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## Exploring the Transtheoretical Model of Change, Barriers, and Motives to Telemedicine Adoption in Athletic Training

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# Exploring the Transtheoretical Model of Change, Barriers, and Motives to Telemedicine Adoption in Athletic Training

## Abstract

**Purpose:** The delivery of healthcare services by athletic trainers (ATs) has evolved over the past two years as a result of the COVID-19 pandemic. Previous research has identified an integration of telemedicine as a necessary, urgent replacement for face-to-face patient encounters in athletic training; however, there is a lack of data to support the habitual and intentional change to one's clinical practice that includes telemedicine. Therefore, the purpose of this study was to identify and analyze ATs respective stages of change related to telemedicine adoption, as well as explore motivating factors and barriers related to the adoption of telemedicine. **Methods:** We performed a cross-sectional study of 883 credentialed ATs. The survey contained a modified TTM stages of change assessment and 51-item telemedicine barriers and motives tool adapted from previous literature. A logistic regression was performed to assess highest level of education with telemedicine adoption status. **Results:** Overall, most ATs were categorized in the action, maintenance, and termination stage (n=551/882, 62.4%) for telemedicine adoption. Other participants were categorized in the stages as unaware (n=8, 0.9%), precontemplation (n=82, 9.3%), contemplation (n=78, 8.8%), and preparation (n=164, 18.6%). The logistic regression model was statistically significant (p<.05). **Conclusions:** The results of the study suggest that most ATs have recently changed their delivery of healthcare in the last 6+ months and intend to maintain telemedicine use as part of their clinical practice. Additionally, telemedicine success was hampered by a lack of exposure but did feel that telemedicine fills gaps in patient care and addresses improved patient satisfaction. Additionally, increasing an ATs highest level of degree earned was associated with an increased likelihood of being in stage five on the modified-TTM assessment suggesting focused, professional development could sustain telemedicine use in athletic training.

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### ABSTRACT

**Purpose:** The delivery of healthcare services by athletic trainers (ATs) has evolved over the past two years as a result of the COVID-19 pandemic. Previous research has identified an integration of telemedicine as a necessary, urgent replacement for face-to-face patient encounters in athletic training; however, there is a lack of data to support the habitual and intentional change to one's clinical practice that includes telemedicine. Therefore, the purpose of this study was to identify and analyze ATs respective stages of change related to telemedicine adoption, as well as explore motivating factors and barriers related to the adoption of telemedicine. **Methods:** We performed a cross-sectional study of 883 credentialed ATs. The survey contained a modified TTM stages of change assessment and 51-item telemedicine barriers and motives tool adapted from previous literature. A logistic regression was performed to assess highest level of education with telemedicine adoption status. **Results:** Overall, most ATs were categorized in the action, maintenance, and termination stage ( $n=551/882$ , 62.4%) for telemedicine adoption. Other participants were categorized in the stages as unaware ( $n=8$ , 0.9%), precontemplation ( $n=82$ , 9.3%), contemplation ( $n=78$ , 8.8%), and preparation ( $n=164$ , 18.6%). The logistic regression model was statistically significant ( $p<0.001$ ). The model was highly sensitive (86.3%; specificity=23.3%). Throughout the seven barrier subscales, most participants expressed concerns with at least one 'hamper to success' (790/883) or technological barrier (711/883); however, they did not commonly identify barriers with administration (226/883). ATs strongly disagreed/disagreed that telemedicine was seen as a local threat (637, 93.5%) and disagreed that their collaborating physician would not like telemedicine (454, 86.6%). **Conclusions:** The results of the study suggest that most ATs have recently changed their delivery of healthcare in the last 6+ months and intend to maintain telemedicine use as part of their clinical practice. Additionally, telemedicine success was hampered by a lack of exposure but did feel that telemedicine fills gaps in patient care and addresses improved patient satisfaction. Additionally, increasing an ATs highest level of degree earned was associated with an increased likelihood of being in stage five on the modified-TTM assessment suggesting focused, professional development could sustain telemedicine use in athletic training.

