina, a single portal, KatrinaHealth.org, was set up to allow authorized pharmacists and providers access to prescription medication records for tens of thousands of evacuees.[38] Though no longer active, ICERx (In Case of Emergency Prescription Database) grew out of KatrinaHealth and was a public-private collaboration that allowed authorized pharmacists and providers assisting patients impacted by disasters to access medication records.[39] Addressing prescription restoration during and following an emergency is a persistent challenge, and telehealth technologies have provided significant strides in overcoming and preparing for this challenge.

Telemental Health

Telehealth, in iterative forms, has been used for decades to provide mental health assessments and deliver care. The US Department of Defense and Department of Veterans Affairs (VA) are recognized pioneers in the field, with the VA operating an expansive telemental health program that is used to treat nearly all mental health disorders, including anxiety and substance abuse disorders.[40] Successful utilization of telehealth for mental health services in these spaces helped lay the foundation for use in routine care.

Advances in technology, particularly video conferencing, complemented by the growth and accessibility of mobile devices capable of video, have helped make telemental health more prevalent. Dozens of studies have demonstrated that in addition to increasing access to care, telemental health is effective for diagnosis and assessment within many patient populations (e.g. children, adult, etc.) and for treating a spectrum of disorders in different settings, including the emergency department.[41] While most literature focuses primarily on video conferencing, uses and efficacy of asynchronous methods are being explored and mobile apps for mental health are a burgeoning field.

Applications for Emergency Preparedness and Response

Telemental health is increasing the resilience of healthcare by expanding access to care and reducing the impact patients in need of mental healthcare are having on emergency departments. Telepsychiatry is increasingly being integrated into emergency departments, for example, where approximately one in eight visits to emergency departments involves mental health or substance abuse.[42] While telemental health services provided outside the emergency department have been shown to reduce trips to the emergency department and hospital admissions, telemental health services, specifically telepsychiatry, play a valuable role within emergency department functions by helping to reduce wait times for patients in crisis, and assisting providers in triaging patients and communicating urgent needs to providers on site with the patient.[43] Telepsychiatry provided in the emergency department has also been linked to reductions in subsequent inpatient stays, costs, and the likelihood of readmission.[44] Similar to other telehealth offerings, telemental health services in the emergency department are valuable in improving access to care and making

TELEPSYCHIATRY PLAYS A VALUABLE ROLE WITHIN EMERGENCY DEPARTMENT FUNCTIONS BY HELPING TO REDUCE WAIT TIMES FOR PATIENTS IN CRISIS.

Statewide Telepsychiatry: NC-STeP

In North Carolina, where thirty five counties are classified as Mental Health Professional Shortage Areas and twenty eight do not have a psychiatrist, law makers recognized the strain patients seeking care in the emergency department was having on hospitals. In 2013 the state passed a law directing the Office of Rural Health to implement and oversee a statewide telepsychiatry program, North Carolina Statewide Telepsychiatry Program (NC-STeP). The program has led to reduced lengths of stay in the emergency department for patients waiting to be transferred to inpatient treatment and number of involuntary commitments to local hospitals or state psychiatric hospitals.

expertise available where it otherwise would not be. For rural emergency departments and facilities where the impact of mental health disorders is greater, and where mental health providers are scarce, telemental health represents a safe and effective way to provide care.

Facilities without mental health providers may enter into agreement with private telemental health providers to not only make mental health services available, but to make them available 24 hours a day. In the event of a natural disaster or other crisis, the benefits of telemental health services both in and out of the emergency department would be vital in ensuring timely access to care for those who need it and reducing the impact on hospitals.

USES IN EMERGENCY PREPAREDNESS AND RESPONSE

With its ability to provide care virtually following a disaster, and capacity to facilitate real-time or near real-time information sharing, telehealth holds great potential for improving emergency preparedness and response to natural disasters and public health emergencies. It is important to note, however, that connectivity is an incredibly important consideration when applying telehealth to disaster response planning specifically. Many telehealth uses during a disaster rely on availability of cellular service and/or broadband internet. While there are mechanisms for addressing this challenge, such as incorporating secondary and tertiary communications methods into plans and hardening systems to the greatest extent possible, the potential to be without utilities upon which telehealth relies upon remains a barrier for telehealth use in disaster response efforts.[45]

