A worldwide pandemic's implications for community hospitals and the effect on the patient experience: an ever-evolving challenge to the infrastructure partially addressed by telemedicine

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Abstract

Background: The COVID-19 pandemic has resulted in changes to the health care system, particularly affecting rural community hospitals. Community hospitals have faced unprecedented challenges including but not limited to: resource limitations, supply chain delays, revenue depletion, and, most importantly, confrontation of a pandemic. Systems have been faced with the challenge of addressing infrastructure change to ensure management of COVID-19 spread and to guarantee consistent delivery of quality care.

Objective: The aim of this systematic literature review is to identify the challenges faced by rural hospital systems, particularly in but not limited to the United States, as well as to discuss infrastructure change, specifically development and dependence on telehealth to assist in patient care.

Methods: Initially, a systematic literature search was conducted, and 25 articles were reviewed. Selection criteria including recent publication in 2016-2021, and keywords of 'rural hospitals and COVID-19,' 'telemedicine, community hospitals and COVID-19,' and 'telemedicine and patient satisfaction COVID' were utilized.

Results: Rural hospitals were challenged almost immediately, with too few staff, too few ICU beds, and too many positive cases. Telemedicine helped as a supplement to their income when elective surgeries and clinics had to be canceled to reduce transmission. Patient satisfaction grew

in this new world of technology. Individual experience scores and local hospital experience permitted elaboration upon necessitated infrastructure change to ensure sustainable patient satisfaction.

Conclusion: COVID-19 has changed daily routines. COVID-19 has changed how people experience the world and interact with one another. COVID-19 has left an everlasting impression on health care systems with the development of telehealth, as an example. It has provided an opportunity for rural health systems to set themselves apart with a renewed dedication to patient experience. Patients. First.

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List of Abbreviations

CARES	**Coronavirus Aid, Relief, and Economic Security Act**
COVID-19	**Coronavirus disease 2019**
EHMG	**Excela Health Medical Group**
HCO	**Healthcare Organization**
HHS	**Department of Health and Human Services**
HIPAA	**Health Insurance Portability and Accountability Act**
ICU	**Intensive Care Unit**
IDSA	**Infectious Diseases Society of America**
IT	**Information Technology**
MERS-CoV	**Middle East Respiratory Syndrome Coronavirus**
OCR	**Office for Civil Rights**
PPE	**Personal Protective Equipment**
SARS-CoV	**Severe Acute Respiratory Syndrome Coronavirus**
WHO	**World Health Organization**

Preface

I want to thank my patients, who inspire me daily to be a better physician.

I am honored to have the opportunity to care for them each and every day.

I want to thank my mother who inspires me daily to give back, and to my sons, who I believe have pure hearts and will strive to serve as they grow into active members of our community.

I owe the utmost thanks to my essay advisor, Dr. Jeremy Martinson, who helped make it possible for me to obtain my goal of earning my MPH; thank you.

1.0 Introduction

1.1 Inspiration

"You closed your doors when I needed you most."

--Patient polled after their recent telemedicine visit

"We closed our doors to save your life and the life of your family. We closed our doors despite loss of revenue. We closed our doors because we put you first."

~ Physician at local hospital

Sounds almost counterintuitive—close the door to help the patient. As a physician at Excela Health, I was witness as the System chose to delay elective surgeries, reduce flow through clinic doors, convert to telemedicine appointments, and restrict visitors in the inpatient setting. Despite knowledge that revenue would plummet, infection rates would undoubtedly rise without these drastic calls to action. The pandemic forced systems focused on distribution of healthcare to change some of their defining principles. Patients. First.

By reviewing literature on the challenges uniquely faced by community and rural hospitals during the pandemic, including but not limited to telemedicine services, reduced revenue, and limited staffing, we identify learning points to foster a stronger preparedness phase moving forward during this pandemic and when facing other system challenges in the future.

Telemedicine has grown exponentially over the last two years and has become an essential part of accomplishing healthcare services during this pandemic. Rural hospitals, which may have been least prepared for such a dependency on technology, rose to the challenge and developed telemedicine programs that other systems emulate. Despite impending threats of limited medical

resources almost constantly, supply chain demand and resultant delays, and loss of revenue, patient care remained paramount and physicians were reminded of the Oath they are to live by, "I will prevent disease whenever I can, for prevention is preferable to cure…and may I long experience the joy of healing those who seek my help."

1.2 Introduction

A pandemic is an outbreak of disease that spreads across a large area, such as multiple countries or continents, and affects a large number of individuals.[1] Throughout the 20th century, people were taught about the 1918 Influenza Pandemic as something of the past, causing over 50 million deaths.[2] Now, almost two years into the COVID-19 (Coronavirus disease 2019) pandemic, over 5 million have died worldwide as of the end of November 2021. "Quarantine", "N-95", "isolation", "prone positioning"-words that once were generally confined to the halls of a hospital are now part of the general lexicon of ordinary Americans.

On January 30, 2020, the World Health Organization (WHO) announced COVID as a global health emergency.[3] The emergence of the novel coronavirus SARS-CoV-2, designated as COVID-19 by the World Health Organization (WHO) on February 11, 2020, is one of the highly pathogenic β-coronaviruses.[4] On March 11, WHO declared COVID-19 a pandemic.[5] Daily life changed as it was once known: people grab masks as they head out the door, and vaccination status is part of everyday conversation and job requirements. Healthcare has been particularly challenged over the last two years, specifically rural and community hospitals, which are mostly non-profit organizations.

Over half of the hospitals in the United States are rural hospitals,[6] which have attempted over the last two years to continue to provide the same access to and level of care while facing distinct challenges. This paper will explore one way in which rural hospitals have tried to combat these disadvantages by initiating and/or further developing the use of telemedicine, particularly because rural hospitals often serve a vast geographical region.

Resource limitations have been a specific challenge to rural institutions,[7] only now more challenged by the pandemic. In particular, delay of elective procedures that produce more income dollars is necessary not only to combat the spread of COVID-19, but support a reduction in healthcare personnel throughout the pandemic. Rural hospitals have faced greater risk of closure of their doors, limiting healthcare access even more. In the first year of the pandemic, 28 rural systems were forced to close. Currently, there are 453 rural hospitals at risk of closure.[7]

Rural hospitals serve 18% of America's population, yet house only 1% of ICU beds.[8] However, not far behind resource constraints, lies the challenge of distributing care. In rural systems, care is most often provided in an outpatient setting. Healthcare delivery was reconstructed by institutions in order to increase inpatient bed number and reduce staffing of outpatient sites, converting much outpatient care to telemedicine. This infrastructure change also reduced transmission prior to vaccinations.