**Keywords:** telehealth, barriers, motivators, sports medicine

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## INTRODUCTION

The profession of athletic training integrates highly qualified, multi-skilled healthcare providers for individuals with injury, illness, and disease as a result of work, life, and sport. The services provided by board certified athletic trainers include injury prevention, emergency care, clinical diagnosis, and therapeutic interventions for injuries and medical conditions.<sup>1</sup> For individuals participating in sport and physical activity, the access to athletic training services improves their overall well-being and quality of life.<sup>2</sup> The allied healthcare profession continues to expand throughout the United States and globally with over 58,000 credentialed athletic trainers serving as a vital link to communities for the assessment and diagnoses of many musculoskeletal disorders, concussions, and general health conditions.<sup>3</sup> Typically, athletic trainers have direct access to daily patient care through school-based athletic training programs, the military, and clinics. The profession of athletic training has recognized that the integration of technology in athletic training for job specific tasks, like medical documentation, has been a long-standing issue for clinicians.<sup>4</sup> The adoption of electronic medical record systems has been slow with many athletic trainers citing technology and software complications as the two most common barriers to its use.<sup>4</sup>

However, the COVID-19 pandemic forced athletic trainer to pivot and explore technology for the delivery of care by athletic trainers. The access to athletic trainers changed over the duration of the pandemic and creating a need for telemedicine as a delivery mechanism for patient care. Telemedicine, for this study, was defined as health services that were provided from a separate location from the patient using technology for the purposes of diagnostic evaluations and therapeutic intervention for either prevention or treatment.<sup>5</sup> This technology allows for athletic trainers to expand their care beyond the traditional athletic training facility. During the COVID-19 pandemic, athletic trainers had the potential to connect with their patients virtually with over 40% of athletic trainers stating they provided some form of telemedicine services during that period.<sup>6</sup> Telemedicine gave athletic trainers the ability to complete initial visits or check-ins for their patients in an online format. Research has shown that telemedicine is an effective tool for follow-up with clinicians when a face-to-face meeting is not feasible.<sup>7</sup> Though telemedicine has been shown as an effective way to connect with patients, it comes with its own complications that athletic trainers and other healthcare providers find with its use. Numerous healthcare providers have identified telemedicine barriers as access to appropriate technology and high-speed internet, reimbursement and legal concerns, and the socioeconomic status of both the patient and the surrounding community.<sup>5,8-11</sup>

Barriers and knowledge of telemedicine have been established in previous literature, though it is continuing to be studied. There has been no research into why athletic trainers have not adopted telemedicine once they have learned about its use. Some research suggests that an integration of telemedicine as a necessary, urgent replacement for face-to-face patient encounters in athletic training; however, there is a lack of data to support the habitual and intentional change to one's clinical practice that includes telemedicine. To address the adoption and integration of technology, specifically telemedicine use, in athletic training, we must first explore the factors that may be affecting one's ability to use telemedicine for healthcare delivery. We recognize that telemedicine adoption is multi-factorial from the lens of the provider and the patient. Therefore, the purpose of this study was to explore the adoption of telemedicine by athletic trainers, as well as specific barriers and motives to its use.

## METHODS

### Study Design

This cross-sectional study used an online survey program (Qualtrics, Inc, Provo, UT) to collect data related to demographic information, about the participants and their work settings, as well as potential barriers and motives to telemedicine use in their clinical practice. The University of South Carolina Institutional Review Board approved this study.

### Instruments

The multi-part survey consists of two instruments including a 1) modified transtheoretical model (TTM) stages of change assessment and 2) previously validated barriers and motives to telemedicine matrix. Personal demographic information that was gathered included their age, highest degree earned, number of years credentialed as an athletic trainer, job setting and their race/ethnicity.