Natural Disasters

Natural disasters – hurricanes, winter storms, tornadoes and more – threaten healthcare and patients in many ways. These events can

damage facilities patients rely on for care, impact transportation routes patients and providers rely on, and directly injure patients and exacerbate existing conditions. Telehealth is recognized as a valuable asset for the life cycle of disasters, from preparedness to recovery. From sending messages to patients about anticipated impacts to health or preparedness actions to take for expected events such as hurricanes, to making health and medical expertise available where it would not otherwise be following a disaster and during recovery, telehealth is being used to enhance resilience through the lifecycle of disasters.

mHealth and Remote Patient Monitoring for Preparedness

Protecting access to healthcare, ensuring patients and communities are informed and empowered to manage their health conditions, and ensuring responders have the tools and resources required to provide disaster medical assistance are among the primary planning considerations in natural disaster preparedness. Telehealth can be used in each of these instances, with mHealth holding particular value.

With its ability to push information, and studies suggesting 90% of all text messages are read within three minutes of delivery, text programs and mHealth allow planners and healthcare providers to share information before an event, provide real time updates, and enhance situational awareness. [46] Health departments can use text messages to share information with the public on expected impacts to health, resources for assistance, and more. Smartphone apps and texting also make it easier for patients to refill prescriptions. Many chain drug stores allow patients to manage prescriptions through apps. In addition to sending alerts when prescriptions are ready and refill reminders via text message, apps allow patients to refill prescriptions.

mHealth can also store and make health information more accessible. A 2015 study by

Text Messages for Rx Refills

A study conducted by CVS Health and HHS/ASPR found that pharmacy text messages to patients with chronic conditions encouraging them to refill medication prescriptions was effective in prompting the desired preparedness action. The study additionally found that public-private partnerships were helpful in facilitating timely outreach by pharmacies.

Source: Lurie N, Bunton A, Grande K, Margolis G, Howell B, Shrank WH. A Public-Private Partnership for Proactive Pharmacy-Based Outreach and Acquisition of Needed Medication in Advance of Severe Winter Weather. JAMA Intern Med. 2017;177(2):271-272

the IMS Institute for Healthcare Informatics found there were over 165,000 mobile health apps available to users.[47] While many of these may not be useful for preparedness, they do signal the possibility for patients to be more involved and aware of their own health conditions, which can in turn position them to be more prepared. Apple's iPhones currently come with a HealthKit platform. This suite of health-related apps includes a health records app that allows providers to make health records available in a variety of approved methods. As the number of health and emergency mobile apps continue to grow, this rapidly emerging field provides many avenues for encouraging preparedness at the individual level and improving the preparedness

posture of communities and patient groups. From disaster-specific apps from the American Red Cross, to apps specially designed for public health emergency responders and apps managed by federal, state and local authorities, mHealth has the potential to help educate patients and the public and instill preparedness in daily routines through the use of mobile devices.[48]

Synchronous and Asynchronous Telehealth for Disaster Response

Various forms of telehealth have been employed in response to natural and man-made disasters for decades and recent advances in technology position it to be more useful than ever before. Telehealth acts as force multiplier during a response by making health expertise available where it otherwise would not be and minimizing safety and logistical challenges necessary in transporting providers to impacted areas.[49] This virtual surge capacity can be brought to impacted areas by connecting to existing networks that support telehealth, through specially developed telehealth systems, or increasingly though mobile devices.

During the acute response phase, telehealth (primarily synchronous methods) can be used to assist with field triage, patient monitoring during transportation, and logistics coordination. During the subacute phase, or the days and weeks following an event, telehealth could be used to conduct consultations with specialists and triage patients in a manner that mitigates against

NATO Telemedicine Partnership

North Atlantic Treaty Organization (NATO) partners harnessed the power of telehealth for international emergency response efforts by developing a multi-national telemedicine system that allows emergency responders to access specialists virtually for diagnoses and recommendations. Launched in 2017, the program allows responders to deploy with portable telemedicine kits that connect with specialists.

Source: NATO develops telemedicine system to save lives in emergencies

overwhelming hospitals and emergency facilities. Additionally, throughout a disaster response, telehealth can enable just-in-time education to responders and patients alike on the specific disaster and/or relevant healthcare knowledge for the situation, as well as allow providers from a distance determine if special healthcare supplies need to be sent to the impacted area. It also helps foster equitable delivery of care by making more care available virtually and standardizing care.[50]

Direct-to-consumer (DTC) telehealth technologies could be used during the acute response phase to engage bystanders in supporting timely response efforts by using synchronous technologies to connect bystanders with trained medical professions to deliver care such as cardio-pulmonary resuscitation (CPR).[51] While the authors cite the shortcomings of DTC systems in accomplishing this due to a requirement to have an existing account to initiate an encounter with a DTC provider, they suggest slight structural changes could better position DTC to be a response resource.