Use of telemedicine certainly affected patient experience and satisfaction in rural health systems. An unintended change in the healthcare system during the COVID-19 pandemic may become access and provision of telemedicine to rural communities; determining benefits of such programs becomes imperative given many rural hospitals are at the brink of closure.

2.0 Background

2.1 Emergence of COVID-19

Coronavirus-2 (SARS-CoV-2) is the virus responsible for the COVID-19 pandemic. The first case has been traced to Wuhan City, Hubei Province, China on December 8, 2019.[9] This particular virus is a member of the genus *Coronaviridae*, a pleomorphic RNA virus. It is 80% similar to the evolutionary development of severe acute respiratory syndrome coronavirus (SARS-CoV) and 50% similar to the Middle East respiratory syndrome coronavirus (MERS-CoV), which previously caused outbreaks in the earlier part of this century. It was found that those suffering from this pneumonia in early December were linked to the Huanan seafood wholesale wet market. First isolated on January 7th, SARS-CoV-2 led to the first documented mortality on January 9, 2020.

As of November 21, 2021, there have been 5,127,696 worldwide deaths reported by WHO with over 255 million positive cases.[10] At the same time, it is estimated that 41.5% of the world's population is fully vaccinated.[11] However, depending on income, country vaccination rates drastically differ – the proportion of the vaccinated population in high income countries is 67.9% while in low income is most closely estimated at 6.4%. Variants of the virus continue to emerge, complicating vaccinations more and adding stress to the healthcare system. Variants continue to become more infectious and increase transmissibility. The Delta variant was first identified in India; it is more easily transmitted and can cause more severe disease. More recently, the Omicron variant was identified in South Africa; uncertainty currently surrounds disease state and vaccine efficacy in regards to this variant. Approaches to healthcare must evolve as COVID evolves.

2.2 Rural hospitals and COVID-19

More than half of the hospitals in the United States are considered rural.[12] Though definitions vary on what defines a rural hospital, overall, it is estimated that rural healthcare systems distribute care to 18% of the US population (57 million people) but serve 84% of the land area.[13] Rural healthcare systems include a variety of designations amid these community settings, adding to the complexity of market share, reimbursement strategies, and distribution of aid (see Table 1).

Table 1. Rural hospital designations[13]

Critical access hospital (CAH)	• Rural hospitals maintaining no more than 25 acute care beds. • CAHs must be located more than 35 miles, or 15 miles by mountainous terrain or secondary roads, from the nearest hospital—unless designated by a state as a necessary provider prior to 2006. • Unlike hospitals paid prospectively using inpatient prospective payment system, CAHs are reimbursed based on the hospital's Medicare allowable costs. • Each CAH receives 101 percent of the medicare share of its allowed costs for outpatient, inpatient, laboratory, therapy services, and post-acute swing bed services.
Rural referral center (RRC)	• Rural tertiary hospitals that receive referrals from surrounding rural acute care hospitals. • An acute care hospital can be classified for Medicare purposes as an RRC if it meets one of several qualifying criteria based on location, bed size, or referral patterns.
Sole community hospital (SCH)	• A designation based on a hospital's distance in relation to other hospitals, indicating that the facility is the only like hospital serving a community. • Distance requirements vary depending on whether a facility is rural and how inaccessible a region is due to weather, topography, and other factors.
Medicare-dependent hospital (MDH)	• A designation from the Center for Medicare and Medicaid Services that provides enhanced payment to support small rural hospitals with 100 or fewer beds for which Medicare patients make up at least 60% of the hospital's inpatient days or discharges. • This designation is not available to rural hospitals already classified as a SCH.
Disproportionate share hospital (DSH)	• A special reimbursement designation under Medicare and Medicaid designed to support hospitals that provide care to a disproportionate number of low-income patients. • Although not a rural-specific designation, the DSH designation allows some rural facilities to remain financially viable.
Rural community hospital demonstration	• Implements cost-based reimbursement in participating small rural hospitals that are not eligible for CAH designation. • Designed to assess the impact of cost-based reimbursement on the financial viability of small rural hospitals, and test for benefits to the community.

Rural hospitals have become a key part of community infrastructures. They serve myriad purposes including providing access to healthcare, employment, and economic stimulation; the loss of a facility can be devastating for a community. Unfortunately, each year since 2011, there has been a net loss in rural hospitals nationally. In 2016 alone, 15 of the 21 hospitals that closed served rural communities.[14] From 2010 to January 2019, 95 rural hospitals closed.[12] Complicating things, three out of four hospitals generate more than 60% of their revenue from outpatient services. As care shifts to the outpatient setting, hospitals face competition from clinics outside the rural health system.

Almost 100 rural health systems have closed their doors over the last decade, as operating margins for rural health systems have consistently decreased. Urban hospitals, on the other hand, have seen a steady increase in operating margins over the last decade.[15] The concern is that, therefore, disparities will grow between urban and rural healthcare delivery. Research surrounding health outcomes, mortality, and life expectancy is beginning to show a greater divide between urban and rural locations. Some systems have merged with larger systems to avoid closure that is becoming inevitable otherwise.

Concerns and challenges affecting rural communities take their toll on rural hospital systems, often forcing the hand in closure. Challenges, not limited to operating margins, include: workforce shortage now even more palpable as the pandemic surges, low patient volume, high cost of drugs, etc. (see Figure 1).[13,16]

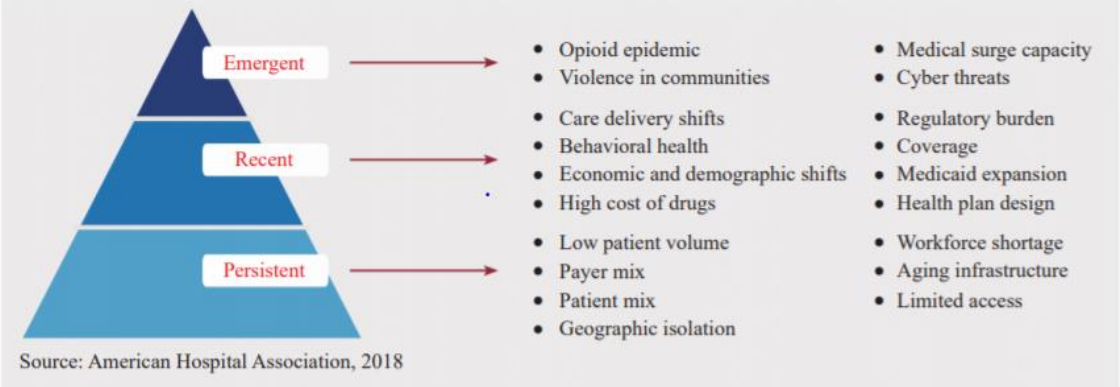

Figure 1. Challenges facing rural communities[13,16]

