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Factors of Experience and Training and Physician Intention to Adopt Telemedicine

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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MS, Rosalind Franklin University of Medicine and Science, 2016

Doctoral Study Submitted in Partial Fulfillment

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Abstract

Despite the increased role of telemedicine services, physicians' intention to adopt telemedicine for the long term remains disproportionately low; further, little research has focused on the factors behind these intentions. The purpose of this study was to determine and compare the effects of two causal factors: previous experience of physicians in telemedicine and company telemedicine training, on physicians' intention to adopt telemedicine. The Davis's technology acceptance model was used as a theoretical framework for this study, which included analytical data of health care regulatory organizations, medical professional alliances, and secondary statistical data of a marketing company with experience in conducting surveys in health care. The findings of Kruskal–Wallis tests on effects of those factors were statistically significant with $p < .05$ for both, with large effect sizes ($E^2 = .66$ for the factor of experience and $E^2 = .71$ for the factor of training). Comparative analysis (via Mann–Whitney test) of the effects of the two factors revealed that company telemedicine training had a significantly greater impact on the outcome variable ($p < .05$) with a medium effect size ($r = .42$). Thus, the study findings demonstrated that company telemedicine training is an important positive factor for physicians' adoption of telemedicine. The most important implication of this study's findings for positive social change could be the reduction of inequalities in access to healthcare services by offering telemedicine to numerous population groups with limited mobility due to their health status, age, remote location, and the COVID-19 pandemic.

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Dedication

This study is dedicated to my dear late father, who read my first books to me, taught me to read, and accompanied me to my first day of first grade as well as first college. Thank you, father, for your support, love, and trust. You instilled in me a desire for learning, and you taught me to like what I do. Your belief in me made me strong. My research aims to support the professional efforts of my son in health care. I believe that he will help many people and that the use of telemedicine will assist him in reaching his goals. Special thanks to my mom for her constant, unshakable confidence that her daughter will be fine.

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Section 1: Foundation of the Study and Literature Review

Introduction

Physician intention to adopt telemedicine has been identified as a major barrier against telemedicine integration (Hyder & Razzak, 2020). Despite the increased role of telemedicine services and growth of the investments into this segment of health care, physician acceptance of telemedicine is disproportionately low (Kissi et al., 2020). The evidence of the meaningful growth of telemedicine services is represented in the research literature. According to the Research and Development Survey (RANDS), a research and evaluation platform for National Center for Health Statistics, the percentage of the health care providers offering telemedicine changed from 14.1% before the pandemic to 37.1% during pandemic in 2020 (Centers for Disease Control and Prevention [CDC], 2020a). During the first year of the pandemic, the number of providers practicing telemedicine increased by 2.6 times. Although the dynamics of telemedicine integration during the COVID-19 pandemic have varied (U.S. Department of Health and Human Services [HHS],2020), the significant increase in telemedicine services during the last 2 years has been recognized in the research literature (Demaerschalk et al., 2020). Projected development of the U.S. telemedicine market for the next 7 years, with compounded annual growth of about 30%, will increase investments in telemedicine from $9.5 billion in 2020 to $25.88 billion in 2027 (Grand View Research, 2021). Such a positive long-term trend in telehealth development demonstrates that the pandemic situation was not the single factor for accelerated telehealth growth in 2020 (Leite et al., 2020). The main advantages of telehealth, such as better care access, cost effectiveness, and higher quality of the data processing, provide the sustainable high rate of the telemedicine development (Ranganathan & Balaji, 2020).

While current development and projected long-term trends of U.S. telemedicine are characterized by an increase in the number of the patients served, scope of services, and investments into further integration of telemedicine, the surveys of the physician intention to adopt telemedicine demonstrate the negative dynamics. Thus, a 2020 survey of American physicians represented by The Physicians Foundation revealed that only 52% of the applying telemedicine physicians planned to continue use of telemedicine in post-COVID times (The Physicians Foundation, 2020). The 2020 physician survey conducted by Decision Research Group (DRG), a leading health care research company, detected the same low level of intention in physicians to continue telemedicine implementation in the post-COVID era (52% of the respondents; DRG, 2020). Although those physician surveys did not address all the complex reasons for the reluctance of physicians to use telemedicine over the long term, the main physician obstacles in telemedicine were indicated. For instance, a physician survey conducted by the Physician Foundation revealed that majority of physicians (72%) are not satisfied with the amount of reimbursement size and the process by which telemedicine services are rendered (The Physician Foundation, 2020). The DRG physician survey also revealed that 58% of U.S. physicians have lingering reservations about the quality of care they can provide remotely (DRG, 2020).

Despite the importance of solving the issues with reimbursement and quality in telemedicine for physicians, fixing separate elements will not eliminate the resistance of physicians to adopt telemedicine. The intrinsic reason for this resistance is rooted in the disruptive nature of the process of new technology integration. Telemedicine as a disruptive process brought systemic changes to previously existing models of the health care process, delivery of services, and relationships between physician and patient (Sterling & Le Rouge, 2019). Thus, physicians' disproportionate responses to rapid telemedicine integration with meaningful systemic changes are objective problems that should be addressed in Doctor of Health Administration (DHA) practice. Failure to address this issue creates challenges in DHA practice that could be described as a workflow bottleneck when telemedicine requests and workload grow too quickly for the handling by physicians. A bottleneck is defined as a constraint on patient access to health care services that occurs when the demand for a particular resource in health care (e.g., telemedicine) is greater than the available supply (Institute for Healthcare Improvement, n.d.). Bottlenecks have been identified as a problem in modern telemedicine by multiple researchers (Barnett et al., 2020; Ranganathan & Balaji, 2019). Physician shortage, not a lack of investment or technology, is seen as the main reason for the bottleneck in telemedicine (Barnett et al., 2020). Physicians' low intention to adopt telemedicine has exacerbated the physician shortage problem in telemedicine.

In this study, I examined and measured the influence of the two factors recognized as positive predictors for the higher intention of physicians to adopt telemedicine. The first factor is previous experience in the use of telemedicine, which encourages physician support for implementation and resolution of possible challenges (Morilla et al., 2017). The second factor of physician training in telemedicine, despite its recognized benefits, has not been sufficiently studied and implemented in DHA practice due to the rapid process of telemedicine integration and lack of DHA policy in this new dynamic segment (Stovel et al., 2020). In this study, I examined the effects of training on physician intention to adopt telemedicine, and I investigated the research literature on the most effective forms of physician training in telemedicine. The statistical significance of these two factors in physician intention to adopt telemedicine were measured and compared. Literature detailing the most effective DHA approach to telemedicine adoption was reviewed. Relying on the results of the study, health care administrators could develop sustainable and cost-effective policies for physician engagement in telemedicine.

Solving the issues of physician engagement in telemedicine can bring about meaningful positive social change. Eliminating the barrier of low physician intention to adopt telemedicine can reduce health disparities in society. Telemedicine is recognized as the main way to eliminate disparities in health care access for patients in rural areas, as well as patients with limited mobility due to age, health status, or the pandemic situation (Chunara et al., 2021). The problem of access to health care services drastically increased in the pandemic year of 2020 when the number of the people with reduced access to health care reached 48.1% of the population with the maximum of 51.5% in the 45 to 64-

year-old age group (CDC, 2021b). Thus, physician intention to respond to growing demand for telehealth is critical.

Section 1 outlines the research problem; study purpose; research questions and related hypotheses; theoretical foundation for the study; nature of the study; literature search strategies; literature review related to concepts, key variables, and covariates; literature review summary; definitions of terms used in the study; assumptions for the study; scope and delimitations for the study; and significance of the study.

Background

After reviewing the research literature, two gaps were identified. Physician experience and training in telemedicine were described as the positive factors for physician intention to adopt telemedicine. Nevertheless, a research gap exists in quantitative measuring and the comparative analysis of those factors. Such analysis can be beneficial for targeted DHA practice for physician integration into telemedicine practice. A differentiated approach to the various groups of innovation-adopting physicians can enable the development of time- and cost-effective DHA policy in telemedicine with effective combination of the factors of physician experience and training in telemedicine. The second gap in the research literature is a lack of complex analyses of the causal factors (e.g., experience, training) and factors contributing to physicians’ intention to adopt telemedicine (e.g., physician practice size, geographic location, and age of physicians).

Problem Statement

The specific research problem addressed in this study is that the level of physician intention to adopt telemedicine is low, and there is a lack of research literature about the reasons why. Although researchers have investigated the issues of physician engagement in telemedicine, their undifferentiated approach has not allowed them to sufficiently assess this problem and factors affecting it. The undifferentiated approach in physicians' surveys about telemedicine was described and criticized by Kane and Gillis (2018). They revealed that survey questions were asked on the practice level, without reflecting on physicians` personal experience in telemedicine (Kane & Gillis, 2018). One negative outcome of an undifferentiated approach to physician intention to adopt telemedicine has been attempts in DHA practice to create a standard, on the practice level, demand of physicians for telemedicine without addressing specific needs of the practitioners in telemedicine (Sukel, 2019). Sukel (2019) identified the untargeted approach of "one size fits all" as a main barrier against the adoption of telemedicine among physicians. In my study, the issue of an undifferentiated approach to assessment of physician intention to adopt telemedicine was eliminated with the application of the targeted method. A Normalization MeAsure Development questionnaire (NoMAD) (Finch et al., 2015), which was applied by the data provider for the physician survey, allows assessment of individual physician intention to adopt telemedicine (Vis et al., 2019). Sukel found that physician intention to adopt telemedicine is low, especially in small physician practices; whereas 55% of hospital physicians are willing to adopt telemedicine for the long-term, only 20% physicians in small practices intend to apply it. The contributing factors of the size of physician practice, age, and location affecting physician adoption of telemedicine have been insufficiently investigated; thus, they were examined in this study.

Although researchers have identified the issue of low intention of physicians to adopt telemedicine, the research base about the factors of this problem is insufficient. There has been no quantitative comparative analysis of the difference between factors of experience in telemedicine and telemedicine training, whereas these two factors are associated with two different DHA approaches to physician engagement in telemedicine. This study could address the gap in the research literature about the factors for physician intention to adopt telemedicine. In this study, the effects of the factors of experience and training on individual demand for telemedicine among the physicians were measured and compared. I addressed the DHA practice issue of using an undifferentiated approach to physician intention to adopt telemedicine. The consumer- (that is, physician-) oriented approach to measuring individual physician intention to adopt telemedicine was applied.

Purpose of the Study

The purpose of this study was to address the identified gaps in the related research literature, testing the hypotheses about the influence of the factors for physician intention to adopt telemedicine and making conclusions that could be useful for developing DHA policy for sustainable engagement of physicians into telemedicine. The purpose of this quantitative study was to examine and measure the relationship between the dependent variable of physician intention to adopt telemedicine technology and the independent variables of physician experience in use of telemedicine (3 ranks) and telemedicine training (3 categories) and comparing the effects of those factors on physician intention to adopt telemedicine.

Both factors (experience and training) have been recognized as positive predictors for physician engagement into telemedicine in the modern research literature (Kissi et al., 2020; Morilla et al., 2017). Meanwhile, I intended to address the gap in the research literature by measuring the effects of these factors and comparing the strength of the relationships between the factors and the dependent variable. The practical purpose of measuring and comparing effects of the experience and training on physician intention to adopt telehealth is developing effective DHA policy for physician engagement in telemedicine. The study assisted in finding the optimal combination of two DHA approaches for physician engagement in telemedicine. The first approach, that is, time-consuming and cost-effective, aims at creating a group of physicians experienced in telemedicine; the second approach, that is, time-effective and cost-consuming, offers training for engagement of physicians into telehealth.

Research Questions and Hypotheses

Research Question (RQ)1: Based on physician questionnaire scores, what is the relationship between physician experience in telemedicine and physician intention to adopt telemedicine?

$H_0$1: Based on physicians` questionnaires scores, there is no statistically significant relationship between the experience in using telemedicine and physician intention to adopt telemedicine.

H_a1: Based on physician questionnaire scores, there is a statistically significant relationship between the experience in using telemedicine and physician intention to adopt telemedicine.

Research Question 2 (RQ2): Based on physician questionnaire scores, what is the relationship between the telemedicine training and their intention to adopt telemedicine?

$H_0$2: Based on physician questionnaire scores, there is no statistically significant relationship between the training for using telemedicine and physician intention to adopt telemedicine.

H_a2: Based on physician questionnaires scores, there is a statistically significant relationship between the training for using telemedicine and physician intention to adopt telemedicine.

Research Question 3 (RQ3): Based on physician questionnaire scores, what is the difference between the median score of the physician group with experience in telemedicine and the median score of the physician group with training in telemedicine?

$H_0$3: Based on physician questionnaire scores, the difference of medians equals zero.

H_a3*:* Based on physician questionnaire scores, the difference of medians is not equal to zero.

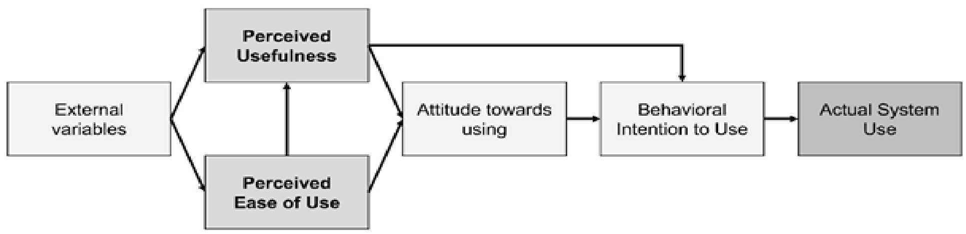
Theoretical Framework

The theoretical foundation for this study was Davis's technology acceptance model (TAM), a theory that recognizes attitude and behavioral intention as the main factors in technology adoption by specialists (Davis, 1989). Effectiveness of TAM in forecasting the adoption of telemedicine by physicians has been recognized by modern researchers (Kamal et al., 2020; Kissi et al., 2020; Mugo et al., 2017). Meanwhile, the outcome- (economic and clinical) oriented approach has appeared to be more popular in the research literature about telemedicine integration. Dossary et al. (2017) revealed that only 21% of research articles that evaluated telemedicine applied clinician satisfaction surveys for measuring attitude toward telemedicine adoption, whereas 79% of the articles evaluated economic and clinical outcomes of the telemedicine for the 1978 to 2017 period.

The product-oriented approach, with an emphasis on economic and clinical outcomes, has been a popular strategy for involving physicians in new business models of telemedicine. For instance, Sterling (2019) considered that the problem of physician involvement in telemedicine could be solved by providing a "viable business model." Meanwhile, the consumer-oriented approach in health care measuring attitudes has been associated with higher quality of services and better clinical outcomes (McColl-Kennedy et al., 2017). Pertaining to physician engagement in telemedicine, the consumer-oriented approach implies assessment of physician opinion and the factors affecting their intention or reluctance to apply telemedicine. TAM recognizes that the attitude of the user of technology is the main criterion of technology acceptance. This idea served as a theoretical foundation for the consumer-oriented approach in this study about intention of physicians to adopt telemedicine. Figure 1 shows the TAM.

Figure 1

Technology Acceptance Model (TAM)



Note. From "The Technology Acceptance Model (TAM) and its Application to the Utilization of Mobile Learning Technologies," by D. G. Mugo, K. Njagi, B. Chemwei, and J. O. Motanya, 2017, *BJMCS*, *20*(4),1-8. Reprinted from the public domain www.sciencedomain.org.

Abbreviations used for the description of TAM include attitude toward using (ATU), behavioral intention to use (BIU), actual system use (ASU), perceived usefulness (PU), and perceived ease of use (PEU).

The logical connection between the presented framework (Davis's TAM) and the nature of this study is that physician intention to adopt telemedicine (similarly to ATU in TAM) has been identified as the initial step in the process of telemedicine adoption (BIU and ASU in TAM). Similar to TAM, where PU and PEU have been identified as two main factors for attitude toward using technology, the NoMAD physician questionnaire

(Finch et al., 2015) was applied by the data provider for measuring usefulness and ease to use telemedicine. Later developments of Davis's TAM model from 1989 up to 2008, described in Lai (2017), have a varied scope of external variables. In my study, two external variables were examined (i.e., factors of experience and training in telemedicine).

Nature of the Study

The nature of this study was quantitative research aimed at examining and measuring correlations between physician intention to adopt telemedicine and variables of experience in telemedicine and telemedicine training with further comparing strength of correlations and revealing the most influential factor for physician engagement in telemedicine. The survey method selected by the data provider for measuring physician intention to adopt telemedicine provided a quantitative description of trends, attitudes, and opinions (see Creswell & Creswell, 2018). The cross-sectional design was applied as a type of observational study without altering the effects of the factors (see Setia, 2016).

The selection of the study variables facilitated the analysis of factors for physician adaptation of strategies to overcome challenges in telehealth adoption. Wade et al. (2017), in their study about designing quantitative telemedicine research, underlined the disruptive nature of telemedicine and recommended a formative, complex, and comparative design. In this study, I applied a formative and comparative quantitative research, and, instead of complex research with multiple explanatory variables and factors, one explanatory variable with a causational effect on all processes of telemedicine integration (dependent variable of physician intention to adopt telemedicine for the first and second research questions) was selected. Instead of investigating multiple factors, only two leading factors for physician adaptation to telemedicine were investigated (i.e., independent variable of experience in the first research question and independent variable of telemedicine training in the second research question).

To address RQ1 in this quantitative study, linear regression (a Kruskal-Wallis test, a nonparametric version of one-way ANOVA) was applied to examine and measure the relationship between physician intention to adopt telemedicine (measured with a NoMAD questionnaire with a 10-point Likert scale; Finch et al., 2015) and experience in telehealth (measured in months). A Kruskal-Wallis test was conducted for RQ2 about the relationships between physician intention to adopt telemedicine and telemedicine training (measured as a categorical nominal variable). For RQ3, a Mann-Whitney U test, a nonparametric version of parametric independent two samples *t* test, was performed to investigate and measure the difference between the medians (in a nonparametric test) of two groups (physician group “experience” and physician group “training”). Because an independent samples *t* test and analogous nonparametric Mann-Whitney test allow prompt assumptions about difference (Schnuerch & Erdfelder, 2020), they are widely applicable in telemedicine for comparative analysis (Chunara et al., 2021; Goldman et al., 2020;). The effects of three covariates for physician intention to adopt telemedicine (i.e., age of physician, location city or rural, size of physician practice) were examined and measured in this study.

The secondary data of health care regulatory organizations and medical research companies were used for analysis in this study. The telemedicine-related secondary data source of the Agency for Healthcare Research and Quality was used. The Agency for Healthcare Research and Quality provides statistics, fact sheets, and reports about technology assessment in telemedicine. The resources of the CDC's National Center of Health Statistics, particularly Research and Development about telemedicine, were applied.

MedLine and Inter-University Consortium for Political and Social Research (IUCPSR) resources were applied for accessing data sets about trends in telemedicine and existing frameworks for telemedicine evaluation (e.g., American Telemedicine Association principles for telemedicine, NoMAD questionnaire for measuring clinician adoption of telemedicine, and value-based quality metrics for telemedicine).The secondary statistical data about physician experience, training, and satisfaction were provided by the telemedicine company, which serves approximately 5 million people in Europe and the United States.

Literature Search Strategy

The literature search strategy targeted peer-reviewed studies written within the last 5 years and found either in Walden University`s online library or in open online resources for research literature (i.e., Google Scholar, National Library of Medicine, National Institute of Health, Directory of Open Access Journals). The PRISMA flow chart was applied as a tool for the topics-related selection of the literature (see Moher et al., 2009). It included identification of the literature related to the topics through the database CINAHL & MEDLINE Combined Search; screening for criteria of availability, date, relevance, and peer-review status; and checking for eligibility (scientific validity, significance for the study). MedLine and IUCPSR resources were applied for accessing datasets about existing frameworks for telemedicine evaluation (American Telemedicine Association principles for telemedicine, National Quality Forum value-based quality metrics for telemedicine, and questionnaires for measuring clinician adoption of telemedicine). The following are the key search terms that were applied: *physician adoption of telemedicine, physician barriers to telemedicine, measuring physician satisfaction in telemedicine, physician experience in telemedicine, physician training in telemedicine, age factor in telemedicine, size of practice and adoption of telemedicine,* and *rural telemedicine*.

Literature Review Related to Concepts

The concepts that affected variable selection and research question development in this study were derived from three theories: TAM, diffusion of innovations, and theory of change management.

Concepts of the TAM

As identified in the recent physician surveys (CDC, 2021a; The Physicians Foundation, 2020), the low level of physician intention to adopt telemedicine is a behavioral problem that cannot be explained from a technical or economic viewpoint in the period of the robust development of telemedicine. As a key component in the process of new technology adoption, behavioral intent to adopt telemedicine has become an evolving area of study in current research literature (Ramírez-Correa et al., 2020).

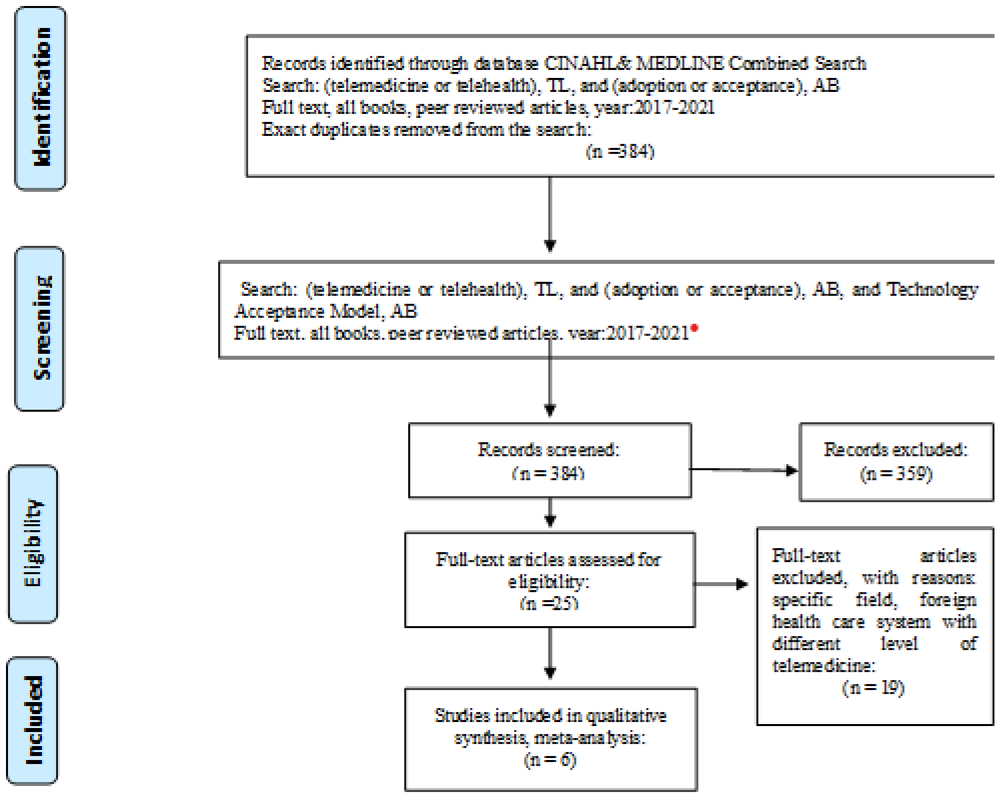
In this study, the concept of the ATU was derived from the behavioral theory of the TAM (see Davis, 1989) and applied to the justification of the selection, as a key variable, of physician intention to adopt telemedicine. According to this concept, behavioral intent (ATU), presented in this study as physician intention to adopt telemedicine, is an initial step toward the implementation of new technology, particularly for this study, telemedicine.

The second concept derived from the TAM theory and reflected in this study explained the influence of two main factors for ATU: PU and PEU (Davis, 1989). These main influencing factors coincided with the principles of the NoMAD questionnaire (see Finch et al, 2015), which was applied to measure physician intention to adopt telemedicine by the data provider. Most of the NoMAD questions measured physician opinion about the ease of use and usefulness of telemedicine.

As mentioned above, Davis's TAM was chosen as a theoretical framework for the study. Literature research about TAM application in health care justified such a selection. Jacob et al. (2020) revealed that TAM is the most used framework for research about the clinician adoption of telemedicine, applied in 34% of such studies. Figure 2 represents the PRISMA flow chart for studies about TAM.

Figure 2

PRISMA Flowchart of Selection Studies About TAM in Telemedicine



Note. Six studies about TAM implementation for assessment of physician intention to adopt telemedicine were selected. The flowchart blank was reprinted from public domain www.prisma-statement.org.

According to the PRISMA flow chart, TAM is a recognized by modern researchers as a tool for assessing the problems of telemedicine adoption. Compared to other comprehensive methods of telemedicine adoption analysis, for instance, the telemedicine service maturity model (Dyk & Schutte, 2013) or the model for assessment of telemedicine

(Kidholm et al., 2017), TAM operates with fewer factors and one main effect: BIU. In telemedicine, implementation of TAM allows for the elimination of generalizations and the investigation of specific causal relationships between the factors and their main effect, BIU. Thus, TAM is a tool for the effective prompt analysis of the issues of telemedicine adoption (Wade et al., 2017).

