

Medical Students' Knowledge, Perceptions, and Expectations Regarding Telemedicine Education

Tıp Öğrencilerinin Teletıp Eğitimi Hakkındaki Bilgi, Algı ve Beklentiler

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Abstract

Aim: This study aims to determine the knowledge levels and perceptions of medical faculty students about telemedicine, as well as their willingness to be prepared for telemedicine before graduation from their own perspectives. In line with this aim, the current situation was comprehensively analyzed to develop solution proposals.

Methods: In this study, which employs a cross-sectional survey design, data were collected using both qualitative and quantitative questions. Participants were asked direct questions (e.g., yes/partially, undecided/no; very low=1 to very high=5), followed by follow-up questions (direct or open-ended) related to these questions, aiming to gain in-depth information about their perspectives. The data obtained from open-ended questions, which were designed to allow participants to express their thoughts freely and in detail, were analyzed using content analysis techniques, including categorical and frequency analysis.

Keywords:

Telemedicine, Medical Education, Medical Students, Knowledge, Perception

Anahtar Sözcükler:

Teletıp, Tıp Eğitimi, Tıp Öğrencileri, Bilgi, Algı

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Results: The study results indicated that although the number of students taking courses related to telemedicine or telemedicine applications in their current medical education processes is quite low, nearly half of the students stated that they have at least a low level of knowledge about this subject. Specifically, 48.2% of the students reported having no knowledge of the telemedicine concept, while 33.4% indicated partial knowledge. Despite this, 67.8% of the students expressed that telemedicine should be included in the curriculum. Moreover, students who had taken a course related to telemedicine reported significantly more knowledge ($M=3.74$) compared to those who have not taken such a course but claim to have some knowledge ($M=2.29$) ($F(1, 268) = 291.841, p < 0.01$). These findings emphasize the necessity of including telemedicine education in the curriculum.

Conclusions: As medicine continues to incorporate telemedicine technologies into patient care, it is important for medical faculties to introduce students to the care methods they will use in the future, allowing them to analyze the advantages and disadvantages. The results of this study also showed that the majority of students are aware of the importance of telemedicine and its education. While the majority of students expressed positive views about the inclusion of telemedicine courses in the medical faculty curriculum, a significant portion also stated that it should be integrated into other courses. This indicates

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that students are interested in telemedicine and believe that it should be taught either as a separate course or integrated into other courses within the curriculum. Therefore, the curriculum should be updated to accommodate digitalization and telemedicine technologies. It is important to provide necessary education before graduation so that medical students, who will play a key role among future health professionals, are prepared for the digitalized health system. To achieve this, the curriculum should be updated to include courses that contribute to their digital competencies or integrate relevant achievements into other courses. Additionally, efforts should be increased and education provided to protect against risks associated with the use of telemedicine and its processes.

Özet

Amaç: Gerçekleştirilen bu araştırmada, tıp fakültesi öğrencilerinin teletıp hakkındaki bilgi düzeyleri ve algıları ile mezuniyet öncesi teletıp hazırlıklı olma istekliliklerinin kendi bakış açılarıyla belirlenmesi amaçlanmıştır. Bu amaç doğrultusunda, mevcut durumu kapsamlı bir şekilde analiz ederek çözüm önerileri geliştirilmiştir.

Yöntem: Kesitsel anket çalışması (cross-sectional study) deseninin kullanıldığı çalışmada, nitel ve nicel sorular ile veri çeşitlemesi yapılmıştır. Katılımcılara, doğrudan soruların (örneğin, evet/kısmen, kararsızım/hayır) yanı sıra bu sorulara bağlı olarak takip soruları (doğrudan ya da açık uçlu) sorulmuştur. Böylece, duruma ilişkin derinlemesine bilgi alınmaya çalışılmıştır. Düşüncelerini serbestçe ve detaylı bir biçimde ifade etmelerine olanak sağlamak amacıyla yazılı olarak yanıtlanmak üzere verilen açık uçlu sorulardan elde edilen veriler ise içerik analizi türlerinden kategorisel ve frekans analizi teknikleri ile çözümlenmiştir.

Bulgular: Çalışma sonuçları, mevcut tıp eğitim süreçlerinde teletıp veya teletıp uygulamaları ile ilgili ders alan öğrenci sayısının oldukça düşük olmasına rağmen, öğrencilerin neredeyse yarısının bu konuda en azından düşük seviyede bilgi sahibi olduklarını belirtmiştir. Özellikle, öğrencilerin %48,2'si teletıp kavramı hakkında hiçbir bilgiye sahip olmadığını, %33,4'ü ise kısmen bilgi sahibi olduğunu bildirmiştir. Buna rağmen, öğrencilerin %67,8'i teletıp eğitiminin müfredata dahil edilmesi gerektiğini ifade etmiştir. Ayrıca, teletıp ile ilgili bir ders almış olan öğrenciler, böyle bir ders almamış ancak bir miktar bilgiye sahip olduğunu iddia eden öğrencilere kıyasla ($M=2,29$) önemli ölçüde daha fazla bilgiye sahip olduklarını bildirmiştir ($M=3,74$) ($F(1, 268) = 291.841, p < 0.01$). Bu bulgular, teletıp eğitiminin müfredata dahil edilmesi gerekliliğini vurgulamaktadır.