And then came the pandemic. Hospital systems as a whole lost $323 billion dollars in 2020 alone.[17] Though specific numbers are not available, the burden has likely been disproportionately felt in rural systems that have smaller amounts of cash on hand to absorb short-term shocks. The Federal government, recognizing the emergent nature of the pandemic on the country's infrastructure, authorized $1.9 trillion dollars of relief to the nation, of which only $8.5 billion was dedicated to rural health systems. Given that approximately 20% of Americans receive healthcare at rural hospitals,[18] that number should have been closer to $64 billion dollars. Figured another way, in quantity, rural hospitals make up over 50% of the hospitals serving the US, which would have earmarked an estimated $161 billion dollars, nearly 20 times what was actually funded.

2.3 Telemedicine in rural sites

Lockdowns and social distancing to reduce transmission shifted services in rural hospitals from outpatient back to inpatient amid fears of inpatient overcrowding and limited ICU beds.[19]

Telemedicine became a feasible option to ensure delivery of care and reduce transmission, radically altering the landscape of rural medicine in a breathtakingly short period of time.

Telemedicine, also referred to by some as telehealth, has developed exponentially over the last two years. Defined as using two-way communication technology for healthcare services,[20] it had originally been experiencing growth throughout the 2000's as a way to reach patients that are geographically isolated or struggle to travel due to the extent of their medical conditions. From 2004 to 2013, telehealth visits in rural Medicare sites increased from 7,015 to 107, 955.[15] With goals of addressing healthcare disparities, geographically distanced patients, and the aging population, technology has helped to deliver care more often and more consistently. Telehealth as a tool has many advantages including the ability to address health care disparities – such as reaching patients that lack dependable transportation and providing service at a more affordable rate, serve geographically distanced patients, and treat an aging population in their homes, and can help deliver care more often and with greater consistency. It also allows for subspecialty care offerings that wouldn't otherwise be available to patients, such as telestroke or neurosurgical consultations, given their lack of ability to travel due to physical or financial limitations.

Federal regulators granted exceptions to certain telemedicine healthcare rules to facilitate the necessity of exponential growth to serve during pandemic times. For example, the Office for Civil Rights (OCR) at the Department of Health and Human Services (HHS) granted HIPAA flexibility in order to use applications such as Zoom, Skype, Facebook Messenger, etc. to help support patient access. Medicare and Medicaid also expanded coverage to permit billing for telehealth services across state lines and as if it was an in-person appointment.[20] The overarching goal of the Federal government was to remove any barriers to receiving healthcare in a time of global crisis.

Web connectivity was a limiting factor in distributing telemedicine. Though in India, teledensity is almost 90%,[21] adequate broadband remains a challenge in much of rural America. It was estimated in 2019 that over 34 million Americans still lacked adequate connectivity, limiting their ability to gain access to healthcare through telehealth.[15] Healthcare systems have pushed forward to improve connectivity, expand telehealth services, improve access and reimbursement for rural health systems to ensure survival of healthcare during a pandemic. These changes have likely affected patient experience in ways currently not well-defined.

For this essay, I completed a rapid review of the literature to understand and describe the impact of COVID-19 on rural hospitals, with particular emphasis on the use of telehealth in response to the challenges posed by the pandemic. It is intended to review the unique aspects of distributing healthcare in a rural setting while trying to limit transmission of COVID-19 without sacrificing patient satisfaction.

3.0 Methods

3.1 Literature search

Multiple PubMed searches were conducted using the key terms “rural hospitals and COVID-19,” “telemedicine community hospitals and COVID,” and “telemedicine and patient satisfaction COVID.” All references for articles found were scanned for relevance.

Using the following eligibility criteria, 25 articles were part of this literature review. This review process is summarized in Figure 1.

3.2 Eligibility criteria

Inclusion Criteria. Articles were included if they met all of the following requirements:

1. Abstract must be present.
2. Peer-reviewed journal articles published between the years 2016-2021 (most importantly 2019-2021, though telemedicine discussions may date back to 2016).
3. Article must be written in English.
4. Must have access to full article.
5. Articles discussed rural hospital responses to COVID-19 and implications for rural hospital infrastructure, use of telemedicine in rural settings, and affect of telemedicine on patient experience.

Exclusion Criteria. Articles were excluded if they met any of the following descriptors:

1. Abstracts for Conferences or book chapters.
2. Articles written in another language besides English.
3. Telemedicine articles for specific medical subspecialty experiences.
4. Abstracts only.