The development and changes in Davis's model were studied and presented in several reviews about TAM application in modern health care (Ammenwerth, 2019; Momani & Jamous, 2017; Taherdoost, 2018). The later versions of TAM (TAM2, TAM3) represented complex constructs with added multiple cofactors to the main two factors (PU and PEU; 7 cofactors in TAM2 and 13 cofactors in TAM3; Momani & Jamous, 2017). Meanwhile, the original TAM model developed by Davis in 1989 remains applicable as a robust and effective tool for the analysis of telemedicine adoption (Rahimi, 2018).

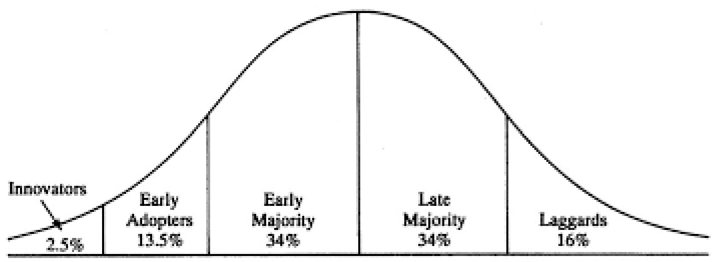
For this study, the concepts of the initial TAM model described in Figure 1 was applied. Specific for this study, a model combines TAM concepts of ATU, PU, and PEU, as well as external factors of experience and training.

Concepts of the Theory of Diffusion of Innovation

The concepts of five groups of innovation adopters, as derived from the diffusion of innovation (DOI) theory (Rogers, 1983), affected the selection of the variable of physician experience in telemedicine as an influential factor for telemedicine adoption among physicians. This concept allowed for understanding of the advantages and barriers in the acquiring and spreading of experience in telemedicine by physicians. Figure 3 describes DOI.

Figure 3

Diffusion of Innovation Process

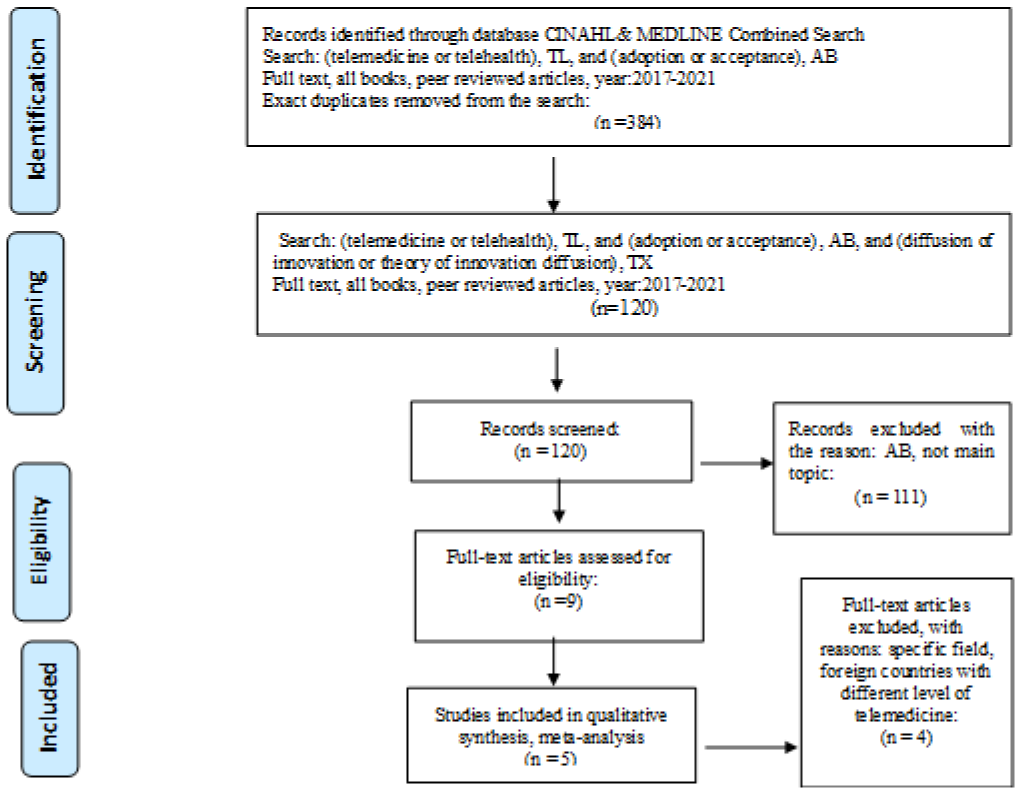


Note. According to Rogers's model, the DOI allows robust adoption of telemedicine in the groups of innovators, early adopters, and early majority (about 50% of all adopters). Reprinted from open public domain www.researchgate.com.

Figure 4 represents flow chart for studies about DOI.

Figure 4

PRISMA Flowchart for Selection Studies About DOI in Telemedicine



Note. Five studies about DOI implementation for assessment of physician intention to adopt telemedicine were selected. The flowchart blank was reprinted from public domain www.prisma-statement.org.

According to the PRISMA flow chart, the popularity of the DOI in current research literature about telemedicine adoption has diminished. Researchers of the process of telemedicine adoption indicated that, in modern telemedicine, the idea of DOI has limited explanatory power (Haun et al., 2020; Otto et al., 2021; Sterling & LeRouge, 2019). For developed telemedicine, the need for a new telemedicine maturity model was identified (Otto et al., 2021). Meanwhile, in the systematic review of theories predicting the acceptance of telemedicine, Harst et al. (2019) assumed that DOI is still applicable in studies about telemedicine adoption. For instance, DOI could be used to explain the reasons for physician latent resistance to telemedicine adoption in the COVID period with widespread forced adoption of telemedicine. When more than 75% of physicians became involved in telemedicine, the late majority and laggard groups with lower levels of intention to adopt telemedicine became involved in telemedicine (See Figure 3). Rogers's model is useful for understanding the difference between the groups of the adopters in the process of acquiring experience in telemedicine.

The justification of the selection of physician experience as a key variable is based on the assumption about the important role of early adopters and early majority groups in the integration of telemedicine by spreading their experience. Pertaining to my study, the concept of five groups of telemedicine adopters predicted the variability in measuring the correlation between physician intention to adopt telemedicine and the experience of the physicians in telemedicine measured in months. Belonging of the physicians to the specific group of the telemedicine adopters could positively or negatively affect physician intention to adopt telemedicine.

Concept About Training of the Theory of Change Management

The concept of training in the change management theory influenced the selection of training as a factor for physician intention to adopt telemedicine. While training was not identified as a step or task in Kotter's (1995) initial change model, the following developments of change management theory recognized training as an important part of the change model (CM). The review of Galli (2018) about further developments of CM demonstrated that training was included in Lewin's change model ("provide support and training on 'refreeze' stage"), Awareness, Desire, Knowledge, Ability and Reinforcement model (domain "knowledge," task "provide training or coaching"), and McKensey's 7-S model (domain "skills," task "development distinct capabilities by staff"; Galli, 2018).

In modern research about CM, the role of training in change adoption and providing change sustainability is prioritized. In an analytical review of existing models of change, Hayes (2018) recognized training as a required step before planning and preparing change. Collective learning was identified as a necessary factor for sustainability of change (Hayes, 2018). Cameron and Green (2019) justified the need for training due to the disruptive nature of changes. The effective training should apply all four identified approaches to individual change (behavioral, cognitive, psychodynamic, and humanistic psychology; Cameron & Green, 2019). Kho et al. (2020) revealed that modern researchers of the telemedicine adoption process recognize training as the main factor for success in telemedicine adoption by clinicians. In the review of change management practices used in telemedicine, Kho et al. identified that, in 33 out of 44 studies, training was recognized as the main factor for successful telemedicine adoption. Thus, in this study, selection of training as a factor for physician intention to adopt telemedicine is supported by the concept of modern change models about its important role.

Literature Review Related to Key Variables

Population

The population group targeted in this research included active, state-licensed U.S. physicians who were working at least 20 hours per week. This included those working in direct patient care, administration, medical teaching, research, or other nonpatient care activities (see American Association of Medical Colleges [AAMC], 2020). According to AAMC's *2020 Physician Specialty Data Report,* in 2019, the total number of active physicians was 298,987, with 120,171 working in primary care, 118,198 in family medicine/general practice, and 60,618 in pediatrics. In 2019, 44.9% of active physicians in the United States were age 55 or older (AAMC, 2021).

The number of physicians applying telemedicine in their practice has varied in the last 5 years. According to the American Medical Association's first national representative survey on how many physicians use telemedicine, conducted in 2017, 26.6% applied it within the study group of 3,500 physicians (as cited in Kane & Gillis, 2018). Estimates of the number of the physicians using telemedicine during the pandemic vary due to the changes in dynamics of telemedicine usage. Two CDC reports showed meaningful changes at the beginning of the pandemic. In March 2020, there was a 154%

increase in online visits compared to the same period in 2019 (Koonin et al., 2020). During June to November 2020, there was a 25% decrease in the overall percentage of online visits — from 35.8% in June to 26.9% in November (Demeke et al., 2021).

Meanwhile, despite the changes in the volume of telemedicine services, the total number of active physicians who provide telehealth is estimated to be as high as 90%, according to the Sermo physician survey with 1,300 participants (Sermo, 2020). Only 52% of them planned to use telemedicine in the long term (The Physicians Foundation, 2020). Thus, 10% of active physicians were not using telemedicine (29,898) and 48% of physicians using telemedicine (129,162) still had issues with its adoption. In 2020, the total number of physicians who were experiencing issues with telemedicine adoption was approximately 159,060, based on surveys. This study intends to fill a gap in the literature by examining, measuring, and comparing correlations between physicians' intention to adopt telemedicine for the long term and the factors of their experience and training in its use.

Physician Intention to Adopt Telemedicine

Identification of the Problem of Physician Intention to Adopt Telemedicine

Physician lack of intention to adopt telemedicine was identified as one of the main barriers to its use. In the 2018 review of research about barriers to telemedicine adoption, this specific issue was not identified (Kruse et al., 2018). In the period preceding COVID-19, economic and technical barriers were the main focus of researchers, according to table *Results of Analysis* (Kruse et al., 2018). Low intention of physicians to adopt telemedicine was described as a barrier in only six of 30 identified research studies about barriers to telemedicine (Kruse et al., 2018). Meanwhile, the continued low engagement level of physicians in telehealth, despite positive changes in computer literacy, quality of telemedicine and reimbursement policies, prompted the discussion of physician intention to use it. Physicians' low intention to adopt telemedicine for the long term during the pandemic became the main obstacle for telehealth development (Bokolo, 2021).

Kane and Gillis (2018) in their review to CDC, critically evaluated the use of telemedicine services by the physicians. They investigated that the levels of integration are low (from 8.2% in small practices to 26.5% in large practices), and there is a practice of offering standard telemedicine services for all physician practices. They found that the major limitation of the physician surveys was that physicians were asked to answer at the practice level without reflecting on their personal experiences with telemedicine. In this study, the operational issue in DHA practices was indicated (i.e., an untargeted approach in DHA practices that attempts to integrate standard telemedicine services and create standard demand among physicians). This issue will be addressed in my targeted-approach study about the factors for individual physician intention to adopt telemedicine services.

Sukel (2019) studied the DHA operational and administrative problems in the integration of telemedicine services among physicians, such as costs, reimbursements, and other issues. She found that physicians' intention to integrate telemedicine is low

(55% of physicians in hospitals and 20% of physicians in small practices). The untargeted approach of “one size fits all” in DHA operations for the integration of telemedicine services was identified as a main barrier to the adoption of telemedicine among physicians. The target approach combining a study of, and the integration of, physicians’ opinions into DHA operations was seen as a way to address this barrier. My research is intended to eliminate the untargeted approach by implementing physician surveys on the level of personal experience and addressing questions about the specific needs of physicians related to practice and training.

Hyder and Razzak (2020) estimated the current level and problems of telemedicine integration, with its advantages, barriers, and issues. They identified physician low intention to adopt telemedicine as one of the main barriers in the process of its integration. They say a differentiated approach and gradual integration of telemedicine will be the optimal solutions for solving the issue of physicians’ low engagement levels. This reasonable conclusion raises questions about DHA operational improvements, switching from a standard approach in telemedicine integration to a targeted approach. This requires taking measures to meet specific needs of physicians in telemedicine.

In research literature, end-user satisfaction (patient and physician) was identified as one of the main objectives of telemedicine success (Harst et al., 2019; Kissi et al., 2020). Kissi et al. (2020) recognized a disproportion between an increase in telemedicine services technology and slow adoption of telemedicine by physicians. In their research, physicians’ satisfaction with telemedicine services adoption was evaluated based on the

Davis` technology acceptance model (TAM), where physician intention to adopt telemedicine was equivalent to ATU (attitude toward use). Findings within the study group of 500 physicians demonstrated strong positive correlation between PU (perceived usefulness), PEU (perceived ease of use) and physician intention to adopt telemedicine. Thus, the main role of physician intention was demonstrated by considering the current situation. Pertaining to my study, it justified the selection of TAM as a theoretical framework.

In the research of Nguyen et al. (2020), which was accessed and cited by multiple users in open source, the satisfaction of both patients and providers was recognized as an important factor for telemedicine success. The researchers applied technology acceptance model constructs for measuring providers' satisfaction. The six-dimension system for measuring satisfaction offered by Nguyen et al. contains five objective dimensions (type of stakeholder, type of care, type of telemedicine service used, type of facility, type of remote communication) and the dimension of overall satisfaction with care, which measures the provider's attitude toward usefulness and ease of use (as in TAM), as well as reliability.

The meaning of this research for my study is that behavioral intent to apply telemedicine by providers, including physicians, was identified and supported by the study as a main factor for telemedicine success. Five of the dimensions in the six-dimension system contain non-measurable referential information that does not affect satisfaction. In the sixth dimension, two of three measures were derived from the Davis` model (TAM) without a description of how they will be measured. The third measure of reliability was not specified. All those drawbacks will be eliminated in my study with application of quantitative measurables for the description of the process of telemedicine adoption by physicians.

The research of Morilla et al. (2017) is not applicable for modern DHA practice in U.S. health care because it was conducted based on specific data about telemedicine in Spain in the period before COVID-19; however, it has scientific value. The article represents a good sample of research methods for investigating physician intention to adopt telemedicine. TAM framework was applied. End-user satisfaction (patients and providers) was recognized as the main factor for telehealth adoption. The applied questionnaire for assessing physician attitude toward telemedicine in a representative group (930 physicians) contained specified measures on a 10-point Likert scale. The effective method of detailed quantitative analysis allowed an estimation of physicians' level of intention to adopt telemedicine and the positively correlated factors for it. For the purposes of my study, this research could serve as an example of detailed, specific, and measured quantitative analysis of physicians` intention to adopt telemedicine.

The research in Tsai et al. (2019) contains a review of international studies about the process of telemedicine integration. The end-user satisfaction (patient and physician) was recognized as the main criterion for telemedicine adoption. TAM was identified as one of the most influential theories applied by the international researchers for study of the telemedicine adoption process. Tsai et al. offered their own version of TAM development, where external factors for ATU were divided into two main groups of "enablers" and "inhibitors." The researchers selected a set of factors and conducted a quantitative study with estimation and comparison of the strength of correlation. In general, such a method with specific selection of influencing factors is valid for an evaluation of physician intention to adopt telemedicine in any specific environment (i.e., country, stage of telehealth development, etc.). In my study, two enabling factors (experience in telemedicine and training) will be selected and examined. The correlations between those factors and physician intention to adopt telemedicine will be measured and compared.

Methods for Evaluation of Physician Intention to Adopt Telemedicine

Health Care Regulatory Organizations and Medical Professional Networks Methods. Important sources of the research literature for this topic were reviews and analytical reports from health care regulatory organizations and medical professional networks. Evaluation of a physician's intention to adopt telemedicine applied in the research from this source had two approaches. The first was characterized by prioritizing the statistical data about increase in telemedicine services and underestimation of the barriers, including the behavioral factors of a physician's intention to adopt telemedicine. For instance, Koonin et al. (2020), in a report to the CDC, determined causation between current (January–March 2020) meaningful increase of telemedicine services (50% more compared with the same period in 2019) and projected long-term uptrends in telemedicine. The unproven assumption that telehealth is "generally well-accepted by patients and clinicians" has low scientific validity. Low scientific validity was also demonstrated in the *2020 Telemedicine Report* introduced by Doximity, the largest professional medical network with over 70% of all U.S. physicians as members. Physician adoption in the report was measured by physicians reporting telemedicine as a skill, whereas having skill and intent to apply telemedicine over the long-term is not the same. Improper selection of measurement allowed misleading assumptions about the stable increase of a physician's intention to adopt telemedicine.

Underestimation of the behavioral barrier in adoption of telemedicine, i.e., physician intention to adopt telemedicine for the long-term, leads to the biased economic prognosis and planning in telemedicine, which will cause issues for DHA practice. The common approach for such biased planning is applying the 2020 annual growth rate in telemedicine for long-term predictions. For instance, the Doximity report contained predictions about $106 billion in telemedicine spending in 2023 based on 2020 growth rate, when pandemic factors caused tremendous increase of telemedicine services. Ignoring real dynamics and barriers in telemedicine adoption, particularly, problems with a physician's intention to adopt it will lead to an increase of DHA operational issues already defined in this study as a bottleneck.

In the second approach of the research literature from this source, multiple factors, including the barriers, were considered. It allowed realistic estimation of the telehealth adoption process. For instance, the HHS report about trends in Medicare Beneficiary Telehealth Utilization amid COVID-19 (HHS, 2020) contained analysis of multiple factors for telemedicine adoption and determines local (state, urban/rural) and time (weekly changes for half year) specifics of the telemedicine adoption process. Thus, a decrease in telemedicine services since April 2020 has been detected. Consequently, the pandemic's initial increase was estimated as an uptick but not an uptrend. According to the HHS report, in the post-pandemic period, the increase of telemedicine is expected to be two times lower than during the quarantine (21% vs 51%). The insufficient legal support for telemedicine was identified as an important barrier for physicians' telemedicine adoption. The HHS reduced the legal barrier by removing geographic, state limitations for telehealth providers since March 6, 2020 (HHS, 2020). This report was an example of how analysis of multiple factors allows making realistic conclusions about the process of physicians' telemedicine adoption.

The positive example of a complex evaluation of physicians' intention to adopt telemedicine was the American Medical Association's (AMA) *Digital Health Report* about physicians' motivations and requirements for adopting digital health (AMA, 2020). The data were driven from the longitudinal survey of 1300 health care providers, including 650 physicians. The report demonstrated various rates of increase of the services provided from 2016–2019. The realistic conclusion about the uptrend in telemedicine was supported by specified quantitative data. Intention to adopt telemedicine within the year varied from 18% of respondents planning to apply remote monitoring to 5% of the respondents willing to adopt consumer access to clinical data. Remote control was detected as a main motivator for telemedicine adoption (68% of the respondents recognized this service as important). This report provided insights about a physician's intention to adopt telemedicine from their professional viewpoint and without factoring in the pandemic.

Research Literature Methods. The modern research literature applies surveys and interviews as the methods of evaluation of physician intention to adopt telemedicine. Those effective and reliable methods in the research literature allow specific measured findings about physicians' intention to adopt telemedicine. Choi et al. (2019) conducted a survey of the four groups of telemedicine stakeholders (policymaking officials, physicians, patients, and other providers). The survey revealed that physicians are the most resistant to telemedicine. The main identified reason for their resistance was related to quality of the treatment process. This research emphasized the importance of addressing the problem of physician intention to adopt telemedicine.

Sauers-Ford et al. (2019) applied an interview method for evaluation of the intention to adopt telemedicine among health care specialists, including physicians, in the hospital ED. Even though usefulness of telemedicine was recognized, and ED was sufficiently equipped for telemedicine, the adoption was slow. The main findings were that the barriers for telemedicine adoption were biases and lack of information about advantages of telemedicine. Proposed improvements in the policy for telemedicine integration included recognizing and addressing biases about telemedicine, clarifying advantages and process of telemedicine, involvement of care specialists in inter-professional communication, and patient–provider communication via telemedicine to increase collaboration and quality of services (Sauers-Ford et al., 2019). The findings could be applied for various health care settings. Identified as the prime, the need for explanations about telemedicine, training among physicians and other health care specialists justified selection of the training as an important factor for physician intention to adopt telemedicine in my research.

Several studies have discussed the influence of the pandemic on physicians' intention to adopt telemedicine. The review of three research studies (Bokolo, 2020; Yu et al., 2021; Saiyed et al., 2021) revealed that the problem of physicians' low acceptance of telemedicine was not lessened during the COVID-19 pandemic but became the main obstacle against telemedicine's robust integration. For instance, Bokolo (2020) identified physicians' low intention to adopt telemedicine as the main reason for limitations in adoption of telemedicine in COVID and post-COVID periods. Based on analysis of the research literature, the author identified training for physicians as a main way to eliminating biases against telemedicine (Bokolo, 2020).

Yu et al. (2021) compared patient and physician surveys about their intention to adopt telemedicine at the early stage of the COVID-19 pandemic. The authors found that patients were more satisfied with telehealth than physicians (84% vs. 42%; $p < 0.001$) and were more likely to believe that their concerns were properly addressed by telehealth (94% vs. 29%; $p < 0.001$). Physicians' feedback to telehealth was less positive than that of the patients. Only 44% of the physicians in the study group strongly supported implementation of telemedicine in post-COVID time, and 18% of the physicians were not intended to apply telemedicine after the pandemic. In their attempts to explain such low intention of physicians to adopt telemedicine at the pandemic's early stage, Yu et al. referred to the technology acceptance model (TAM). During the COVID-19 pandemic, usefulness of telemedicine (PU) was evident, but high load and lack of training caused the problems with ease to use (PEY). Yu et al. supported the same thesis as Bokolo (2020) in regard to increased meaning of physician training in the robust growth of telemedicine.

Saiyed et al. (2021) conducted a physician's survey in which the authors identified the problem of physicians' long-term acceptance of telemedicine despite the rapid growth of telemedicine services during the COVID-19 pandemic. For instance, only 56% of physicians currently using telemedicine planned its future use in 25% of their visits; further, 31% agreed to use telemedicine in the future for 25%–50% of the total visit, and only 1% planned to apply telemedicine for 75% and more of the visits. The researchers concluded that telemedicine training is a way to address the problem of long-term acceptance of telemedicine by physicians. In my study, the selection of the survey method for evaluation of a physician's intention to adopt telemedicine was justified by the modern research literature where this problem was investigated.

Measuring Physician Intention to Adopt Telemedicine

The 2017 National Quality Forum introduced the regulatory framework for measuring physician experience in telehealth. The report, creating a framework to support measure development for telehealth sponsored by DHHS, represented a comprehensive model for measuring quality of telemedicine, where the physician's adoption of telemedicine was recognized as a specific area. The component of the model 'Acceptability' was estimated as a part of access to telemedicine, and requirements included acceptance of telemedicine by both patients and clinicians. Whereas the model did not represent a method and technique for measuring a physician's intention to adopt telemedicine, it is important to note that acceptability of telemedicine by physicians was recognized as an indicator for measuring telemedicine in this framework, which serves as the U.S. national model for measuring quality of telemedicine (National Quality Forum, 2017).

The research literature related to measuring a physician's intention to adopt telemedicine has been in development since 2017 and represents a trend with switching from qualitative methods and comprehensive models to quantitative target approach methods with specific measured outcomes. Tonn et al. (2017) and Phillips et al. (2018) represented comprehensive models for measuring physicians' satisfaction with the telemedicine platform (Tonn et al., 2017) and preparedness of physicians for telemedicine (Phillips et al., 2018). In both studies, the target approach toward the needs of clinicians was replaced by following theoretical models. The eight-point questionnaire that replicated the eight-step Kotter`s model of change management was applied in the research by Tonn et al. The human, organization, technology fit (HOT) model was applied in the research of Phillips et al. Following theoretical frameworks allowed for generalized descriptive conclusions with low practical meaning of such findings. In my study, the target approach will be applied for measuring physicians' opinions about their intention to adopt telemedicine.

Hollander and Neinstein (2020) has studied development of the system of metrics since 2017 when the National Quality Forum created a framework for measuring telemedicine development. The authors addressed the gap in knowledge arising from the fact that the main emphasis of the current DHA practice in telemedicine has been switched from solving the issues with access to solving quality issues. It is important for my study because I will apply a value-based approach and, particularly, one of the quality metrics for telemedicine introduced in this research (i.e., a physician opinion survey).

The measuring method, which will be applied by the data provider, was described by Vis et al. (2019). Originally presented by Finch et al. (2015) for measuring new technology adoption, the method was examined by Vis et al. for measuring clinicians' intention to adopt telemedicine. Vis et al. demonstrated the example of implementation of the NoMAD questionnaire with sampling, data collection, and analysis methods. The NoMAD questionnaire is a construct with 23 questions using a 5-point Likert scale. It allows measuring physician intention to adopt telemedicine and comparison between sample groups. NoMAD is a complex measuring instrument containing questions for all measures identified in the review of questionnaires used for evaluating telemedicine services (Hajesmaeel-Gohari & Bahaadinbeigy, 2021) except for patient satisfaction questions.

