

Telemedicine: The cure for rural outmigration?

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Abstract The Quadruple Aim — enhancing patient experience, improving population health, reducing costs and improving the work life of healthcare providers — is widely accepted as a compass to optimise health system performance. Access to timely, high-quality health-care services is an ongoing challenge in most rural communities in the USA, and a shortage in family practice and specialty-trained physicians is increasing rapidly according to current projections. In addition, a significant number of rural facilities are facing financial challenges and potential closure. Telemedicine offers an innovative solution to these problems in rural America by increasing access to medical specialty expertise. This paper considers the implementation of telemedicine services and potential barriers to its successful implementation, and describes examples of successful telemedicine programmes.

KEYWORDS: telemedicine, outmigration, rural medicine, access, physician engagement

INTRODUCTION

Access to timely, high-quality health-care services is an ongoing challenge in most rural communities because of a rapidly increasing shortage of family practice and specialty-trained physicians. According to current projections, the USA will face a shortage of 90,000 physicians of all specialties by 2020, and this shortage will rise to 130,000 by 2025.¹ Physician shortage is associated with provider burnout and job dissatisfaction, lower patient satisfaction and reduced health outcomes in hospitalised patients.² Research has shown that patients want to have their health problems addressed, to be seen in a timely fashion and with empathy, and to enjoy an ongoing relationship with high-quality clinicians whom they choose.³ This patient-centred approach to practice has been described as 'They give me exactly the help I need and want exactly when I need and want it.'⁴

By increasing access to medical specialty expertise, telemedicine, the remote diagnosis and treatment of patients by means of telecommunications technology, offers a potential solution to the problem of physician shortages in rural America. Globally, the acceptance and use of telemedicine has rapidly expanded from an estimated 500,000 patient encounters in 2012 to a projected 7 million encounters in 2018.⁵

Research findings show that telemedicine reduces patient care costs and can help rural hospitals avoid costly patient transfers, resulting in significant cost savings and retaining revenues in their home facilities.^{6,7} For example, one provider of telemedicine emergency services to 137 small and rural hospitals reported that in 2009 its client facilities experienced US\$3.5m in cost savings by avoiding transfers of over 700 patients who

were able to be cared for locally because of telemedicine emergency medicine oversight.⁸ The ability of rural hospitals to keep patients in their rural communities rather than transferring them to tertiary care centres allows them to recoup the cost of telemedicine services, to keep patients near their family systems of support and to keep healthcare-related jobs in the community.^{9,10} In another study, transfers from long-term care facilities decreased by 68 per cent over three years after telemedicine consultation services became available, decreasing from an initial referral rate of 54 per cent in 2013 to 17 per cent in 2015. Averting these unnecessary transfers also saved US taxpayers over US\$5m in Medicare and Medicaid charges related to hospital admission (511 avoided transfers $\times$ US\$11,000 per average hospitalisation from a long-term care facility).^{11,12} Telemedicine also improves patient access to care by saving time and mileage travelled and has been used successfully in many rural settings.¹³

In addition, specialty medical consultation via telemedicine can help rural hospitals overcome issues with provider shortages. Specifically, telemedicine services can enhance access to care, improve care quality and provision of evidence-based care, increase medical resources during critical events, improve care coordination and recruitment of physicians, and stabilise the rural hospital patient base by reducing unnecessary patient transfers.¹⁴⁻¹⁷ Telemedicine can also provide relief or backup coverage for medical staff in rural hospitals, significantly improve provider, patient and family satisfaction with care, and reduce patient care costs.¹⁸ Telemedicine services can also be used to close gaps in quality oversight and provide staff educational opportunities (please see

description of eStewardship later in this paper).

Telemedicine has been shown to provide rural hospitals with unique opportunities to address specialist access needs. For example, researchers performing a review of 38 studies evaluating the use of telemedicine in emergency care found that telemedicine promoted high-quality patient care and user satisfaction. The investigators concluded that telemedicine emergency care consultation successfully meets the needs of small and rural hospitals to address infrequently encountered emergencies requiring specialist care.¹⁹

In our experience, at Howard County Medical Center in St. Paul, Nebraska, patients in pursuit of specialty medical services were required to leave the community and drive over 240 miles, all while experiencing up to a four-month delay in receiving care. In response to these patient care needs, Howard County Medical Center now provides local access via telemedicine for multiple clinical services, including pulmonology, nephrology, dermatology and endocrinology. Also, in patient satisfaction surveys, patients frequently indicate that they feel physicians listen more intently while on camera than they do in a typical face-to-face appointment.