3.3 Study selection

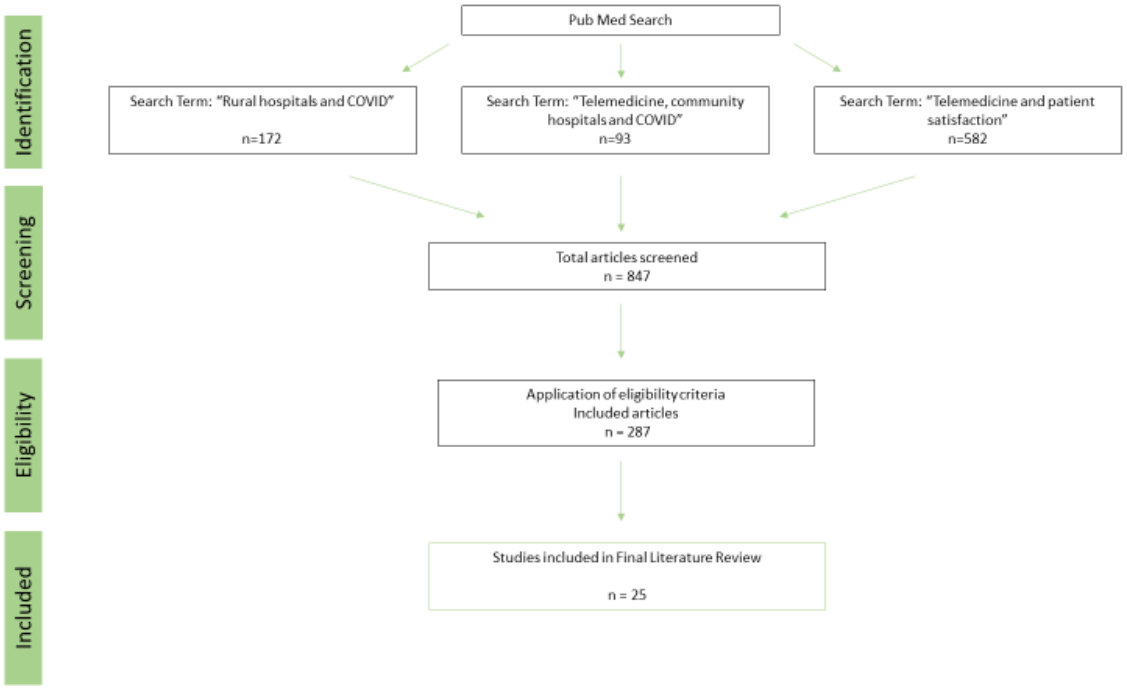

Figure 2. Article selection process

4.0 Results

4.1 Rural hospitals greeted by a pandemic

Many rural hospitals had to close their doors to outpatient services and elective procedures, their main sources of revenue, in order to support the increased need for inpatient coverage during the first months of the pandemic. This was also done to serve as time for healthcare facilities to prepare for a COVID patient surge.[22] Low on supplies, threats of limited personal protective equipment, and the unknown regarding COVID-19 were only some of the initial challenges.

With only 1% of ICU beds serving upwards of 20% of Americans, rural hospitals did not have the infrastructure to initially care for these patients.[8] Rural sites had less access to experimental treatments, clinical trials, and telemedicine, limiting treatment options for patients hospitalized in rural systems.[23] Transfers to urban centers for access to experimental treatments and trials were delayed due to overcrowding. In the beginning of the pandemic, the Infectious Diseases Society of America (IDSA) published treatment guidelines for COVID-19 on April 11, 2020. IDSA recommended treatment of COVID-19 patients with pharmacologic agents only in the context of a clinical trial. Unfortunately, rural health systems are rarely part of these initial clinical trial sites.

The initial weeks and months of the pandemic were marked by uncertainty, changes, and shortages. Surge teams were formed throughout hospital systems, but failure of epidemiological models given the novelty of COVID-19 made planning more difficult. Hospitals constructed negative pressure rooms, increased number of ICU beds, retrained and redeployed their workforce, and opened COVID testing sites, in a coordinated response to the pandemic.[8]

Staff struggled to procure personal protective equipment, and preventing infections and transmission in healthcare facilities became top priority.[9] Staff self-screened at home, and were screened again on arrival to work. Lunch breaks were staggered and employees were distanced.

Rural hospital systems had to learn to stand alone in preparation for COVID-19's predicted surge. Financial constraints on rural systems only became more evident during the pandemic as sources of income were stalled.[7] Suggestions on improvement of rural systems during the pandemic included growth of Information Technology (IT) to administer telemedicine, with reduction of cost of IT services in order to implement this in smaller healthcare organizations (HCO's). Howard, Counte, et al. also discuss the need for a better understanding of patient experience and how this will help shape the future of healthcare within and following the pandemic.[7]

COVID-19 confusion was not limited to the United States. For example, initially, fever standards were difficult to implement and understand at rural sites, particularly seen in Japan. Fever standards were issued and then changed by the country, and medical professionals were left confused as to how to best screen patients. Specialists were refusing to see febrile patients at all.[24] Social fear was rampant in Japan,[25] among other countries, yet lowering the fever standard led to increased patient numbers and increased staff burden.

Patients experienced fear of transmission and diagnosis of the virus. In Germany, in both rural and urban areas, stroke admissions decreased by 20% in urban centers and by 20-25% in rural hospital systems.[26] Similar delays in seeking care were seen in China.[27] Researchers investigated this trend; they saw it occur in many countries as a result of patients avoiding the hospitals when symptoms were milder so as to avoid COVID-19.

Healthcare institutions had to evolve quickly and implement consistent ways of distributing care within the limitations of reducing transmission, contributing to revenue, and maintaining continuity of care for patients.

4.2 Necessity of telemedicine

"You never want a serious crisis to go to waste. And what I mean by that [is] it's an opportunity to do things you think you could not do before."

~ Rahm Emanueal

As the COVID-19 pandemic began, hospital systems had to reduce outpatient visits and postpone elective surgeries in an attempt to reduce transmission of the virus and allow healthcare systems to divert resources and alter their infrastructure to prepare for an inpatient surge. Access to care was limited in rural regions prior to the pandemic due to distance traveled for care; the pandemic only further limited these services. Subspecialty care is, in particular, quite difficult to obtain rurally.[28] Providers had to be trained in telehealth visits and technology services had to quickly scale-up to meet this need. Improvement of telemedicine services at rural sites required improved insurance coverage for patients, reimbursement for systems, internet access, and privacy and security enhancements. By improving telehealth technology and thereby enhancing patient access during the pandemic, rural hospital systems could use this as an alternate source of income when otherwise dependable outpatient services were postponed.

Cost of telehealth visits, in general, is less for patients. A telehealth visit costs about $50 while an in-person visit costs about $176.[29] Co-pays can reduce this cost to the consumer to around $20 per in-person visit, but, during the beginning of the pandemic, co-pays for telehealth visits

were waived by many of the major insurers.[30] Under the Coronavirus Preparedness and Response Supplemental Appropriations Act, coverage restrictions for telehealth were altered and loosened effective March 6, 2020 given the national public health emergency.[31] During the public health emergency, Medicare reimbursed healthcare systems for telephone and audio-visual telehealth appointments as if they were conducted in-person. Impressively, over 25% of Medicare subscribers had a telehealth visit during the pandemic from March 2020 through May 2021, which improved access to disadvantaged populations. The 117th Congress has proposed permanently covering some of these telehealth expansions given the witnessed improvement in healthcare distribution.

Subspecialty care has become more accessible to patients in rural areas now that telemedicine is more readily available, and telemedicine has improved the ability of patients to avoid transfer to tertiary care centers given the opportunity for specialty consult without transfer.[32] In fact, one system developed two telemedicine programs: 1) provided a consultation service from a tertiary center to two understaffed rural hospitals, and 2) provided hospital-to-home telehealth for patients recently discharged. This helped to limit exposures, provided care in understaffed areas, and ensured proper follow-up in rural areas.