Experience of Physicians in Telemedicine

Previous experience of physicians in telemedicine projects was identified as the most influential factor in a physician's intention to adopt telemedicine (Morilla et al., 2017; Silver et al., 2021; Marshall et al., 2018. In the research of Morilla et al. (2017) based on physicians' survey about their experience in telemedicine, the multiple-regression method was applied for examining the correlations of seven identified factors on physicians' intention to adopt telemedicine (dependent variable). The strongest positive correlation was between the DV and previous experience in telemedicine projects (r squared = 0.53; p <.001). An applied t student test for measuring the influence of two factors (has experience with telemedicine, has no experience with telemedicine) revealed that experience was correlated with higher physician intention to adopt telemedicine in all seven examined domains (e.g., therapeutic compliance, quality of clinical practice, cost, etc.) (Morilla et al., 2017). Vice versa, the first most important barrier among four identified barriers against physicians' intention to adopt telemedicine was their lack of previous experience in telemedicine (Marshall et al., 2018). In both studies, the experience of physicians in telemedicine was considered as a behavioral intent according to Rogers`s concept of different groups of innovation adopters. Whereas, in my study, the experience of the physicians will be measured in months, physicians belonging to the specific group of adopters according to Rogers`s model will be considered as one of the contributing factors for variance. It implies that the groups of physicians able to independently acquire and spread experience are innovators, early adopters, and early majority (50% of all physicians participating in telemedicine).

Acquired experience of physicians in telemedicine, according to the research, was positively correlated with their satisfaction and intention to continue integration of telemedicine. Evidence of this may be found in the quantitative research about the process of transitioning toward telemedicine during a pandemic. Silver et al. (2021) examined the factors related to technology, patients, and physicians in the process of telemedicine integration in their company. They revealed that physician satisfaction and intention for continuing telemedicine integration reached the highest level on the last stage of the transitional process developed by the company (Silver et al., 2021). Nguyen et al. (2020), in their review of studies about physician satisfaction in telemedicine, indicated a positive correlation between physicians' participation in developing telemedicine projects and their intent to integrate those projects into the practice. Nguyen et al. also identified that the previous experience in telemedicine projects positively affected physician satisfaction and intent to apply telemedicine (Nguyen et al., 2020). In my study, the factor of physician participation in telemedicine projects will not be assessed. Meanwhile, the suggestion about involvement of physicians in telemedicine projects development will be done with the reference to the research.

The barriers against physician experience in telemedicine were theoretically justified by the researchers based on Rogers' model of innovation diffusion (Dedehayir et al., 2017; Sterling, 2019; Sterling & LeRouge, 2019). Dedehayir et al. (2017) reaffirmed

Rogers` concept about various groups of innovation adopters and added detailed characteristics to the groups of early adopters and early majority. The conclusions were based on meta-analysis of modern studies about innovation diffusion in six industries including health care. The authors determined that groups of innovators, early adopters, and the normal majority play an active role in spreading telemedicine even without sufficient training. The size of those two groups is limited, i.e., it is not more than 50% of all participants in telemedicine, according to Rogers`s model. Prior experience in telemedicine was identified as the most important predictor of telemedicine adoption in Dedehayir et al.'s conceptual model of variables (Dedehayir et al., 2017). Thus, according to behavioral tendency, the limited size of active adopter groups (innovators, early adopters, and normal majority) is one of the barriers against physicians gaining experience in telemedicine.

Sterling (2019) identified one more important limitation to physician experience in telemedicine, i.e., the disruptive nature of telemedicine as an innovative process. Sterling operated with the definitions of Rogers`s model of innovation diffusion, i.e., group of early adopters and normal majority through the lens of disruptive health technology. Disruptive process creates a threat of fragmentation in telemedicine (Sterling, 2019). Therefore, over time, the need for system-level organized telemedicine increases for solving problems introduced in the initial period of telemedicine adoption (e.g., fragmentation of care, risk for disruption of care, quality issues, and resistance of physicians of late majority and laggard groups). Sterling and LeRouge (2019) consider that specific business models and strategies could solve the problems caused by the disruptive nature of telemedicine. In my study, the effect of physician experience will be examined as one of the most important factors for physician's intention to adopt telemedicine. Research literature justifies such a selection.

Physician Training in Telemedicine

The physicians' need for training in telemedicine is high but is not sufficiently addressed. The growing need for training could be explained by two identified objective factors in the research literature. As noted, the initial period of telemedicine integration is a disruptive process that creates the problem of fragmentation in health care (Sterling, 2019). As long as the need for a system approach in telemedicine for providing continuum of care growth is present, the need for training supporting this system will also grow. The other reason for the growing need for physician training in telemedicine in pandemic and post-pandemic periods is forced involvement in telemedicine (Ross,2020) the groups with lower abilities to adopt innovations (late majorities and laggards) (Dedehayir et al., 2017). In health care, late majority and laggard groups (50% of telemedicine adopters) could be specialists with system thinking, high demand for safety and quality of services, and tendency to avoid risks. Thus, the number of physicians who need training in telemedicine is potentially great.

The current level of physician training in telemedicine is insufficient. There is a great disproportion between the number of physicians involved in telemedicine and the number of physicians who received the formal training, and there is a lack of readily available literature for learning telemedicine skills (Silver et al., 2021). Kirchberg et al. (2020) revealed that 97% of physicians in the study group were applying telemedicine, and more than 80% stated that their knowledge regarding the legal aspects and data safety of medical apps and cloud computing is insufficient, and they need training (Kirchberg et al., 2020). Doarn et al. (2019) indicated that the majority of the telemedicine users in the study group with 95% of physicians needed more training (Doarn et al., 2019). Bokolo (2020), in his review of research literature about telemedicine integration in the pandemic, identified the lack of physician training as one of the main challenges and suggested providing training for solving the problem of low physician intention to adopt telemedicine. He highlighted the need for training via example from research literature when only 8.1% of the physicians (447 out of 5517) were able to apply a beneficial telemedicine platform in the COVID-19 pandemic due to lack of training (Bokolo, 2020).

The lack of education and previous knowledge about telemedicine increases the importance of training in telemedicine for physicians. Pourmand et al. (2020), based on national reports and surveys of the medical schools, examined the development of telemedicine education in medical schools. It significantly increased in 2013–2015 (15% growth in the number of students) and plateaued from 2016 to 2018 (4% growth in the number of students) (Pourmand et al., 2020). Kong et al. (2020) examined the level of medical student preparedness for telemedicine based on the survey study of 20 medical schools. The authors revealed that only 17.4% of the students had exposure to telemedicine, 17.1% of the students planned to utilize telemedicine in their future practice, 18.5% did not plan to utilize it, and 64.4% were undecided (Kong et al., 2020). Thus, insufficient education, i.e., lack of knowledge about telemedicine, increases the importance of telemedicine training for physicians.

Whereas there is a system of informational support for physicians applying telemedicine in online resources of regulatory agencies and medical professional alliances (American Telemedicine Association, CDC, Medicare, Association of American Medical Colleges), the researchers revealed that the most effective form of the support of physicians in telemedicine is group training coordinated by the company (Lawrence et al., 2020; Portnoy et al., 2020). Vaughan et al. (2019) detected that online group videoconferencing is preferred by trainees as the training delivery method for health care workers (Vaughan et al., 2019).

The forms of effective and feasible telemedicine training for health care workers, including physicians, were examined by Vaughan et al. (2019). It was detected that training in the form of videoconferencing was the most effective. Its usability was estimated by the trainees as high (average 4.7/5.0, ±0.4). The training increased trainees' knowledge in telemedicine (pretest 15.8 ± 1.3; post-test 21.8 ± 1.2; $p < 0.001$). The average satisfaction score of the participants was 5.8/6.0, ±0.5. The form of videoconferencing was preferred by all trainees to in-person training. Lawrence et al. (2020) also revealed the effectiveness of the training organized by the company in the form of online group sessions. The satisfaction of the trainees in two groups (i.e., in-person training and online training) was higher among those who participated online.

Online training was effective in addressing both case-specific (history-taking, collateral information, physical exam) and core competencies (technical, communication, collaboration competencies) (Lawrence et al., 2020).

Pertaining to this study, the selection of the independent variable ‘telemedicine training for physicians’ was justified by the research literature, which indicated its growing importance. The data about the variable will be obtained from the online telemedicine training course developed for physicians by the company which will be a provider of the data for my study. This training program for physicians addresses competencies in telemedicine described by Lawrence et al. (2020): technical, communication, collaboration competencies, and specific skills of history-taking, collateral information, and physical exam (Lawrence et al., 2020).

Literature Review Related to Contributing Variables

Geographic Location of Physician Practice (Urban or Rural)

The research literature on the geographic factors (rural or urban areas) for telemedicine adoption revealed that the effect of these factors on physicians’ intention to adopt telemedicine was ambiguous. This could be explained by the presence of both predisposing factors and barriers to telemedicine in rural areas. The main predisposing factor for telemedicine adoption by physicians in rural areas is the high perceived usefulness of it. Telemedicine is a solution to the problem of limited access to health care in rural areas. Although the rural population is about 15% of the US population (46 million) (CDC, 2020b), 62.93% of Primary Care Health Professional Shortage Areas (HPSAs) located in rural areas in 2019 (Rural Health, 2021).

The traditional barriers to telemedicine in rural areas include the scarcity of economic resources compared with urban areas, as well as demographic characteristics with higher rates of older, low-income, and uninsured individuals (Kichloo et al., 2020). Chen et al. (2020) evaluated the process of telehealth adoption in rural and urban areas based on AHA and IT surveys. The main finding was that due to the barriers in rural areas, substantial differences in telehealth adoption exist among hospitals located in rural, micropolitan, and metropolitan areas. Chen et al. revealed that telemedicine adoption rates increase with urbanicity. The main barrier to telehealth in rural areas that the researchers identified is the higher cost of implementation (Chen et al.,2020). Zachrison et al. (2020), who analyzed barriers to telemedicine implementation in rural emergency departments, made the same conclusion that the high cost is the main barrier to telemedicine adoption (Zachrison et al., 2020).

The important technological barrier is poor broadband internet access for telemedicine use in rural areas. Drake et al. (2019), who estimated the difference between broadband penetration rates by physician access in urban and rural areas, analyzed this problem. Thus, for primary care physicians in urban areas, adequate access to broadband was 96.4%, and inadequate access was 93.9%. In rural areas, it was 82.9% and 79.6%, respectively. Important facts that should be considered include the fact that broadband internet is available in physician offices in rural areas, where the driving time for physicians to reach eligible patients is up to 110 minutes by Medicare Advantage standards (Drake et al., 2020). Broadband's availability within the traveling distance is not guaranteed.

Kichloo et al. (2020) analyzed trends in telemedicine adoption in a review of the research literature. They emphasized that the shortage of physicians in rural areas is a predisposing factor for telemedicine adoption among physicians. The current ratio of primary care physicians to patients in rural areas is 39.8 per 100 000 compared with 53.3 per 100 000 in urban areas. As the AAMC predicted, the growing shortage of physicians (122 000 by 2032) will increase this disproportion between rural and urban areas (Kichloo et al, 2020). The conclusion that could be derived from the research literature is that telemedicine is the most suitable solution to the problem of health care access in rural areas. In my study on physicians' intention to adopt telemedicine, the equal representation of physicians working in urban and rural areas will be a requirement for the secondary data set to minimize the effect of geographic location on the study findings.

Age of the Physicians

Although age is a recognized factor for telemedicine adoption by both patients and physicians (Kruse et a., 2018), no specific research study exists on the correlation between physician age and the rate of telemedicine adoption. The annual 2020 consumer report from American Well, one of the biggest providers of telemedicine in the US, was focused on physicians' adoption of telemedicine. It was revealed in this report that unlike with patients, no correlation exists between the youngest age of the physicians and their intention to adopt telemedicine. Thus, according to the report, the age category of 35-44 years old had the highest rate (77%) of intention to apply telemedicine compared with the age categories of 25-34 years old (74%), 45-54 years old (70%), and 55+ years old (60%) (American Well, 2020b). Such a distribution could be explained by the factors of the amount of experience gained in the physician age category of 35-44 years old, as well as the lack of experience gained in the youngest age category of physicians.

The research of Riew et al. (2021) added knowledge by examining provider age factors in the rate of telemedicine adoption in the specific field of spine surgery. It was revealed that the age group of less than 45 years old demonstrated a higher level of willingness to adopt telemedicine compared with the age group of more than 45 years old (Riew et al. 2021).

An important fact about the ages of physicians in the US is that a meaningful number of them (31% state mean) are older than 60 years old (AAMC, 2019). According to the 2020 physician survey, 37% of physicians would like to retire in the next few years (The Physicians Foundation, 2021). Thus, in the US, the size of the age category with the lowest level of intention to adopt telemedicine is significant.

In the secondary data that will be applied for the investigation of the research questions, age will not be a criterion for the selection of the study group participants. Meanwhile, for the analysis of the covariant “age of physicians”, participants will be divided into three age groups (25-34, 35-44, 45 and older) similarly to the physician age grouping in the American Well 2020 annual consumer report. This approach enables the intention to adopt telemedicine among different age groups to be examined and compared.

Size of Physician Practice

The research literature in which the adoption of telemedicine in small physician practices is discussed allows for understanding that two main factors affect physicians' intention to adopt telemedicine: high perceived usefulness of telemedicine, and economic and administrative barriers to telemedicine adoption in small practices. The longitudinal study of Rittenhouse et al. (2017) based on the surveys of 566 small primary care practices (up to eight physicians) demonstrated that the rate of telemedicine utilization in physician-owned practices was higher than in hospital-owned practices in the period before 2013 (2.49 vs. 1.48, respectively) (Rittenhouse et al., 2017). Prasad (2020) described the benefits of telemedicine specifically for small practices. Specifically, it allows for a better quality of care by providing a continuum of care (for instance, chronic condition care via telemedicine). It also improves the workflow, access, and scheduling for patients. Telemedicine in small practices is additionally associated with more effective health administration methods and results in cost reduction in the middle and long terms (Prasad, 2020).

Meanwhile, the other researchers (Kane & Gillis, 2018; Finnegan, 2018), who emphasized the meaning of economic barriers to telemedicine adoption in small physician practices, came to different conclusions. Kane and Gillis found that practice size is an important correlate to telemedicine adoption (i.e., the telemedicine adoption rate is higher in hospital-based physician practices due to better financial resources as well as developed DHA policy and practice) (Kane & Gillis, 2018). Finnegan (2018) compared the rates of telemedicine adoption in small and larger physician practices and concluded that larger practices are using telemedicine more, as the financial burden of implementing the technology is a barrier for small practices (Finnegan, 2018). The statistical data that Finnegan provided support this statement. Thus, in 2016, the use of telemedicine in small practices (1-4 physicians) was 8%, whereas it was 27% in practices with more than 50 physicians (Statista, 2021).

Parthasarathy et al. (2021) analyzed the devastating impact of COVID-19 on small physician practices when 8% of them (about 16,000) were closed because of COVID-19 and 4% were planning to close their practices in the next 12 months. The adoption of telemedicine was seen as a solution for providing sustainability for small physician practices. Physicians' intention to adopt telemedicine in small practices was estimated to be a crucial factor for small physician practices' sustainability (Parthasarathy et al., 2021).

The difference in the estimation of telemedicine use in small practices in the research literature could be partially explained by the criteria of practice size (up to eight physicians in one study, or up to four physicians in another study) and by the specifics of the sample groups. Meanwhile, researchers commonly accept the assumption that telemedicine in small physician practices is correlated with the higher sustainability of the organization, better quality of care, mid- to long-term cost reductions, the optimization of workflows, and patient access. This research study is aimed at addressing the issue of small physician practices in telemedicine adoption. The study of the influence of physician experience and training in telemedicine on physicians' intention to adopt telemedicine will provide new insights into resources for telemedicine adoption in small practices that experience a lack of financial and administrative resources.

Definitions

NoMAD questionnaire: The Normalization Measure Development questionnaire is a set of 23 items for assessing innovation implementation from the perspective of health care professionals. This measuring tool was developed for assessment of the dynamics of integration and implementation of complex new technologies, based on normalization theory process (Rapley et al., 2018).

Physician experience in telemedicine: Based on TAM (Davis, 1989; Mugo et al., 2017), physician experience in telemedicine is not limited to hands-on skills. It also includes physicians' behavioral intent toward telemedicine (intention to adopt and apply telemedicine for the long term). The NoMAD questionnaire allows evaluation and measurement in both domains of skills and behavioral intent of physicians toward telemedicine (Finch et al., 2015).

Physician practice size: Based on the data about distribution of U.S. physicians by practice size, three groups of physician practices, depending on the number of physicians, were determined: small physician practice size (up to 10 physicians, 53.7% of physician practices in 2020), medium size (from 11 up to 49 physicians, 29.1% in 2020), and big size physician practices (more than 50 physicians, 17.2% in 2020; Kane, 2020).

Telemedicine: Telemedicine is the practice of medicine using technology to deliver care at a distance (American Academy of Family Physicians, n.d.) It refers to the delivery of clinical services from physician practice locations to remote patients. Telehealth and eHealth are broader in scope and include delivery of clinical and nonclinical services. In telehealth and eHealth, medical, health, and information technology converge while telemedicine serves the goals of clinical care.

Telemedicine training for physicians: Instructor-led company training with the goals of developing motivation for adoption, knowledge, and hand-on skills in telemedicine. The company employee training, particularly physician training, differs from entry-level training programs for physician licensure in telemedicine, which could be, for example, just a 30 to 45-minute online session (Washington State Hospital Association, 2021). The company training that was considered in this study consists of a 2-hour/week, 7-week course with three possible forms (online sessions, in class, and hybrid). Company telemedicine training also differs from telemedicine education, which applies academic approaches and takes longer than company training.

Urban and rural areas: Division between metropolitan and rural areas in health care is based on the Census data about population density. The characteristics of the areas can be obtained from the online population (urban/rural) maps (U.S. Census Bureau, 2021; United States Department of Agriculture,2020). While the metropolitan statistical areas are associated with better access to health care and telemedicine (Terlizzi & Cohen, 2019), the physicians in rural areas demonstrate high PU toward telemedicine.

Assumptions

The assumptions about the data which should be provided by the telemedicine company were that the sample groups will be representative, and the data will be valid. Measurements will be performed with sufficient accuracy that will be verified with application of the appropriate tool, i.e., Cronbach`s alpha tests (Schrepp, 2020).

The statistical assumption about the relationship between dependent (DV) and independent variables (IV) in RQ1 and RQ2 was that correlations exist between physician intention to adopt telemedicine and experience in telemedicine (RQ1) and between intention to adopt telemedicine and telemedicine training (RQ2).

The assumption of equality of variance stated that the variance in the different samples of the population was the same (Schmidt & Finan, 2018).). In this study, the assumption about equality of variance was applied for the subgroups within the sample. Levene test was planned for assessment of equality of variance. The statistical assumption about normality of the distribution is not a requirement for nonparametric tests (Boston University, n. d.) which will be applied in this study.

Limitations

The methodological limitations of the research could be explained by the disadvantages of the selected method of survey, cross-sectional study, and convenience non-probability sampling.

The survey data was collected using a single questionnaire (NoMAD). The results were subjective, based on the perceptions and opinions of the respondents. There are two potential biases related to the questionnaire: the question biases (close-ended questions, tendentiously selected questions, low-relevance questions) and responders' biases (nonresponse, self-report with downplay of negative attributes, recall and interpretation biases) (Story & Tait, 2019).

For addressing limitations of the survey method, a 10-point Likert scale with detailed description of each point was included in the NoMAD questionnaire by the data provider. A 10-point Likert scale is more accurate than the 5-point scale (Pimentel, 2019) adopted in the original version of the NoMAD questionnaire. The sequential logical order of the NoMAD questions should eliminate high variability of the results and reduce the risk of outliers.

A cross-sectional study has limited ability to represent true cause-effect relationships because of simultaneous assessment of exposure and outcome (Solem, 2015). In contrast to longitudinal study, a cross-sectional design does not allow considering changes in opinion over time. Meanwhile, this limitation should not be a barrier for the summative analysis. For the purposes of DHA practice, which deals with current operational issues, the results of the summative analysis of the physician's intention to adopt telemedicine are more appropriate than the results of formative analysis obtained via longitudinal measurements.

The potential limitation of the convenience sampling could be underrepresentation of the subgroups in the sample and overrepresentation of specific groups of the study population (Sharma, 2017). Also, the negative effect of outliers in the convenience sample group could be meaningful (Etikan et al, 2016). The main disadvantage of convenience non-probability sampling is limited generalizability. For addressing limitations of convenience sampling, the sample groups should be randomly selected from a representative study population (more than 10,000 physicians integrated within one company) by the secondary data provider. The SPSS tests were planned for control of homogeneity of variance (Levene tests for RQ1, RQ2, and RQ3).

Scope and Delimitations

Scope

The focus of the study was the relationships between physician intention to adopt telemedicine and two factors (experience and training in telemedicine) that were recognized as the leading causal factors by the theories explaining the process of innovations integration (TAM with the concept of behavioral intent to adopt new technology and change management theory with the concept of training as a required initial step in change integration). The specific aspect of my study about relationships between physician intention to adopt telemedicine and those two factors was application of quantitative measurables and methods for evaluation of physician opinion on the individual level, based on a customer-oriented approach, as opposed to the traditional product-oriented approach on the practice level. This issue of internal validity (lack of customer-oriented approach, not considering physician intention toward telemedicine) was identified in the research literature (Sukel,2019; Kane & Gillis,2018). My study addressed the issue of underestimation of physician intention to apply telemedicine. Such selection was justified by the research literature and corresponds with the current issue of low physician engagement in US telemedicine, which should be addressed in DHA policy. The specific scope of this study included US physicians in the target population. The planned study population included more than 10,000 physicians working with the developed international telemedicine company. The planned sample group was represented by the physicians working with this company. The sizes of the sample groups were calculated according to the sampling requirements.

Delimitation

Delimitation of the study allowed recognition of other factors for physician telemedicine adoption that were not the subjects for examining in this study. Economic, technological, and regulatory factors also impact physician intention to adopt telemedicine. Those factors could act as either barriers or stimuli for telemedicine adoption by the physicians in the various settings. Delimitation of the target population of a study (US physicians) is that results of this study could be applicable for the wider international community of physicians. Delimitation of the data source is that valid data could be obtained from the additional telemedicine providers, hospitals, and other HSOs that apply telemedicine. Delimitation of the selected non-probability sampling method is that probability methods are also applicable for the study about factors for physician adoption of telemedicine.

Generalizability

The type of planned data provider (a large telemedicine company serving more than 10,000 physicians) allowed for elimination of the main limitation of non-random (convenience) sampling, which is described as a lack of generalizability (Pace,2021). Random selection of the study groups participants within the large group of 10,000 physicians allowed the assumption that normality of the distribution will not be violated. The planned Shapiro-Wilk (SW) test of normality of the population distribution (Mishra et al., 2019) was able to confirm this assumption and reject the main limitation of non-probability (lack of generalizability). With a sufficient study group size, which was calculated with application of statistical methods, and proven in SW test normal population distribution, the study results could be applied to the general (target) population (Simon & Goes, 2013). Also, composite Likert scale score (interval data), which was applied for measuring physician intention to adopt telemedicine, allowed to implement tests with interval dependent variables and make assumptions about normality of the data (Bockenholt, 2017).

Significance

Contribution to Discipline-Specific Knowledge

The study has potential to advance knowledge about factors for physician intention to adopt telemedicine by providing a method of quantitative evaluation (data collection, measurement, and analysis). An example of the justified selection and implementation of appropriate measuring tools and methods of quantitative analysis (improved 10 -point Likert scale NoMAD questionnaire and nonparametric tests for the analysis of correlations in telemedicine) could be the contribution to DHA discipline-specific knowledge. While the literature contains descriptions of only parametric tests for quantitative analysis of correlations in telemedicine, the experience of nonparametric tests is important, because it provides opportunity for quantitative study in DHA practice within a small or medium size physician practice. The potential contribution to discipline- specific knowledge could be offering the systemic correlational analysis in telemedicine (two main factors and three contributing factors for physician intention to adopt telemedicine).

Contribution to DHA Practice and Policy

This study is practice-based because it addresses the current main issue in the process of telemedicine adoption and real-time factors therein. The research offers a method of correlational study in telemedicine with the application of nonparametric tests. This method could be useful for developing effective practice-based DHA policy for assessment and addressing issues of telemedicine adoption among the small -sized (up to 10 physicians), mid-sized (11-49 physicians,) and big size (more than 50) physician practices.