Telemedicine consultation can also promote patient care quality and safety by decreasing physician medication errors. In one study involving 234 patients, investigators found that patients whose care involved telemedicine consultation experienced significantly fewer physician-related medication errors than did patients receiving care based on telephone consultations or no consultation (a 3.4 per cent rate of medication errors versus 10.8 per cent and 12.5 per cent rates of medication errors, respectively; $p < 0.05$).²⁰

Hospital readmission rates can also be reduced through improvements in care quality and patient outcomes related to

telemedicine consultation, resulting in significant cost savings from the avoidance of unnecessary care and readmission penalties from Medicaid and Medicare.^{21–23} The reduction of hospital readmission also prevents the exposure of medically fragile patients to transfer-related health risks, and eliminates strain on patients and family members.²⁴ Additional cost savings can result from reduced hospital length of stay due to improved patient outcomes.²⁵

TELEMEDICINE REDUCES PATIENT OUTMIGRATION, BENEFITING HOSPITALS, PATIENTS AND COMMUNITIES

By creating access to specialised medical care for communities with resource and geographical constraints, telemedicine solutions bring care to the patient and reduce the need for patients to travel to a distant hospital or medical centre because the care they require is unavailable in their home community (patient outmigration). This reduction in patient outmigration, resulting in a reduction of transfers from rural hospitals to regional medical centres, offers a host of supplementary benefits for rural hospitals, patients and communities.

Some patient benefits include enhanced access to care, increased satisfaction with care, dramatic reductions in waiting times to obtain care, reduced burden of care and reduced care costs because high-quality care can be obtained locally. In addition, patients benefit from enhanced coordination of care, because telemedicine allows multiple medical specialties to be offered ‘under the same roof’ in rural hospitals. Also, the flexibility of telemedicine makes care available to patients where they are and when they need it (such as providing direct-to-patient virtual urgent care services to college students, working adults, persons travelling outside the community and elders in living communities). At the same time, economic

benefits accrue to rural communities by keeping patient care local, providing local healthcare jobs and supporting local businesses.

Telemedicine augments care delivery in rural communities while reducing the burden on community physicians, decreasing burnout and enhancing physician recruitment, retention and work–life balance. Additionally, nursing staff and other clinical staff have access to around-the-clock physician support through telemedicine, which reduces clinical turnaround time and supports clinical communication after hours.

Benefits to specialist medical providers and originating-site hospitals include expanded clinical reach, a larger patient referral base, reduced travel time for satellite specialty clinic activity, improved clinical efficiency and reduced overhead costs.

CONSIDERATIONS IN IMPLEMENTING TELEMEDICINE

Considerations in the implementation of telemedicine programmes include legal issues such as creating a telemedicine entity and developing contracts with providers and rural facilities. Legal issues may also involve cybersecurity, medical malpractice, and licensure and deployment of services across state lines. Legal requirements vary from state to state and from country to country, so a detailed understanding of regulations and laws governing telemedicine services is required.

There are many potential approaches to developing a telemedicine business model. The foundational components include determining the scope of services that will be offered, the identification and development of clinical resourcing, and the supporting revenue and funding strategy. The objectives of the telemedicine programme must be clearly identified to determine the breadth and depth of services provided. Many programmes focus on specific service lines, while other

programmes offer a broad array of support and services. Clinical resources may be identified within local medical staff or may be contracted through national telemedicine service provider networks. If programme resources are developed internally, important considerations include medical liability, clinical schedule, programme orientation and technical training for telemedicine providers.

Technology considerations can include challenging connectivity issues in many rural locations, networking with local rural information technology (IT) personnel to manage network security, bandwidth concerns, and 24/7 oversight of the connectivity and functionality of telemedicine hardware and software. Strong consideration must be given to equipment that supports local workflow needs. Finally, education and training of local staff, including nursing staff, medical staff and IT personnel, is critical to the success of the programme.

Credentialling and privileging of providers must also be addressed, including revisions of the medical staff bylaws to allow for the delivery and scope of telemedicine activities. Credential issues related to scalability of services may be severely hindered by the cost and time associated with completion of the full credential process at each facility. Credentialling by proxy is an invaluable tool for efficient expansion of telemedicine services. To overcome rural hospital hesitation over the proxy credential process, several documents were created within our programme to support proper understanding of the proxy credential process. These documents included the following:

1. An agreement for proxy credentialling between the rural hospital and the tertiary medical centre, where telemedicine providers will be fully credentialled.
2. Standardised language for rural hospital bylaws that are created by a recognised legal resource to allow appropriate privileges for the telemedicine providers.