Sonuç: Tıp, teletıp teknolojilerini hasta bakımına dahil etmeye devam ederken, tıp fakültelerinin öğrencilerini gelecekte kullanacakları bakım yöntemleriyle tanıştırmak, avantaj ve dezavantajlarını analiz etmelerini sağlamak önemlidir. Gerçekleştirilen bu çalışma sonucunda da öğrencilerin büyük bir bölümünün teletıp ve eğitiminin öneminin farkında oldukları görülmektedir. Tıp fakültesi müfredatında teletıp'a yönelik ders eklenmesi noktasında öğrencilerin büyük bölümü olumlu görüş bildirmekle birlikte önemli bir kısmı da diğer derslere entegre edilmesi gerektiğini belirtmişlerdir. Bu durum öğrencilerin teletıp'a olan ilgisini göstermekle birlikte öğretim programlarında ayrı bir ders ya da diğer derslere entegre edilerek öğretilmesi gerektiğine inandıklarını göstermektedir. Bu nedenle, müfredatın dijitalleşme ve teletıp teknolojilerine uyum sağlayacak şekilde güncellenmesi gerekmektedir. Tıp öğrencilerinin, aktif göreve başladıklarında süreci planlayabilmeleri ve yönetebilmeleri için mezuniyetleri öncesinde gerekli eğitimlerin verilmesi önemlidir. Bunun için ise geleceğin sağlık profesyonelleri arasında kilit role sahip olacak olan tıp fakültesi öğrencilerinin dijitalleşen sağlık sistemine hazırlıklı hale getirilmesi için öncelikle öğretim programlarının güncellenerek dijital yetkinliklerine katkı sağlayabilecek derslerin konulması ya da diğer derslerle ilişkilendirilerek ilgili kazanımların verilmesinin sağlanması gerekmektedir. Ayrıca, teletıp ve süreç içinde kullanımına yönelik risklere karşı korunmalarına yönelik çalışmaların artırılması ve eğitimlerin verilmesi gerekmektedir.

INTRODUCTION

Digital health involves using information and communication technologies to improve healthcare services (1). This approach has the potential to empower individuals to take a more active role in their own healthcare. A digitized healthcare system can improve prevention, diagnosis, treatment, and monitoring processes while also allowing for easy access to health data for both healthcare professionals and patients. Despite some existing challenges, the ongoing digital transformation of medical practices promises improved clinical outcomes, democratized healthcare services, and enhanced quality of life (2).

The convergence of technologies like artificial intelligence, big data, and robotics, coupled with the global impact of the recent pandemic, has accelerated the global momentum toward digitizing healthcare processes. Although telemedicine has been a healthcare practice since the mid-20th century, aimed at bridging gaps in healthcare access (3), its full adoption has been hindered by various factors, such as lack of technical skills, support, training, etc. (4). The COVID-19 pandemic underscored telemedicine's potential as a pivotal solution for maintaining uninterrupted healthcare services during social distancing and mobility restrictions (5). However, it has become evident that even countries with advanced healthcare systems struggled to establish consistent and sustainable telemedicine services (6).

The sustainable integration of telemedicine within healthcare systems hinges on the acceptance and adoption by its users (7, 8). Successful adoption of any new technology depends on various factors, including users' attitudes, perceptions, skills, and work environments (9, 10). While the new generation of physicians possesses a high degree of digital literacy in their personal lives (11), this does not necessarily translate to their professional careers. With medical students set to practice in an increasingly digitized environment, it is imperative to equip them with the skills required

for efficient functioning in a digitized healthcare system. Therefore, integrating health technology into educational curricula becomes crucial to enhance students' technological competence and their active participation in the digital transformation. In the ever-evolving healthcare landscape, students must acquire competencies surpassing digital literacy, evolving into proficient technology leaders. Given physicians' role in promoting patients' health and well-being, current medical students will play a pivotal role in the success of the digitized healthcare system. Thus, it is essential to ensure that students are adequately prepared for the digitized healthcare system, addressing both technical competencies and psychological readiness.