The study outcomes could be useful for telemedicine integration in small and rural physician practices. Being integrated into DHA policy, the study findings about positive factors for physician behavioral intent to adopt telemedicine may help to reduce the negative impact of economic inequality in those HSOs, relative to large and urban HSOs. This study has potential to provide solutions for the problem of low physician engagement into telemedicine that could be applied in DHA policies of all sizes HSOs that provide physician care and telemedicine.

Significance to Social Change

Offering solutions for solving the issue of the latent resistance of numerous physicians toward telemedicine might be helpful for improvement of access to health care services. Sufficient access to telemedicine has potential to reduce disparities in health care delivery caused by patient limited mobility, an epidemic situation, or remote location. The possible improvement of access to health services will allow the democratization of the health care system. It could be the main social change caused by increased engagement of the physicians into telemedicine.

Summary and Conclusion

In the research literature about modern telemedicine, the behavioral aspect of telemedicine adoption by physicians has become a popular topic. In the current period of tremendous investments, regulatory improvements, and high patient demand for telemedicine, physicians' low intention to adopt telemedicine was identified as the main reason for limitations in adoption of telemedicine in the COVID period of 2019-2020. (Bokolo, 2020). In the research literature, application of the TAM with the concept of leading role of behavioral intent to adopt new technology became the most popular and appropriate theoretical justification of the process of telemedicine adoption by physicians (Jacob et al., 2020).While TAM was applied by the researcher for identifying the leading role of the behavioral intent to adopt telemedicine, Rogers's concept about the categories of innovation adopters was used in the research literature for explaining specifics of the telemedicine adoption by different groups of physicians.

Connecting those two theories (TAM and Rogers's concept about categories of innovation adopters) and drawing conclusions from the literature review, it is reasonable to assume that the increased problem of physician resistance to telemedicine adoption could be explained by the fact that the resistant to innovations late majority and laggards (the second 50 % of innovation adopters) became involved into telemedicine in the COVID-19 (2020-2021) period. It is indicative that analytical reports based on physician questionnaires and research literature revealed that approximately 50 % of physicians are resistant to adoption of telemedicine for the long term. This theoretical conclusion would imply development of DHA policy for addressing specifics of those groups of physicians (late majority and laggards) with elevated resistance to telemedicine adoption.

This study has addressed existing gaps in the research literature about influence of the factors for physician intention to adopt telemedicine. Although the factors of experience and training had been studied in the research literature, this research provided quantitative comparative analysis of the two main causative factors for physician intention to adopt telemedicine: experience and training. The results of this study have addressed the gap in DHA practice, offering specific policy for solving the issues of physician resistance to telemedicine. The methods that were applied in the study could serve as an example of assessment of physician intention to adopt telemedicine in DHA practice. The results of such assessment might provide a basis for creating effective DHA policy for physician engagement into telemedicine.

Section 2: Research Design and Data Collection

Introduction

Physicians’ low intention to adopt telemedicine is a primary barrier to integrating telemedicine; however, virtually no comprehensive quantitative analyses exist on the factors affecting it. There is a lack of complex analyses of the causal (e.g., experience, training) and factors contributing to physicians’ intention to adopt telemedicine (e.g., physician practice size, geographic location, and age of physicians). In this study, a quantitative analysis was conducted for examining correlations between physician intention to adopt telemedicine and their experience (RQ1) and training (RQ2), with covariates considered, and additional comparative analysis of the effects of those two factors (experience and training; RQ3).

In Section 2, I describe the research design, methodology, validity threats, and ethical procedures. The specific methodology questions include a description of the population, sampling and sampling procedures used to collect the data, instrumentation, and operationalization of constructs.

Research Design and Rationale

A correlational design was used to determine whether physician intention to adopt telemedicine (dependent variable) related to experience in telemedicine (independent variable) for RQ1. I also explored if and how the same independent variable related to training in telemedicine (RQ2). The effects of covariates of physician practice size, physician age, and geographical factor (urban/rural) were studied for each of the two independent sample groups selected for RQ1 and RQ2. For RQ3, the difference between medians in those two samples was examined. I determined whether the difference was statistically significant.

Research Design

A cross-sectional survey design was used by the data provider for examining physician intention to adopt telemedicine. A cross-sectional design is highly applicable in health care research because many outcomes and factors could be evaluated simultaneously (Wang & Cheng, 2020). The cross-sectional design fit the goals of this study, which addressed complex factors for physicians' intention to adopt telemedicine. This type of design is beneficial for DHA practice because it allows obtaining multiple outcomes for in-depth analysis in a relatively quick and inexpensive way (Wang & Cheng, 2020). In health care, a cross-sectional design is an effective way to address issues with operations and workflow and address them in DHA policy.

In the secondary data set, a survey design was selected by the data provider to measure individual physician opinions about telemedicine adoption. The NoMAD questionnaire, which was applied in the survey, is a recognized and effective tool for measuring health care professionals' intention to adopt new technology (see Elf et al., 2018; Loch et al., 2020; Vis et al. 2019). In this study, the composite score of the NoMAD questionnaires was applied for measuring physician intention to adopt telemedicine.

Because of convenience sampling, which is considered a nonrandom selection of participants, nonparametric tests were applied. The primary difference between nonparametric and parametric tests is that nonparametric tests do not require sampling randomness (Grech & Calleja, 2018). Thus, nonparametric Kruskal-Wallis tests, an alternative to parametric ANOVA tests, were applied for RQ1 and RQ2. A nonparametric Mann-Whitney test, as an alternative to parametric independent samples *t* test was applied in RQ3 (see Mircioiu & Atkinson, 2017).

Rationale

The rationale for using the secondary data obtained with the implementation of convenience sampling is that a large telemedicine company integrating more than 10,000 physicians could serve as a source of representative and reliable statistical data to study the problems of physician engagement with telemedicine. While statistical data from telemedicine regulatory organizations (CDC RANDS and Centers for Medicare and Medicaid Services) provide general information about trends, barriers, and federal policies, the statistical data from the company providing telemedicine services for physicians are discipline-specific, supporting validity of the findings.

The rationale for the selection of the secondary data obtained with the application of the survey method is that the survey reflects personal opinions of physicians about telemedicine adoption, which was the aim in this study, with a behaviorist approach. The advantages of conducting a survey within one company are better organization and quality and opportunity for the reduction of information biases. For those purposes, preliminary training about the application of the 10-point Likert scale in the NoMAD questionnaire was offered by the data provider to the survey participants.

The rationale for the cross-sectional study is that this type of research design allows obtaining multiple outcomes for in-depth analysis in a relatively quick and inexpensive way. In health care research, the cross-sectional design is popular because it allows the analysis of multiple factors at a single point in time (Wang & Cheng, 2020). Notably, the cross-sectional design was applied to examine two main factors (measured on three levels) and three cofactors. The analysis method developed in this study could be applicable in DHA practice for evaluating and developing policy for physician engagement in telemedicine.

Methodology

Target Population

The target population for this study was active U.S. physicians who applied telemedicine in their work. There were no exact data about the number of physicians involved in telemedicine. Meanwhile, in the United States, approximately 80% of the total number of physicians have become involved in telemedicine, according to the 2020 Amwell Physician and Consumer Survey (American Well , 2021a). If the estimated number of active U.S. physicians was 298,987 in 2019 (AAMC, 2021), the approximate number of U.S. physicians involved in telemedicine was 240,000 in 2020. The study population, or accessible population (see Asiamah et al. 2017), included more than

10,000 physicians integrated by the telemedicine company that was planned to be a data provider for this study.

Sampling and Sampling Procedures

Sampling Strategy

Because sampling was performed by the data provider within one company and despite many integrated physicians, formally, the type of sampling could be considered nonprobability (see Sharma, 2017). However, the large size of the study population (more than 10,000 physicians) allowed random selection of the study participants. The method of stratified random sampling was applied for selection subgroups, or strata (see Sharma, 2017), for the sample group in RQ1 (subgroups of physicians with low level of experience in telemedicine, sufficient level, and high level) and for the sample group in RQ2 (subgroups of physicians with no training, online training, and on-site training). Thus, the data provider’s sampling strategy combined nonprobability (convenience) and probability (stratified random) sampling. Such an example of the combination of nonprobability convenience sampling with a random selection of strata within a large sample population was previously described in the research literature (see Pace, 2021). The rationale for selecting a secondary data set in which the combined sampling strategy was applied reaches optimal results in the customer- (i.e., physician) oriented study.

Procedures for Data Collection

Secondary data were obtained from the company providing telemedicine services for the physicians. The company profile supports the reputability of this source of information. The company serves more than 5 million patients on the international market of telemedicine services and integrates more than 10,000 physicians. The company has permanent access to its consumers, including physicians, to obtain feedback, provide tech support and marketing research, among other activities. The company has a marketing department with experience in conducting physician surveys.

The data use agreement between the data provider (telemedicine company) and me included obligations for providing reliable physician surveys. According to the data use agreement, the company provided recruitment, the training video, and written instructions about Likert-type scale use, participation of respondents, data collection, and the required number of filled-out questionnaires. My access to the data set was provided after institutional review board (IRB) approval for the research.

The data obtained from the company were screened for quality. The criteria for exclusions of the questionnaires from the data set were the accuracy of the answers (undifferentiated answers, nonlogical answers) and outliers (abnormal difference in the answers compared to the median of the group answers).

Sample Size

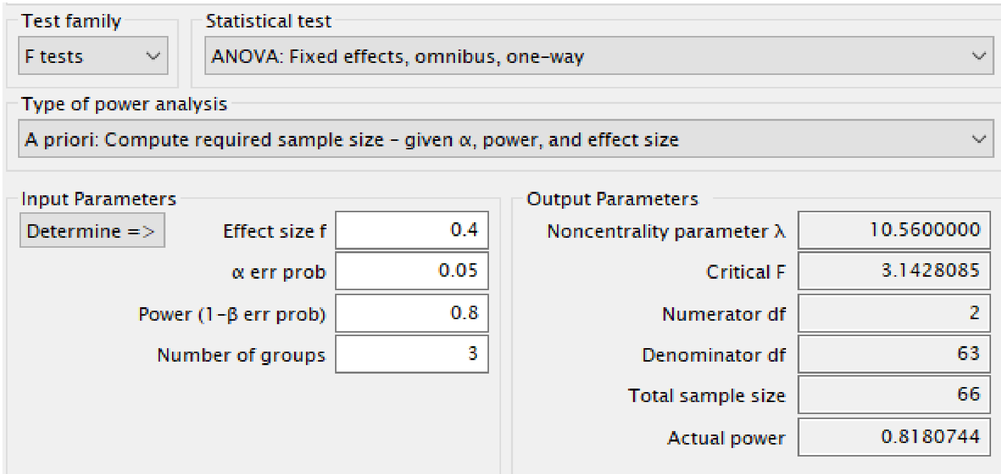
Statistical power analysis related to hypothesis testing was applied to determine the smallest sample size that would make it possible to reject the null hypothesis and avoid a Type II error (nonrejection of the false null hypothesis; see Ledolter & Kardon, 2020). Various statistical power analysis methods have been described in the methodological studies (see Abt et al., 2020; Ledolter & Kardon, 2020; Uttley, 2019).

The G*Power test (see) is a tool for prompt and practical selection of an adequate sample size. This software offers free access but requires inputs for the estimated effect size, alpha, power (1-beta), and the statistical test (Abt et al., 2020). The inputs could be adjusted depending on the goals of the research. For this research, the minimum appropriate alpha was 0.05; the medium effect size was 0.5. A minimum level of statistical power should be at least 80%, although exceeding 80% is better for detecting a meaningful difference if one exists (Ledolter & Kardon, 2020). The G* Power test does not have an option for the Kruskal-Wallis test, a nonparametric alternative for ANOVA. However, because nonparametric tests are considered to have smaller sample sizes than the parametric analogical tests (Minitab, 2021), the sample sizes for RQ1 and RQ2 with Kruskal-Wallis tests were calculated in G*Power the same way as for analogous ANOVA tests.

The results of the calculation of the sample sizes for the statistical tests in G*Power were as follows: minimum of 66 participants for sample groups for RQ1 and RQ2, with an optimal size of 100 participants in each group (95% power on the plot) and a minimum of 82 participants for each group for the Mann-Whitney test pertaining to RQ3. Thus, the planned size of two sample groups with 100 participants was sufficient for the Kruskal-Wallis tests (RQ1 and RQ2) and the Mann-Whitney test (RQ3). Figure 5 describes calculation of the sample sizes for RQ1 and RQ2.

Figure 5

*Calculation of the Sample Sizes for RQ1 and RQ2 in G*Power*

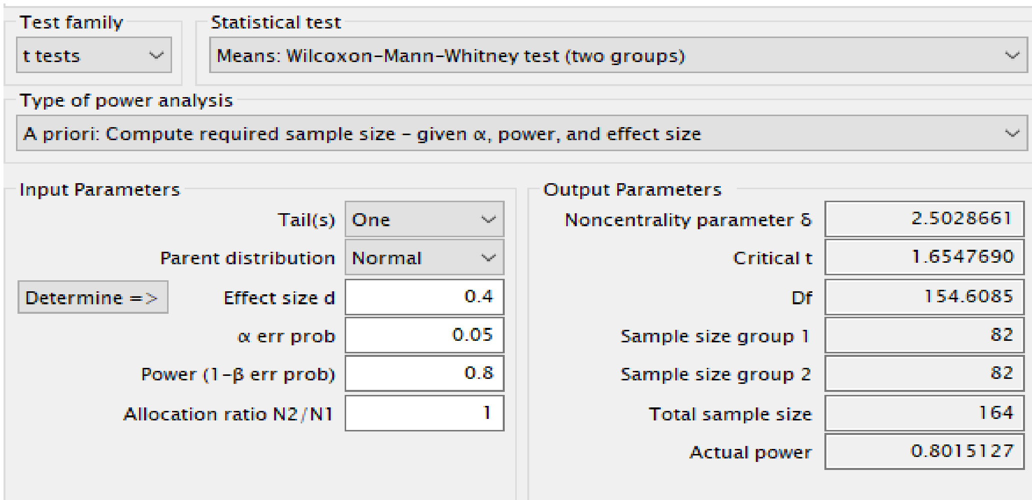


Note. G*Power is a free-access application described by Faul et al. (2009). The free application was downloaded form https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower

Figure 6 describes calculation of sample sizes for RQ3.

Figure 6

*Calculation of the Sample Sizes for RQ3 in G*Power*



Note. G*Power free application was downloaded from https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower

Instrumentation and Operationalization of Constructs

Instrumentation

The instrumentation for this study was relevant to the research goals to examine the factors for physician intention to adopt telemedicine. IBM SPSS nonparametric tests were applied for measuring relationships between the variables and covariates. The special tool for measuring physician opinion was the adjusted NoMAD questionnaire (see Finch et al., 2018). In the secondary data set, which was collected by the data provider, participants were selected according to the subgroup criteria described above regarding the sampling procedures. Participants were equally distributed across the three subgroups (categorical ranks) for RQ1 and the three subgroups (nominal ranks) for RQ2.

The tool for measuring dependent variables for RQ1 and RQ2, physician intention to adopt telemedicine, was a 23-item NoMAD questionnaire (see Finch et al., 2018) with an adjusted scale (10-point Likert-type scale for all questions instead of 5- or 10-point scales in the original NoMAD). New Castle University developed the questionnaire, and developers require the reference to the original study (Finch et al., 2015). However, the later version of the NoMAD questionnaire offers a reduced number of questions (23 instead of the initial 46; Finch et al., 2018). The selection of 23 questions resulted from cleaning (eliminating redundant questions) and testing for construct validity by the developers. Cronbach's alpha in all four domains of the 23-item questionnaire was sufficient (see Finch et al., 2018). Thus, the 23-item NoMAD questionnaire is an instrument with statistically proven validity. Moreover, the NoMAD questionnaire is a popular tool for measuring the intention of health care professionals toward the integration of new technology.

This tool is recognized in international medical and health care research (see Elf et al., 2018; Loch et al., 2020; Vis et al., 2019). The tool was appropriate for this study because its questions across four domains corresponded to the behavioral approach selected in my study for examining physician intention to adopt telemedicine. The NoMAD questionnaire is based on the normalization process theory (NPT), which seeks to understand the cognitive and behavioral intent of the professionals toward innovative technologies (Davis, 2020). The questionnaire allows quantitative measuring of the professionals' intention (particularly physicians) to adopt telemedicine and integrate it for the long term into the practice.

Operationalization of Variables

Operationalization is a process of transferring concepts to measurable characteristics of those concepts, variables, and indicators (measurable characteristics of the variables) (Huhta, 2018). The operationalization process in this study is described in the following tables, which demonstrate how variables characterize concepts and the measurable characteristics of the variables. Table 1 represents operationalization of variables.

Table 1

Operationalization of Variables

Name of variable	Type	Level of measurement	Measure
Table 2.Operationalization of Variables			
Physician intention to adopt telemedicine	Dependent variables in RQ1 and RQ2	Interval	Composite score in the questionnaire with 10-point Likert scale
Physician experience in telemedicine	Factor, independent variable in RQ1	Categorical ordinal	3 ranks of experience measured in months: low (1<x<6), sufficient (6<=x<12), high(x>=12)
Physician training in telemedicine	Factor, independent variable in RQ2	Categorical nominal	3 categories of training: "hybrid", "online training", and "in class training" coded as "1", "2", "3"
Physician groups	Grouping independent variable in RQ3	Categorical nominal	2 categories: group 1 (Physicians selected for experience assessment), group 2 (physicians selected for training assessment).
Physician intention to adopt telemedicine	Test variable in 2 independent samples Mann-Whitney test, dependent variable	Interval	Composite scores in the questionnaires with 10-point Likert scale

Note. In the table, the names and types of the variables, levels in the samples (categories and ranks), levels of measurement, and measures are described.

Table 2 represents covariates in the study.

Table 2

Covariates in the Study

Name of covariate	Type	Level of measurement	Measure
Physician practice size	Independent covariate in RQ1, RQ2	Categorical/ordinal	3 groups coded as “1”, “2”, “3” (1-10, 11-49, more than 50 physicians)
Physician age	Independent covariate in RQ1, RQ2	Categorical/ordinal	3 groups coded as “1”, “2”, “3” (25-34, 35-44,45-54 y. o. physicians)
Urban/rural area	Independent covariate in RQ1, RQ2	Categorical/ nominal	2 groups coded as “1”, “2” (Physicians in urban and rural areas)

Note. Three main covariates were analyzed in RQ1 and RQ2 (physician practice size, physician age, and location (rural/urban) of the physician practice).

Data Analysis Plan

IBM’s Statistical Package for the Social Sciences (SPSS), Version 27, will be applied for the data analysis. Before preparing the SPSS datasets, data cleaning will be performed. The questionnaires with missing or irrelevant information (errors, duplicates) (Schmidt, 2019) will be excluded. Then, the screening of the SPSS data sets for the issues with normality will be performed with the application of the relevant SPSS tools for data screening (Analyze/Descriptive Statistics/Explore). A Cronbach’s alpha test will be applied for testing the consistency and reliability of Likert-scale data (Laerd Statistics, 2021a) for the samples in RQ1 and RQ2. Levene test will be applied for testing homogeneity of variance within the data categories.

The Boxplot option in SPSS (Analyze/Descriptive Statistics/Explore) facilitates the detection of outliers in data sets marked with circles (potential outliers) and asterisks (extreme outliers). If outliers are detected, each related questionnaire with outliers will be analyzed for the consistency of the answers. Questionnaires containing outliers with inconsistent answers will be excluded, and the questionnaire with outliers and consistent answers will be included in the data set. When the data sets for variables are entered in SPSS, the categorical variables will be screened for errors with the SPSS tool for checking categorical variables (Analyze/Descriptive Statistics/Frequencies) (O'Toole, 2021).

According to the research question, characteristics of the data and variables, the appropriate test will be selected. A one-way ANOVA test, which examines and measure the correlation between physician intention to adopt telemedicine (dependent variable) and experience in telemedicine (independent variable), could be appropriate for RQ1. Meanwhile, because of combined method of sampling (probability and non-probability selection), the non-parametric equivalent of ANOVA, Kruskal-Wallis test (Pallant,2020) will be applied in RQ1.The dependent variable will be represented as an interval NoMAD test composite scores, the independent variable will be represented with three levels of experience in telemedicine, including low (1-6 months), sufficient (6-12 months), and high (12 months or more) levels of experience.

A one-way ANOVA test could be appropriate for RQ2 in which the correlation between physician intention to adopt telemedicine and training in telemedicine will be examined and measured. Meanwhile, because of combined sampling method (probability and non-probability selection), the nonparametric version of ANOVA, Kruskal-Wallis test (Pallant,2020) will be selected for RQ2. The dependent variable will be measured with NoMAD questionnaires composite scores; the independent variable, training in telemedicine, will be represented with three levels variable ("hybrid training," "online training," and "on-site training").

An independent samples *t* test could be applied in RQ3 for measuring the mean difference in two independent sample groups: the sample group selected for the study of experience factor (RQ1) and the sample group selected for the study of training factor (RQ2). Because of combined sampling method (probability and non-probability selection), the non-parametric version of independent samples *t*-test, Mann-Whitney test (Pallant,2020) will be applied in RQ3.Equal size of the groups will be necessary for variance equality in this test (Schober and Vetter, 2019).

For measuring the effects of cofactors of physician age, physician practice size, and practice location on physician intention to adopt telemedicine, *Compare Means* SPSS test will be applied. For examining statistical significance of the relationships between each covariate and the DVs in RQ1 and RQ2, the nonparametric equivalent of ANCOVA test, Quade's test (IBM, 2021a), will be applied.

Research Questions and Hypotheses

Research Question 1 (RQ1) -Based on physician questionnaire scores, what is the relationship between physician experience in telemedicine and physician intention to adopt telemedicine?

$H_0 1$ -Based on physicians` questionnaires scores, there is no statistically significant relationship between the experience in utilizing the telemedicine and physician intention to adopt telemedicine.

$H_a 1$ -Based on physician questionnaire scores, there is a statistically significant relationship between the experience in utilizing the telemedicine and physician intention to adopt telemedicine.

Research Question 2 (RQ2)-Based on physician questionnaire scores, what is the relationship between the telemedicine training and their intention to adopt telemedicine?

$H_0 2$-Based on physician questionnaire scores, there is no statistically significant relationship between the training for utilizing the telemedicine and physician intention to adopt telemedicine.

$H_a 2$ -Based on physician questionnaires scores, there is a statistically significant relationship between the training for utilizing the telemedicine and physician intention to adopt telemedicine.

Research Question 3 (RQ3)- Based on physician questionnaire scores, what is the difference between the median score of the physician group with experience and the median score of the physician group with training?

$H_0$3- Based on physician questionnaire scores, the difference of medians equals zero.

H_a3- Based on physician questionnaire scores, the difference of medians is not equal to zero.

Detailed Analysis Plan

Hypotheses testing for RQ1 and RQ2 will utilize the nonparametric Kruskal-Wallis tests, an alternative to parametric one-way ANOVA. A standard confidence interval of 95% and an alpha of 0.05 will serve as parameters. For nonparametric Kruskal-Wallis test, eta squared will a parameter for effect size (Tomczak and Tomczak, 2014). Effect size will be computed in SPSS (Analyze/Descriptive Statistics/Frequencies) using Cohen's criteria for eta squared (SPSS Tutorial, 2021).

The nonparametric Mann-Whitney test, an alternative to the parametric independent samples *t* test, will be applied for testing the hypothesis in RQ3. The parameters of the confidence interval of 95% and alpha of 0.05 will be applied. The effect size for this test will be calculated according to the formula (r = Z/square root of N), where *N* is the total number of the cases and *Z* describes the position from the median, will be obtained in this SPSS test. The effect sizes r will be estimated using Cohen's criteria of .1 = small effect, .3 = medium effect, and .5 = significant effect (Pallant, 2020).

To analyze the three covariates (physician practice size, rural/urban location of practice, age of physicians) in RQ1 and RQ2, the *Compare means* test will be applied.

This test will allow measuring and comparison of the effects of those cofactors on physician intention to adopt telemedicine which will be measured as the composite scores of NoMAD questionnaires. For examining if the relationships between covariates and DVs in RQ1and RQ2 are statistically significant, the nonparametric version of ANCOVA, Quade's test will be applied.

Threats to Validity

Threats to External Validity

External validity refers to the ability of the research findings to be applied to a broader population. Two concepts of external validity, generalizability and applicability, characterize the extent to which the results of a study apply. Generalizability refers to the target (general) population. The requirement for generalizability is that a study sample should represent the target population from which it was drawn. The concept of applicability addresses the question about the usefulness of the findings for the study population (Murad et al., 2018). In DHA practice, guideline developers and policymakers usually emphasize reaching applicability rather than generalizability of the study findings. However, the problems of both generalizability and applicability will be addressed in this study.

Some specifics of the secondary data (convenience sampling, survey method, and cross-sectional design) can cause threats to external validity.