When establishing telehealth services for rural sites, it was imperative that the focus be hands-on training of staff, use of the simplest technology to accomplish the goal with essential practice sessions, improved broadband and unlimited data so that connections did not fail, and provision for feedback and quality improvement.[18] Both outpatient and inpatient consultations were conducted. The use of telemedicine served to reduce transmission of COVID-19 by limiting staff exposure. What began as an initiative to improve income, quickly became a public health initiative to improve care and reduce risk. These initiatives were quickly recognized by the

government, and policy makers passed legislation as early as March 27, 2020, 16 days after COVID-19 was declared a pandemic, which addressed increased telehealth capabilities.[33]

Though one study found that rural sites were often more prepared to offer telemedicine services than their urban counterparts, services were also limited in smaller hospitals, in general. Providers in rural areas were also more averse to learning telehealth and putting it into practice.[19] As of 2017, Figure 2 demonstrates prevalence of telemedicine capabilities in rural hospitals prior to the pandemic.

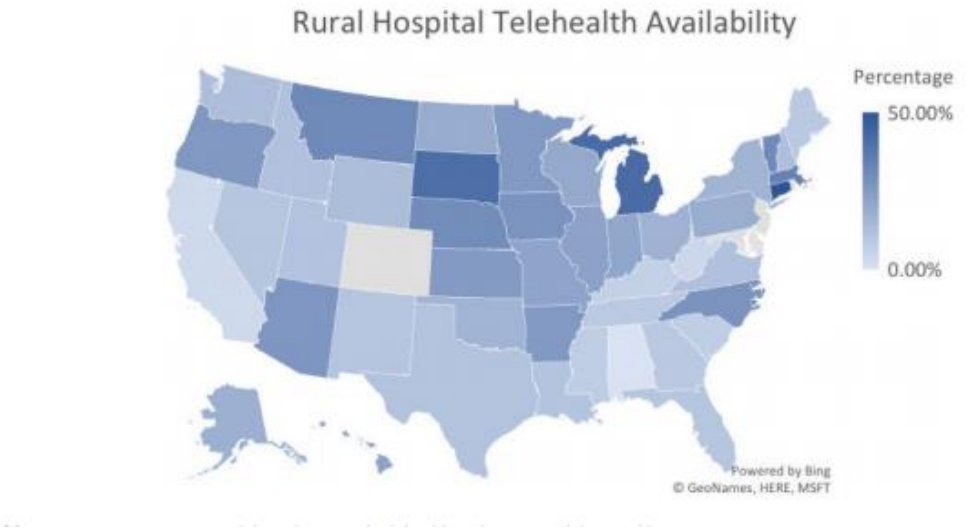

Figure 3. Percentage of rural hospitals configured with telehealth capabilities, by state[33]

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Expansion of telehealth services was imperative worldwide to permit healthcare to not only survive but thrive in a time when need skyrocketed. As early as March of 2020, 2.6 billion people worldwide were already in lockdown.[34] To ensure continuity of care, telemedicine became not only a valid option but the only option in many cases. Telehealth services had to be established, providers had to be trained, patients had to be educated, and healthcare guidelines had to change

in order to promote this type of care. Telemedicine began to enmesh itself into what is now normal healthcare.

In India, healthcare is centered in urban areas. However, the majority of the Indian population (67%) is in rural areas.[21] Connectivity/teledensity is almost 90%, which confirms that the offering of telehealth services would potentially reach more of the population as a whole. Telehealth not only offered rural residents an opportunity to see a provider without risk of transmission in busy city centers and waiting rooms, but it also provided a unique way to increase access to general healthcare in India.

Providers were polled in Saudi Arabia regarding usefulness of telemedicine and one-third felt telemedicine could improve the intervention and 44% believed quality of care was enhanced with telehealth use.[35] Overall, it was felt to also provide psychological support, improve compliance, and help patients save time and money. Though providers still preferred in-person assessments to ensure proper diagnosis, most felt there is a future role for telemedicine as part of healthcare. In both the studies in India and in Saudi Arabia, the providers expressed concern around access of telemedicine for the elderly population.

Vietnam was felt to have one of the most effective pandemic response strategies in the world as identified by WHO.[36] On June 22, 2020, the Vietnamese Ministry of Health launched a project to improve remote medical examinations and treatments from 2020 to 2025, establishing the Vietnam Telemedicine Center for COVID-19 Outbreak Control. This includes web-based consultations for difficult cases and telemonitoring during surgeries (see Figure 4).

Figure 4. Real-time heart surgery telementoring for a case involving a 55-month old child with a ventricular septal defect hole under 2 aortas[36]

Telemedicine services broadened throughout clinics and health systems during the pandemic particularly due to the lockdowns and rules regarding social distancing. In a time of need, technology came to serve the world well. Acceptance of that technology by patients and providers is following suit.

4.3 Telemedicine and patient experience

Patient experience has become a defining characteristic for health systems. In a study of 18 articles regarding satisfaction of the use of telehealth not only in the United States but across other countries, 14 of 16 of the articles showed a high level of patient satisfaction with the use of

telehealth during this pandemic.[37] Caregivers also have positive comments regarding the use of telehealth. Five of the 18 studies looked at clinician satisfaction and four of the five reported a high level of provider satisfaction of 80% and above. The fifth study showed a satisfaction score of 78% out of 100. Satisfaction with telehealth was present prior to the pandemic, but its use has grown exponentially since the emergence of COVID-19. When looking at patient satisfaction, Kruse, et al. evaluated for common themes and telehealth interactions that lead to increased scores.[38] Overall, it was found that telehealth provided increased access to care, improved outcomes, decreased wait times, decreased readmissions, and improved medication adherence.

In another review article of 45 studies, again across multiple countries including but not limited to the United States, India, and China, they discussed the importance of telemedicine for daily follow-up of hospitalized patients and medical rounds via video, follow-up visits in the outpatient setting, and limitation of the use of personal protective equipment given the lack of direct contact.[39] In the time when PPE was limited, this allowed for use when necessary. As discussed by Dr. James Hamilton in Kansas, his nursing staff was having to reuse PPE.[40] Observers would need to be paid to ensure that the caregiver was removing and reapplying their PPE correctly, but they were experiencing increased risk of infection each time they reused the same gown.

Studies from Australia also found high levels of patient satisfaction with telemedicine visits. Of 596 telehealth users, 61.9% stated that their telehealth visit was 'just as good as' or 'better than' their in-person visit. Patients also felt telehealth would be 'moderately' to 'very' useful for appointments after (and if) the pandemic ends.[41] Only 1.4% of patients reported they were unable to access a telemedicine appointment. Barriers reported by these 19 patients included: telemedicine

services were not offered by their physician, they did not have the Internet, the appointment was not available at the requested time, and telehealth services felt too complicated (n=5, 26.3%).

