Clinical Implications of Telemedicine for Surgical Care: An Evidence-to-Practice Review

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ABSTRACT

Telemedicine is a newer concept in medicine that utilizes technological devices to provide care to patients. In a society already greatly advanced with technology, telemedicine is the new frontier in healthcare. Implementing telemedicine into current practices will benefit both the patient and the provider. The technology utilized with telemedicine has demonstrated promise by decreasing patient travel time, decreasing lost time from work, increasing patient interactions, and increasing interprofessional collaboration. The cost of implementation is minimal compared to the cost savings that will be accrued from utilizing this technology. There are many specialty areas in healthcare where telemedicine can be implemented such as primary care, surgical, orthopedic, rehabilitation, and evidence-based research. An emerging setting for telemedicine is athletic training and sports medicine with potential to drastically change the profession for the better. Many of the skills athletic trainers perform on a regular basis can be completed via telemedicine. Regular use of telemedicine can provide benefits for the clinician, the patient, and the organization. Using telemedicine expedites the speed at which care can be provided to aid in patient recovery by limiting restrictions of distance or time away from work, life, and sport. Overall, telemedicine can advance the medical system by allowing a larger number of patients to have access to high quality health care similar to that of a face-to-face visit.

Key Phrases
Patient education, healthcare information technology, preceptor training and development

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SUMMARY

CLINICAL PROBLEM AND QUESTION

The use of electronic information and communication technologies to provide and support health care started as simple audio-only consultations following the invention of the telephone in 1876.[1] Today, telemedicine has reflected the innovations of technology to provide health care utilizing a wide variety of virtual methods. Access to care is an essential aspect of patient-based health care, and providers must have the ability to make contact with the patient, especially when a distance separates them.[2,3] It was reported that transportation issues such as distance, and not owning a vehicle delayed medical care for 5.8 million Americans in 2017.[4] Even when transportation is not an issue, the increasing costs of outpatient services inhibits access for about 1 in 10 adults.[5]

Telemedicine allows many populations to benefit from health care interactions while maximizing time.[6] For example, patients that have undergone surgery may experience functional impairments or may be prescribed opioids, both preventing them from operating motor vehicles which limits their ability to access providers.[7] Medical professionals can perform pre-operative assessment, post-operative care, and follow-up without the need for the patient to travel as they often include patient education, surgical wound checks, vital sign monitoring, or symptom assessments.[7] Utilizing

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telemedicine for health care limits patient travel while saving time and money and broadening provider reach limited by physical location. [7] Telemedicine can be used with, but is not limited to, video and tele-conferencing, mobile-phone images, text messaging, and electronic monitoring devices.[7] Many studies have investigated different aspects of telemedicine within specific subsets of surgical care, but none have looked at the use of this delivery method for surgical care from a larger perspective. Therefore, the purpose of this evidence-based review is to explore the broad range of telemedicine for surgical care with a specific reflection on how the athletic training profession may have a role in the use and deployment of telemedicine in operative management. For athletic trainers, understanding the role and benefits of telemedicine is necessary for the potential future growth of the profession. Specifically, telemedicine has the potential to impact the ease of communication with patients and the guidance of self-care initiatives for athletic trainers.

SUMMARY OF LITERATURE

This guiding systematic review included 24 articles that assessed telemedicine use before, during, or following any type of surgery guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.[7] The articles included were mostly prospective observational studies, but also included retrospective studies, randomized control trials, and pilot studies. The studies reviewed the usage of various types of telemedicine technology including video and tele-conferencing, mobile phone, tablet applications such as Skype, digital images, and text messages.[7]

Within this guiding systematic review, three types of surgical protocols utilized telemedicine, including: pre-operative assessment, post-operative assessment, and conventional clinic replacement.[7] Articles in the review analyzed the comparisons between usual care and telemedicine. Those that used some type of telemedicine pre-operatively utilized it for surgical referrals, diagnosis, review from other surgical teams, as well as at home consultation.[7,8] Comparisons between telemedicine and direct vision were analyzed for pre-operative means. Post-operative telemedicine was utilized by providers to assess wounds and medical equipment from vascular surgeries, appendectomies, total joint arthroplasties, ambulatory surgeries, and orthopedic trauma.[7] Post-operative telemedicine also included use of at-home medical technology such as surgical drains, blood pressure monitors, and electronic medication trays.[7] Conventional clinic visits were replaced with telemedicine to address follow-up requirements for various surgeries, such as ileostomies, prostatectomies, and pediatric urology surgeries.[7] Analysis of how telemedicine compared to usual in-person visits were assessed for both post-operative and conventional clinic care.

