ORIGINAL ARTICLE

Telemedicine Education Amidst COVID-19: Review of Literature and Call to Action

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Background: In the presence of COVID-19, telemedicine is being utilized to limit person-to person spread. Unfortunately, despite this increase in utilization, the amount of training provided to healthcare professionals has not increased with it creating a gap between user and machine. To combat this problem, the American Medical Association has called for an increase in formalized training for telemedicine. The purpose of this literature review is to provide more recent examples of telemedicine education techniques in order to close this training gap and give providers the tools they need to succeed in the new COVID-19 world.

Methods: The authors conducted a retrospective literature review in the United States during April through June of 2020 by searching the PubMed (MEDLINE) database for publications pertaining to telemedicine education and training. After review, 10 pieces of literature were analyzed for methods and skills taught in telemedicine, means to assess competency as well as future directions.

Results: This study identified a broad scope of skills to be taught from orientation to technology, to patient interaction methods, as well as the current medico-legal guidelines. Using standardized assessments and being supervised by trained physicians, there is a role for telemedicine to be incorporated into formal curricula.

Conclusions: While it is accepted that telemedicine increases access to care, this does not translate to an increase in quality of care. One of the ways to close that gap is by optimizing training. This work provides examples of how telemedicine can be incorporated across all healthcare disciplines.

Keywords: Communication Skills, Computers, Simulation, New Technology, Curriculum Development/Evaluation

تعليم التطبيب عن بعد وسط COVID-19: مراجعة الأدب والدعوة إلى العمل

الخلفية: في وجود COVID-19 ، يتم استخدام التطبيب عن بعد للحد من انتشار المرض من شخص لآخر. لسوء الحظ ، على الرغم من هذه الزيادة في الاستخدام ، فإن مقدار التدريب المقدم لأخصائيي الرعاية الصحية لم يزداد مع خلق فجوة بين المستخدم والآلة. لمكافحة هذه المشكلة ، دعت الجمعية الطبية الأمريكية إلى زيادة التدريب الرسمي على التطبيب عن بعد. الغرض من مراجعة الأدبيات هذه هو تقديم أمثلة أحدث لتقنيات تعليم التطبيب عن بعد من أجل سد فجوة التدريب هذه ومنح مقدمي الخدمات الأدوات التي يحتاجونها للنجاح في عالم COVID-19 الجديد.

الأساليب: أجرى المؤلفون مراجعة أدبية بأثر رجعي في الولايات المتحدة خلال الفترة من أبريل إلى يونيو من عام ٢٠٢٠ من خلال البحث في قاعدة بيانات PubMed (MEDLINE) عن المنشورات المتعلقة بالتعليم والتدريب في مجال التطبيب عن بُعد. بعد المراجعة ، تم تحليل ١٠ قطع من الأدبيات للطرق والمهارات التي يتم تدريسها في التطبيب عن بعد ، ووسائل تقييم الكفاءة وكذلك الاتجاهات المستقبلية.

النتائج: حددت هذه الدراسة نطاقًا واسعًا من المهارات التي يجب تدريسها من التوجيه إلى التكنولوجيا ، إلى طرق التفاعل مع المريض ، بالإضافة إلى الإرشادات الطبية القانونية الحالية. باستخدام التقييمات الموحدة والإشراف من قبل الأطباء المدربين ، هناك دور للتطبيب عن بعد ليتم دمجه في المناهج الدراسية الرسمية.

الاستنتاجات: في حين أنه من المقبول أن التطبيب عن بعد يزيد من الوصول إلى الرعاية ، فإن هذا لا يترجم إلى زيادة في جودة الرعاية. تتمثل إحدى طرق سد هذه الفجوة في تحسين التدريب. يقدم هذا العمل أمثلة على كيفية دمج التطبيب عن بعد في جميع تخصصات الرعاية الصحية.