Convenience Sampling

Convenience sampling, which will be applied by the data provider for collecting the data set for this study, is considered a non-probability type, and, theoretically, it is associated with the limited generalizability of the findings (Sharma,2017). Meanwhile, the large size of the company, provider of data, and its meaningful geographical diversification will allow the representativeness of the samples. Application of the described above combined method of sampling (non-probability convenience and probability stratified random sampling) will reduce the barrier to generalization of the study findings. Meanwhile, this sampling method will not guarantee generalization. The most reliable way to test generalizability is experimental when findings within a study group applied to the target population during the test-retest (Gravesande et al., 2019).

Thus, the potential threats to the generalizability of the study finding could be a violation of randomness for participants selection and violation of the data normality assumption. The advantage of convenience sampling is the high applicability of the findings for the study population (Jager,2017). The analysis of field-specific data may provide valuable outcomes applicable in DHA practice.

Survey Settings

It will be essential to address a specific threat to external validity—interaction of setting (Creswell & Creswell, 2018) during the survey which will be conducted by the data provider. To address the threat of interaction of setting, the negative factors of stress, lack of time, and unpreparedness of the selected participants for the survey must be eliminated. According to the agreement with the data provider, the company will offer preliminary information on applying a 10-point Likert-type scale (training video and written information) to provide preparedness of the participants of the survey. The company will provide sufficient time and room for the survey participants to reduce the threat of setting interaction.

Cross-Sectional Study

Addressing the threat of interaction of history to external validity (Creswell & Creswell, 2028) is essential for this cross-sectional study. The cross-sectional design aligns with the summative assessment of physicians' intention to adopt telemedicine, which will be used to develop a DHA policy for physician engagement in telemedicine. Meanwhile, the applicability of the findings should be examined in the repeating tests at later times, no less than once annually, concerning rapid changes in telemedicine.

Internal Validity Threats

Internal validity is the extent to which a study establishes a trustworthy cause-and-effect relationship between dependent and independent variables in the research. It eliminates alternative explanations about the reasons for the effect (Baldwin, 2018). Among the threats to internal validity described in the methodological literature (see Baldwin, 2018; Creswell & Creswell, 2018; Flannelly et al., 2018), the threats of selection, testing, and regression to the mean are the most likely to occur in this study due to specifics of its design.

Threat of Selection

For addressing the threat of selection during the secondary data collection, survey participants will be randomly selected within the specified ranks and categories of the study population. It will be performed by the data provider according to the agreement about data use.

Testing Threat

The testing threat exists for this study because of the logical structure of the NoMAD questionnaire. During the survey, there will be a risk that logical time-saving answers without reflecting details and issues could be given by the responders. Self-report and answering on the level of practice are potential biases of the survey. To address those testing threats, the introductory training video will be offered for the survey participants to motivate them to provide reliable information useful for DHA practice in solving issues in telemedicine.

Regression to the Mean Threat

Regression to the mean is the threat of outliers in sample groups. For eliminating outliers, the questionnaires with extreme scores should be excluded from the secondary data set (Creswell & Creswell, 2018). The SPSS tools for outlier analysis allows detection of mild and extreme outliers (Pallant, 2020, p. 60). After obtaining the results of the SPSS test for outliers, the extreme outliers will be excluded from the samples.

Conclusion Validity Threats

Conclusion validity refers to the degree to which the conclusions about relationships in the data are reasonable (Trochim, 2020). Threats to the statistical conclusion validity appear due to Type-I and Type-II errors (García-Perez, 2012). The typical requirement for reducing Type I error is minimizing the significance level of the hypothesis test, for instance, to .01. The main requirement for reducing Type II errors is increasing the sample size for the test. The minimum requirement for this study will be a statistical significance level of .05, the most appropriate level for a survey study (Walters, 2021). The sizes of the samples for the statistical tests will be greater than the calculated with G*Power adequate size of the study groups: 100 participants in each of two groups instead of calculated 66 participants for Kruskal-Wallis test and 88 participants for Mann-Whitney test. The emphasis on the accuracy of data processing (cleaning, testing, and tests results analyses) will allow to minimize validity threats.

The main threat to conclusion validity in this study will be the reliability of the survey method, which is characterized as the most prone to biases due to its subjective answers (Walters, 2021). The reliability of the survey data for this study will be improved by eliminating mentioned-above testing threats and by increasing the number of questions on Likert scale (10 instead of 5 in the original version of NoMAD questionnaire). Cronbach's alpha test recommended for Likert-scale surveys will be applied for analysis of the data reliability (Chan & Idris, 2017).

Ethical Procedures

The secondary data for the study will be provided by the telemedicine company serving physician practices. One of the purposes of the agreement with the data provider will be protection safety and benefits of the survey participants. According to the agreement, the company's obligation will be providing the principles of voluntary participation and anonymity of the survey participants. Since all secondary data will be de-identified, there will be no threat of a confidentiality breach in the study.

Collecting and analyzing the data adheres to the ethical requirements of the IRB. Access to the secondary data set will be provided to the researcher only after IRB approval.

Because of the de-identified secondary data set, HIPAA requirements for regulating ethical issues will not be applicable. Regulations from the Office for Human Research Protections (OHRP) of the U.S. Department of Health & Human Services will be applied to this research. The data use agreement will be aligned with OHRP's principles of voluntary participation, beneficence, nonmaleficence, and anonymity of the survey participants, as described in Regulations, Policy & Guidance (OHRP, 2021).

According to the principle of voluntary participation in the research, the data use agreement will contain the requirement for the data provider to inform each participant about their right to discontinue participation in the survey at any time without penalties. This preliminary agreement will allow the data provider to plan how to fulfill the data set size requirements, either through recruitment of a larger number of survey participants or recruitment of new participants.

Data transfer and storage will be protected by utilizing a secure application with TLS encryption protocol for files in transit. According to the OHRP requirements, the data should be stored for at least 3 years after the completion of the research (OHRP, n.d.) The data set will be destroyed 3 years after study completion.

In international research, the OHRP requirement is to ensure that data subjects outside of the United States who participate in research receive an equal level of protection as research participants inside the United States (OHRP, 2021). The main OHRP's principles of voluntary participation, beneficence and nonmaleficence, and anonymity of the survey participants will be reflected in the data use agreement with the data provider.

Summary

This section discussed the research design and its rationale, the target population, sampling procedures, sample size estimation, instrumentation, and operationalization of variables. A detailed plan for the data analysis, description of external, internal, and statistical conclusions validity threats, and the ways to address them were introduced. Ethical procedures related to IRB approval and data handling and storage were described.

Section 3 will present the data analysis and findings related to the research question and hypotheses.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative study was to examine, measure, and compare the effects of previous experience in telemedicine and telemedicine training on physicians' intention to adopt telemedicine for long-term use. While both factors have been recognized as positive predictors for physician intention to adopt telemedicine, further quantitative analysis of these factors was necessary. Quantitative assessment and comparison of the effects of these factors are important for DHA practice because each factor is associated with a specific approach to telemedicine integration. The results of this study might be useful for health care administrators for selecting the most effective approach to physician engagement with telemedicine. The study also introduced a unique assessment and comparison of how physician intention to adopt telemedicine was associated with physicians` age, geographic location, and practice size. The results of the study have potential to contribute to DHA practice for addressing the existing problem of low physician intention to adopt telemedicine for long-term use (see Hyder & Razzak, 2020).

The relationships between the independent variables (previous experience of physicians in telemedicine and telemedicine training) and dependent variables of physician intention to adopt telemedicine were examined in the RQ1 and RQ2. In RQ3, the strength of the effects of those two factors (experience and training) on physician intention to adopt telemedicine was compared.

Research Question 1 (RQ1) -Based on physician questionnaire scores, what is the relationship between physician experience in telemedicine and physician intention to adopt telemedicine?

$H_0$1 -Based on physicians` questionnaires scores, there is no statistically significant relationship between the experience in utilizing the telemedicine and physician intention to adopt telemedicine.

H_a1 -Based on physician questionnaire scores, there is a statistically significant relationship between the experience in utilizing the telemedicine and physician intention to adopt telemedicine.

Research Question 2 (RQ2)-Based on physician questionnaire scores, what is the relationship between the telemedicine training and their intention to adopt telemedicine?

$H_0$2-Based on physician questionnaire scores, there is no statistically significant relationship between the training for utilizing the telemedicine and physician intention to adopt telemedicine.

H_a2 -Based on physician questionnaires scores, there is a statistically significant relationship between the training for utilizing the telemedicine and physician intention to adopt telemedicine.

Research Question 3 (RQ3)- Based on physician questionnaire scores, what is the difference between the median score of the physician group with experience and the median score of the physician group with training?

$H_0$3- Based on physician questionnaire scores, the difference of medians equals zero.

H_a3- Based on physician questionnaire scores, the difference of medians is not equal to zero.

Section 3 includes a description of the data collection process, including time frame, discrepancies in the use of the secondary data set from the initial plan, baseline descriptive characteristics, justification for covariates selection, and population characteristics. In the subsequent part of the section, the results of the quantitative analysis of the secondary data are described and findings are represented. In the final part, the answers to the research questions are summarized.

Data Collection of Secondary Data Set

Time Frame and Response Rate

For this cross-sectional study, the secondary data set was obtained from the marketing company that conducted the physician survey and provided the Likert scale questionnaires. The time frame for creating the data set depended on two factors: existing standards for conducting surveys in the marketing company and quality requirements for the secondary data set for the research. The first survey results included 200 complete physician Likert-scale questionnaires and were obtained over 14 days. After the company-mandated test for reliability of the Likert scale, questionnaires were implemented, that is, the Cronbach alpha test (see Schrepp, 2020); 40 of 200 questionnaires were rejected, and an additional survey was given. It took about 3 weeks for the marketing company to collect 200 complete, reliable physician questionnaires, which passed the Cronbach alpha test. After obtaining IRB approval (Walden IRB approval number 10-15-21-0970307), for the study materials, the secondary data set with de-identified data and reliable Likert-scale physician questionnaires were electronically delivered in the form of an Excel file. The secure application for the data transfer, WeTransfer, with TLS encryption protocol for files in transit, was used. It was not possible to calculate a response rate for the survey because of the agreed upon limited number of responses (200 questionnaires).

Discrepancies in the Use of the Secondary Data Set From the Plan Presented in Section 2

The discrepancies in the use of the secondary data set from the plan described in Section 2 were mainly caused by the change of the secondary data provider. Instead of the planned telemedicine company, a marketing company with experience conducting surveys in health care was selected as a data provider for the research. One of the positive consequences of the change was increased randomness of the data. While the initially planned data provider would have offered an internal survey within one telemedicine company, the marketing company conducted an external survey among physicians employed in various organizational and geographic settings of Eastern Europe and Central Asia. The second positive consequence of the data provider change was better quality of the data. The marketing company was able to obtain the required grouped data, whereas the telemedicine company did not guarantee that data specified by length of experience, type of training, age, practice size, and location groups of the physicians could be sufficiently represented.

Despite the increased randomness of the data that were provided by the marketing company, the research sampling method remained a nonprobability type that could be classified as a purposive sampling. The distinctive characteristic of purposive sampling is selection of groups that can provide the best information for reaching the objectives of the study (Ilker & Kabiru, 2017). The marketing company, as a data provider, was able to deliver the data from specific groups of physicians for the purposes of this study. Such specific, tested, and accurate survey data allowed implementation of the target approach in examining physician intention to adopt telemedicine for the long term.

Baseline Descriptive Characteristics of the Samples

For assessment of baseline descriptive characteristics of the sample, the method of measuring central tendency, that is, means, was selected. The use of means is appropriate for descriptive analysis of the categorical data that were represented in this study (see Laerd Statistics, 2021c). The advantage of mean calculation is that all data points within a category can be taken to the account, and an average value (mean) can then be compared with the means of other categories. For calculation of the mean scores of the physician intention to adopt telemedicine, the SPSS Compare Means tests were applied. Before the tests, the sample groups, variables, covariates, and their categories were described.

The dataset obtained from 200 physician questionnaires was divided into two equal size groups: group 1 “experience,” which included the responses of physicians with telemedicine experience (without substantial telemedicine training) and group 2 “training,” which contained the responses of physicians who had telemedicine training without meaningful experience in telemedicine. In both groups, independent variables were divided into three categories: three levels of experience in telemedicine measured in months (independent variable “experience”) and three types of training measured as online, in class, and hybrid forms (independent variable “training”).

Physician age (three ordinal categories), physician practice size (three ordinal categories), and location (two nominal categories) were represented and examined as covariates for the dependent variables of physician intention to adopt telemedicine in RQ1 and RQ2. Dependent variables of physician intention to adopt telemedicine in RQ1 and RQ2 were measured as a composite score of the 10-point Likert scale questionnaire (see Wu & Leung, 2017). Descriptive quantitative characteristics of two main groups (“experience” and “training") demonstrated discrepancies within the composite scores of the physician's intentions to adopt telemedicine as a long-term practice . Table 3 represents results of comparison of means between groups “experience” and “training”.

Table 3

Comparison of Means Between Group 1 “Experience” and Group 2 “Training”

Report

CompositeScore

Group	Mean	N	Std. Deviation	Minimum	Maximum	Range
1	7.0197	100	1.11523	4.30	9.78	5.48
2	8.0587	100	1.05293	6.04	9.96	3.92
Total	7.5392	200	1.20063	4.30	9.96	5.66

Note. Table 3 was obtained from the report of the SPSS test "Compare Means."

The results of a comparison of means between group 1 ("experience") and group 2 ("training") showed that a higher level of intention to adopt telemedicine long-term was associated with telemedicine training (M = 8.05 in group 2 vs. M = 7.02 in group 1).

Comparison of the means between the categories of the IV experience revealed a positive correlation between the length of experience in telemedicine and the mean score of physician intention to adopt telemedicine. Table 4 represents results of comparison of means between the categories of IV1 "experience".

Table 4

Comparison of Means Between the Categories of IV1 "Experience"

Report

composote score of Likert scale questionnaire

months of experience	Mean	N	Std. Deviation	Minimum	Maximum	Range
1-6 months	5.9303	33	.72413	4.30	6.91	2.61
7-12 months	7.0045	33	.63078	6.04	8.04	2.00
more than year	8.0918	34	.68246	7.09	9.78	2.69
Total	7.0197	100	1.11523	4.30	9.78	5.48

Note. Table 4 was obtained from the report of the SPSS test "Compare Means."

Comparison of means between the categories of IV "experience" demonstrated that longer experience in telemedicine was associated with the higher mean of physician intention to adopt telemedicine: M = 5.93 in the subcategory with 1 to 6 months of experience, *M* = 7.00 in the category with 7 to 12 months of experience, and *M* = 8.09 in the category with more than 1 year of experience. Comparison of the means between the categories of the IV training revealed discrepancies between the type of training in telemedicine and the mean score of physician intention to adopt telemedicine. Table 5 represents results of comparison of means between the categories of IVs ("training").

Table 5

Comparison of Means Between the Categories of IV "Training"

Report

composit score of likert scale questionnaire

type of training	Mean	N	Std. Deviation	Minimum	Maximum	Range
online	9.0903	33	.63991	7.65	9.96	2.31
in class	6.9418	33	.58830	6.04	7.78	1.74
hybrid	8.1415	34	.52401	7.35	9.04	1.69
Total	8.0587	100	1.05293	6.04	9.96	3.92

Note. Table 5 was obtained from the report of the SPSS test "Compare Means."

The comparison of the means of the categories of the IV training demonstrated that the most beneficial form of training for physician intention to adopt telemedicine was online training, *M* = 9.09. In-class training was the form with the lowest effect on physician intention to adopt telemedicine, *M* = 6.94. A mean score of physician intention to adopt telemedicine in the category of hybrid training, *M* = 8.14, was higher than total mean, *M* = 8.06.

Comparison of means between the categories of the covariates of age, practice size, and location in the group experience revealed the categories with the highest, medium size, and lowest means of physician intention to adopt telemedicine. Table 6 represents descriptive characteristics for covariates in group 1 “experience”.

Table 6

Descriptive Characteristics for Covariates in Group 1 “Experience”

composote score of Likert scale questionnaire * age group o

composote score of Likert scale questionnaire

age group o	Mean	N	Std. Deviation	Minimum	Maximum	Range
25-34 years old	7.1042	33	.57559	6.04	7.91	1.87
35-44 years old	7.9850	34	.89207	5.61	9.78	4.17
45 and more years old	5.9406	33	.70543	4.30	6.91	2.61
Total	7.0197	100	1.11523	4.30	9.78	5.48

composote score of Likert scale questionnaire * practice size group

composote score of Likert scale questionnaire

practice size group	Mean	N	Std. Deviation	Minimum	Maximum	Range
1-10 physicians	5.8606	33	.66124	4.30	6.91	2.61
11-49 physicians	7.2227	33	.76669	6.04	8.87	2.83
50 and more physicians	7.9476	34	.68215	7.09	9.78	2.69
Total	7.0197	100	1.11523	4.30	9.78	5.48

composote score of Likert scale questionnaire * rural/urban area

composote score of Likert scale questionnaire

rural/urban area	Mean	N	Std. Deviation	Minimum	Maximum	Range
rural	6.5200	50	.89922	4.30	8.87	4.57
urban	7.5194	50	1.09301	5.17	9.78	4.61
Total	7.0197	100	1.11523	4.30	9.78	5.48

Note. Table 6 was obtained from the report of the SPSS test “Compare Means.”

The highest mean scores of physician intention to adopt telemedicine were in the categories 35-44 years old (age covariant), *M* = 7.99; 50 and more physicians (practice size covariant), *M* = 7.95; and urban area (location covariant), *M* = 7.52. The lowest mean scores were in the categories of 45 and more years old, *M* = 5.94; 1-10 physicians practice size, *M* = 5.86; and rural area, *M* = 6.52. Table 7 represents the descriptive characteristics of the categories of the covariates of age, practice size, and location in the group training.

Table 7

Descriptive Characteristics for the Covariates in Group 2 "Training"

composit score of likert scale questionnaire * age groups of physicians

composit score of likert scale questionnaire

age groups of physicians	Mean	N	Std. Deviation	Minimum	Maximum	Range
25-34 years old	8.0677	35	.59835	7.04	9.04	2.00
35-44 years old	9.0809	33	.64745	7.65	9.96	2.31
45 and more years old	6.9947	32	.65887	6.04	7.96	1.92
Total	8.0587	100	1.05293	6.04	9.96	3.92

composit score of likert scale questionnaire * practice size groups

composit score of likert scale questionnaire

practice size groups	Mean	N	Std. Deviation	Minimum	Maximum	Range
1-10 physicians	7.1397	34	.79488	6.04	8.74	2.70
11-49 physicians	7.9739	33	.60549	6.65	9.04	2.39
50 and more physicians	9.0903	33	.63991	7.65	9.96	2.31
Total	8.0587	100	1.05293	6.04	9.96	3.92

composit score of likert scale questionnaire * rural/urban area

composit score of likert scale questionnaire

rural/urban area	Mean	N	Std. Deviation	Minimum	Maximum	Range
rural	7.3096	50	.80504	6.04	9.96	3.92
urban	8.8078	50	.66831	7.35	9.91	2.56
Total	8.0587	100	1.05293	6.04	9.96	3.92

Note. Table 7 was obtained from the report of the SPSS test “Compare Means.”

Comparison of means between the categories of the covariates of age, practice size, and location in the group “training” demonstrated that the categories with the highest mean scores of physician intention to adopt telemedicine were the categories 35-44 years old (age covariate), *M* = 9.08; 50 and more physicians (practice size covariate), *M* = 9.09; and “urban area”, (location covariate), *M* = 8.81. The lowest mean score of physician intention to adopt telemedicine were in the categories 45 and more years old, *M* = 6.99,”1-10 physicians’, *M* = 7.14, and “rural area”, *M* = 7.31.

Comparison of the means between two groups (“experience” and “training”) showed that the highest mean scores of physicians’ intention to adopt telemedicine occurred among the categories physicians 35-44 years old, 50 or more physicians in the practice, and urban area in both groups. This conclusion corresponds to similar findings in the research literature and analytical reports about the process of telemedicine integration within the target population among US physicians (see American Well, 2021a; Chen et al.,2020; Kane & Gillis, 2018). Also, comparison of means between the groups allowed us to identify the categories with the lowest mean score of physician intention to adopt telemedicine: age category 45 and more years old, 1-10 physicians as a practice size category, and the location category of rural area. Those findings allow the identification of the advantages and problems in DHA practice of telemedicine integration. One more important finding for DHA practice is the specific, positive effect of online training on physician intention to adopt telemedicine (see Table 7).

Justification of Inclusion of Covariates

Implementation of the univariate analysis of covariance (ANCOVA), which requires that the dependent variable must be normally distributed (Pallant,2020), was not possible with the available categorical covariates of age of the physicians, physician practice size, and location of the practice and non-normally distributed DVs in RQ1 and RQ2. Meanwhile, the bivariate Pearson correlation SPSS test contains an option for calculation of covariance between the non-normally distributed dependent variable and categorical ordinal covariates (Kim, 2018). This option was applied for evaluation of the relationships between the composite score of physician intention to adopt telemedicine (dependent continuous variable) and covariates of physician age and physician size practice, both of which were categorical ordinal data.

For measuring strength of the relationship between the non-normally distributed dependent variable of physician intention to adopt telemedicine and dichotomous nominal covariate (rural or urban location), the Biserial correlation test was applied. As a special case of Pearson correlation, this test was conducted with the same procedures as the Pearson correlation test. Unlike categorical ordinal covariates for which covariance indices were calculated, the relationship between DV and dichotomous nominal covariates was characterized by the Pearson correlation coefficient (Islam & Rizwan, 2021).

RQ1

Table 8 describes covariance in group 1 “experience”.

Table 8

Covariance in Group 1 “Experience”

Correlations

		composote score of Likert scale questionnaire	months of experience	age group o	practice size group	rural/urban area
composote score of Likert scale questionnaire	Pearson Correlation	1	.797**	-.426**	.769**	.450**
	Sig. (2-tailed)		.000	.000	.000	.000
	Sum of Squares and Cross-products	123.130	72.400	-38.400	69.800	24.985
	Covariance	1.244	.731	-.388	.705	.252
	N	100	100	100	100	100

Note. Table 8 was obtained from the report of the bivariate correlation SPSS test with the option “Cross-product deviation and covariances”.

A Pearson correlation coefficient was computed for assessment of the relationship between location of the physician’s practice and score of physician intention to adopt telemedicine in the group “experience”. There was a positive correlation between the two variables, r (98) = .45, p = .000. There were statistically significant, positive, medium strength associations between the DV and the covariate location in the first group “experience”. Thus, the null hypothesis that there is no relationship between the covariate of physician practice location and dependent variable of physician intention to adopt telemedicine in group 1 was rejected, and inclusion of this covariate in the model was justified.

Cov (Composite Score, Age Group) = (-.39) indicated negative covariance between the DV and the covariate of age group of the physicians. *Cov* (Composite Score, Practice Size) = .71 indicated positive covariance between the DV and the covariate of practice size group. Thus, the null hypotheses that there are no relationships between the covariates of age and physicians practice size and DV in group 1 were rejected, and inclusion of those covariates in the model were justified.

RQ2

Table 9 describes covariance in group 2 "training".

Table 9

Covariance in Group 2 "Training"

Correlations

		composit score of likert scale questionnaire	type of training	age groups of physicians	practice size groups	rural/urban area
composit score of likert scale questionnaire	Pearson Correlation	1	-.364**	-.401**	.761**	.715**
	Sig. (2-tailed)		.000	.000	.000	.000
	Sum of Squares and Cross-products	109.757	-31.229	-34.364	65.289	37.455
	Covariance	1.109	-.315	-.347	.659	.378
	N	100	100	100	100	100

Note. Table 9 was obtained from the report of the bivariate correlation SPSS test with the option "Cross-product deviation and covariances".

A Pearson correlation coefficient was computed to assess the relationship between location of the physician practice and score of physician intention to adopt telemedicine in group 2 "training". There was a positive correlation between the two variables, *r* (98) = .72, *p* = .000. There was a statistically significant, positive, large association between the DV and the covariate location in the second group "training". Thus, the null hypothesis that there is no relationship between the covariate of physician practice location and dependent variable of physician intention to adopt telemedicine in group 2 was rejected, and inclusion of this covariate in the model was justified.

Cov (Composite Score, Age Group) = (-.35) indicated negative covariance between the DV and the covariate of age group of the physicians. *Cov* (Composite Score, Practice Size) = .66 indicated positive covariance between the DV and the covariate of practice size group. Thus, the null hypotheses that there are no relationships between the covariates of physician age, practice size and DV in group 2 ,training, were rejected, and inclusion of those covariates in the model were justified.

Some results of the covariance comparisons could be useful for DHA practice. For instance, covariates of age and practice size in the group 2 "training" had a lower effect on DV than in group 1"experience". This could serve as evidence that training decreases discrepancies caused by age and practice size in the process of telemedicine adoption among physicians. One more important piece of evidence is that the biserial correlation test demonstrated a stronger association between the covariate of location and

DV in group 2 “training” (r = .72 vs. r = .45 in the first group). The increased effect of the covariate location in the group training should be considered in the DHA practice.