The language is created in such a way that the document can be simply inserted into the rural hospital's medical staff bylaws agreement.

3. A document outlining statutes and provisions that allow the adoption of telemedicine services and proxy credentialing, thereby offering supportive documentation that creates a level of comfort for the rural hospital administration and staff.
4. A list of actions that the rural site should complete in order to fully support the credentialing and privileging process while complying with the proxy credential process.

When utilising proxy credentialing, the originating hospital typically fully credentials all telemedicine providers, then the rural hospital determines privileges for the physicians based on the specialty and types of telemedicine services they will provide. State laws, regulations and legislative activity regarding telemedicine services must be considered, as well as interstate licensure issues, if telemedicine services are provided across state lines. In the USA, for example, licensing compacts such as the Interstate Medical Licensure Compact (IMLC) can simplify interstate licensing. The IMLC is an agreement that involves (as of January 2018) 22 states and 29 medical licensing boards and strengthens public protection through enhanced sharing of disciplinary information about physicians between states. Once qualified within the IMLC, physicians may apply to practise in any state within the compact.

Potential barriers

As with any new clinical process, telemedicine can take some time to introduce. Hospital board members, administrators, physicians and nursing staff can feel threatened by the introduction of new technology, concerns related to job

security or the new concept of telemedicine. Factors promoting acceptance and adoption include working with important stakeholders to help with understanding the value of telemedicine services to the local healthcare system, demonstrating the effectiveness of telemedicine programmes in similar rural settings and assisting with the incorporation of telemedicine into the long-term strategic plan of the rural hospital. These discussions are often carried out in multiple stakeholder encounters that require frequent community visits to better understand local needs. Presenting telemedicine as a tool to address seemingly unsolvable problems that have already been identified by board members, administrators and staff is important for gaining the buy-in of local stakeholders.

In addition, rural hospitals must develop appropriate telemedicine capability, which will likely require financial support for the introduction of equipment, training, technical support, services and maintenance costs. Technical concerns such as internet connectivity, bandwidth, and network and wireless infrastructure will require detailed analysis. Telemedicine equipment must meet the clinical needs of the local community while supporting local clinical workflow.

Patients are sometimes initially hesitant regarding the telemedicine encounter. Primary sources of concern include interaction with the cart and equipment and unfamiliarity with the telemedicine physician. Nebraska State law requires patient consent regarding telemedicine encounters.²⁶ Patient acceptance is significantly affected by local nursing staff's comfort with the technology and support for the telemedicine programme. In the author's experience, it has been exceedingly rare for patients to refuse telemedicine services. The eHospitalist programme in Lexington, NE, for example, has experienced zero refusals to date.

Having trained staff at the rural hospital who can act as knowledgeable advocates during the implementation of

the telemedicine programme allows staff to feel confident during the training and deployment stages. Important personnel include IT staff, nurse leadership and local physicians who champion the use of telemedicine. Well-trained local telemedicine champions will significantly reduce barriers to implementation.

It is important to select providers who are very comfortable with digital technology. During the initial launch of our telemedicine platform, some providers within the programme found it difficult to adequately and efficiently care for patients via telemedicine technology. Frequency of use of the equipment is an important component of developing provider competency. Ultimately, the model dictated a smaller defined central team of telemedicine providers who maintain high competency through frequent use of the system.

Further, education regarding telemedicine is not standardised. Telemedicine is not a curricular component in all medical and nursing education, and industry-wide competency testing has not been well developed. Telemedicine training is therefore often provided only on the job. In addition, patients may not be comfortable with the technology used to provide telemedicine services, especially if providers or staff are uncomfortable using the telemedicine system.

Finally, reimbursement issues can sometimes act as barriers to telemedicine implementation, as insurers may not offer the same reimbursement for telemedicine and face-to-face visits. As of 2018, however, the majority of states in the USA have enacted or are in the process of enacting parity laws governing private insurance coverage of telemedicine. Although coverage parity is supported, payment parity in many cases remains an issue. Thus, depending on the location of the patient within the healthcare system, significant issues may remain regarding payment for telemedicine services.

Programme development

The process of planning and developing telemedicine programmes is highly individualised, based on the needs of the rural hospital. Planning begins with a collaborative listening session to identify specific needs of the hospital, important stakeholders and supportive services that can be offered. Business models can be customised on the basis of individualised needs and preferences of the rural hospital. Services may be offered through a contracted service rate or an hourly rate with or without an associated fee-for-service component.