SUMMARY OF OUTCOMES

The outcomes from the guiding systematic review identified significant benefits of using telemedicine for both the providers and patients.[7] Overall, the experience of using telemedicine in surgical care for the providers yielded benefits with the ease of transmission of information to other hospitals regarding pre-operative details from the original patient interaction.[6,7] Additionally, pre-operative surgical care performed using telemedicine for diagnostic procedures, specifically such as analyzing organ structure and function, had the same level of provider accuracy as assessments performed within a conventional on-site clinic.[7] The experience for providers using both synchronous and store-and-forward telemedicine was positive. Improved communications leading to reductions in unnecessary transfers and faster access to a specialist. Finally, the providers also noted improvements with overall surgical care provided,

based on fewer complications during surgery and a reduced mortality rate.[7]

The ability for the patient to conduct pre- and post-operative appointments from home saved them a trip to the healthcare facility, while also enhancing at-home care plan adherence and long-term outcomes.[7] During the at-home care, patients utilized synchronous telemedicine through live video and mobile phone communication to monitor surgical wounds. Moreover, patients used remote monitoring devices like an electronic blood pressure cuff and surgical drains for continuity of care with their providers.[7] Patients also noted a strong patient-provider connection using telemedicine that resulted in a faster adjustment medications as needed.[7]

FINDINGS AND CLINICAL IMPLICATIONS

According to the guiding systematic review, telemedicine was found to be useful in surgical care. The majority of studies assessed the use of telemedicine between providers and patients, while one explored the inter-hospital use of telemedicine.[7] We believe the findings highlighted in the summary of outcomes section identifies that telemedicine has a place in the care of surgical patients by allowing patient education and continuity of providers from pre-operative care to discharge. The findings also suggest that the benefits of telemedicine are two-fold, with patients and providers both noting improvements in their work and in their health outcomes. Based off the findings of this review, athletic trainers should continue to explore the implementation of telemedicine in various clinical settings.

To get started with telemedicine in one's clinical practice, technology and equipment must be obtained. Previous research exploring inter-hospital use of telemedicine stated several limitations focused on the cost of telemedicine technology.[7] In one study, the hospital systems believed implementing telemedicine would not save enough money to be significant for the overall cost of the system.[7] However, the cost of technology to implement telemedicine has drastically decreased in the last decade, making it more affordable to health care providers and patients. For example, mobile phone applications and web browser platforms exists that are either no cost or low-cost alternatives to larger telemedicine systems, while telepresence robots are often seen in larger hospital systems. We recommend that athletic trainers attempting to introduce telemedicine explore these budget-friendly options, such as Doxy.Me, for their daily use.

It is important to note that as we explore cost-effective options for telemedicine that we consider the privacy and security of the platforms. An aspect of care that differs from traditional face-to-face appointments is the privacy of the patient.[7] Previous research highlighted that athletic trainers, whether they were users or non-users of telemedicine, were most concerned with the privacy of platforms when exploring telemedicine opportunities.[9] Additional precautions and policies should be implemented to reduce the threat of patient confidentiality being breached.[7] Encrypted servers and specific telemedicine rooms within the healthcare facility can be beneficial in providing private telemedicine patient encounters.[7] Many of the low-cost applications are compliant with the Health Insurance Portability and Accountability Act (HIPAA) Rules, as well as the Health Information Technology for Economic and Clinical Health (HITECH) Act. Platforms that are HIPAA compliant such as Doxy.me, thera-LINK, VSee, or Zoom for Healthcare should be used rather than non-compliant platforms like FaceTime, Skype, and Facebook Live.

After the initial cost for startup is considered, the guiding systematic review identified that long-term benefits may involve cost savings from other aspects of patient care. Previous research analyzing costs of multidisciplinary healthcare

team meetings between face-to-face and telemedicine methods identified that the actual cost per patient was more expensive with the use of face-to-face evaluations and telemedicine may serve as an alternative.[10] While most, but not all, athletic trainers do not bill for their athletic training services, the cost-savings from using telemedicine meetings may come from a reduction in missed time from work or additional expenses such as driving. For example, outpatient services that were conducted using telemedicine in comparison to traditional in-person visits saved each patient an average of 31.2 miles and 39 minutes of travel time and $4.26 in travel costs.[11] We suggest that athletic trainers consider the long-term cost benefit of adopting telemedicine from multiple facets of their patient care, as well as the expenses from the patient perspective when choosing to adopt telemedicine.