Demographic Characteristics of the Sample Group

The surveyed population was represented by physicians from Eastern Europe and Central Asia, i.e., the former republics of the Soviet Union such as Kazakhstan, Belorussia, Ukraine, and Russia. Culture, environment, socioeconomic status, healthcare standards, and lifestyle differ between the surveyed population and the US physicians. However, there are some factors in the healthcare systems of these countries outside the US that promote telemedicine, despite the economic discrepancies, to usage levels as high as in the United States. One of those factors is the high level of legislative and administrative management of telemedicine in private and public care (Tretyakova, 2020). The formalization of the process of telemedicine integration fosters robust diffusion, dissemination, and implementation of telemedicine in Western Europe (Cwiklicki, 2020). The governments provide financial and organizational support for telemedicine development in both public and private health care as an alternative to the stagnated post-soviet health care system (Baksheev, 2020). The effective business models and IT technologies allows penetration of the big telemedicine companies of those countries in the market of telemedicine services in Western Europe. Thus, the findings of this study have the potential to be generalized to the wider international population of interest, particularly, to the population of US physicians.

Representativeness of the Sample Group

A representative sample should be an unbiased reflection of the characteristics of the target population. The main advantage of the method of purposeful nonprobability sampling that was selected for this study is replication of the target group characteristics considered in the study (Sharma, 2017). For survey data, the method of purposeful selection is recognized as a design-based enhancement against “size effect” in sufficiently large samples (Klar & Leeper, 2019). For a limited-size sample group, as in this study, purposeful sampling is the most effective method to meet requirements of representativeness (Etikan,2016).

The main drawback of purposeful selection, also called judgmental selection, is the subjective opinion of a researcher in selecting groups for assessment (Sharma, 2017). This drawback was eliminated in this research by replicating the criteria for the groups selection that were applied in the research about the target population (US physicians). Selection of the groups of physicians depending on age, practice size, and location, as well as defining categories within those groups, corresponded with the gradation of the physicians into groups and subgroups in the US research about telemedicine integration. The method of the replication of the sampling criteria, which were applied to the target population, in the selection of study groups among the accessible population could be defined as homogeneous sampling (Sharma,2017). Similarity of levels of telemedicine development among the accessible and target populations, as well as consistent application of purposive sampling allowed for the assumption that the selected sample was representative.

Study Results

This subsection includes the statistical assumptions, research questions, results of the statistical analysis findings, hypotheses test results, answers to the research questions, and concludes with a summary of the study results.

Summary of the Descriptive Analysis of the Sample

Descriptive analysis, i.e., comparisons of means, revealed that there were relationships between the factors of experience (RQ1) and training (RQ2) and the mean scores of the physicians` intentions to adopt telemedicine in the groups of physicians that were divided into categories based on length of experience (RQ1) and type of telemedicine training (RQ2). According to the descriptive test results, the main 3 conclusions are as follows. First, there was a positive correlation between the length of physician experience in telemedicine and the mean scores of their intention to adopt telemedicine. The second conclusion was about the relationship between the type of training and the mean score of physician intention to adopt telemedicine in which the online training was identified as the most effective type of training, and in-class training was the least effective type. The third conclusion about the greater effect of the factor of training on the physician's intention to adopt telemedicine compared to the factor of experience was obtained by comparing the total means in the two groups (experience and training). Also, descriptive analysis (comparison of means for the categories of the covariates) allowed for assumptions about the effects of the cofactors of physician age, practice size, and location on the physician's intention to adopt telemedicine.

The limitation of the descriptive analysis was that the general summarization did not allow statements about statistical significance of the relationships between the variables, which were required for the rejection of the null hypotheses (Simonsohn et al.,2021). For further examining and revealing if the relationships between the factor of experience and physician intention to adopt telemedicine (RQ1) and the factor of training and their intention to adopt telemedicine (RQ2) were statistically significant, the inferential statistical method with implementation of the nonparametric Kruskal–Wallis (KW) tests was applied. For examining if the difference between the effects of those factors (experience and training) on physician intention to adopt telemedicine was statistically significant, the inferential statistical analysis with implementation of nonparametric Mann–Whitney (MW) test was applied in RQ3.

Statistical Assumptions for Nonparametric Kruskal-Wallis and Mann-Whitney Tests

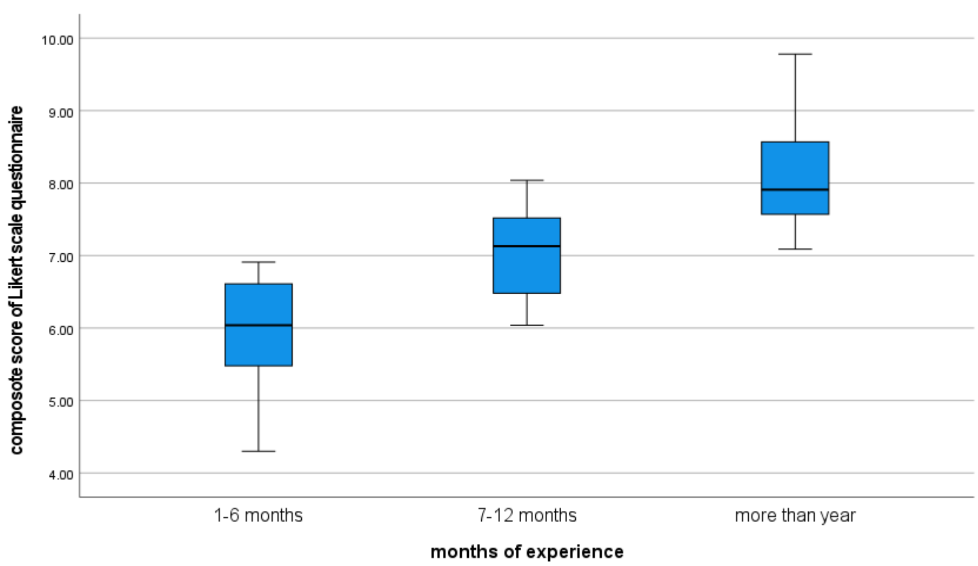
The main difference between nonparametric tests and their parametric alternatives is that the normality of the distribution is not assumed for nonparametric tests (Pallant,2020).

Two assumptions for the nonparametric tests are related to the specifics of the test variables. For KW, the two assumptions are: (a) an independent variable (IV) should consist of two or more independent categorical (ordinal or nominal) groups and (b) the dependent variable (DV) should be measured at the ordinal or continuous level and represent an interval or ratio (Laerd Statistics, 2021d). The first assumption was met in the RQ1 where the IV was represented by 3 ordinal categories and in the RQ2 where the IV was represented by 3 nominal categories. The second assumption was met in RQ1 and RQ2 where the DVs were Likert scale scores measured as interval data (St. Andrews University,2021). For the MW test, the two assumptions about variables are: (a) the IV should consist of 2 categorical independent groups and (b) the DV should be measured at the continuous or ordinal levels (Pallant,2020). Those assumptions were met in RQ3 where IV consisted of 2 independent categorical nominal groups of physicians (“experience” and “training”), and the ordinal level DV was represented by interval data with Likert scale scores (St. Andrews University,2021). Other important assumptions for nonparametric tests are randomness in the selection of the groups and independence of observations. It is important to note for the latter that independence is identified as an absence of a relationship between the observations in each group or between the groups themselves (Pallant,2020). These assumptions for RQ1, RQ2, and RQ3 were met in the process of the data collection by the marketing company who provided the data for this study.

Equality of variance is an assumption for both parametric and nonparametric tests. While Levene homogeneity of variance test could be performed as a part of a parametric test (ANOVA, *t* test), the nonparametric Levene test does not have one -step option. It requires 3 additional steps with creation of 3 additional variables (Shear et al, 2018). This test was replaced by the effective and relatively fast method of analysis which is based on the visual comparison of variance distribution shapes, i.e., box plots (Zhang et al. 2021). Depending on the equality or inequality of variance distribution, the medians of the categories – or ranked means – could be selected for comparisons in the KW and MW tests (Laerd Statistics, 2021b). The assumptions about equality or inequality of the variability in each group (experience and training) were made by comparisons of the distribution shapes between the categories of IVs (Grande, 2021) (see Figures 7, 8 ,9). Figure 7 describes comparison of the distribution shapes in the groups of IV in RQ1.

Figure 7

Comparison of the Distribution Shapes in the Groups of IV in RQ1



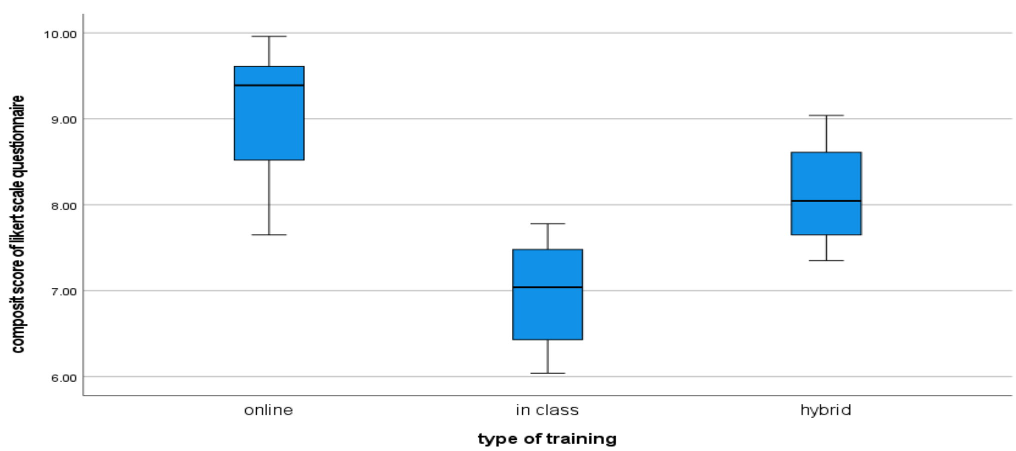
Note. The boxplots were obtained from SPSS test *Descriptive Statistics-Explore* (Analyze/Descriptive Statistics/Explore/Statistics & Plots). The skewness values were

obtained from the test report, Skew = (-.439) for category 1; Skew = .020 for category 2; Skew = .752 for category 3.

The different shapes of boxplots (representing the distributions of scores in 3 categories of IV) and the differences in skewness for each category, Skew = (-.439) for category 1, Skew = .020 for category 2, Skew =.752 for category 3 , supported the assumption about the inequality of variability within the categories of IV in RQ1. As such, the ranked means were applied in the RQ1 KW test. Figure 8 represents comparison of the distribution shapes in the groups of IV in RQ2.

Figure 8

Comparison of the Distribution Shapes in the Groups of IV in RQ2



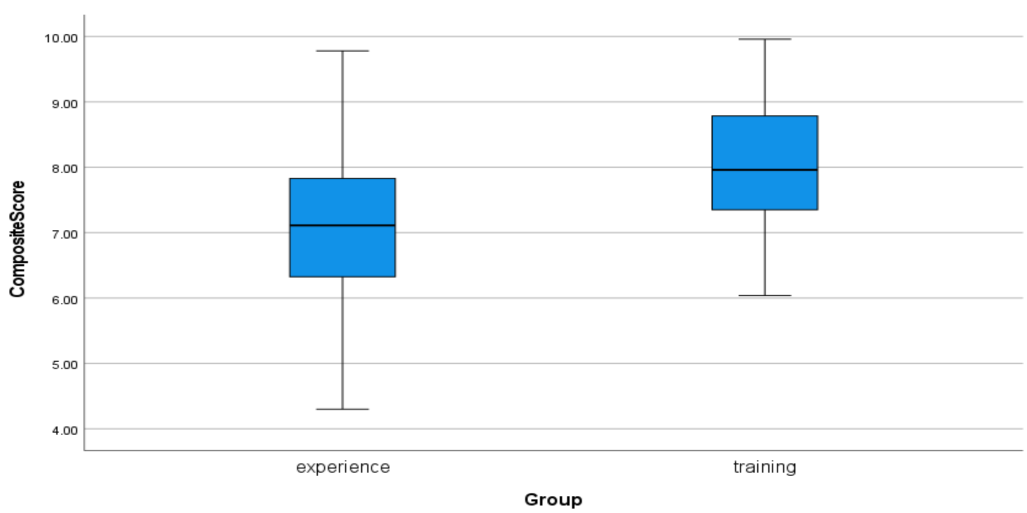
Note. The boxplots were obtained from SPSS test *Descriptive Statistics-Explore* (Analyze/Descriptive Statistics/Explore/Statistics & Plots). The skewness values were

obtained from the test report, Skew = (-.529) for category 1; Skew = (-.003) for category 2; Skew =.058 for category 3.

The different shapes of boxplots (representing the difference of the distributions of the scores within the categories of IV) and the difference in skewness for each group, Skew = (-.529) for category 1, Skew = (-.003) for category 2, Skew =.058 for category 3 , supported the assumption about the inequality of variability within the categories of IV in RQ2. Therefore, the ranked means were applied in the KW test for RQ2. Figure 9 describes comparison of the distribution shapes in the groups of IV in RQ3.

Figure 9

Comparison of the Distribution Shapes in the Groups of IV in RQ3



Note. The boxplots were obtained from SPSS test *Descriptive Statistics-Explore* (Analyze/Descriptive Statistics/Explore/Statistics & Plots). The skewness values were

obtained from the test report Skew = (-.031) for the group experience; Skew = (- .070) for the group training.

The different shapes of distribution (represented by the boxplots and histogram) and the difference in skewness for each group, Skew = (-.031) for the group experience; Skew = (- .070) for the group training , supported the assumption about the inequality of variability within the two independent groups of IV in RQ3. Therefore, the ranked means were applied in the MW test for RQ3.

Research Question 1

Test Results. In the RQ1, KW was applied to examine the relationship between DV "physician intention to adopt telemedicine" and IV (the ranks which characterized the length of the physician's experience in telemedicine). The rank-based nonparametric KW test was used to determine if there are statistically significant differences between two the groups of an independent variable on a continuous or ordinal dependent variable (Laerd Statistics,2021d), i.e., on a continuous interval variable in RQ1. Table 10 represents results of KW test in RQ1.

Table 10

Kruskal-Wallis Test Results in RQ1

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
composote score of Likert scale questionnaire	100	7.0197	1.11523	4.30	9.78
months of experience	100	2.01	.823	1	3

Kruskal-Wallis Test

Ranks

	months of experience	N	Mean Rank
composote score of Likert scale questionnaire	1-6 months	33	22.24
	7-12 months	33	49.06
	more than year	34	79.32
	Total	100	

Test Statistics[a,b]

	composote score of Likert scale questionnaire
Kruskal-Wallis H	64.983
df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: months of experience

Note. The table was obtained from the SPSS KW test report (Analyze/Nonparametric Tests/ Legacy Dialogs/K Independent Samples).

The KW test in the RQ1 showed that there was a statistically significant difference between the three categories of IV "experience", H (2) = 64.98, p = .000, with M-rank = 22.24 for the category 1-6 months of experience, M-rank = 49.06 for the category 7-12 months of experience, and M-rank = 79.32 for the category more than 1 year of experience.

Because the KW test in the RQ1 showed statistical significance in the difference between the categories, the post hoc test was implemented for specifying differences between 3 categories. For the KW test, the applicable post hoc is Dunn's test (International Business Machines [IBM], 2021b) which represented the results of the pairwise comparison between the categories described in Table 11.

Table 11

Pairwise Comparison Between the Groups in Post Hoc Dunn's Test in the RQ1

Pairwise Comparisons of months of experience

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
1-6 months-7-12 months	-26.818	7.140	-3.756	.000	.001
1-6 months-more than year	-57.081	7.088	-8.054	.000	.000
7-12 months-more than year	-30.263	7.088	-4.270	.000	.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note. The results of pairwise comparison between categories in RQ1 were obtained from the SPSS Dunn's test report (Analyze/Nonparametric Tests/Independent Samples Test/Fields/ Settings/Kruskal-Wallis test/*Hypothesis Test Summary* table).

Pairwise comparisons in the post hoc test demonstrated that the differences between the categories in all pair combinations were statistically significant with $p < .05$ for each pair. The pairs and their p-values were as follows: between categories 1 (1-6 months of experience) and 2 (7-12 months), $p = .001$; between the categories 1 and 3 (more than 1 year of experience), $p = .000$; and between the categories 2 and 3, $p = .000$.

The effect size – a coefficient which measures the strength of relationship between two variables – was calculated with the application of the formula $E^2 = H/(N^2-1)/(N+1)$ where H is the value obtained in the Kruskal-Wallis test, N is the total number of observations, and E^2 is a coefficient with a value from 0 (indicating no relationship) to 1 (indicating perfect relationship) (Tomczak & Tomczak, 2014). The result of the calculation was that $E^2 = 64.98/ (10000-1)/101 = .66$. According to Cohen's criteria for the effect size (Pallant, 2020), $E^2 = .66$ indicated large effect size meaning a strong relationship between the variables in RQ1.

Thus, the KW test in RQ1 showed that the factor of experience had a statistically significant and large effect on the physician's intention to adopt telemedicine , H (2) = 64.98, $p < .05$, $E^2 =$

.66, The highest M-rank (79.32) was in category 3 (more than 1 year of experience), the lowest M-rank (22.24) was in category 1 (1-6 months of experience), and category 2 (7-12 months of experience) had an M-rank = 49.06.

Hypothesis Test Results. The results of the KW and post hoc Dunn's tests allowed the rejection of the H01 which stated that there is no statistically significant relationship between physician experience in telemedicine and physician intention to adopt telemedicine. The relationship between two variables was statistically significant, $p < .05$, with the meaningful differences in the ranked means: M-rank = 22.24 for category

1, M-rank = 49.06 for category 2, and M-rank = 79.32 for category 3. The differences between the groups in the post hoc pairwise comparisons were statistically significant in all pairs with p < .05 for each pair. Also, the post hoc test produced a hypothesis test summary which contained N01 rejection. Table 12 represents post hoc test in RQ1.

Table 12

Hypothesis Test Summary in Post Hoc Dunn's Test in RQ1

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of composote score of Likert scale questionnaire is the same across categories of months of experience .	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Note. Hypothesis test summary was obtained from the SPSS Dunn's test report (Analyze/Nonparametric Tests/Independent Samples Test/Fields/Settings/Kruskal-Wallis test).

Research Question 2

Test Results. In RQ 2, KW was applied for examining the relationship between DV ("physician intention to adopt telemedicine") and IV (ranks which characterized the type of telemedicine training). The rank-based nonparametric KW test (Pallant, 2020) was used to determine if there were statistically significant differences between the 3 categories of the independent variable on a continuous interval variable in RQ2. Table 13 represents KW test results in RQ2.

Table 13

Kruskal-Wallis Test Results in RQ2

Kruskal-Wallis Test

Ranks

	type of training	N	Mean Rank
composit score of likert scale questionnaire	online	33	78.82
	in class	33	19.30
	hybrid	34	53.29
	Total	100	

Test Statistics[a,b]

	composit score of likert scale questionnaire
Kruskal-Wallis H	69.964
df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: type of training

Note. The table was obtained from the SPSS KW test report (Analyze/Nonparametric Tests/ Legacy Dialogs/K Independent Samples).

The KW test in the RQ2 demonstrated a statistically significant difference between the three categories of IV "training", H (2) = 69.96, p = .000, with M-rank = 78.82 for the category online training, M-rank = 53.29 for hybrid training, and M-rank = 19.30 for in-class training.

The post hoc test was applied after finding that the difference between the mean ranks of the categories of IV was statistically significant, $p < .05$. The appropriate post hoc for KW test, Dunn's test (IBM,2021b), was utilized for specifying the differences between 3 categories of the IV in RQ2. Pairwise comparisons between the categories are represented in Table 14.

Table 14

Pairwise Comparison Between the Groups in RQ2

Pairwise Comparisons of type of training

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
in class-hybrid	-33.991	7.087	-4.796	.000	.000
in class-online	59.515	7.140	8.336	.000	.000
hybrid-online	25.524	7.087	3.602	.000	.001

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Note. The results of pairwise comparison between the IV categories in RQ2 were obtained from the SPSS Dunn's test report (Analyze/Nonparametric Tests/Independent Samples Test/Fields/Settings/Kruskal-Wallis test/ *Hypothesis Test Summary* table).

Pairwise comparisons in a post hoc test showed that the differences between the categories were statistically significant with $p < .05$. The pairs and p-values were as follows: in class and hybrid had $p = .000$; in class and online had $p = .000$; and hybrid and online had $p = .001$.

The effect size was calculated using the formula for E^2 (shown above). The result of the calculation was that E^2 = 69.96/ (10000-1)/101 = .71 According to Cohen's criteria for the effect size (Pallant,2020), E^2 = .71 indicated a large effect size and strong relationships between the variables in RQ2.

Thus, the KW test in RQ2 showed that the telemedicine training had a significantly large size effect on physician intention to adopt telemedicine, H (2) = 69.96, $p < .05$, $E^2 = .71$. The highest *M*-rank (78.82) was in the category online training, the lowest *M*-rank (19.30) was in the category in class training.

Hypothesis Tests Result. The results of the KW and post hoc Dunn's tests allowed rejection of the H02 which stated that there is no statistically significant relationship between the telemedicine training for the physicians and their intention to adopt telemedicine. The relationship between two variables was statistically significant, $p < .05$, with the meaningful differences in the ranked means: *M*-rank = 19.30 for the category in class training, *M*-rank = 53.29 for hybrid training, and *M*-rank = 78.82 for the category online training. In the post hoc test, pairwise comparisons of the categories demonstrated statistically significant differences in all pairs with $p < .05$ for each pair. The post hoc test supported rejection of the HO2 in the hypothesis test summary. Table 15 represents results of the post hoc test in RQ2.

Table 15

Hypothesis Test Summary in the Post Hoc Dunn's Test in RQ2

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of composit score of likert scale questionnaire is the same across categories of type of training.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Note. Hypothesis test summary was obtained from the SPSS Dunn's test report (Analyze/Nonparametric Tests/Independent Samples Test/Fields/Settings/Kruskal-Wallis test).

Research Question 3

The Test Results. The nonparametric MW test was used to compare differences between two independent groups when the dependent variable is either ordinal or continuous (Laerd Statistics, 2021e), such as continuous interval in RQ3. This test was applied for examining whether the scores of physician intentions to adopt telemedicine differed based on the group factor (experience and training). Table 16 represents MW test results in RQ3.

Table 16

Mann-Whitney Test Results in RQ3

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
CompositeScore	200	7.5392	1.20063	4.30	9.96
Group	200	1.50	.501	1	2

Mann-Whitney Test

Ranks

	Group	N	Mean Rank	Sum of Ranks
CompositeScore	experience	100	76.23	7623.00
	training	100	124.77	12477.00
	Total	200		

Test Statistics[a]

	CompositeScore
Mann-Whitney U	2573.000
Wilcoxon W	7623.000
Z	-5.931
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Group

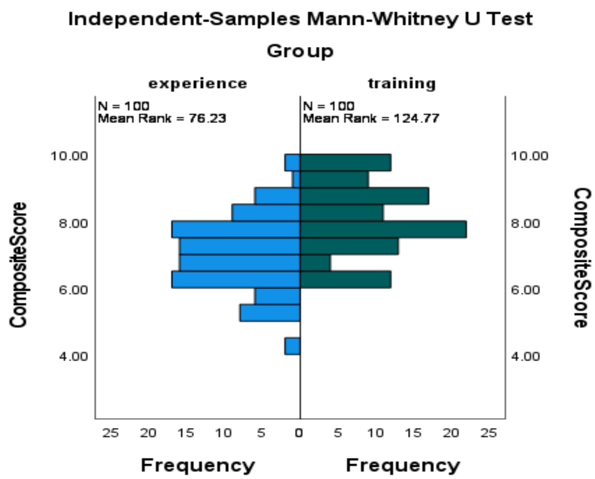
Note. The table was obtained from the SPSS MW test report (Analyze/Nonparametric Tests/ Legacy Dialogs/2 Independent Samples).

The MW test demonstrated that the difference between effects of two factors (experience and training of physicians in telemedicine) on physician intention to adopt telemedicine was statistically significant (*U* = 2573, *p* = .000), with the higher *M*-rank = 124.77 for "training" as compared to *M*-rank = 76.23 for "experience."

Although the post hoc test is appropriate for multiple comparisons between 3 or more groups, Dunn's test based on the Bonferroni approach could be applied as a post hoc for MW test which has only 2 groups (McDonald, 2021). The Bonferroni approach is used when one or two comparisons are significant (Lee & Lee,2018). Because the comparison in the MW test in RQ3 demonstrated a significant difference between 2 groups (*p* = .000), the implementation of Dunn`s-Bonferroni post hoc test was possible. Although pairwise comparisons were not available in the post hoc for MW test, the Dunn`s test produced a graphical comparison which specified the differences between the two independent groups . Figure 10 represents the results of this comparison.

Figure 10

Graphical Representation of Comparison of Frequency Distributions



Note. The Figure was obtained from the SPSS Dunn's post hoc test (Analyze/Nonparametric Tests/Independent Samples Test/Fields/Settings/Mann-Whitney test).