IT is a major challenge, and selecting a technology partner is an important consideration in the development of a successful programme. The right partner should have an established presence in the telemedicine industry and yet be flexible enough to adapt to the needs of the programme as it evolves and changes. Equipment needs will vary from service line to service line. Some, such as behavioural health programmes, may only require secure video conferencing. Others, such as emergency medicine or intensivist services, can require sophisticated telemedicine carts with multiple medical peripherals and remotely controlled cameras. The choice of proper equipment and software to meet the demands of the service is an important component in delivering the best possible service at the lowest cost. Additional considerations include ease of use for both the telemedicine provider and the nurse at the bedside.

Connectivity from the patient to the physician is a critical component for successful telemedicine encounters. Most rural hospitals have taken advantage of Universal Service Fund opportunities to improve their internet connectivity in order to accommodate the use of remote backup, hosted electronic medical records (EMRs) or offsite radiologist services. Improvements

in video compression algorithms have helped reduce the bandwidth needs for telemedicine, but more sophisticated services will consume more bandwidth than simple video conferencing. Wireless technology is much more commonly used in today's telemedicine programmes and can be a challenge in older facilities whose wireless infrastructure may not be up to par.

Other challenges include provider familiarity with multiple EMRs, the process of sharing documents and imaging studies, and establishing a reliable hand-off process at the beginning and end of the telemedicine shift. Remote stethoscopes have created ease-of-use challenges for both the nurse and the telemedicine provider.

Buy-in from the local medical staff and referral base is another important consideration. Meetings with local medical staff and primary care providers can provide information to clarify the goals of the programme. If the goal of the telemedicine programme is to keep more patients in the local facility or healthcare marketplace, it will need to be clearly stated how this goal will be accomplished and what the impact will be for local healthcare providers. In addition, the local referral base will need to understand the qualifications and credentials of the telemedicine providers in order to feel comfortable making referrals. On-site meetings between the telemedicine physicians and the local rural providers are an important component of strong programme development. Timely hand-off communication from the telemedicine provider to local providers after a telemedicine encounter will help emphasise the importance of collaboration and strong communication, and will support high-quality clinical care.

Training for telemedicine providers can range from 2 to 8 hours of intensive training, depending on the clinical service that is being provided. In addition, the Bryan Telemedicine model dictates telemedicine

provider familiarity within multiple EMR systems. Up to 4 hours of additional training is required to achieve competency within each EMR. The selection of providers who are motivated to succeed in the virtual environment is essential to the successful deployment of telemedicine services.

Regular monitoring of the usage and quality of the telemedicine programme is an important sustainability component. Stakeholders should be periodically surveyed, and any issues followed up on and addressed rapidly. Communication about usage of the telemedicine programme, outcomes and issues that have been addressed builds confidence in the programme and helps to increase use. As the telemedicine programme matures, regular communication with local site leadership will often prompt discussion of new opportunities in which telemedicine can be used to improve patient care, reduce costs and improve the work-life balance of local providers.

BRYAN TELEMEDICINE SERVICES

Bryan Health is a Nebraska-governed, non-profit health system that cares for patients, educates tomorrow's healthcare providers and motivates its community with fitness and health programmes. Bryan Health provides an award-winning network of doctors, hospitals and medical providers to offer effective care; works with industry leaders to introduce leading-edge, proven treatments to the region; and serves rural communities in four states through outreach clinics, mobile services and telemedicine care. With more than 4,400 highly trained staff members, Bryan Health is fully committed to providing the best care, the best education, the best wellness and recovery services, and the best work environment. Its health system includes Bryan Medical Center, Bryan Heart, the Bryan Foundation, Bryan Physician Network, Bryan Enterprises, the Bryan College of Health Sciences, Bryan Health

Connect, Crete Area Medical Center and Merrick Medical Center.

Bryan Health is also the sponsoring organisation for the Heartland Health Alliance, with 48 affiliated hospitals, and a Bryan Critical Access Hospital Network, with 28 network hospitals, and has management agreements with Clarinda Regional Health Center and Saunders Medical Center.

Bryan Medical Center

The Bryan Medical Center is a 640-bed, non-profit, locally owned healthcare organisation based in Lincoln, Nebraska. It includes two acute care facilities (Bryan East Campus and Bryan West Campus) in Lincoln, plus many outpatient clinics that together serve patients throughout Nebraska as well as in parts of Kansas, Iowa, South Dakota and other states in the region.