Advances in technology are enabling telehealth to maximize patient safety and provide decision-making support during critical transport, particularly from rural areas. In addition to connecting responders to specialists and other needed providers, telehealth technologies can

help the care team – responders and remote providers – determine the appropriate medical facility to which a patient needs to be transferred. This capability is particularly important when transporting patients in rural areas, when delivery of lifesaving care is time sensitive and facilities with the capabilities and resources required may be father away. Alternatively, as seen in applications of telehealth technologies to routine 911 calls, it can also help prevent unnecessary transport to hospitals and emergency facilities, reducing the impact on hospitals and likely saving costs.

Video Conferencing and Telemental Health for Disaster Recovery

During the weeks and months following an event, healthcare infrastructure may be compromised or limited, and some health resources or providers may not be accessible or restricted. Telehealth conducted through healthcare systems could help fill gaps in access to specialty care, while DTC services could augment strained primary care providers.[52]

Studies and real-world events demonstrate the value and promise telemental health holds for disaster recovery, particularly when mental health providers with disaster and trauma training are

needed. Researchers showed telehealth methods were effective in meeting disaster-related mental needs for communities impacted by Hurricane Katrina.[53] Video conferencing allows for patients in disaster-impacted areas with scarce mental health resources to access mental health providers. This capability is especially important in light of the notion that the demand for mental health services is soaring amidst a documented mental health care provider shortage in the US.[54]

Just as telemental health is increasingly being used as a means of routine care to treat mental health disorders unrelated to disasters or traumatic events, telemental health is also beginning to be used to provide behavioral and mental health resources for public health crises, such as the opioid crisis.[55]

Telemental health can also help provide specialized mental health services that may be required during a response, such as making pediatric mental health providers or mental health providers with expertise in disasters available to communities and healthcare facilities with scare resources.

Challenges

While telehealth holds great promise for disaster preparedness, response, and recovery, it is still confronted by several distinct challenges. It is important to note that these challenges are not insurmountable, but are important considerations when developing plans and policy regarding telehealth and disaster response.

Challenges particularly relevant to achieving optimal use of telehealth in disaster response include:

- **Interoperability:** Ensuring systems are interoperable is paramount in disaster response, particularly when health information and medical records need to be accessed and shared, as they are during a disaster. Though federal working groups, in partnership with private sector partners, have made and continue to make marked progress in this

area, it will likely continue to remain a primary consideration as technology continues to advance and agencies and healthcare systems continue to implement telehealth technologies at different rates.

- **Routine Use of Technology:** Experts in both preparedness and healthcare emphasize that the key to integrating telehealth into preparedness initiatives and response plans is using, or adapting, systems and processes providers are already using in normal operations. This ensures providers are familiar with workflows and systems and are not required to learn a new system during an emergency, or just for an emergency.

- **Connectivity and Access:** Many telehealth technologies requires a power source (or is at best limited in length of use due to battery life), an internet connection, or a cellular signal in order to function as desired during an emergency. While many efforts can be taken to harden these technologies and build in redundancies, dependence on the very utilities that are frequently lost or damaged during an event continues to pose a challenge to telehealth's adoption into emergency management.

Disease Outbreaks and Public Health Emergency

In the event of a disease outbreak or other public health emergency, telehealth can be employed to great effect to share information, provide decision-making support, minimize risk to the public and providers, and possibly allow for preemptive care to take place. Synchronous communications technologies and remote patient monitoring have both been demonstrated to improve patient and provider safety, as well as patient outcomes, in combatting infectious diseases. mHealth applications for sharing event information with patients and the public, as well as health information between providers and patients, are continuing to be explored and developed.

Call Centers & Phone Triage

Call centers staffed by healthcare professionals have been shown to be effective in assessing and directing patients to appropriate care facilities in the event of a pandemic or disease outbreak. Call centers and hotlines staffed by health professionals can be used to provide health and event information that can reassure or prompt callers to seek care, potentially protecting them from unnecessary exposure and minimizing risk of infection. Triage lines staffed by healthcare providers can also be used to screen callers, determine if they require immediate care and help patients obtain antivirals.

Equally important, call centers and triage lines reduce the surge on hospitals by assessing the 'worried well' and reassuring them that they do not need to seek unnecessary care. This in turns helps ensure that only those patients with the most acute need seek in-person care. Transmission of the infectious disease is also reduced by keeping healthy people away from those with the infectious disease.