The graphical representation of the differences between two independent groups visually represented details on how the scores of the physician intentions to adopt telemedicine differed based on the group factor (experience or training). "Training" showed a higher frequency of the higher scores and a higher *M*-rank = 124.77 than that of "experience," which had a lower frequency of the higher scores and a *M*-rank = 76.23.

The effect size for the MW test was calculated with the formula $r = Z \,/\, \sqrt{N}$, where Z is the absolute (positive) standardized test statistic Z obtained in the test and N is the total number of cases in two groups (see Karadimitriou & Marshall, 2021). The effect size, $r = 5.931 / \sqrt{200}$ =.42, demonstrated a medium size effect of the group factor on physician intention to adopt telemedicine according to Cohen's classification of effect sizes (Pallant, 2020). This would imply that 42% of the variability in the ranks was accounted for by the group factor.

The MW test demonstrated that the difference between effects of the factors of experience and training on physician intention to adopt telemedicine was statistically significant with medium size effect, $U = 2573$, $p < .05$, $r = .42$, with the higher *M*-rank for the group “training” as compared to the *M*-rank in the group “experience” (124.77 vs. 76.23).

Hypothesis Tests Results. The results of the MW and post hoc Dunn's tests allowed rejection of the H03 which stated that, based on physician scores of intentions to adopt telemedicine, the difference of ranked means in two groups (“experience” and “training”) equals zero. The MW test demonstrated that the difference of ranked means in two groups was not equal to zero (124.77-76.23=48.54). The difference was statistically significant, $U = 2573$, $p < .05$. The post hoc test supported rejection of the H03 in the hypothesis test summary (see Figure 25). Table 17 represents results of the post hoc test in RQ3.

Table 17

Hypothesis Test Summary in the Post Hoc Dunn's Test in RQ3

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of CompositeScore is the same across categories of Group.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Note. Hypothesis test summary was obtained from the SPSS Dunn's test report (Analyze/Nonparametric Tests/Independent Samples Test/Fields/Settings/Mann-Whitney Test).

Answers to Research Questions

RQ1: Based on physician questionnaire scores, what is the relationship between physician experience in telemedicine and physician intention to adopt telemedicine? The relationship between the two variables was statistically significant with large effect size, H (2) = 64.98, $p < .05$, $E^2 = .66$.

Descriptive (comparison of means) and inferential analyses (Kruskal-Wallis and post hoc Dunn's tests) showed that there was a positive correlation between the length of experience in telemedicine and physician intention to adopt telemedicine. Comparison of means demonstrated that the mean scores of physician intention to adopt telemedicine were increasing with the increase of length of their experience in telemedicine: M = 5.93 for category 1 (1-6 months of experience), M = 7.00 for category 2 (7-12 months of experience), and M = 8.09 for category 3 (more than 1 year of experience). Increase in ranked means in the KW test was also associated with increased length of experience (*M*-rank = 22.24 for category 1, *M*- rank =4 9.06 for category 2, and *M*- rank = 79.32 for category 3). Results of the post hoc pairwise comparisons with $p < .05$ for each pair showed statistical significance of the differences between the categories of IV in RQ1.

RQ2: Based on physician questionnaire scores, what is the relationship between the telemedicine training of the physicians and their intention to adopt telemedicine? The relationship between the variables was statistically significant with large effect size, H (2) = 69.96, $p < .05$, $E^2 = .71$.

The descriptive (comparison of means) and inferential analyses (Kruskal-Wallis and post hoc Dunn's tests) demonstrated that online training was the most effective type, and the in-class training was the least effective type. Comparison of means revealed the difference between mean scores of the groups with $M = 9.09$ for the category online training and $M = 6.94$ for the category in-class training. The KW test represented the highest *M*-rank = 78.82 for the category online training and the lowest *M*-rank = 19.30 for the category in-class training. Pairwise comparisons in the post hoc test revealed that the differences in each pair of the categories of IV were statistically significant with $p < .05$ in each pair.

RQ3: Based on physician questionnaire scores, what is the difference between the median scores of the physician group with experience and physician group with training? The difference between the effects of two factors on physician intention to adopt telemedicine was statistically significant with moderate effect size, $U = 2573$, $p < .05$, *r* = .42. Training was found to have a greater effect than experience on the physician's intention to adopt telemedicine. This was supported by the findings of descriptive (means comparison test) and inferential analyses (Mann-Whitney and post hoc Dunn's tests). Based on a comparison of means test, the difference between total means of two groups was 1.04 (8.06 - 7.02 = 1.04). Based on the MW test, the difference between ranked means was 48.54 (124.77 -76.23 = 48.54).

Covariance Analysis

The nonparametric version of ANCOVA, Quade's test, which is also known as ranked ANCOVA, was applied to determine whether the effects of covariates on variables were statistically significant (see Canguri et al., 2018). Because each covariate was an independent cofactor, the Quade's tests were separately performed for each covariate. In a case of simultaneous analysis of multiple covariates, Quade's test produces a combined value *(Unstandardised Residual)* that does not allow for specifying significance of the effect of each cofactor in the test results. A three-steps Quade's test (IBM,2021a; Rehman,2021) was performed for each covariate in RQ1 and RQ2.

RQ1

Result of Quade's test for covariate "location" in RQ1 is presented in Table 18.

Table 18

Quade's Test Result for Covariate "Location of Physician Practice" in RQ1

Tests of Between-Subjects Effects

Dependent Variable: Unstandardized Residual

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	21905.258[a]	2	10952.629	24.620	.000
Intercept	2.650	1	2.650	.006	.939
ExperienceFactor	21905.258	2	10952.629	24.620	.000
Error	43151.742	97	444.863		
Total	65057.000	100			
Corrected Total	65057.000	99			

a. R Squared = .337 (Adjusted R Squared = .323)

Note. Table 18 was obtained from the report of the Quade's test (1-Transform/Rank Cases; 2-Analyze/Regression/Linear; 3- Analyze/GLM/Univariate).

The difference in levels of the IV and the DV was statistically significant when the cofactor of physician practice location was present, F (2,97) =24.62, p=.000. Table 19 shows Quade's test results for covariate "age of physicians" in RQ1.

Table 19

Quade's Test Result for Covariate "Age of Physicians" in RQ1

Tests of Between-Subjects Effects

Dependent Variable: Unstandardized Residual

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	33451.042[a]	2	16725.521	45.717	.000
Intercept	4.443	1	4.443	.012	.912
ExperienceFactor	33451.042	2	16725.521	45.717	.000
Error	35487.701	97	365.853		
Total	68938.744	100			
Corrected Total	68938.744	99			

a. R Squared = .485 (Adjusted R Squared = .475)

Note. Table 19 was obtained from the report of the Quade's test (1-Transform/Rank Cases; 2-Analyze/Regression/Linear; 3- Analyze/GLM/Univariate).

The difference in levels of the IV and the DV was statistically significant when the effect of cofactor of physician age was present, F (2,97) =45.72, p=.000. The result of Quade's test for the covariate "size of physician practice" in RQ1 is represented in Table 20.

Table 20

Quade's Test Result Covariate "Size of Physician Practice" in RQ1

Tests of Between-Subjects Effects

Dependent Variable: Unstandardized Residual

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3449.814[a]	2	1724.907	5.468	.006
Intercept	.338	1	.338	.001	.974
ExperienceFactor	3449.814	2	1724.907	5.468	.006
Error	30600.736	97	315.472		
Total	34050.550	100			
Corrected Total	34050.550	99			

a. R Squared = .101 (Adjusted R Squared = .083)

Note. Table 20 was obtained from the report of the Quade's test (1-Transform/Rank Cases; 2-Analyze/Regression/Linear; 3- Analyze/GLM/Univariate).

The difference in levels of the IV and DV was statistically significant when the effect of cofactor of physician practice size was present, F (2,97) = 5.47, p = .006.

RQ2

Table 21 represents Quade`s test result for covariate "location of physician practice" in RQ2.

Table 21

Quade's Test Result Covariate "Location of Physician Practice" in RQ2

Tests of Between-Subjects Effects

Dependent Variable: Unstandardized Residual

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5685.821[a]	2	2842.911	8.471	.000
Intercept	.024	1	.024	.000	.993
TrainingFactor	5685.821	2	2842.911	8.471	.000
Error	32552.839	97	335.596		
Total	38238.660	100			
Corrected Total	38238.660	99			

a. R Squared = .149 (Adjusted R Squared = .131)

Note. Table 20 was obtained from the report of the Quade's test (1-Transform/Rank Cases; 2-Analyze/Regression/Linear; 3- Analyze/GLM/Univariate).

The difference in levels of the IV and the DV was statistically significant when the effect of cofactor of physician practice location was present, F (2,97) =8.47, p=.000. Table 22 shows the result of Quade's test for covariate " age of physicians" in RQ2.

Table 22

Quade's Test Result Covariate "Age of Physicians" in RQ2

Tests of Between-Subjects Effects

Dependent Variable: Unstandardized Residual

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	45685.492[a]	2	22842.746	84.753	.000
Intercept	.252	1	.252	.001	.976
TrainingFactor	45685.492	2	22842.746	84.753	.000
Error	26143.646	97	269.522		
Total	71829.138	100			
Corrected Total	71829.138	99			

a. R Squared = .636 (Adjusted R Squared = .629)

Note. Table 22 was obtained from the report of the Quade's test (1-Transform/Rank Cases; 2-Analyze/Regression/Linear; 3- Analyze/GLM/Univariate).

The difference in levels of the IV and DV was statistically significant when the effect of cofactor of physician age was present, F (2,97) = 84.75, p = .000. The result of Quade's test for covariate "size of physician practice " is represented in Table 23.

Table 23

Quade's Test Result Covariate "Size of Physician Practice "in RQ2

Tests of Between-Subjects Effects

Dependent Variable: Unstandardized Residual

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7318.383[a]	2	3659.192	12.523	.000
Intercept	.921	1	.921	.003	.955
TrainingFactor	7318.383	2	3659.192	12.523	.000
Error	28343.944	97	292.206		
Total	35662.327	100			
Corrected Total	35662.327	99			

a. R Squared = .205 (Adjusted R Squared = .189)

Note. Table 23 was obtained from the report of the Quade's test (1-Transform/Rank Cases; 2-Analyze/Regression/Linear; 3- Analyze/GLM/Univariate).

The difference in levels of the IV and the DV was statistically significant when the effect of cofactor of physician practice size was present, F (2,97) = 12.52, p= .000.

Summary

In Section 3, the results of the descriptive (comparing means tests) and inferential (Kruskal-Wallis, Mann-Whitney, post hoc Dunn's tests, and Quade's covariance tests) analyses were described. While descriptive analysis allowed for conclusions about relationships between variables and covariates, inferential analysis provided evidence for statistical significance of the relationships with large effect size between the factors of both experience in telemedicine (RQ1) and training in telemedicine (RQ2) and physician intention to adopt telemedicine. The test result in RQ3 showed that the difference of effects of 2 factors (experience and training) on physician intention to adopt telemedicine was statistically significant with medium size effect. Covariance tests (comparison of means) demonstrated that there were relationships between the DVs in RQ1 and RQ2 and a covariates of physician age, practice size, and location. Quade's tests revealed statistical significance of those relationships for each covariate.

Some results of the statistical analysis in this study were unique, such as examining and comparing effects of the multiple cofactors on physician intention to adopt telemedicine (physician age, practice size, and location). The results of the comparisons of means of the covariates (comparing means test) and ranked means (KW tests with post hocs in RQ1 and RQ2) allowed for the detection of the beneficial and detrimental cofactors on physician intent to adopt telemedicine. Another unique finding in this study was the conclusion in RQ3 about the stronger effect of training factor on physician intention to adopt telemedicine compared to the factor of experience in telemedicine. The contribution of the study findings to the DHA fields of knowledge and practice was analyzed in Section 4.

Because the KW and MW tests produced asymptotic *p*-values, which are applicable for the small size groups and could vary from the exact *p*-values obtained from large sample groups (Bodnar & Reis, 2016), the findings of the tests are valid for statistically small groups (i.e., 200 participants in the sample group for this study). Thus, this study represented a valid nonparametric method of assessment of physician intention to adopt telemedicine that could be applied in DHA practice in small and medium size HSOs. The potential for the generalizability and the applicability of the study results for wider population of interest was analyzed in Section 4.

Section 4 represents a comprehensive analysis and an interpretation of the study findings. This section includes the comparison of findings to the peer-reviewed literature, assessment, and explanation of the findings within the context of the theoretical and/or conceptual framework. It contains a description of the limitations of the study, results, and analysis on how the findings could be generalized and applied in professional DHA practice and contribute to positive social change.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative study was to examine, measure, and compare effects of factors of experience and training on physician intention to adopt telemedicine, that is, the outcome variable for all three research questions. Those two factors were identified in the research literature as the leading causal factors for this outcome variable. Results of testing on the effects of the factors of experience (RQ1) and training (RQ2) on physician intention to adopt telemedicine revealed the statistically significant relationships between variables with strong effect size in both research questions. In RQ3, results of the nonparametric versions of the independent *t* test, Mann–Whitney test, were statistically significant, with a medium-size effect difference between those two factors, that is, stronger impact of the factor of training on physician intention to adopt telemedicine with an *M*-rank = 124.77 compared with an *M*-rank = 76.23 for the factor of experience. Further, the cofactors of physician age, practice size, and location (urban or rural) were examined and compared within two groups of physicians (experience and training). The results of the comparative quantitative analysis allowed conclusions on the differences of the factor and cofactor effects, which could be useful in health administration practices for physician engagement in telemedicine. Detailed analysis of significance and applicability of the study findings is presented in this section. Section 4 includes an interpretation of the findings, limitations of the study, recommendations for further research, and implications for professional practice and social change.

Interpretation of Findings

In this study, the health administration approach to analysis of the factors and cofactors for physician intention to adopt telemedicine implied a switch from the "big picture" of telemedicine (business model, strategy, policy) to focus on the particular operations (telemedicine training), workflow problem (identified and described in Section 1 problem of "bottleneck"), and staff characteristics (experience in telemedicine, intention to adopt telemedicine; see Safian, 2014). The main advantages of such an approach were (a) the targeting method for solving the issue of physician resistance to telemedicine integration and (b) the potential economic efficiency with relying on the existing resources of a health care company. This subsection contains an analysis of how this study with a practice-oriented (health administration) approach for analysis of physician intention to adopt telemedicine extended, confirmed, or disconfirmed findings of the research literature, which is reviewed in Section 1.

Findings to Research Literature

Physician Intention to Adopt Telemedicine

Identification of the Problem of Physician Intention to Adopt Telemedicine. According to the latest research, forced by the COVID-19 pandemic, increased engagement of physicians in telemedicine did not eliminate the problem of physician resistance to telemedicine integration in a long-term context (see Alhajri et al., 2021; DePuccio et al., 2021; Miner et al., 2021). The problem of physician engagement in telemedicine was identified in the research literature, which was reviewed in Section 1 of this study. In an analytical report to the CDC, Kane and Gillis (2018) raised the problem of disproportionately low levels of telemedicine integration compared with the high level of patients' demand on telemedicine services and high level of investment in this health care segment. The importance of physician surveys and opinions about telemedicine was recognized in this article. Physician resistance to telemedicine adoption was identified as one of the important barriers to the telemedicine adoption in the reviewed research literature (see Bokolo, 2021; Harst et al., 2019; Hyder & Razzak, 2020; Kissi et al., 2020).

The main distinction of this study is that physician intention to adopt telemedicine was examined as the main barrier or enhancer, depending on its level, to telemedicine adoption in physician practice. Physician intention to adopt telemedicine was selected as the outcome variable in all research questions for analysis of its variability, depending on two main factors of experience and training in telemedicine. Such a selection was justified by the theory (TAM) and health administration practice. In the TAM, the intention to adopt technology is considered as the preceding step to actual use of the technology. In health administration practice, addressing the problem of physician intention to adopt telemedicine is an initial necessary step for solving the existing workflow problem, that is, the so-called "bottleneck" when a high workload cannot be sufficiently processed due to lack of organizational resources in the period of new technology integration.

The health administration approach to the problem of physician resistance to telemedicine differs from the comprehensive approaches with multiple factor analysis in the reviewed research. For instance, Sterling and LeRouge (2019), who applied a comprehensive approach to the problem of telemedicine adoption, concluded that a special business model should be created for the engagement of physicians in telemedicine, whereas in my study, the health care company's resources were considered (experience and training of the physicians). In accordance with the health administration approach, physician intention to adopt telemedicine was selected as the main outcome variable, and existing resources, experience and training, were selected as the main factors. Such selection of variables in the study allowed feasible analysis with results that could be applicable in health administrative practice.

This study targeted a physician-oriented approach, in which physician intention to adopt telemedicine was the single main outcome variable and differs from the reviewed research in which multiple barriers against telemedicine integration were analyzed (see Morilla et al., 2017; Nguyen et al., 2020; Tsai et al., 2019). Evidently, the research on multiple factors and multiple outcomes in the process of telemedicine adoption had a more abstract cognitive value than practical value for solving the problem of physician intention to adopt telemedicine. The distinction of this study is the increased practical value of the findings. This study, in which the level of physician's intention to adopt telemedicine was recognized as the main cause for success/failure of telemedicine adoption, extended the physician-oriented approach to this problem in the research literature (see Bokolo, 2020; Hyder & Razzak, 2020; Sukel, 2019).

Methods for Evaluation of Physician Intention to Adopt Telemedicine. In this study, the appropriateness of the survey method and cross-sectional design for analysis of physician intention to adopt telemedicine was confirmed. Survey is a popular method for the assessment of physician opinions about telemedicine in the reviewed research (see Hollander & Neinstein, 2020; Saiyed et al., 2021; Yu et al., 2021). Whereas in the reviewed research literature, the results of comprehensive physician surveys about multiple barriers to telemedicine adoption were discussed (see Nquyen et al., 2020; Phillips et al., 2018; Tonn et al., 2017), the survey, which was applied in this study, contained specific narrow questions about physician intentions to adopt telemedicine. The data derived from the NoMAD questionnaire with specific narrow questions allowed me to answer specific research questions about factors that affect physician intention to adopt telemedicine. Such a form of survey increased significance of the findings. For comparison, surveys with questions about multiple factors and outcomes for telemedicine adoption (see Morrila et al., 2017; Phillips et al., 2018; Tonn et al., 2017) represented data with unclear cause–effect relationships and, therefore, low significance for practice. Thus, the main distinctions of the survey method applied in this study were specified questions and data, which made it possible to examine cause–effect relationships between the variables, answer the research questions, and obtain significant research results about the effect of training on physician intention to adopt telemedicine.

This study with nonprobability selection and nonparametric testing differed from the reviewed research literature in which probability selection was applied, and results of the parametric tests were discussed. The advantage of nonprobability selection and nonparametric tests is the ability to perform robust examination of physician opinions when research is conducted in statistically small- and medium-size groups up to 200 physicians, as it was in this study. Descriptions of Kruskal–Wallis and Mann–Whitney tests with Dunn's post hoc and nonparametric Quade's tests for covariance represented a comprehensive model of nonparametric testing of the effects of the factors and cofactors on physician intention to adopt telemedicine for statistically small- and medium-size groups. The example of nonparametric testing, which was represented in this study, extended knowledge about quantitative methods described in the reviewed literature about telemedicine adoption.

Measuring Physician Intention to Adopt Telemedicine. The applicability of the Likert scale measurements for quantitative research was confirmed in this study. In almost all reviewed research, 5- to 6-point Likert scales were applied, except Morilla et al. (2017) with a 10-point Likert scale for survey questions. The advantage of the 10-point Likert scale is the better opportunity for assessment of the variability of physician opinions. Also, the 10-point scale provides sufficient gradation for categorical data. In this study, the 10-point Likert scale was selected as the most appropriate for the survey; while applied in this study, the NoMAD questionnaire offers a 5-point scale for assessment of clinician opinions about new technology adoption (see Finch et al., 2015;

Vis et al., 2019). In this study, the applicability of the Cronbach alpha test for consistency of the survey data was confirmed (see Schrepp, 2020; St. Andrews University, 2021). Thus, the study extended knowledge on measuring physician intention to adopt telemedicine by providing an adjusted improved instrument, that is, NoMAD questionnaire with 10-point Likert scale.

Factors and Cofactors for Physician Intention to Adopt Telemedicine

This study differs by an optimized limited number (two) of the selected most influential factors and cofactors for the outcome variable of physician intention to adopt telemedicine, whereas the reviewed research represented comprehensive models with multiple factors affecting the level of telemedicine adoption (see Phillips et al., 2018; Tonn et al., 2017; Tsai et al., 2019). Selection and results of examining the factor of experience in this study confirmed the findings, that is, that previous experience in telemedicine, was one of the most influential factors for the level of telemedicine adoption (see Marshall & Bidmead, 2018; Morilla et al., 2017; Silver et al., 2021). Selection and results of examining the factor of training in this study confirmed findings, which indicated the growing importance of training in the process of telemedicine adoption (see Bokolo, 2020; Doarn et al., 2019; Kirchberg et al., 2020).

This study further extended knowledge on the role of training in the process of telemedicine integration by providing quantitative supporting data and by justification from the viewpoint of theory of DOI. Only two articles from the reviewed research referenced DOI in the discussions, which were not related to the training factor (see

Dedehayir et al., 2017; Ross, 2020). Despite limited popularity and criticism from researchers toward DOI, the concept of this theory was useful as a theoretical background for the conclusion on the growing importance of training in the process of new technology, particularly, telemedicine adoption.

The study extended knowledge on factors for telemedicine adoption. The method of quantitative comparative analysis of the factors in this study differed from the descriptive method, which was applied in the reviewed literature. Nonparametric Mann–Whitney test, analogous to independent samples *t* test, was applied in this study and produced results with higher reliability compared with the results of the test, that is, comparison of means, which was used in the reviewed literature to compare effects of factors on the adoption of telemedicine (see Morrila et al., 2017; Phillips et al., 2018; Tonn et al., 2017).

Selection of the covariates and results of tests for covariance in this study confirmed the findings on the importance of those specific cofactors in analytical reports and research literature. Physician age, practice size, and location (urban or rural area) were considered as characteristics affecting the level of telemedicine integration (see American Well, 2020; Kichloo et al., 2020; The Physicians Foundation, 2021). The study results confirmed that the intention of the physician to adopt telemedicine is higher in large-size healthcare services organizations (HSOs), similar to findings in reviewed literature (see Finnegan, 2018; Kane & Gillis, 2018). The study results on the higher physician intention to adopt telemedicine in urban areas supported similar findings in the reviewed research literature (see Chen et al., 2020; Zachrison et al., 2020). The quantitative test (comparison of means) revealed the same result as in the annual 2020 consumer report from American Well (2021a) in that the physician age category, that is, 35 to 44 years old has the highest rate of intention to adopt telemedicine compared with other physician age categories.

In conclusion, three main distinctive characteristics of this study could be highlighted. The first distinction is the implementation of the targeted physician-oriented approach with selection of physician intention to adopt telemedicine as an outcome variable. The second positive difference is that, unlike the comprehensive models for analysis of the multiple factors for the multiple barriers to telemedicine adoption, this study represented an optimized model, which contained one outcome variable that characterized the step preceding actual use of telemedicine, two main factors, and three important cofactors for this outcome variable. It allowed me to examine the cause–effect relationships between the outcome variable and two main factors with comparison of their effects. The third distinction of this study is the quantitative conclusion about the leading effect of the training factor on physician intention to adopt telemedicine. The RQ3 result demonstrated that the difference between the effects of the factor of experience and the factor of training on physician intention to adopt telemedicine was statistically significant with moderate effect size, $U = 2573$, $p < .05$, $r = .42$. The factor of training had a stronger impact on physician intention to adopt telemedicine with *M*-rank = 124.77 compared with *M*-rank = 76.23 for the factor of experience. For comparison, in some research, statements about the increased role of training in telemedicine were justified by the theory only (TAM) with abstract reasoning and without quantitative evidence (see Bokolo, 2020; Sterling, 2019). Other research contained quantitative characteristics of the effects of factors with approximate conclusions on the differences between the factors (Doarn et al., 2019; Kirchberg et al., 2020; Vaughan et al., 2019). Overall, the study extended the knowledge on training in the process of telemedicine adoption.

Findings to Theory

The theoretical foundation of the study was the TAM (Davis, 1989). The main idea derived from TAM was in regard to the meaning of intention to adopt technology as a preceding step for actual technology use. In the study, the relationships between two components of the TAM were examined, that is, external factors (experience and training in telemedicine) and intention to adopt new technology for telemedicine. While in the original version of TAM, factors were not specified (see Figure 1); in this study, two main factors for intention to adopt telemedicine were selected and examined. By including the specified factors, this study confirmed the trend in the later developments of TAM (TAM-2, TAM-3) in which multiple specific factors for the intention to adopt new technology were included (see Kamal, 2920). For instance, TAM-3 contains 13 specific factors for intention to adopt new technology (see Venkatesh & Bala, 2008). Whereas the later developments of the Davis's TAM model introduced numerous external factors (Lai, 2017), in this study, the main two factors for the intention to adopt new technology, that is, telemedicine, were analyzed. Thus, the potential contribution to TAM development could be the introduction of an optimized model, which included main causal factors only. Such a model allows feasible quantitative examining of cause–effect relationships and comparison of factor effects on the outcome variable.