More specifically, in New York City, researchers compared Press Ganey data on video and in-person visits. They looked at results from an urban academic Medical Center in New York City. There was an 8729% increase in video visits during the COVID-19 pandemic.[42] Press Ganey scores were significantly higher in video visits than in-person visits with a score of 94.9% versus 92.5% ($p<0.001$). The mean age of those using telehealth was also 58.8 years of age, showing that telehealth is not just the domain of the young.

In general, when reviewing satisfaction with telemedicine appointments, patients consistently reported a 95 to 100% satisfaction rate.[43] When asked for a reason that they prefer telemedicine, patients most often cite decreased travel times and decreased cost. Certain qualities regarding telemedicine programs were identified in healthcare systems that seem to result in improved provider and patient satisfaction scores (see Table 2).

Table 2. Recommendations to improve provider and patient satisfaction with telemedicine[43]

Improved provider satisfaction	Improved patient satisfaction
•Involve providers in the design of the telemedicine program	•Promote realistic expectations before the visit takes place
•Administrative support for use of TM	•Use satisfaction surveys formatively to improve the experience of telemedicine
•Easy to use, reliable technology	•Easy to use, reliable technology
•Involve appropriate providers who are flexible, enjoy innovation	•Involve appropriate patients who are adaptable and who welcome the convenience of the new technology
•Adequate reimbursement for care delivered via TM	

Reprinted by permission from Springer Nature Customer Service Centre GmbH: Springer. License Nuber 5210311243277. Nguyen M, Waller M, Pandya A, Portnoy J. A Review of Patient and Provider Satisfaction with Telemedicine. *Curr Allergy Asthma Rep*. 2020;20(11):72. Published 2020 Sep 22.

Telehealth services can be used not only in family medicine and some of the more cognitive subspecialties, but also in the surgical subspecialties. A look at telemedicine and orthopedic surgery revealed that patients on average were satisfied with telehealth and 37% of patients preferred that future visits be conducted with telehealth.[44] Surgeons were similarly satisfied with the telehealth experience; despite their physical examinations being only rated as moderately effective, they were fairly confident in their diagnoses. About one third of surgeons believed that their telehealth patients would still require an in-person visit, but 93.9% of the surgeons surveyed will continue using telehealth beyond the COVID-19 pandemic. This is a common theme among medical specialties.

Growth of telemedicine throughout the pandemic has permeated healthcare specialties. For example, orthodontic consultation is now being done via telemedicine. Fifty-nine orthodontic patients were surveyed and 93% found the telemedicine instructions to access the consultation easy to follow. Clinicians were surveyed (n= 62) and 70% of them reported no connection issues. Seventy-six percent of patients reported that the telehealth consultation was more convenient than face-to-face and 66%, two thirds of patients, reported that they would like further telemedicine appointments in the future.[45]

The literature points to healthcare's newfound dependence on telemedicine to distribute care, contribute to revenue, and improve patient satisfaction.

5.0 Discussion

5.1 Telemedicine fills used

In high- and middle-income countries, telemedicine replaced many in-person visits over the last two years as social distancing was promoted as a way to stop transmission of COVID-19. Telemedicine became a way to reduce use of PPE on the inpatient side by limiting personnel interactions with patients. As Aron, et al. and Muralidar, et al. point out, various strategies to reduce transmission and preserve PPE were essential to rural health system survival.[8,9] Telemedicine was a way to address both. It permitted administration of care to patients that were in quarantine. Telehealth also served to supply care and reach patients that otherwise would be limited in their access secondary to travel limitations.

As pointed out by researchers in Japan,[25] Germany,[26] and China,[27] fear isolated patients. Telemedicine became a way to address this isolation, reduce transmission as discussed by Muralidar, et al.[9], and improve continuity of care. Use of telehealth also expanded distribution of care to include subspecialties as discussed by JM Nagata[28], which patients previously had to travel to obtain.

Impressively, both patient and provider satisfaction scores throughout rural health systems remained stable or improved with the initiation of telehealth visits as described by Andrews, et al. in their review of 16 articles.[37] Patients often preferred telemedicine visits as they saved both time and money. Telemedicine eliminated the need for frequent travel, which can be particularly difficult in rural settings where patients can travel for hours to see a healthcare provider, again discussed by JM Nagata.[28] Though both patients and providers understand that there are

appointments that telemedicine will never replace, such as was described by Buchalter, et al.[44] regarding surgeon's thoughts on limitations of telehealth, its value has been demonstrated and is likely to persist after the pandemic.

Overall, telemedicine use helped to improve income for these rural systems.[28] Cost to the patient is less as described by Brian O'Connell,[29] and co-pays were waived as part of the Coronavirus Preparedness and Response Supplemental Appropriations Act. As pointed out, over 25% of Medicare patients had a telemedicine visit during the pandemic,[31] which advertises the growing popularity of telemedicine.

This emerging technology has seen much change over the last two years. In April of 2020, telehealth visits were at 78x the utilization of February 2020.[46] This has stabilized, 18 months later, at a rate 38x that of February 2020. Systems are having to persistently commit capital monies to support evolution of telehealth technology, access, and laws. Consistency in telehealth offerings has become imperative for system perseverance and limitations on transfers has resulted in increased revenues to the rural systems, as discussed by Gutierrez, et al.[32]

Policies governing telemedicine are under frequent review, which can lead to confusion among both healthcare workers and patients. When Virginia's public health emergency ended in Summer of 2021, 1,000 patients could no longer receive remote care at Johns Hopkins University.[47] Massachusetts General Hospital reportedly had to cut care to thousands of patients as varying state laws changed. In order to continue seeing some out-of-state doctors, patients are traveling to nearby states and dialing in to telehealth visits from the sides of the roads. Access that was hailed as lifechanging, is now being limited once again.

University of Utah Health saw over 100,000 out-of-state telemedicine visits in 2020 alone.[47] Now, continuity of care with those patients is threatened. A doctor in that health system

stated that a patient traveled over eight hours to see him but had to stop at an Emergency Room along the way due to low blood pressure. Licensing was relaxed for medical doctors and now is becoming more restricted, with licenses needed in each separate state instead of one license to serve all. This is starting to limit patient access once again. And, when the public health emergency expires for the nation in early 2022, Medicare will stop reimbursement for most telehealth services. Though Medicare has expanded reimbursable telehealth codes for 2021,[46] a large question for healthcare centers is if Medicare continues to pay, will they pay at the same rate they have been for the last two years, a rate equal to that of in-person visits? The answer is likely no. But that raises only more questions.