Flu on Call®

In the event of a severe pandemic, the Centers for Disease Control and Prevention has developed a national network of phone lines, Flu on Call®, that can be used to provide information and triage callers. This network of call centers engages United Way 2-1-1 help lines, poison control centers, and nurse advice lines.

Callers will be assessed by healthcare providers via phone and given information as well as directed to appropriate care sites, e.g. hospital, clinic, etc. This minimizes the impact on hospitals while ensuring those who require care are directed to the most appropriate facility.

Source: ASTHO Flu on Call FAQ

> ## FOR HIGHLY INFECTIOUS DISEASES, RPM REPRESENTS THE SAFEST MEANS OF TREATMENT FOR PATIENT, PROVIDERS, AND THE COMMUNITY BY ALLOWING FOR SPECIALISTS TO DEVELOP CARE PLANS FROM A SAFE DISTANCE.

Remote Patient Monitoring

RPM technologies already play an important – and growing role – in managing chronic diseases. Many of these same technologies could be used during a disease outbreak to provide and manage care while also protecting providers and the public from exposure. Providers could monitor data transmitted from patient devices to determine if and when an intervention is needed. Similarly, RPM devices could be used to determine the type of intervention required, whether it is a visit from a home healthcare worker or admission to the hospital. More timely interventions have been shown to reduce emergency department visits and hospitalizations. RPM devices can also help educate patients and family members or caregivers about treatment plans and engage patients more proactively in care, which could help assuage anxieties about access to care.[56]

For highly infectious diseases, RPM represents the safest means of treatment for patient, providers, and the community by allowing for specialists to develop care plans from a safe distance. Perhaps the most well-known example of RPM being employed to treat a highly infectious disease outbreak was the Ebola virus disease outbreak of 2014. RPM technologies found to be effective in

Project ECHO

Started in 2003 by a liver disease specialist, Project ECHO (Extension for Community Healthcare Outcomes) is a well-known model for telemedicine that uses a 'hub and spoke' model to connect specialists at the 'hub' with primary care and other providers at 'spokes.' This model could be used during an outbreak to train providers.

Source: Arora, Sanjeev, et al. "Academic health center management of chronic diseases through knowledge networks: Project ECHO." Academic medicine: journal of the Association of American Medical Colleges 82.2 (2007).

monitoring and treating the disease ranged from wearable devices that continuously monitor vital signs to sophisticated Ebola treatment centers in hospitals that leveraged video conferencing and other tele-ICU technologies.[57] [58]

The US Centers for Disease Control and Protection (CDC) also relied on telecommunications technologies to follow and monitor personnel returning from deployments to West Africa. Returned deployers that had potentially been exposed were quarantined for 21 days and self-monitored and reported updates as directed though text messages, phone, and email. The CDC also developed guidance for local health departments for monitoring both travelers and healthcare workers that had potentially been exposed.[59]

Healthcare preparedness experts suggest that RPM technologies could be used to even greater benefit in the event of an outbreak by facilitating preemptive care. Patients susceptible or vulnerable to infectious diseases could receive RPM devices at the outset of an outbreak. Early monitoring could help prevent exposure and/or facilitate an early intervention if needed.

mHealth for Information Sharing

mHealth is increasingly being explored as a tool public health departments may use in the event of

an outbreak to push event and health information to the public.

Public health messaging programs have proven to be effective. The CDC's Text4Baby program, a free text messaging service for pregnant women and new moms that provides critical health and safety information such as reminders about immunizations, nutrition, and more, has been found to benefit enrollees and improved health outcomes and could serve as a model for health departments interested in developing their own programs.[60] Studies examining the effectiveness of text messages to notify healthcare facilities of outbreaks in resource-limited areas have demonstrated text message systems to be effective in timely notification and enhancing disease surveillance.[61]

Similar to receiving text messages regarding prescription refills before a disaster, public health agencies are researching the feasibility of using text messages to track and encourage adherence in the event of a pandemic that requires multiple courses of antivirals. After receiving the first course, patients would receive a text message reminder when it was time to take the subsequent course.

Synchronous and Asynchronous Technologies for Decision-making Support & Expertise

Various telehealth technologies can provide important decision-making support to healthcare providers during the response to a disease outbreak in several different ways. As previously indicated, RPM can allow a provider to determine if an intervention or disease screening is required, or even consult with family members and caregivers. The more or less continuous provision of data and health information, compared to the episodic information afforded by traditional care, could play a significant role in the event of a pandemic or other outbreak.