### *Transtheoretical Model Stages of Change Assessment*

The TTM for Health Behavior is a tool that has been used to determine levels of adoption of new behaviors.<sup>12</sup> The TTM theorizes that behavior change goes through six stages of change before a new behavior is truly adopted.<sup>12</sup> This model allows researchers to begin to understand the behavior behind the lack of adoption of telemedicine amongst athletic trainers. The assessment asked participants to identify if they had 1) heard, 2) used, 3) considered using, and 4) general thoughts regarding telemedicine in athletic training. The responses postulated a stage of change category (Table 1) for the athletic trainers included 1) unaware, 2) precontemplation, 3) contemplation, 4) preparation, or 5) action, maintenance, and/or termination (AMT). For the athletic trainers

who were categorized as stage 5 (AMT), an additional question was presented related to the timeframe for adoption, use, and current status of telemedicine in relation to March 2020 (start of COVID-19 restrictions).

**Table 1.** Modified-Transtheoretical Model Descriptions adapted from Boston University School of Public Health

Stage of Change	Description
Unaware	AT has not heard of telemedicine
Precontemplation	AT does not intend to adopt telemedicine in the next 6 months
Contemplation	AT intends to start using telemedicine within the next 6 months
Preparation	AT is ready to change in the next 30 days
Action, Maintenance, and Termination (AMT)	AT has either recently changed (last 6 months) or for a while sustained (longer than 6 months) telemedicine adoption. In addition, the AT intends to maintain telemedicine use moving forward.

AT=Athletic Trainer

### **Barriers and Motives**

Next, the participants completed a matrix table of statements from previous literature in acute care<sup>13</sup> pertaining to the barriers and motives for implementation of telemedicine. The survey consisted of a 51-item telemedicine barriers and motives tool adopted from previous literature and adapted for athletic training. The tool consisted of 37 barriers which were categorized into seven subscales including cultural (i.e., patients, incentives), administration (i.e., physician, leadership), technological (i.e., usability, internet), regulatory (i.e., credentialing, reimbursement), hamper to success (i.e., exposure, understanding), buy-in (i.e., staff, executives), and maintenance (i.e., other providers, managers). In addition, the tool contained 14 items focused on motives, importance, and value of telemedicine implementation. All items were evaluated using a 5-point Likert-scale respective to agreement (1=strongly disagree, 3=neutral, 5=strongly agree) with a higher score indicates agreement with that implementation barrier or motivation.

### **Procedures**

Following IRB approval, recruitment e-mails were sent to 23,947 athletic trainers, representing all geographic areas and job settings between July and August 2021. The survey was open for 6 weeks with reminders sent weekly to individuals who had not completed the study. In total, 1,544 individuals started the survey. After opening the link to the web-based survey, the participant read an invitation to participate and indicated electronic informed consent. The participants were able to skip any questions they wished or close the browser to exit the survey to stop their participation.

### **Participants**

The participants were athletic trainers and members of the National Athletic Trainers' Association (NATA). We recruited NATA certified members through the NATA research database. Of the initial recruitment e-mails sent, a total of 883 participants (age=39±13y; years of experience as an athletic trainer=15±12y) completed both tools in their entirety and included in the final analysis. Table 2 provides the background and demographic information of the participants.