The findings from the guiding systematic review highlighted improvements in the communication and collaboration of the healthcare team, as well as the patient's involvement in the process. The use of telemedicine has the potential to expand the access to specialty physician care and healthcare options that may not be directly accessible to physical location barriers. The access to specialty physician care has a direct influence on the shared decision making that shapes the patient-centered care approach that athletic trainers hope to achieve. Moreover, the connection of specialty care via telemedicine may allow the specialists to be more accessible. Previous research identified that specialists only attended 15% of face-to-face meetings compared to 100% attendance at telemedicine meetings.[10] While it is surprising, the decreased rate of those specialist physicians attending face-to-face meetings was undoubtedly due to the burden of travel through direct and indirect costs. We believe that telemedicine has the potential to improve the efficiency of the specialist providers, like orthopedic physicians and neurologists for sports medicine, when consults are needed on difficult or timely patient cases.

Increasing the attendance of specialty care can improve the quality of the work-ups, as well as the overall patient satisfaction of the pre-operative education.[10] Methods similar to this can be transitioned to the athletic training facility as collaborating physicians are typically not readily accessible, especially in the secondary school setting. The access to an orthopedic physician via telemedicine can provide student-athlete patients with access to a diverse and multifaceted healthcare system. The integration of telemedicine at the secondary school, college/university, and professional sport settings allows for ease of scheduling and scheduling preferences for the patient and the stakeholders involved in the patient's care plan. We believe that in-person collaborations between physicians and athletic trainers for patient care can often seem rushed, limited in number or pushed to a specific time (example: waiting till game day). Time constraints for these physicians can be cut down by utilizing telemedicine visits to save travel time, as well as potentially increasing the number of appointments throughout the week.[10,11] Athletic trainers that experience difficulties with physician collaboration should explore telemedicine as a creative solution to enhance interactions.

For the providers, standardization is needed to ensure that each patient telemedicine encounter is similar in experience. This requires training for the providers to learn how to use the system and provide care through a different medium other than face-to-face.[7] The length of the telemedicine visits also varied compared to face-to-face visits.[7] The initial telemedicine encounters were longer, but as the patient and clinician were more familiarized with the process, the appointment times decreased.[7] State regulations should be reviewed prior to a telemedicine encounter to ensure the location of the meeting, and to ensure that procedures for informed consent and documentation are followed. Providers should also prepare for and conduct the meeting with a professional approach, establishing a webside

manner through empathy and eye contact with their camera. It is also essential that providers dedicate and organize a specific private area that is sufficient for telemedicine with adequate lighting and sound quality and a stable internet connection. We suggest that athletic trainers, regardless of athletic training facility size, dedicate a space such as their office to telemedicine encounters.

CLINICAL BOTTOM LINE

There are many options that make telemedicine possible for healthcare providers. In the current climate with an abundance of technology in our society, telemedicine is becoming a part of everyday practice. There are significant benefits of using technology to provide medical care including decreased travel time, decreased number of unnecessary visits, and ease of communication. Telemedicine can be used in a variety of settings and for a variety of clinical reasons including wound care, surgical follow-up, and initial evaluation, all of which skills athletic trainers are qualified to do. Specific to surgery, athletic trainers have a direct role in being there from time of injury to diagnosis and care planning, to pre-operative and post-operative care, and finally during return-to-activity and discharge of the patient. As athletic trainers are engaged in several practice settings, telemedicine for surgical care has the potential to improve the job duties and experiences for those in both traditional (secondary school and college/university) and non-traditional (physician practice and hospitals) settings. For example, follow-up appointments to monitor wounds post-surgery are common practice and can be provided via telemedicine.[7] This method is respectful of the patient and provider's time because these interactions are typically short.[7]

It is also important to note that most clinicians are already using telemedicine without even realizing it. When patients send pictures of rashes or post-surgical scars, the identification of the pathology and communication of next steps is technically telemedicine. Athletic trainers can use telemedicine to communicate with patients who may not be able to show up to the athletic training facilities for multiple reasons such as being bedridden following surgery, taking prescribed opioids, and conflicting class schedules. Telemedicine can also be utilized in many practical ways in the profession of athletic training, including wound checks and post-operative evaluations, but also with initial evaluations and therapeutic rehabilitation. Additionally, the use of telemedicine allows for improved provider communication and collaboration with the patient or separately for general clinical advancement. Telemedicine allows these meetings to happen despite time and location constraints. As athletic trainers, we are encouraged to improve our patient-centered approach to healthcare delivery. Patient-centered care can be achieved with many platforms including telemedicine as it prioritizes patient comfort, needs, and improves the ease of communication. Overall, the integration of telemedicine as a supplement to the practice of athletic training specifically for pre- and post-surgical care, as well as other routine daily practices, has the ability to enhance patient outcomes and improve the patient-centeredness of our interactions.

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