Importantly, telehealth can also enable consultations and interaction with disease

specialists and other healthcare providers during an outbreak and facilitate equitable care. An outbreak of a familiar disease, such as pandemic influenza, could see infectious disease specialists and critical care nurses providing support to rural healthcare facilities through video conferencing and other modalities. Similarly, an outbreak of an emerging infectious disease could see disease-specific specialists and researchers providing expertise to multiple healthcare facilities.

Congress's passage of the Expanding Capacity for Health Outcomes (ECHO) Act in December of 2016 has laid the foundation to make the Project ECHO a national model for telehealth. With the model's successes and efficiencies well documented, the legislation holds importance for the application of telehealth to disease outbreaks. The legislation calls on HHS to examine and prepare a report on the model's effect on public health programs, including those related to disease prevention, disease outbreaks, and public health surveillance.[62]

Medical Supply Dispensing & Resource Awareness

Telehealth and technology are increasingly being used to ensure the public has timely access to medical countermeasures and other medicines they might need in an emergency. The 2009 Pandemic and All Hazards Report to Congress cites the inclusion of remote telehealth consultations at countermeasures points of dispensing (PODs) sites as a means of filling a potential gap in dispensing operations when medical screenings are required but the availability of healthcare professionals is limited due to the event at stake.[63] Thought leaders in public health preparedness also cite the possibility of using mobile devices to report inventory levels at PODs to a centralized source managed by public health departments. This data could then in turn be used to help direct the public to the best-resourced POD near them.

Challenges

In addition to the challenges and barriers summarized earlier, applying and integrating telehealth into public health emergency and disease outbreak response efforts faces a distinct set of challenges. Primary challenges include:

- **Adapting Technology:** Healthcare and public health experts point out that state and local agencies are likely to invest in systems that will be used in normal operations over systems more oriented for response. Therefore, in order for telehealth to be incorporated into preparedness and response it will likely have to be done by engaging systems already in place and possibly not designed with response efforts in mind.

- **System Flexibility**: Demands on telehealth systems are likely to surge during an outbreak or public health emergency. Systems must be adaptable and able to scale up for emergencies and built with an all hazards approach in mind. For example, RPM systems may be engaged and relied upon much more heavily during an outbreak and systems must be able to accommodate this surge in data transfer.

- **Privacy and Security:** The 2009 report by ASPR in response to PAHPA points out that privacy laws regarding personally identifiable health information differ by state and could impact data sharing through telehealth in a multi-state event. As it applies to mhealth, health departments have also expressed uncertainty at the ability to use mHealth for messaging.[64]

Public health departments may face a unique set of challenges in implementing telehealth programs for preparedness and response, including

- **Funding:** Telehealth initiatives frequently require funding both for technology and program design, implementation, and evaluation. Public health programs are often funded by grants from both public and private organizations that are typically tied to a specific use. This can lead to difficulties in sustainably funding telehealth programs.

- **Competing Priorities:** Public health departments are often occupied dealing with "the disease or disaster of the day." This can leave limited resources and staff available to identify and implement new programs such as telehealth initiatives.

TELEHEALTH AND TECHNOLOGY ARE INCREASINGLY BEING USED TO ENSURE THE PUBLIC HAS TIMELY ACCESS TO MEDICAL COUNTERMEASURES AND OTHER MEDICINES THEY MIGHT NEED IN AN EMERGENCY.

CONCLUSION

Telehealth is often described as a 'disruptive innovation' or 'disruptive technology' by healthcare leaders and researchers for the potential it has to displace or 'disrupt' traditional means of healthcare delivery with new, alternative ways that are more efficient.[65] By highlighting examples of how telehealth already is – and could – be used in emergency preparedness and response this paper sought to underscore the potential this disruption has for strengthening healthcare and protecting patients' access to care – even in times of emergency – in an effort to foster greater dialogue on how this potential could be realized. Though it is often the case that regulations do not keep up with technology, this cannot be the case

when patient care during times of emergency is at stake. While telehealth faces significant barriers to wider adoption, these are not insurmountable and dialogue on overcoming them, particularly for emergency preparedness and response purposes, should continue in earnest.

With demands on healthcare increasing and public health preparedness funding consistently at risk, it is vital that a trend like telehealth be integrated into emergency plans and response efforts where appropriate. Though telehealth should not be considered a silver bullet for addressing gaps and inefficiencies in providing healthcare during times of emergency, its potential to enhance capabilities where possible is not yet fully realized.

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