الكلمات المفتاحية: مهارات الاتصال ، الحاسب الآلي ، المحاكاة ، التكنولوجيا الجديدة ، تطوير / تقييم المناهج

COVID-19 آموزش پزشکی از راه دور در دوران کووید ۱۹: بررسی متون و جهت گیری عملکردهای جدید

زمینه و هدف: در دوران همه گیری کووید ۱۹، پزشکی از راه دور برای محدود کردن انتقال فرد به فرد استفاده می شود. متأسفانه با وجود پیشرفت در این زمینه، میزان آموزش ارائه شده به متخصصان مراقبت های بهداشتی به دلیل خلاء موجود بین کاربر و وسایل الکترونیکی افزایش نیافته است. برای مبارزه با این مشکل، انجمن پزشکی آمریکا خواستار افزایش آموزش رسمی برای پزشکی از راه دور شده است. هدف از این بررسی متون، ارائه نمونه‌های جدیدتر از تکنیک‌های آموزش پزشکی از راه دور به منظور پر کردن این خلاء آموزشی و ارائه ابزارهای مورد نیاز برای موفقیت در دنیای پس از کووید ۱۹ است.

روش: در پژوهش حاضر مروری بر متون گذشته‌نگر در ایالات متحده در طی ماههای آوریل تا ژوئن ۲۰۲۰ با جستجو در پایگاه داده پابمد (مدلاین) برای منابع مربوط به آموزش پزشکی از راه دور انجام شد. پس از بررسی، ۱۰ مقاله در بخشهای روش ها و مهارت های آموزش داده شده در پزشکی از راه دور، ابزارهای ارزیابی شایستگی و همچنین جهت گیری های آینده مورد تجزیه و تحلیل قرار گرفت.

یافته‌ها: این مطالعه دامنه وسیعی از مهارت‌ها شامل جهت‌گیری تا فناوری، روش‌های تعامل با بیمار و دستورالعمل‌های پزشکی–حقوقی فعلی را شناسایی کرد. با در نظر گرفتن ارزیابی های استاندارد تحت نظارت پزشکان آموزش دیده، نقش پزشکی از راه دور در برنامه های درسی رسمی گنجانده می شود.

نتیجه‌گیری: گرچه اعتقاد بر این است که پزشکی از راه دور دسترسی به مراقبت های بهداشتی را افزایش می‌دهد، اما این به معنای افزایش کیفیت مراقبت نیست. یکی از راه های رفع خلاء موجود، بهینه سازی آموزش است. این تحقیق نمونه هایی ارائه می دهد که نشان می دهد چگونه پزشکی از راه دور می تواند در همه رشته های مراقبت های بهداشتی گنجانده شود.

واژه های کلیدی: مهارت های ارتباطی، کامپیوتر، شبیه سازی، فناوری جدید، توسعه/ارزیابی برنامه درسی

کے درمیان ٹیلی میڈیسن کی تعلیم: ادب اور کال ٹو ایکشن کا جائزہ

پس منظر: COVID-19 کی موجودگی میں، ٹیلی میڈیسن کا استعمال ایک شخص سے دوسرے شخص کے پھیلاؤ کو محدود کرنے کے لیے کیا جا رہا ہے۔ لیکن، صحت کی دیکھ بھال کرنے والے پیشہ ور افراد کو فراہم کی جانے والی تربیت کی مقدار میں اضافہ نہیں ہوا ہے جس سے صارف اور مشین کے درمیان فرق پیدا ہوا ہے۔اس لٹریچر ریویو کا مقصد ٹیلی میڈیسن کی تعلیم کی تکنیکوں کی تازہ ترین مثالیں فراہم کرنا ہے تاکہ تربیت کے اس فرق کو ختم کیا جا سکے اور فراہم کنندگان کو وہ اوزار فراہم کیے جائیں جن کی انہیں نئی COVID-19 دنیا میں کامیابی کے لیے ضرورت ہے۔

طریقے: مصنفین نے ریاستہائے متحدہ میں اپریل سے جون ۲۰۲۰ کے دوران ٹیلی میڈیسن کی تعلیم اور تربیت سے متعلق اشاعتوں کے لی پابمد ڈیٹا بیس کو تلاش کرکے ایک سابقہ ادب کا جائزہ لیا۔ جائزہ لینے کے بعد، ٹیلی میڈیسن میں پڑھائے جانے والے طریقوں اور مہارتوں کے لیے ادب کے ۱۰ ٹکڑوں کا تجزیہ کیا گیا، جس کا مطلب قابلیت کے ساتھ ساتھ مستقبل کی سمتوں کا جائزہ لینا ہے۔