Unlike TAM, the elements of Rogers's theory of DOI were not integrated into the study construct. While the DOI concept about five groups of new technology adopters was not replicated in this study, it did confirm the behaviorist DOI idea that adopters have different individual attitudes toward new technology (Rogers, 1983). A physician-oriented approach, which was applied in this study, was justified by the behaviorist idea of the DOI in that individual specific of adopters affect the process of innovation integration. Further, the study results confirmed the concept of DOI that training becomes increasingly important when groups other than innovators, with higher resistance to new technology (early majority, late majority, and laggards) enter the process of new technology adoption (Rogers, 1983).

The study concluded that training minimized the difference between various categories of physicians–adopters (urban and rural) and extended DOI concepts about groups of adopters and role of training. The study further demonstrated that training provides intergroup dynamics, whereas DOI does not present ideas about intergroup dynamics. Results of covariance analysis in this study revealed the limitations of DOI, where the objective factors, for instance, location (urban/rural) and organizational form (physician practice size), were not considered. Overall, in this study, the DOI individual approach to adopters and the concept about the growing role of training in the process of innovation adoption were confirmed. The rigid approach to defining groups of adopters and stages in the process of technology adoption was disconfirmed.

Limitations of the Study

Generalizability Limitations

In this study, two potential limitations to generalizability of the findings were identified. The first limitation was related to selection bias, which occurs when a sample does not reflect the characteristics of the target population (Asiamah, 2017), e.g., geographic location, socioeconomic, and ethnocultural (physicians in the countries in the post-Soviet area in Central Asia and Western Europe), which differed from the relevant characteristics of the target populations (US physicians). Meanwhile, as described in Section 3, accessible and target populations had one distinctive characteristic in common, i.e., intensive process of telemedicine integration on the growth stage with high patient demand for services and with the problem of physician resistance to the adoption of telemedicine. Sharing at least a single attribute of interest makes study participants eligible members of a wider population of interest, i.e., target and general populations (Creswell & Creswell, 2018). Thus, the shared problem of physician resistance to telemedicine adoption during its robust integration on the stage of growth allowed generalization of the study findings to the target population. Because this problem is international (see Bokolo, 2021; Morrila et al., 2017; Mugo, 2017), the study findings could be also generalized to the general population, international community of physicians in countries with similar stages of telemedicine development.

For reducing potential limitation to generalizability of the study findings due to selection bias, purposive homogeneous sampling (Sharma, 2017) was selected. This type of sampling implies replication of the sampling criteria, which were applied in the research literature and statistical reports on target population. Such type of sampling provided feasibility of the comparisons between the study results and relevant characteristics of the target population, which were previously revealed in the research literature and analytical reports. Comparisons demonstrated that types of relationships between physician intention to adopt telemedicine (DV) and specified factors and cofactors were similar among the target population and the study group, i.e., positive correlations between factors (experience and training) and the DV, greatest effect of an online form of training, higher DV level in subcategory urban area compared with subcategory rural area, and the highest level of DV in the age category 35 to 44 years old. Similarities in the relationships between specified factors and cofactors and physician intention to adopt telemedicine among target and accessible populations provided evidence for generalizability of the study findings. Thus, limitations due to selection bias were minimized in this study to the degree that makes generalizability possible.

The second limitation to the generalizability of the study findings was related to the nonprobability type of selection. The nonparametric tests (Kruskal–Wallis tests for RQ1 and RQ2 and Mann–Whitney test for RQ3), for which normal distribution was not an assumption, produced asymptotic significance, which uses an approximation to the true distribution. The asymptotic *p-v*alue, which was derived from the testing in a statistically small study group (200 questionnaires), could differ from exact *p*-values, which use true distribution in large groups (Vasileiou, 2018). Because of potential difference in significance levels (asymptotic *p*-value for small group and exact *p*-value for large group), the limitation to generalizability of the study findings to large population groups exists. Thus, the limitation to the generalizability of study results was applicability of the findings to the small- and medium-size groups of physicians (up to 200) within the target or/and general population. Other potential limitations to generalizability of the study findings might exist due to factors not assessed in this study, e.g., financial (reimbursement), legislative, and others, for physician intention to adopt telemedicine.

Validity Limitations

Potential limitations to the study external validity in this study were related to the specifics of the secondary data set, which was obtained with application of nonprobability sampling, survey method, and cross-sectional design. The identified potential limitations for internal validity were related to nonrandom purposive selection, nonparametric testing, and regression to means due to outliers. Results of the implementation of the planned approaches in Section 2 for elimination or reduction of the potential threats to validity are described in this subsection.

External Validity

Two concepts of the external validity, i.e., generalizability and applicability, refer to the extent to which study results can be applied in other settings. While generalizability of the study findings refers to the target and general population, applicability refers to the other practices and research in the specific field, which were examined in the study (Baldwin, 2018). Applicability limitations have been minimized in this study, but they remain due to specific characteristics of the secondary data set such as nonprobability sampling, survey design, and cross-sectional study.

The external validity limitation due to nonprobability (purposive) selection was reduced here by the large size of the accessible population (about 5000 physicians) and randomized selection of physicians for the defined categories. The reached significance level, $p = .000$, in tests results for all research questions, supported the conclusion about statistical significance and, therefore, applicability of the findings. Meanwhile, obtained asymptotic significance induced an important limitation to applicability of the study findings to large groups of physicians. Thus, the study results could be applied in small- and medium-size physician practices and statistically small study groups in research.

This study carefully addressed limitations related to the survey method by application of a modified 10-point NoMAD questionnaire for better assessment of variability of physician opinions and with 10-minute video instruction for participants on how to apply the questionnaire. The data provider implemented a Cronbach alpha test for testing consistency of the questionnaires and outliers. Those approaches allowed reaching the statistical significance of test results with *p* = .000 in all research questions. Such test results provided evidence for validity of the study findings. Meanwhile, the remaining intrinsic limitations of the survey validity included inability to represent the changes and development and inability to exactly repeat test results in different settings (see Harrison & Azama, 2020).

Due to cross-sectional design, there was limited applicability of the study results to other stages of telemedicine integration, except the stage of adoption. The study findings are applicable to those practices and research that deal with the problem of physician resistance to telemedicine adoption at the stage of growth (nonintroductory and nonmaturity stages).

Internal Validity

The level of trustworthiness of the cause–effect relationships between variables in the study could be considered as sufficient due to reached test results with *p* = .000 in all research questions with large effect size in the Kruskal–Wallis test in RQ1 and RQ2 and medium-size effect in the Mann–Whitney test in RQ3. Quade's tests for analysis of covariance, a nonparametric equivalent of the ANCOVA test, revealed statistical significance, $p < .05$, for each of three covariates in all research questions. Meanwhile, nonparametric tests that use approximation to the true distribution produce results with less trustworthiness compared with the parametric tests using true distribution (Creswell & Creswell, 2018).

Overall, limitations of the study validity were caused by the above-mentioned specifics of the secondary data set and study construct. The study construct was developed for analysis of separate factors and cofactors, which were recognized in the research literature as the most influential for physician intention to adopt telemedicine. Thus, the first limitation of the construct validity was a lack of comprehensive analysis of all factors for physician intention to adopt telemedicine. The second construct limitation was that explanations of the reasons behind the findings were not sufficiently represented.

Reliability Limitations

Reliability of the study findings depends on the degree to which the result of a measurement or calculation can be accurate and trustworthy (Mohamad et al., 2015). Limitations to the reliability of measurements in this study were related to the nonprobability selection, survey method, and specifics of the tool for measuring physician intention to adopt the telemedicine-NoMAD questionnaire. The limitation to trustworthiness of the measurement of physician intention to adopt telemedicine due to nonprobability selection was reduced with calculation within the large group of the accessible population (about 5000 physicians) and randomization of participants selection.

Reliability limitations due to the survey method, e.g., inconsistency of answers, were reduced and controlled by the system of approaches. First, the NoMAD questionnaire was selected as recognized by the researchers' tool with verified consistency of the questions for measuring clinician intention to adopt new technology. The second approach for reducing inconsistency of the answers was a training video for participants, which the data provider introduced. This video contained an explanation on how to use the 10-point Likert scale and why it was important to provide personal opinions without reporting on the practice level. Meanwhile, due to intrinsic limited objectiveness of the survey data, inconsistency of answers was not completely eliminated. For example, the initial survey process resulted in rejection of 20% of the questionnaires (40 out of 200) due to not passing the Cronbach alpha test. Thus, the reliability limitation related to the survey method was not eliminated in this study, but it was controlled by rejection of inconsistent physician questionnaires with application of Cronbach alpha test (Mohamad et al., 2015). The accuracy of the measuring physician opinion to adopt telemedicine could be limited because of application of the NoMAD questionnaire, which was designed for the broader goal of measuring clinician intention to adopt new technology. Some specifics of physician opinions about telemedicine adoption might not be reflected in the NoMAD questionnaire.

Recommendations for Further Research

Recommendations Grounded in Strengths of the Study

Selection of physician intention to adopt telemedicine as the outcome variable in this study was a response to the identified research problem of underestimated physician opinion in the process of telemedicine adoption (see Bokolo, 2021; Harst et al., 2019; Hyder & Razzak, 2020; Kissi et al., 2020). The contribution to solving the problem of underestimated physician opinion in the process of telemedicine adoption could be methodological study, which will aim to examine physician opinions as a measure in the process of telemedicine services assessment. As introduced in research reviews, existing frameworks for assessment of telemedicine and eHealth lack this important measure, i.e., physician opinion (see Enam et al., 2018; Lau & Kuziemsky, 2017; Villumsen et al., 2020). In the NFQ's framework for assessment of eHealth and telehealth, which is recognized as a national framework for telemedicine assessment, physician opinion was not represented in the list of recommended measures, as introduced in Appendix B (National Quality Forum, 2021).

The strength of this study was that the effective positive factor for physician intention to adopt telemedicine was identified and examined. It was revealed that telemedicine training had a stronger effect on physician intention to adopt telemedicine than the factor of experience in telemedicine. Further research could extend knowledge about the methods of telemedicine training. The technology integration matrix (TIM) (Florida Center for Instructional Technology, 2005; Shaw et al., 2018) might be a theoretical framework for the future study of various training methods for physician engagement in telemedicine, depending on the specific stages of telemedicine integration. While this study concerns the period of adoption for telemedicine, in future research, the next stages of the process of telemedicine integration might be examined with a focus on matching training methods for physician engagement in telemedicine. Further, avenues for additional research could include examining the effects of other important factors for physician intention to adopt telemedicine, e.g., reimbursement policy, interprofessional network, and federal and state legislative regulation of telemedicine.

Recommendations Grounded in the Limitations of the Study

The main limitations to applicability, validity, and reliability of the study findings were related to nonprobability selection, survey method, and cross-sectional design. In future research with probability selection, it will be possible to eliminate limitations of the findings' applicability to large-size groups within the target and general population. The exact *p*-value, which will be produced in the parametric tests equivalent to nonparametric Kruskal–Wallis and Mann-Whitney (one-way ANOVA and independent samples *t*-test), will allow applicability of the test results for large groups.

In future research, the application of cross-sectional design will remain a feasible and effective form of in-process evaluation of telemedicine adoption. Repeated cross-sectional assessments about physician intention to adopt telemedicine will reduce the main limitations of the cross-sectional design, i.e., simultaneous results of the exposure and outcome, which reduces opportunity for analysis of cause–effect relationships (Creswell & Creswell, 2018). Future longitudinal research will allow conclusions about changes in physician intention to adopt telemedicine and better opportunities for cause–effect analysis of the variables. Also, the more reliable form of questionnaires for future research could be a new variant of the NoMAD questionnaire, which will contain specific questions about telemedicine adoption instead of general questions about adoption of new technology in health care.

Implications for Professional Practice and Social Change

This study aimed at addressing the barrier of physician resistance to adoption of telemedicine in a long-term context based on a behaviorist approach with Rogers's technology acceptance model (TAM) as a theoretical framework. Popularity of TAM in the research literature about telemedicine adoption supports the idea that resistance of physicians became the main obstacle against telemedicine adoption in the described time period with high demand on telemedicine services among patients, vast investments in this health care segment, favorable reimbursement policy and interstate rules for telemedicine. The theory of diffusion of innovations (DOI) provided insight that the groups of the new technology adopters other than innovators intrinsically possess different degrees of resistance to innovation and require training in the process of new technology adoption. Meanwhile, analysis of reasons for physician resistance is not this study's objective. The main practical goal is to examine and find the most effective resource, or factor, for a health care company to minimize physician resistance to telemedicine adoption. It is commonly known and supported by the research literature that experience and training are the two main company resources or factors that aid in the adoption of new technology, particularly, telemedicine. In this study, quantitative analysis allowed me to answer what were the significance and effect size of relationships between those two main factors and physician intention to adopt telemedicine. Results of the quantitative correlational and comparative analyses provided useful information for health administration practice in telemedicine. Increasement of the level of telemedicine adoption by physicians will have implications for positive social change.

Professional Practice

Empirical Implication for Health Care Management

Telemedicine Training. The study findings about the factor of training on physician intention to adopt telemedicine implies that health care administrators, whose one of the competencies is staff training (Western Governors University, 2021), should transfer from awareness of the positive effect of training to developing and running companies' telemedicine training programs. As defined in Section 1, the company training differs from introductory-level training for clinicians' licensure in telemedicine. The main focus of a company's telemedicine training, as described in Section 1, should be on motivation for telemedicine adoption, providing knowledge and skills that should be relevant to the current stage of the telemedicine integration. While detailed analysis and conclusions about the content of a company's telemedicine training program are not this study's objectives, one important need of physicians could be mentioned and considered in a company's telemedicine training program. As the study survey revealed, many physicians–respondents indicated a lower-than-average score for the question: "I have confidence in other people's ability to use telemedicine." Also, the research literature identified the physicians' need for interprofessional training in telemedicine (DePuccio et al., 2021). Thus, in addition to the defined characteristics of the telemedicine training program, the interprofessional approach should also be utilized.

Resources Efficiency. Company telemedicine training, especially interprofessional training, seems to be a resource-consuming approach in solving the issue of physician resistance to telemedicine adoption. Meanwhile, the meaningfully higher effectiveness of the training compared with the effect of experience in telemedicine, eliminated this apparent disadvantage. Implementation of online training, which is the most effective form of training, according to the study findings, will be more cost-effective than on-site training. One more important implication of online company training is that, according to study findings, it will reduce the difference between the levels of physician intention to adopt telemedicine in urban and rural areas. Thus, online telemedicine training should be applied in rural physician practices as a measure for reducing the negative effect of scarce economic resources for telemedicine integration compared with urban areas.

Workflow Problem. The study findings about the meaningful effect of training on physician intention to adopt telemedicine has positive implications for solving the existing workflow problem in telemedicine, the so-called bottleneck which is described as inability of physicians to process a heavy workload in telemedicine due to objective and subjective reasons. Objectively, lack of physicians is a traditional problem for health care, which worsened during the COVID-19 pandemic. Additionally, in 2020, 28% of physicians reported unexpected retirement due to drastic changes in physician practices (Reynolds, 2021). Thus, elimination of the resistance of physicians toward telemedicine is crucial for improvement in telemedicine workflow. According to the study findings, telemedicine training has potential to meaningfully increase physician intention to adopt telemedicine by minimum 42% based on the calculated effect size for the Mann–Whitney test, $r = .42$.

Sustainability of Physicians Practices. The adoption of telemedicine is seen as a way to reverse the devastating impact of COVID-19 on physician practices (Blumenthal et al., 2020). By April 2020, 97% of physicians who participated in the national survey reported a drop in patient volumes; 71% of physicians reported a 50% or more drop in patient volume (Reynolds, 2021). At the same time, in 2020, the increase in volume of telemedicine patients was meaningful but had lower than 50% drop in patient volume in many physician practices. For example, the number of Medicare patients served via telemedicine increased from less than 1% in 2019 to 39% in 2020 (American Medical Association, 2021). Thus, telemedicine adoption is crucial for sustainability of physician practices, whereas the reached level of its adoption is still insufficient (American Medical Association, 2021). The implication of this study for physician practices is that company training will elevate physician intention to adopt telemedicine and, therefore, will increase sustainability of physician practice. The study findings on the effect of telemedicine training could be applicable for all size physician practice (up to 200 physicians in a study group). Specifically, the implication of telemedicine training will be important for small- and medium-size physician practices for reversing the negative difference in economic and administrative resources compared with larger-size practices.

Methodological Implications

The approaches to selection, processing, and analyzing the data in this study have wider methodological implications and might be applied for the evaluation of the telemedicine adoption in the field of health care administration. Purposive nonprobability sampling method (Sharma, 2017), which was applied in this study could be recognized as the most appropriate type of selection for examining health administration problems. Usually, the focus of a health administrator is on opinions and/or characteristics of specific, statistically small groups of health care specialists without need for probability selection within a large population. According to sample group size calculation in this study, the minimum required number of survey participants should be 68 for running ANOVA or ANOVA analogous nonparametric Kruskal–Wallis tests. If the physician practice has less than 68 physicians, the additional suggestion for sampling method will be purposive homogeneous selection with collecting the data within the groups resembling the characteristics of the target group (Sharma, 2017). Justified in this study, purposive homogeneous selection could be recommended as an optimal type of sampling for analysis and answering questions related to health care administration. This sampling method could be widely applied for evaluation of the level of physician intention to adopt telemedicine within physician practices, including small- and medium-size practices.

As noted, nonparametric testing is not popular in the research on telemedicine integration. In the reviewed literature, nonparametric testing was not represented. Meanwhile, it should be applied more widely along with nonprobability sampling in quantitative studies about health administration problems. This study's contribution to research methodology in the field of health care administration is that a comprehensive model of nonparametric testing was represented as an example for other researchers in this field. It included a correlation test (Kruskal–Wallis) and comparative test (Mann–Whitney) with post hocs and test for covariance (ANCOVA) with post hocs.

The study represented a balanced construct, which allowed us to minimize disadvantages of nonprobability sampling and testing. While nonparametric testing applies a higher level of approximation compared with parametric testing (Pallant, 2020), the targeting approach in this study with the purposive homogeneous sampling allowed us to obtain more accurate survey data. Further, the methodological implication of this study is wider application of purposive sampling and nonparametric testing, which allows robust research in the field of health care administration, including small- and medium-size physician practices.

Theoretical Implications

The technology acceptance model (TAM) (Davis,1989) was applied as a theoretical framework for the study. Unlike the modern developments of TAM, which include multiple factors for BI (behavioral intention to use new technology), the effects of two main causal factors (experience and training) on physician intention to adopt telemedicine were examined in this study. As a result, the feasibility and effectiveness in analyzing cause–effect relationships between variables were reached. The implication of such a variant of TAM with two main causal factors is robustness of the research results and applicability of the findings to the health care administration field. In general, implication of this study to the TAM developments is increased effectiveness and practical value of such an optimized model.

Two concepts of the theory of diffusion of innovations (DOI) (Rogers, 1983) were applied in this study for justification of the meaning of training factor for adoption of telemedicine. One concept was about individual behavioral approaches of the adopters to innovation. The second concept was about the increasing role of training in the process of innovation integration. Study findings about intergroup dynamics disconfirmed the DOI's rigid principle of dividing adopters into groups and process of innovation into periods. Due to characteristics of the telemedicine integration as a disruptive process which requires systemic ongoing improvements (Olson et al., 2019), the idea of iterative company telemedicine training for physicians was justified in this study. Thus, theoretical implication of this study could be adoption of the idea about iterative company telemedicine training for clinicians. This problem was not previously discussed in the reviewed research literature.

Positive Social Change

The positive implications of this study's findings will be induced by increased levels of physician adoption of telemedicine. As the comparative quantitative test demonstrated, company training increases physicians' intention to adopt telemedicine with an effect size $r = .42$ compared with the group of physicians without such training. Increased levels of physician engagement in telemedicine, which will be reached by providing telemedicine training, will bring about positive social changes on organizational and practice levels and for health care systems in general.

Company-Level Positive Social Changes

Health Administrator–Physician Relationships. Increased physician intention to adopt telemedicine and following physician engagement in telemedicine will induce changes in the roles of health care administrators and physicians. The study findings imply that health care administrators should transfer from awareness on the usefulness of company training to developing and implementing telemedicine training for physicians. Telemedicine training will impact the roles of health administrators and physicians. Health administrators will take on the role of facilitators of the company's telemedicine training. Facilitation of the iterative interprofessional company training in telemedicine should be a constant focus of their professional duties. For physicians, higher levels of engagement in telemedicine will increase their independence and responsibility for quality, safety, and the continuum of care in each patient's case. As a disruptive multimodal process that affects all parts of the treatment process (assessment, diagnostics, treatment delivery and monitoring), telemedicine necessitates such a change in the role of physicians.

Patient–Physician Relationships. Increased engagement of physicians in telemedicine, as a result of company training, will increase patients' use of telemedicine, which will lead to democratization of health care. This process is defined as increased patient engagement in the treatment process with opportunities for health-related information and decision-making (Safaei, 2015). As the shift toward patient-centered, individualized, and more democratic health care becomes associated with telemedicine integration (Mason, 2021), company telemedicine training will contribute to this positive change. This study provided evidence about the important role of physicians in telemedicine, as opposed to the vulgar technocratic ideas about "dehumanized" health care in which AI replaces health care specialists (Dalton-Brown, 2020); thus, this study justified the importance of physician opinion in the process of telemedicine adoption; further, the feasible method of quantitative examining physician opinion on this process was introduced.

Practice Level Positive Social Changes

Implementation of company telemedicine training will elevate the level of physician intention to adopt telemedicine; thus, the actual use of telemedicine will also be increased. Researchers consider that telemedicine provides sustainability for physician practices, especially among small- and medium-size practices (Lexa & Golding, 2021). This sustainability is important for society, as this type of HSO is effective for delivery of health services to patients in rural areas, ethno-cultural communities, and in communities with vulnerable populations (Crump et al., 2017). Thus, implementation of company telemedicine training for physicians will contribute to the sustainability of the physician practices and their ability to serve diversified groups of the population.

Implications for Health Care Systems

The main implication of this study's findings for health care systems could be reduced inequality in access to health care services. Increased intention of physicians to adopt telemedicine, as a result of company training and engagement in telemedicine, will improve access to health services via telemedicine for patients with limited mobility due to age and health status, epidemic and pandemic quarantines, and for those who live in health professional shortage areas (HPSA) with long waiting lists for physician appointments and/or long distances to medical offices. Better access to health care via telemedicine will decrease disparities between rural and urban areas. For instance, the current ratio of inequality in access to face-to-face physicians' appointments is .42 (13 physicians per 10,000 population in rural areas and 31 physicians per 10,000 population in urban areas [National Rural Health Association, 2021]). Telemedicine eliminates this inequality by providing equal opportunity for health services via telemedicine (CDC, 2021). Overall, the implications of the study's findings for social positive change could be equality of access to health care service and increased democratization of health care systems and patient roles.

Conclusion

This study aimed at addressing existing knowledge gaps on the factors for physician intention to adopt telemedicine. Despite the identified importance of physician intention to adopt telemedicine, the factors affecting it have been insufficiently investigated (Hyder & Razzak, 2020). While factors of experience and training were identified as important, previous literature lacked quantitative correlational and comparative analyses of those factors on physician intention to adopt telemedicine. Unlike the comprehensive approach in the literature with descriptive analysis of multiple factors for multiple outcome variables related to the process of telemedicine adoption, the approach in this study was more feasible with robust results and increased practical value. Here, an optimized variant of the technology acceptance model (TAM) with two main causal factors of experience and training and outcome variable of physician intention to adopt telemedicine was represented. Inferential correlational and comparative analyses demonstrated results on statistical significance and large-size effects of the selected factors on the outcome variable. Thus, this study addressed the research gap in the factors for physician intention to adopt telemedicine by creating and utilizing an optimized variant of Davis's technology acceptance model (Davis, 1987), which was a theoretical framework for this study.

The main practical value of the research results for a health care administration is that an influential positive factor for physician intention to adopt telemedicine was revealed. According to the comparative analysis (Mann–Whitney test), 42% of variability, i.e., increase of physician intention to adopt telemedicine, was associated with the factor of company training. Such findings should imply a shift from awareness of health care administrators about the usefulness of telemedicine training to the development and implementation of company telemedicine training for physicians. Introduced in this study purposive selection method, a survey method with an adjusted

NoMAD questionnaire with a 10-point Likert scale, cross-sectional design, and nonparametric comprehensive testing could be utilized as a framework for evaluation of physician intention to adopt telemedicine and setting goals for a company's telemedicine training. The topic and study findings will be significant for the long term due to the continuous process of telemedicine adoption and objective need for iterative company training in telemedicine for physicians. The most important implication of this study's findings for positive social change could be elimination of inequality in the access to health care services by providing telemedicine for numerous population groups with limited mobility due to health status, pandemic, age, or due to remote location.

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