Services provided at Bryan Medical Center include cardiology, neuroscience, orthopaedics, vascular care, a Level II Trauma Centre, emergency departments, intensive care, women's and children's health, a Level III neonatal intensive care unit, imaging and mental health. Bryan Medical Center also offers inpatient rehabilitation, mobile diagnostics and treatment, gastroenterology, oncology, urology, nephrology, pulmonary and general medicine, robotic-assisted surgery and a comprehensive bariatrics programme. Bryan Medical Center has the Gold Seal of Approval from the US Joint Commission on Accreditation of Healthcare Organizations, which sets the highest standards for quality and safety in the delivery of health care.

Bryan Telemedicine

The mission of Bryan Telemedicine is to advance the health of individuals in the region by collaborating with communities and local health-care providers to offer

innovative telemedicine solutions that increase access to health services. Bryan Telemedicine develops and manages efficient, comprehensive and sustainable solutions for the delivery of health care to underserved rural hospitals and communities. This solution helps to support clinical outreach efforts to rural communities, offers clinical support to rural providers, promotes clinical expertise and quality across its referral area, and enhances convenience of clinical access for patients across the region.

Bryan Telemedicine currently works with over 40 hospitals in communities throughout Nebraska as well as Georgia, Iowa, Missouri, Kansas, Kentucky and New Mexico. The Bryan Critical Access Hospital Network of 28 critical access hospitals serves as the primary service area for the provision of telemedicine services. Six of these hospitals are identified as frontier designated areas. In the last few years, Bryan Telemedicine has completed thousands of encounters in acute care, virtual urgent care and outpatient specialty clinics.

Bryan Telemedicine offers acute care services in partnership with the rural health-care delivery systems, including emergency medicine, hospitalist medicine, critical care medicine, trauma patient stabilisation, mental health triage support, antibiotic stewardship, nutrition services, infectious disease consultation, psychiatry consultation, utilisation review support, diabetes education and pharmacist medication review. In addition, Bryan Telemedicine provides outpatient specialty clinic offerings in cardiology, psychiatry, pulmonology, urology, dermatology, oncology, nephrology and endocrinology. Bryan Telemedicine also collaborates in community-based care, including services provided within skilled nursing facilities, medical staff peer review support and a virtual urgent care offering. Bryan Telemedicine continues to develop new services as requested to meet unserved medical needs of rural hospitals.

COMMUNITY EXAMPLES: BRYAN TELEMEDICINE

Emergency medicine

This service allows rural facilities access to telemedicine consultations with physicians who are board certified in family medicine and have clinical experience in providing health care in rural communities. This model allows the physicians to provide support to advanced practice clinicians (nurse practitioners or physician assistants) who are on site at the rural facility. Alternatively, emergency room (ER) coverage may be provided even when no other providers are on site.

The telemedicine provider will require the support of the on-site provider in the ER or hospital if a procedural activity beyond the scope of the local nurse is required for treatment. In addition, the telemedicine provider will require the support of the on-site provider if an obstetric-related issue is encountered. The telemedicine provider may feel comfortable with managing the care of a pregnant patient who is at less than 20 weeks' gestation for a non-obstetric issue. All pregnant patients at 20 weeks or more, however, requires the involvement of a local provider. The vast majority of ER and hospitalised patients are safely managed by the telemedicine provider within the Bryan Telemedicine programme.

Using state-of-the-art technology, the Bryan Telemedicine physicians are able to complete the history and physical examination (using sophisticated medical examination peripheral devices), document care and complete orders within the rural facility EMR. Once the evaluation is completed, the physician determines whether the patient should receive treatment in the rural facility or requires transfer to a higher level of care. This service allows the physician to fully manage all aspects of the care of the patient and has been shown to reduce outmigration of patients.

Hospitalist medicine

It is difficult for rural communities to attract and retain physicians, resulting in a physician shortage for inpatient care. Furthermore, physician burnout continues to rise and is especially prevalent among emergency department physicians, general internists, neurologists and family physicians.²⁷ Telemedicine can promote medical staff recruitment and retention in rural communities by providing staffing relief to improve the work-life balance of clinicians. Bryan Telemedicine addressed this challenge by providing eHospitalist services in rural communities in order to address limited availability of physician coverage for inpatients. In Lexington, Nebraska, hospitalist coverage was provided by a locum tenens service prior to the introduction of telemedicine services. Through the use of telemedicine, the facility was able to offer hospitalist services, which substantially reduced the number of transfers from the ER and increased inpatient days retained within the facility. (See Figures 1 and 2, indicating annual transfers and patient days before and after the implementation of telemedicine. Data is based on annual ER visits pre-telemedicine (2,817) and post-implementation (2,781).)