نتائج: اس مطالعے نے مہارتوں کے ایک وسیع دائرہ کار کی نشاندہی کی جس کی تعلیم واقفیت سے لے کر ٹیکنالوجی تک، مریضوں کے باہمی تعامل کے طریقوں کے ساتھ ساتھ موجودہ طبی-قانونی رہنما خطوط تک ہے۔ معیاری تشخیص کا استعمال کرتے ہوئے اور تربیت یافتہ معالجین کی نگرانی میں، ٹیلی میڈیسن کو رسمی نصاب میں شامل کرنے کا ایک کردار ہے۔

نتیجہ: اگرچہ یہ تسلیم کیا جاتا ہے کہ ٹیلی میڈیسن دیکھ بھال تک رسائی میں اضافہ کرتی ہے، لیکن یہ دیکھ بھال کے معیار میں اضافے کا ترجمہ نہیں کرتا۔ یہ کام اس بات کی مثالیں فراہم کرتا ہے کہ صحت کی دیکھ بھال کے تمام شعبوں میں ٹیلی میڈیسن کو کس طرح شامل کیا جا سکتا ہے۔

مطلوبہ الفاظ: مواصلات کی مہارتیں، کمپیوٹر، نقلی، نئی ٹیکنالوجی، نصاب کی ترقی/تجزیہ

INTRODUCTION

We have now entered the second year of the COVID-19 pandemic and coronavirus continues to make laps around the globe. The disease is spreading via respiratory droplets and in response, we make new attempts to limit person to person interaction. Specifically in healthcare, one of these measures has been the rise of the use of telemedicine (TM) modalities. While this technology is certainly not a replacement for our current healthcare system, it is used by healthcare professionals for initial screening, triage of symptomatic patients and routine office visits for established patients/follow-up of chronic conditions in an effort to limit direct patient contact and decrease transmission (1). The use of TM is aimed at helping to reduce the rate of infection and to preserve personal protective equipment for essential personnel. Attending physicians and a variety of healthcare decision makers are utilizing TM to interact with patients, either via programs previously implemented into health systems, or via third-party TM services (1). Additionally, many of the barriers to TM use have been temporarily waived, including lack of reimbursement, licensing restrictions, and HIPAA compliance (2,3). Despite removal of these barriers, there continues to be a lack of proper instruction for health care providers on how to effectively utilize TM. A review of literature between the years 2004-2014 demonstrated only 9 pieces of literature in the field that focused on TM education and training. This was despite the growth of TM at the time and the acknowledgement of the lack of training for healthcare professionals (4). A survey by the American Academy of Family Physicians (AAFP) found that only 15% of family physicians used TM in the past 12 months, citing lack of training as the primary barrier to use (5). Additionally, the American Medical Association called for an increase in formalized training in TM use for medical students and residents, stating that such training is not available for the vast majority of medical students (6). Given such information, we have performed a literature review of the PubMed database regarding TM education for current and future health care providers. With elaboration of the existing publications, our goal is to establish a baseline for criteria used to train currently practicing physicians, fellows, residents, medical students and other healthcare professionals on TM delivery during the COVID-19 pandemic and to establish widespread curricula across healthcare disciplines for TM education in the future.

METHODS

We conducted a retrospective review of literature of the PubMed (MEDLINE) database pertaining to published TM articles. The period of time during data collection and review was April through June 2020 with review conducted in the United States. PubMed was searched using the term "telemedicine" specifically within the abstract or title of the article and only with publications involving human subjects. Further Boolean operators were used to include both the terms "educate" and "training" in each article, in order to emphasize our study was aimed at assessing ways in which TM users and providers are being educated. . Truncation was applied to the terms educate and training to include articles with variations of the key words within the text. This allowed for inclusion of words such as educated, education, trained, etc. The aforementioned key words were chosen based on the emphasis of our project on TM, education of students, and training of TM technology. Search terms "learning, "curriculum," and "teach" were removed in order to isolate articles solely about teaching the use of TM in the delivery of healthcare, not TM use as a tool for delivering educational content. To reflect recent trends and occurrences in TM, articles were limited to publication from 2015 to present. In order to assist in development of curriculum and programming in this time of increased demand, only articles with abstracts or full text access were included. A total of 162 articles were identified after applying the filters to the PubMed database.

A set of inclusion and exclusion criteria were created to evaluate the abstracts found for this study. Inclusion criteria captured articles pertaining to training of TM use, secondarily criteria including pitfalls and shortcomings in education of TM use, and lastly included methods and means to evaluate the skills taught for use of TM modalities. Exclusion criteria considered the use of TM to train and educate a third party rather than prepare for interaction between providers and patients. For example, "TM used to train nurses about mental health" would be disregarded as TM was used as a distance education tool to train nurses. Our articles at hand would pertain only to individuals using TM in order to directly provide healthcare services. After applying inclusion and exclusion criteria to the results of the PubMed database, the two independent reviewers formed a consensus on 18 publications selected with relevant contributions.