The infrastructure of healthcare has changed during the COVID-19 pandemic. This was seen in the United States,[19] as well as in India,[21] Saudi Arabia,[35] and Vietnam.[36] If reimbursement is limited and if laws don't change with the times, then we will likely revert back to square one, where rural access to healthcare declines once again. Systems are dedicated to seeing telehealth continue to ensure continuity of care for those patients most in need. Advocating with examples of successful implementation of telehealth can only support this ever-changing healthcare infrastructure.

5.2 Case study

As a neurologist at Excela Health Medical Group (EHMG), I witnessed firsthand how the pandemic has resulted in the evolution of healthcare over the past two years and the implications on the patient experience. As Chair of a department and the Patient Experience Committee at EHMG, we have committed to expansion of telehealth services and dedication to patient

satisfaction. By sharing some of that experience, I am hopeful that other rural systems may learn from our trials and triumphs.

Excela Health is a rural healthcare system in Southwestern Pennsylvania, primarily serving Westmoreland County. It has three hospitals, over 4,800 employees, as well as the Excela Health Medical Group which focuses on distribution of outpatient services, as well as rehabilitation, home health, therapies, etc. As was discussed in the literature review, rural and community hospitals faced large changes at the start of the pandemic. Previously limited in its ability to supply telemedicine to its patients, telehealth became a key way to distribute healthcare for rural systems as pointed out by Gutierrez, et al.[32] and by Puro, et al.[33]

In the first few months of the COVID-19 pandemic, March through May, Excela Health lost an estimated $38 million dollars as it eliminated elective surgeries and patient in-person visits to help curb transmission and to funnel medical support to the inpatient side. The Coronavirus Aid, Relief, and Economic Security Act (CARES) dedicated $2.2 trillion dollars to help support the economy as COVID-19 disabled the infrastructure.[48] Of that, Excela Health received only $10.4 million to offset their $38 million in losses.[49] Excela was not alone; hospitals across Pennsylvania were estimated to have lost a total of $10.2 billion for the year 2020. This was not stunning considering the $323 billion lost in hospital systems across the United States[17] with only $8.5 billion being distributed back to the rural systems.[18] Both K. MacDonald,[17] and the American Hospital Association,[18] summarized these estimated losses.

EHMG promoted telehealth in order to compensate for the inability to supply in-person care and need to recover lost revenue. Providers and staff developed easy instructions and protocols for secure interactions via telecommunication systems. Initially, staff was nervous and hesitant to accept this new way of administering care; rural systems throughout the United States

felt similarly hesitant as pointed out by Vincent, et al.[19] However, as use increased and as the pandemic surged on, providers and patients practiced acceptance and began to thrive in a world suddenly more dependent on technology. This confidence in telemedicine is clear when provider satisfaction was recorded at 80% and above by Andrews, et al.[37]

A member of each subspecialty was identified by EHMG as a telehealth expert and was available to their colleagues for assistance. Information technologists were assigned to teams to be at the ready to assist patients with connectivity and concerns. Within just a few weeks, telemedicine became a main way hospital staff could supply continuity of care to patients. Similarly, Vietnam utilized telehealth in new ways including telementoring,[36] permitting continuity of care, individual patient cases, and education of physicians. At Excela, the preference for new referrals remained an in-person evaluation, but follow-ups were in majority conducted as telehealth appointments. Patients quickly adapted as did providers. What seemed so foreign in the beginning, quickly became second nature. Kruse, et al. pointed out that telehealth improved access to care, patient outcomes, wait times, readmission rates, and medication adherence.[38] Similar themes were witnessed at Excela Health, including but not limited to improved continuity of and access to healthcare.

The patient experience has been recognized by Excela Health as being an essential focus of the System. By working together, there was a recommitment to the patient, as an individual. One of the most important hurdles faced was showing dedication to each patient's unique health concerns and making that dedication palpable. Initial scores were at the sixty-fifth percentile when compared to other systems regarding the likelihood a patient would recommend the clinic to others. As telehealth was implemented, patient satisfaction scores of these visits at other health systems reached 95-100% as discussed by Nguyen, et al.[43] Overtime, Excela's numbers also improved and

some patients expressed their preference of telehealth appointments. Barriers for patients and providers at Excela were similar to those discussed by Isautier, et al.[41], particularly lack of connectivity and complicated instructions for use of telehealth. By identifying clinic improvement strategies, culture shifts, communication barriers, etc., Excela recommitted to the patient experience. Telehealth became one of these improvement strategies.

It became important for the providers and staff to recognize their own humanity, find joy in their daily work, and recommit themselves to a life of service, all factors identified as key to system improvement. Health, preventative medicine, acceptance, refusing to be defined by illness, are only accomplished with the patient at the center of the care team. This is why it makes sense that patients will be more likely to recommend a practice if the staff works together to care for the patient—90% of patients that felt the staff did not work together, would not recommend the provider or the practice, for example. As pointed out by Nguyen, et al.[43] improved provider and patient satisfaction with telemedicine can also be dependent on setting realistic expectations for the appointment, utilizing surveys, simplifying the technology, and offering telehealth to those patients with adaptability. EHMG did, for example, focus on survey improvement during the later months of the pandemic (early 2021) as a way to improve patient satisfaction.