**Table 2.** Participant Demographics (n=883)

Characteristic	% (n)
Gender	
<i>Women</i>	52.5% (464)
<i>Men</i>	45.6% (403)
<i>Non-Binary</i>	0.1% (1)
<i>Prefer Not to Say</i>	0.8% (7)
<i>Did Not Report</i>	0.9% (8)
Ethnicity	
<i>White</i>	87.1% (769)
<i>Black or African American</i>	3.3% (29)
<i>American Indian or Alaskan Native</i>	0.6% (5)
<i>Asian</i>	2.7% (24)
<i>Native Hawaiian or Pacific Islander</i>	0.3% (3)
<i>Other</i>	4.9% (43)
<i>Did Not Report</i>	1.1% (10)
Job Setting	
<i>Amateur, Rec or Youth Sports</i>	1.4% (12)
<i>Clinic</i>	10.9% (96)
<i>College/University</i>	28.2% (249)
<i>Health/Fitness/Sports/Performance Enhancement Clinic/Club</i>	1.4% (12)
<i>Higher Education and/or Research</i>	5.9% (52)
<i>Hospital</i>	3.4% (30)
<i>Independent Contractor</i>	1.6% (14)
<i>Military, Law Enforcement and Government</i>	2.3% (20)
<i>Occupational Health (Industrial)</i>	4.2% (37)
<i>Other</i>	4.4% (39)
<i>Professional Sports</i>	3.2% (28)
<i>Secondary School</i>	29.7% (262)
<i>Unemployed (prior to COVID-19)</i>	0.6% (5)
<i>Unemployed (due to COVID-19)</i>	0.8% (7)
<i>Retired</i>	1.9% (17)

### Statistical Analysis

Data were collected and transferred from the web-based survey platform into a custom spreadsheet for data cleaning and then analyzed using SPSS (IBM Corporation, Armonk, NY). We performed descriptive statistics (mean, standard deviation, and frequencies) for all items. For the TTM stages of change assessment, data were analyzed using descriptive categorization into one of the five modified-TTM stages of change. A follow-up logistic regression model was executed to identify if an athletic trainer's highest degree earned (bachelor, professional master, post-professional master, doctoral) could predict adoption using the modified-TTM categories. For the barriers and motives, item responses were combined as agree/strongly agree or disagree/strongly disagree, with all neutral responses omitted which was the same statistical approach used by the study who created the barrier and motive list. The total number of agree/strongly agree barriers per category were summed per individual to identify the most common subscales. The alpha level was set at  $P = 0.05$  *a priori*.

## RESULTS

### Transtheoretical Model for Change

Most athletic trainers were categorized in the AMT stage (n=551/882, 62.4%). Other participants were categorized in the stages as unaware (n=8, 0.9%), precontemplation (n=82, 9.3%), contemplation (n=78, 8.8%), and preparation (n=164, 18.6%). For athletic trainers in the AMT phase, most had been using telemedicine before March 2020 (n=152, n=27.6%) or started in March 2020 (n=205, 37.2%). However, 30.5% of participants who were once users of telemedicine have stopped use for unidentified reasons. The logistic regression model was statistically significant ( $\chi^2(3) = 21.504$ ,  $p < 0.001$ ). The model was highly sensitive (86.3%; specificity=23.3%) and correctly classified 62.5% of cases. This means that in 62.5% of cases, the model correctly identified that those who had a higher level of education, were in the AMT phase of the TTM.

### Barriers and Motives

Throughout the seven barrier subscales, most participants expressed concerns with at least one 'hamper to success' (790/883) or technological barrier (711/883); however, they did not commonly identify barriers with administration (226/883). The most prominent barriers included patient quality of care (583, 77.2%), lack of effective leadership in telemedicine (477, 75.7%), lack of exposure (518, 70.9%), and medico-legal issues (393, 67.2%). Athletic trainers strongly disagreed/disagreed that telemedicine was seen as a local threat (637, 93.5%) and disagreed that their collaborating physician would not like telemedicine (454, 86.6%). Motivators, importance, and value of telemedicine use data are presented in Table 3.