The 18 articles underwent full-text review via two independent reviewers to form a consensus of articles, from which 8 articles were further excluded. In May 2020, using the 10 identified articles, a literature matrix spreadsheet was created to list all articles as well as their respective contributions to modalities of teaching, areas of improvement, and methods of testing competency. Here, three reviewers analyzed all relevant abstracts and articles with contributions made to the shared literature matrix (Figure 1).

RESULTS

A total of 10 articles relevant to TM were found from a variety of diverse sources and were reviewed for their contributions to TM education and training. Publications spanned from suggestions in adapting medical school education to opportunities in fellowship training, with emphasis on objectives and regarding telemedicine as a discipline and ensuring quality provider-patient interactions (7-16). The first consideration in the literature was to understand which TM skills were being taught and the modalities used to facilitate learning. Upon the introduction of TM in an encounter, the first imposed change is to become comfortable with a new device and care system. In training providers for TM use, education should emphasize an orientation to equipment as well as the system being used

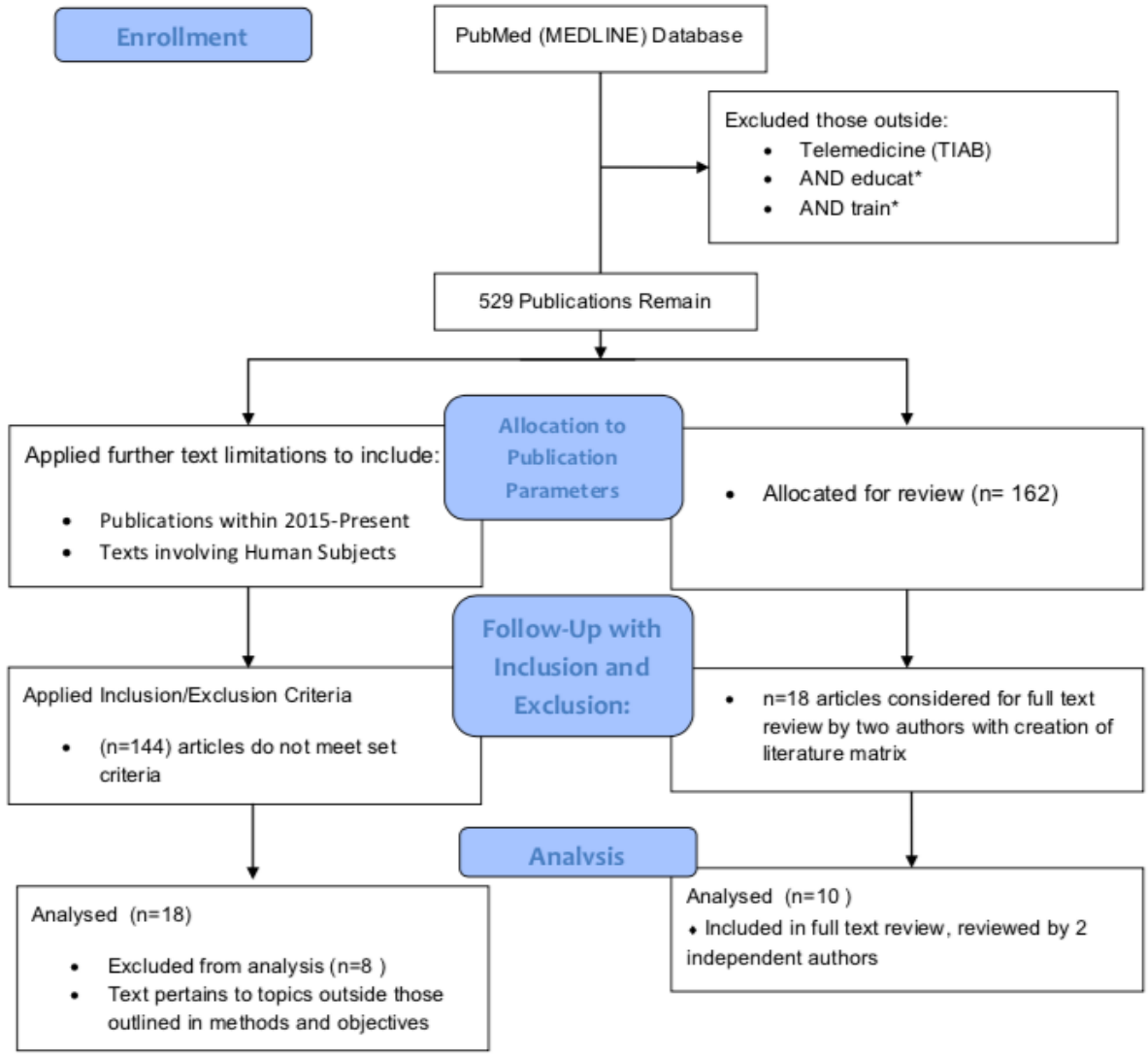

Figure 1. PubMed database was searched using initial keywords from which 529 articles appeared. Limitations on publication date and human species narrowed to 162 articles. Abstract review with inclusion and exclusion criteria narrowed to 18 articles. Full text review established 10 articles relevant to the study

(11-14). Furthermore, providers should also be taught on ways to troubleshoot equipment (13,14).

The process of placing a device between a provider and patient also calls for a different mechanism of approaching patient encounters. As you lose the ability to perform direct physical exams, emphasis is placed on learning physical exam skills and history taking via TM (6-8,11-13,17). With this, communication between the TM provider and patient, as well as family members and other members of a care team are important skills to facilitate (11-13, 16, 17). While not physically with a patient, rules of bedside manner, termed 'webside manner' should apply (11,12,16). Skills can also be developed through didactic training sessions and case reviews utilizing telemedicine modalities (7,11,13,17). The scope of TM utilization does not end with patient interactions, but also requires focus on the evolving concept of care as a whole (13,17). TM education also requires education on the medico-legal concerns being introduced such as privacy, licensure, fraud and reimbursement (9-12.15,17).