During the pandemic, it has become imperative that the caregivers instill confidence in patients by working together. One must focus on the patient's humanity—showing them respect, listening to them, and explaining in ways they can understand. In the same way, it is best to allow the patients to see the caregiver's humanity as well. By assessing physician communication quality, office staff quality, access to care, care coordination, moving through the visit, nurse/assistant, and provider, it was possible to identify goals for FY 2022 with lessons learned (see Figure 5). Reassuringly, patient satisfaction improved as telemedicine opportunities grew in

FY 2021 and now FY 2022; improved use of patient experience surveys following appointments encourages patient feedback, which is shown to increase patient satisfaction.[45]

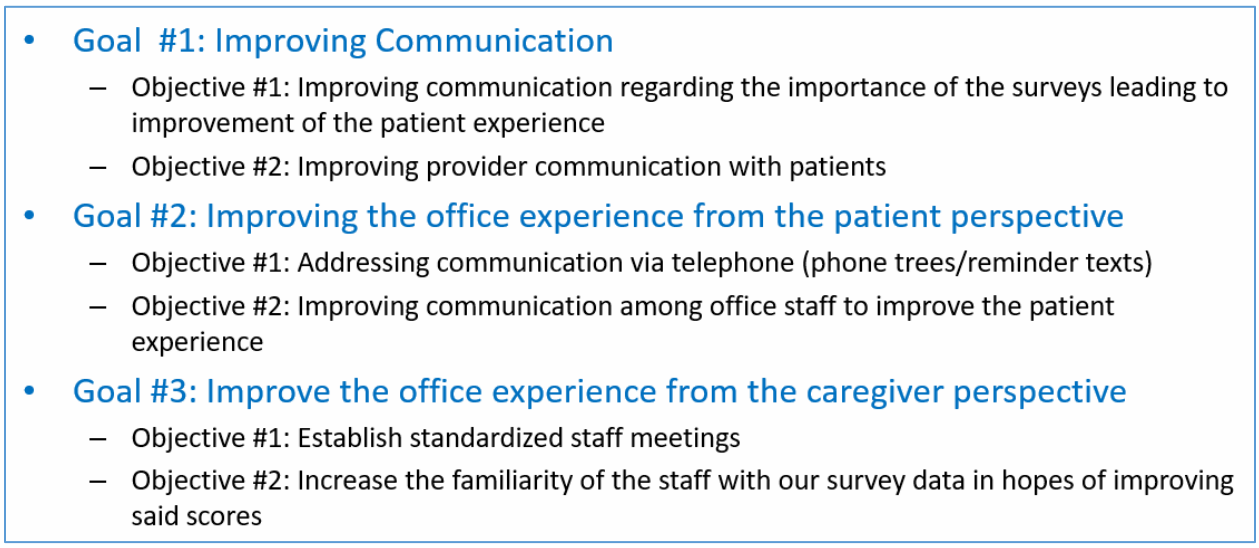

Figure 5. FY 2022 goals to improve patient experience

6.0 Conclusion

Given the unique challenges faced by rural healthcare institutions, infrastructure changes were a necessity for system survival. One of the most effective ways to administer care without spread of COVID-19 became development of and improved use of telemedicine. Rural systems suffered from insufficient staffing, lack of isolation rooms, and lack of telemedicine services. At the same time, patients in rural areas had poor access to healthcare because of travel time, insurance coverage, and lack of public transportation.[50] Chief of Surgery, Dr. James Hamilton, at a rural hospital in Kansas, detailed a chronology of events over 10 days at the start of the pandemic.[40] He pointed out that rural hospitals dependence on elective surgeries and tests resulted in failure of the infrastructure when these procedures had to be delayed. In February, his hospital was $2 million in the black; one month later they were $7 million dollars in the red. Staff were sent home; positions were eliminated. He summed up the situation of so many in rural medicine thusly, “In a war, we are furloughing the army.”

This literature review permitted a closer look at rural healthcare systems and the pressures that existed as the COVID-19 pandemic began. Telemedicine came to serve as a partial answer to the new demands placed on patient access to care. Expansion of telemedicine services became essential to delivery of care as communities were otherwise shut down. Patient satisfaction remained high with use of technology to administer care. Recognition of challenges for the elderly and for those in particularly rural areas, for example, allowed for adjustments that resulted in more dependable care.

Patient experience improved despite the limitations of the COVID-19 pandemic. Though revenue was initially lost, flourishing of telemedicine programs helped to combat that decline.

Continuity of care was also ensured, which improves health outcomes. Though telemedicine was a part of healthcare prior to 2020, the COVID-19 pandemic provided the opportunity of forced development of programs, dedication to its success, and determination to see it succeed. And succeed it did. Now, the future of health systems will clearly maintain telemedicine as an integral part of delivery of care. Previously, more limited to academic and urban centers, community hospitals now have an opportunity to compete in the technologically advancing world. Rural hospitals will maintain their role as providing personalized medicine to communities; telemedicine will only be an added, positive addition to this care structure.

7.0 Limitations

Literature regarding rural healthcare systems during the pandemic and particularly literature addressing telemedicine during the pandemic, is countless. Limitations of this study include the nature of a rapid review of the literature. In particular, specific telemedicine founding principles were not reviewed and that can certainly shape outcomes, both health outcomes and success or failure of a telemedicine program.

The literature review did allow for some discussion of rural health systems and use of telemedicine in other countries, for example including but not limited to Germany, Australia, Japan, Saudi Arabia, India, and Vietnam. However, extensive literature was not available for most other countries making overarching conclusions more difficult and lending itself to more confounding variables when attempting to do so. It would be helpful to conduct further investigation into telemedicine uses in other countries to better understand the range of development of and commitment to telehealth. For example, Vietnam used this opportunity to dedicate itself to positive change and education with the help of telemedicine with a funded, five-year plan. It would be helpful to know if other countries have considered similar movements. It is also important to note that nearly all the countries represented are high-income countries.

In general, research within rural health systems is less predominant than in urban centers and teaching/academic hospitals. The latter has resources that are not available to community hospitals. In this way, data is more limited regarding telehealth usage in rural systems comparatively.

8.0 Public health significance

Rural community hospitals remain vulnerable pieces of our healthcare system. Hundreds remain at risk of closure and are persistently fighting to keep their doors open. Dependable sources of income, including elective procedures, were initially placed on hold given social distancing requirements and are now at times delayed due to overcrowding and limited staffing. Another public health crisis within a pandemic exists.

Changes to the overall infrastructure of rural health systems has been necessary for their survival. Development of telemedicine programs has become an essential element of this survival. Patients and providers have experienced success with telehealth visits and patient outcomes are improving. The impact on public health is a good one. But to paraphrase what Dr. Hamilton of Kansas said, 'in times of war, this is no time to furlough the Army.'[40]

Healthcare administrators and providers have joined together to rededicate themselves to supplying healthcare in effective, efficient, and affordable ways to our rural populations. Telemedicine has become a key aspect of this. Patient experience has improved in the setting of telemedicine. Patient satisfaction is an important part of what keeps hospital doors open. The culture of care defines a healthcare system; the center of that care must always be the patient as an individual. The patient must not be or feel defined by their illness; instead, they must form relationships with their healthcare providers to allow them to take charge of their own health experience. Public health improves only with dedication to, and recognition of, the individuals that are the 'public.' Working together to combat this pandemic will serve to unite healthcare providers and patients in a common goal of wellness. Patients. First.

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