Salary and benefit costs for on-site hospitalists may be prohibitively high, yet utilisation in rural facilities is low owing to low patient volumes. Bryan Telemedicine's eHospitalist programme offers rural hospitals a more efficient staff utilisation model, with the potential for significant cost savings. Bryan Telemedicine's eHospitalist service provides rural hospitals with board-certified physician staffing seven days a week, providing admission and consultation services as well as cross-coverage for hospitalised patients. Bryan Telemedicine's eHospitalists use wireless telemedicine cart technology with associated medical peripheral devices to complete patient history and physical examinations. Rural site

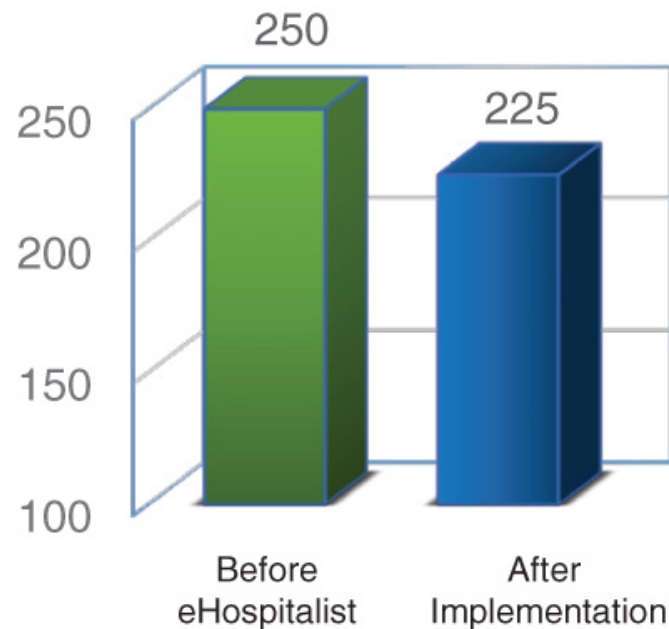


Figure 1: Annual patient transfers

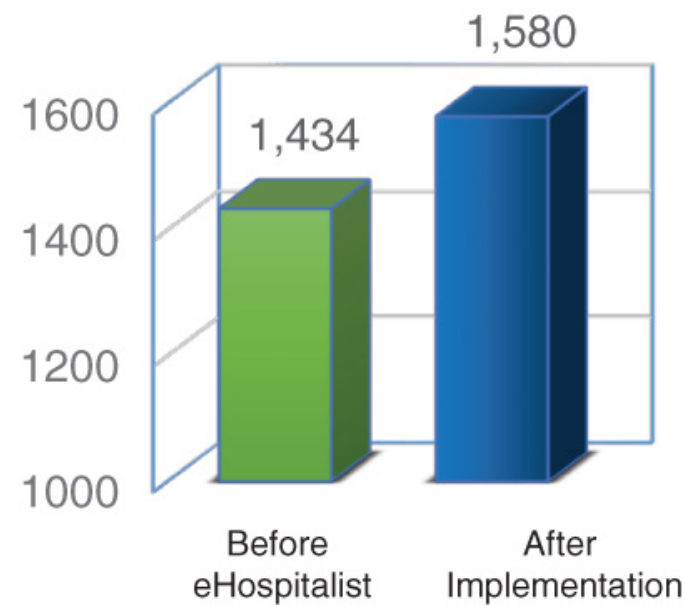


Figure 2: Annual inpatient days

telepresenters are required to successfully operate the equipment during patient encounters. Rural site telepresenters are typically local registered nurses who have been trained in the proper use of telemedicine equipment.

Bryan Telemedicine’s eHospitalist programme allows rural hospitals to improve the utilisation of advanced practice clinicians and nursing staff. Shared decision-making can facilitate more confidence among advanced practice clinicians, allowing them

to maintain care of patients in the local healthcare environment, thus preventing unnecessary transfers. This coverage has also been seen to improve nurse–physician communication and nursing staff confidence while caring for patients at the hospital. Nursing staff, particularly those covering during night shifts, express greater comfort when contacting on-call telemedicine physicians if concerns arise.