In addition to teaching the skill set of TM use, the literature also outlines ways to assess user competency. It is proposed to add TM education into the existing medical school curriculum where students would be assessed via standardized patient encounters and graded based on existing standards (7,8). While medical students enter clinical training, it is possible to incorporate learning into clerkships wholly dedicated to digital health and incorporation of TM into fields such as radiology and dermatology (9). The concept of a TM focused clerkship can be continued into residency and fellowship training with assessments being built into standard resident and fellow evaluations already being given annually (12,13). While training in school or through fellowship years, the review of literature notes the importance of attending physicians to provide oversight and learning points (9,11,13,17).

Many potential areas of improvement also exist for TM education systems already in place. Learners should be exposed to a variety of TM delivery platforms (9,14). Furthermore, importance should be placed on learning the limitations of TM as there are deficiencies in technology, physical exam capabilities and relationship building (12,14). With TM aimed to provide patient care, patients should also be involved in feedback of trainees (17). As TM continues to grow and advance, so should the training that accompanies it (13,17) (Table 1).

DISCUSSION

In this review, we have encountered many of the methods by which TM has been taught, the ways assessments may be delivered, and areas of improvement in education. While TM training can be established as part of a formal curriculum in medical education, there are also benefits to creating small sessions of learning. In some cases, sessions designed to be 10 minutes in length were sufficient enough to provide an introduction to virtual care, but also to assess

Table 1. Literature matrix was created amongst reviewers. All 10 articles were analyzed in accordance to TM skills taught, areas of improvement, and testing competency. Structural order was determined based on order found in literature search