**Table 3.** Motivators, Importance, and Value of Telemedicine (neutral answers omitted)

Item	Disagree/Strongly Disagree	Agree/Strongly Agree
Quality improvement	196, 32.6%	405, 45.9%
Filling gaps in service	73, 9.4%	704, 90.6%
Immediacy of patient access	79, 10.4%	678, 89.6%
Driving institutional growth	180, 33.5%	357, 66.5%
Assisting with staff retention	259, 50.4%	255, 49.6%
Assisting with staff recruitment	273, 55.7%	217, 44.3%
Improving institutional metric	163, 33.7%	320, 66.3%
Satisfying institutional leadership	176, 36.5%	306, 63.5%
Addressing national guidelines	120, 22.9%	403, 77.1%
Addressing patient satisfaction	74, 10.2%	648, 89.8%
Providing clinical support	62, 8.7%	651, 91.3%
Addressing marketing	222, 45.5%	266, 54.5%
Providing quality care	108, 15.1%	609, 84.9%
Reducing costs	126, 20.7%	484, 79.3%

### DISCUSSION

The practice of telemedicine has been developing in one form or another for 40 years.<sup>13</sup> Over the past decade however, there has been an increase in its use through numerous healthcare facets. In athletic training, the use of telemedicine increased exponentially during the COVID-19 pandemic. The data in this study showed that though there was a significant uptake in telemedicine services during this period, but its use has since declined. In order for the use of telemedicine to continue, athletic trainers must view it as an integral part of their practice, not an inessential service.<sup>10</sup>

#### Transtheoretical Model for Change

The TTM for Change has been implemented for numerous purposes within the healthcare system. Most often, the TTM finds that when trying to encourage the adoption of a new behavior, the organization focuses on the precontemplation and contemplation stages, and there is very little focus on the maintenance of the new behaviors.<sup>14</sup> This seems appropriate for the information we found within this study; most athletic trainers had already been through the contemplation stage and were in the maintenance or termination stage of the process. The TTM is most effective with individuals who have poor adherence to a behavior and tend to be less effective with those who have already adopted the new behavior.<sup>15</sup> This could also be true with athletic trainers, and the mindset of how we implement and maintain the adoption of telemedicine has to be changed.

The change in use of telemedicine may also follow Lewin's model of change, Unfreezing, Movement, and Refreezing.<sup>16</sup> In this model, a novel behavior can disturb the balance of an organization, or in this case, a profession. Adoption of telemedicine created a shift during the pandemic in how athletic trainers' practice. When the initial adoption began, movement then ensued, which



allowed for practice as well as trial and error in the use of telemedicine. Some athletic trainers may have found this “new” technology favorable to their practice, while others saw it as a means to an end once face-to-face interactions were allowed again. Then, once the pandemic restrictions began to subside, the practice of telemedicine experienced refreezing. If individuals do not acknowledge the use and sustainability of telemedicine, they will revert to the original state of behavior, which was no longer using telemedicine. The maintenance of telemedicine, as described in the TTM, would only occur if the organization provided methods to sustain the practice of telemedicine. Educational opportunities, incentives, and allocating resources would need to be implemented in order to see a true and sustained increase in telemedicine.

There is some unwillingness to change to telemedicine services in athletic training, and there are mixed findings as to why that is. Telemedicine has been found to be easy to use, improves communication, decrease travel time for patients, and increase access to healthcare.<sup>17</sup> The majority of athletic trainer survey respondents were in the AMT (adoption, maintenance, termination) phase of the TTM, however were very few who identified being unaware or in contemplation of adoption. There were many athletic trainers who stopped using telemedicine for an unidentified reason. This termination of use could be caused by the loss of purpose for athletic trainers due to lack of sport-specific functionality.<sup>18</sup> Once face-to-face patient encounters were able to resume, there was no incentive for them to continue regular use of telemedicine. For long-term adoption, we must consider alternatives for telemedicine use within sports medicine that have lasting use outside of the pandemic such as post-operation checkup, mental health, and travel for away competitions and school breaks.