Intensivist

In traditional electronic intensive care unit (eICU) models, hospitals require substantial built-in monitoring technology, which can be cost prohibitive. In addition, only a few select hospital rooms are typically supported through the eICU model, potentially limiting the clinical reach of the service. In contrast, Bryan Telemedicine brings the physician to the bedside via mobile technology, allowing care to be provided in every patient room in the hospital. This service provides the hospital with access to a physician who is board certified in pulmonary and critical care medicine. Remote video conferencing and medical peripherals allow an intensivist to see and examine the patient, monitor the patient's status, and discuss the patient's care with physicians, staff, family and caregivers at the rural facility. Working within the existing EMR of the rural facility, the physician can manage the patient by providing emergent consultation, performing daily rounding and counselling family members. This solution ultimately allows rural hospitals to expand their scope of care while allowing patients to remain in their local community. Great Plains Health in North Platte, Nebraska, was able to leverage the use of Bryan Telemedicine's eIntensivist programme to meet the needs of its community. Additionally, the physician support provided by the eIntensivist programme helped with recruitment when the health system needed to hire an on-site intensivist. This strategy has been shown

to improve rural medical staff retention, decrease turnover and improve provider quality of life.

Pharmacy

It is often a challenge for rural hospitals to comply with federal and state regulations requiring all hospital medication orders to be reviewed by a pharmacist before administration of the first dose, because many rural communities do not have pharmacists on site at all times. The ePharmacy service offered by Bryan Telemedicine allows rural hospital staff around-the-clock access to a licensed pharmacist with hospital experience. This is another way telemedicine addresses the fourth aim, improving the work life of clinicians and staff, while still meeting the clinical documentation requirements for drug administration. Prospective drug review services include therapeutic duplication, drug–disease contraindications, drug–drug and allergy interactions, dosage review, incorrect drug dosage or duration of drug treatment, and clinical abuse and misuse. This intervention provides a high-quality service while still delivering affordable, trusted and personal care that puts staff at ease and ensures patient safety.

Nutrition

Many rural hospitals lack the appropriate resources to incorporate nutrition therapy into patient care. Workforce shortages in rural areas impact the ability to attract and retain licensed registered dietitians, making it difficult to comply with federal and state safety and quality regulations related to nutrition services. Malnutrition promotes poor patient outcomes such as wound infection, higher infection rates, poor wound healing, longer lengths of stay and higher frequency of hospital readmission. Surprisingly, over 50 per cent of hospitalised patients are malnourished at admission.²⁸

Bryan Telemedicine's eNutrition service benefits rural communities by offering a high-quality, low-cost alternative that increases access to a licensed Nebraska dietitian with hospital experience. Box Butte General Hospital in Alliance Nebraska is a community that began utilising this service in early 2016 after a long-term dietitian retired and they were unable to recruit a replacement. Services provided include inpatient assessment for vitamin and mineral deficiency, malnutrition and overall nutritional health. Outcomes of the assessment include nutritional diagnosis, nutritional goals and treatment plans, and ongoing monitoring to ensure patients meet nutritional goals. Dietician services also offer assistance with screening and treatment plans for patient meals, tube feedings and intravenous nutrition. The telemedicine nutritionist service also helps rural hospitals implement and monitor nutrition services in compliance with federal and state regulations.

Mental health emergency department

Access to mental and behavioural health services is very limited in rural communities, yet the need for coordination of care regarding mental and physical health is critical. Bryan Telemedicine offers several solutions for access to quality mental health-care services. Emergency assessments are performed within local emergency departments by licensed independent clinical social workers using evidence-based protocols. Acute psychiatric care is also provided by licensed psychiatrists on an inpatient basis. Assistance is offered with inpatient mental health hospitalisation decisions. Recommendations for community resource referral may also be offered on the basis of an emergency assessment, which is completed in coordination with rural ER physicians. If outpatient referral from the ER for individual outpatient counselling and outpatient psychiatric care is considered

appropriate, outpatient mental health telemedicine services are available. These service offerings are flexible and can support patient care in rural communities and rural hospitals that otherwise lack mental health services.

eStewardship

The eStewardship programme provides rural facilities with access to board-certified infectious disease physicians. These services have been shown to improve antibiotic use by ensuring that hospitalised patients receive the right antibiotic, at the right dose, by the right route, at the right time and for the right duration. This comprehensive approach promotes antibiotic efficacy and patient safety, and has been well received by medical staff. For example, Hardin Memorial Hospital in Elizabethtown, Kentucky, is a 300-bed facility. After the implementation of the eStewardship programme, antibiotic-related therapeutic interventions directed by infectious disease specialists increased dramatically (see Figure 3). These interventions have resulted in a significant reduction in antibiotic utilisation across all patients and have contributed to a reduction in *C. difficile* diagnoses across all patients²⁹ (see Figure 4). In addition, there have been substantial ongoing monthly cost savings resulting from this programme.³⁰