Author	TM Skills Taught	Areas of Improvement	Testing Competency	Year of Publication
Pathipathi et al.	Physical exam, medicolegal issues, patient interaction, clinical cases, TM clerkship, digital health rotation,	Incorporate into medical curriculum	Clerkship assessment	2016
Sartori et al.	Physical exam, relationship development, standardized patient encounters, history taking, management	Incorporate into medical curriculum	Assessment via standardized patient, structured evaluation of clinical case	2019
Lee et al.	Electronic consultations, technical and policy barriers, reimbursement, policy, communication skills,	Use of experts for training, standardized use across platforms, workflow limitations	Clerkship assessments, review by attending physician	2019
Scott Kruse		Lack of implementation models, teaching status, technical challenges, legal and privacy concerns		2018
Afshari et al.	Separate clerkship, technology familiarity, history taking, interaction with patient-family-staff, evolution of TM, delivery modalities, reimbursement, 'webside' manners, future applications,	Tailor training to facility capabilities, case-based discussions, journal club, impatient and emergency consultations	Attending oversight, learner pre and post-assessments	2019
Govindaraja n et al.	Module based approach, medicolegal issues, relationship building, 'webside' manners, consent and privacy, history taking, physical exam, device implementation	Technology limitations, relationship building limitations, physical examination limitations, recognizing when telemedicine cannot be used	Multiple choice questionnaire, clinical scenario, part of resident evaluation	2017
Jagolino et al.	Capabilities and limitations of equipment, troubleshooting, communication skills, TM clerkship, orientation to TM network, didactics, case conferences, history taking, physical examination, professionalism,	Evolution of training as TM modalities evolve, incorporation into ACGME curricula	Attending supervision, milestone based approach, combine with fellowship/training evaluations	2016
Rienitis et al.	Methods of conducting teleconsultations, medicolegal issues , technical and procedural issues, barriers and benefits of care	Material and equipment requirements for educational courses. Trained staff required for preparation of stations	Post-training self assessment using a 5-point scale of skill improvement, open comment survey.	2016
Teichert	'Webside' manners, empathy and compassion, communication skills, relationship building, proper documentation.	Continued 'webside' manner training, checklist based encounters		2016
Hilty et al.	history-taking, interview skills, assessment, treatment, documentation, medicolegal issues, privacy concerns, reimbursement, interprofessional skills, communication skills, physical exam, didactic lessons, case series, variety of TM models used	Broader consensus on competencies from medical organizations i.e AAMC/ACGME, further research to define competency, further teaching faculty and staff development, patient feedback, further literature on TM training models, evolution of training as TM modalities evolve.	Attending/Faculty supervision, standardized evaluation, assessment of 'reactions, learning, behavior, results,' simulations, learner pre/post-assessments, practice cases.	2015

communication skills in a virtual encounter (8). After sufficient orientation to technology and troubleshooting, focus should be placed on history taking, physical examination, and rapport building skills (7-13). With attending physician supervision, it has been noted that 3-5 observed patient encounters were enough to allow trainees comfortability in performing consultations independently, with support as needed (13). TM should include instruction on medico-legal issues, reimbursement and privacy (9-12). As the field continues to change, so should the methods in which trainees are being taught and assessed in their abilities (13).

While contributing to the overall breadth of knowledge, this review presents some limitations typical for this form of study (17). In processing each article, variation in the interpretation of wording occurs with the goals, methodologies, and pitfalls addressed by each individual author. In order to combat this form of bias, we had two author-reviewers independently analyze articles to determine the characteristics of note for each study. Furthermore, it can be said that the inclusion and exclusion criteria set and the range of publication time and open access provide limitations to the study. In order to address these limitations, we have established clear goals in our methods section and provided references to justify the time periods and text selected for review. Controlling for publication time allows us to present the most current trends with open access allowing for accessibility for those wanting to develop curricula of their own. A strength provided by this study is that it is the largest of its kind, with the largest previous study encompassing 9 articles and ours including 10. Furthermore, strength is added to our study in that TM education and use is now brought to the forefront as a means to provide healthcare during a pandemic. Lastly, all parts of our data have been reviewed independently and cohesively by at least two to four authors prior to incorporation into the text, only allowing for shared consensus and multi-step reviewed data in our publication.

While a growing trend, our sample size of 10 presents a small glimpse into the discipline of TM. With this, we emphasize the need for further research, evaluation, and publication of successful models of training. As TM is being increasingly used in the time of COVID-19, future research and publication could arise from the current models of training being utilized in healthcare settings. This could allow for better preparation for physicians and trainees in using TM, especially in times of increased TM need as we have seen during the COVID-19 pandemic.

Despite the growing widespread use of TM in healthcare today and especially in the time of COVID-19, little can be said about the means by which trainees receive education. While the prospects of TM increase the access to care and provide care from a safe distance, it cannot be purported that without proper knowledge and training this care is of equal quality to in-person consultations in certain clinical situations. From small lesson plans to entire curriculum implementation, we call for increased TM education across all healthcare disciplines. With this, we strongly desire that the methods of data collection and review of findings serves as a model and reference for cases in which TM modalities are being used and expected to be utilized.

Ethical considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors.

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