### **Barriers and Motives**

These findings may match potential barriers related to the adoption and integration of telemedicine for athletic trainers. While some athletic trainers have begun to utilize technology in multiple facets of their job such as web-based applications, electronic medical records, and telemedicine platforms, there are still many who have not taken advantage of this technology for various reasons and concerns.<sup>19</sup> These reasons are often self-imposed through lack of education on the topic, budgets, and resources. Some reasons include complex regulations and complications with reimbursement, which is seen in many other professions with the use of telemedicine.<sup>20</sup> Most athletic trainers found that technology and lack of administrative leadership were the greatest barriers to adopting telemedicine, which are also common barriers to the adoption of telemedicine in other healthcare professions such as nursing.<sup>13</sup> Buy-in and implementation of telemedicine were previously identified barriers which continue to pose potential issues in the adoption of telemedicine, and we found that those barriers continue to impede the continued use of telemedicine. We found that athletic trainers did not see telemedicine as a local threat, nor that their collaborating physicians would not approve of its use. Orthopedic surgeons who use telemedicine have found that adoption is easy and the coordination of visits allows them to provide care while saving time for patients.<sup>21</sup> Billing issues have been noted as barriers for other healthcare professionals<sup>13</sup>, but this study found no barriers related to billing for telemedicine services in athletic training.

Previous literature has identified some barriers to the adoption of telemedicine, but very few pertain specifically to athletic training. One of the largest barriers identified from other healthcare providers was buy-in from clinicians.<sup>19</sup> Buy-in correlates directly with the perceived experiences for clinicians when implementing and practicing telemedicine. Perceived usefulness has been identified as a barrier in nurses adopting telemedicine, which directly correlates to buy-in. However, it is repeatedly found that patients and clinicians show high satisfaction rates with telemedicine,<sup>22</sup> so it is difficult to say why athletic trainers believe that patient satisfaction may be an issue. We suggest that healthcare providers focus on the values of telemedicine, such as closing clinical gaps and providing clinical support, as drivers for continued use of telemedicine moving forward. In the future, we expect that more athletic trainers may have more experience with the implementation of telemedicine from the COVID-19 pandemic.

In the future, there will be many more athletic trainers who have more knowledge about the implementation of telemedicine due to the fact that it is taught in most athletic training education now. We have seen that among physicians who voluntarily adopt telemedicine, there is a higher retention rate for the maintenance for the usage, which may be important when integrating telemedicine in athletic training.<sup>23</sup> Once more athletic trainers are well-versed in the use of telemedicine, the focus needs to shift to what would encourage them to maintain the use of their telemedicine skills in their own clinical practice.

### **Future Research and Limitations**

Our study is not without limitations. The limitations of this study include a response bias of the athletic trainers. Those who have used or have been taught about telemedicine in athletic training previously. Using the NATA research database also poses a limitation due to the convenience of the sample. Not all athletic trainers are members of the NATA, therefore not all certified athletic trainers received the survey. Future research should explore at not only motivators but also incentives for athletic trainers to adopt telemedicine more regularly. Physicians found that during the COVID-19 pandemic, telemedicine not only allowed better convenience of care, but better patient counseling, and improved understanding of medication.<sup>24</sup> These benefits could also be possible for athletic trainers and allow for more one-on-one time with patients, improved continuity of care, and overall improvement



of time resources; which athletic trainers are often in short supply of. Finding the right reasons for adoption of telemedicine will be just as important as teaching the implementation of telemedicine because if you do not have a justifiable reason, the termination of the use of telemedicine will be eminent. This study may be able to be repeated after the pandemic has subsided and most early career athletic trainer in the work force that may have had education and training on telemedicine which could shed different information regarding long-term adoption of telemedicine.

## CONCLUSIONS

Our results suggest that most athletic trainers have recently changed their delivery of healthcare in the last 6+ months and intend to continue using telemedicine. Additionally, increasing an ATs highest level of degree earned was associated with an increased likelihood of being in stage five (AMT) on the modified-TTM assessment suggesting focused, professional development could sustain telemedicine use in athletic training. The athletic trainers in the present study identified that telemedicine success was hampered by a lack of exposure but did feel that telemedicine fills gaps in patient care and addresses patient satisfaction. Professional development in the use and benefits of telemedicine by clinicians, physicians, and leaders may bridge the gap between these factors.

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