Virtual urgent care service

Bryan Telemedicine's ezVisit virtual urgent care service provides patients with a convenient care option to meet their urgent care and sick care needs. Using ezVisit, patients access an online adaptive interview derived from evidence-based medical guidelines. Board-certified physicians in the Bryan Telemedicine network review the information and provide a diagnosis electronically, along with a prescription if needed. The cost per visit is similar to a

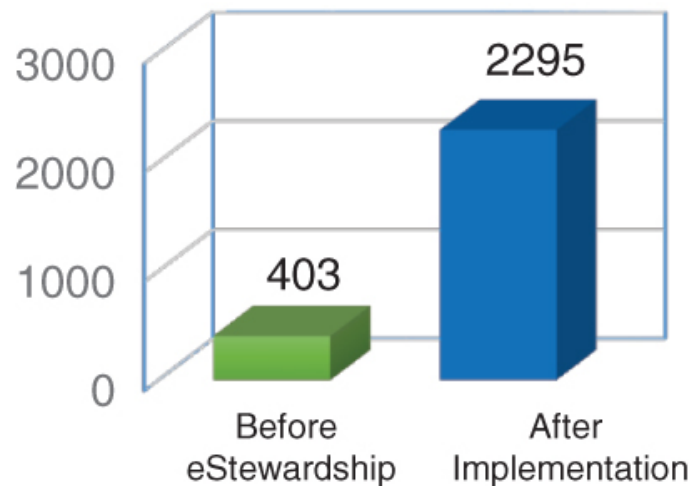


Figure 3: Average monthly interventions (August–April 2016–2017 vs. August–April 2017–2018)

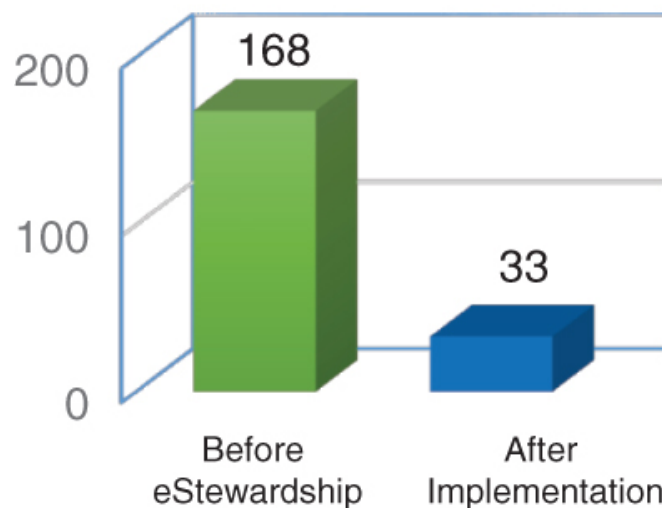


Figure 4: Patients with *C. difficile* diagnosis (August–April 2016–2017 vs. August–April 2017–2018)

co-pay for an office visit. When patients cannot be diagnosed virtually, they are not charged for their ezVisit and instead receive assistance with finding care providers in a location near them. Using ezVisit's innovative geolocation technology, patient care is kept close to home, and patients may avoid expensive ER visits whenever possible.

Memorial Health Care Systems in Seward, Nebraska, started to offer ezVisit after an urgent care facility opened in this rural

community. Hospital administration worked to develop a collaborative partnership with the local university to increase reach and impact. User satisfaction with ezVisit is high, and nearly 90 per cent of patients responded that they would recommend the service to a friend or family member. Patient comments indicate that the quick turnaround (typically within minutes, guaranteed in under an hour), the convenience of accessing an ezVisit at home, at work or on the go, plus

the ability to send prescriptions electronically to the pharmacy of their choice are factors that would bring them back the next time they need care. Memorial Health Care Systems also saw a reduction in the percentage of ER visits related to routine health concerns.

CONCLUSION

Telemedicine can improve access to health-care services in rural communities. Telemedicine offers higher levels of care, more specialised care and more efficient models of care than can otherwise be provided locally in many circumstances. Significant cost savings for patients and payers are being realised because patients, when appropriate, are able to remain in rural facilities. Patients and families are able to avoid transport costs and increased health-care costs for regional and tertiary medical centre services, enhancing the overall patient experience. Preventing unnecessary outmigration also helps rural hospitals remain viable, promoting quality of life for the entire community. In addition, telemedicine services offer rural physicians an improved work-life balance, reducing physician burnout, promoting physician retention and aiding in physician recruitment to rural areas. Telemedicine offers an effective solution to the rapidly expanding problem of physician shortages in rural America. Executives should look to telemedicine as a unique solution with the potential to provide access to services that are highly desirable, cost effective, innovative and personalised.

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