Moreover, as healthcare progressively incorporates telemedicine into patient care, it is critical to familiarize students with future care delivery methods (12). Encouraging active utilization of these technologies, considering their pros and cons, is equally important. To this end, medical students' knowledge, perceptions, and willingness to use telemedicine should be assessed. Although the recent COVID-19 pandemic prompted some research in this vein, studies examining medical students' perspectives related to telemedicine are quite limited. A recent systematic review (12) found that there are limited studies on medical students' understanding, opinions, and attitudes toward telemedicine. Most of these studies are related to e-health, digital/mobile health, or e-learning. Hence, it is crucial to conduct a comprehensive study to determine medical students' current knowledge, views, expectations, and willingness to receive formal education on telemedicine before graduation. To address these concerns, this study explored the following research questions among medical students:

- What is the extent of medical students' perceived understanding of telemedicine?
- How do medical students perceive the role of telemedicine in their future careers?

•To what extent are medical students willing to prepare for telemedicine-enabled healthcare delivery?

METHODS

We used a cross-sectional online survey including quantitative and qualitative questions to assess the medical students' knowledge, perceptions, and willingness to learn about telemedicine before graduation. This method allowed for gaining insights into the perspectives of a large group of medical students, leading to a comprehensive examination of the current situation and recommendations for future medical education practices. This study was conducted upon obtaining ethics approval from the local scientific research ethics board in Turkey with approval number 2023-YÖNP-0432-07/15.

Study Participants

Convenience sampling was employed to recruit medical students from 11 medical schools across Turkey. These students participate in a comprehensive six-year program, initially focusing on basic and pre-clinical science education during the first three years, followed by clinical rotations. The program concludes with a comprehensive internship year to consolidate their clinical knowledge and gain experience in different medical disciplines. This study targeted medical students in their clinical years (year 4 and above). Students who met the inclusion criteria were emailed requesting voluntary participation through an online platform. Student class leaders helped distribute the questionnaire link among 700 medical students in their clinical years. All data collection was completed between January 2023 and June 2023.

Data Collection

In this study, an online cross-sectional survey was used to elucidate pertinent information for comprehensive analysis. Participants were asked direct questions using a binary or Likert

scale (e.g., yes/partly, undecided/no; very low=1 to very high=5), as well as follow-up questions (direct or open-ended) related to those questions, aiming to gain deeper insights into their perspectives about telemedicine.

The data collection tool was designed with a conditional structure, where the next question was based on the response to the previous question, ensuring that relevant questions were answered by students without losing context. For example, if a given student indicated no knowledge of telemedicine, the questionnaire displayed an informational page to raise awareness for better-informed responses to the subsequent questions. The informational page provided students with a definition of telemedicine, a brief historical overview, and details about its current applications. Two expert faculty members in the field of medical education were consulted for the content of this page.

The questionnaire was developed by the researcher based on a literature review and guiding research questions, then was reviewed by three experts: two were faculty members in medical education and information science, and one was a health sciences expert. Experts ranked each item as appropriate, needing revision (provided revision suggestions), or inappropriate. The instrument was finalized after an iterative process based on expert consensus. To ensure validity, a pilot study was conducted with 50 medical students, and Cronbach's alpha coefficient was calculated as 0.85, indicating high internal consistency.

Data Analysis

Responses to quantitative questions were reported in frequencies (and percentages). Additionally, for responses to 5-point Likert scale items (Very low=1 - Very high=5), mean (M), and standard deviation (SD) values were reported. When interpreting the average scores obtained from each item, the following ranges were considered: 1.00–1.80 very low, 1.81–2.60 low, 2.61–3.40 average, 3.41–4.20 high, and

4.21–5.00 very high. Data from open-ended questions were analyzed using content analysis techniques, including categorical and frequency analyses. As the initial step, a codebook was created based on literature and expert input, which was used to code the data. As the next steps, categories of codes were created and organized, facilitating categorical (13) and frequency analyses (14) for determining the quantitative occurrence, density, and significance of concepts identified within the open-ended student responses.

RESULTS

The study population consisted of students in their clinical (years 4 & 5) and intern (year 6) years continuing their education in 11 different medical schools across Türkiye. A total of 521 students (female, 277, 53.2%; male, 244, 46.8%) provided consent for voluntary participation and responded to the questionnaire with a response rate of 74% (521/700). Table 1 shows the demographic information.

Table 1. Study Participant Demographics

Variables	Female	Male	Total
Mean age (\pm standard deviation)	23.14 (\pm 1.29)	23.60 (\pm 1.55)	23.36 (\pm 1.43)
Year, n (%)			
Clinical (Years 4 & 5)	166 (53.7%)	143 (46.3%)	309 (59.3%)
Intern (Year 6)	111 (52.4%)	101 (47.6%)	154 (37.7%)
Total	277 (53.2%)	244 (46.8%)	521 (100%)

n = frequency

The study findings are reported under subheadings for each research question, informed by students' responses to both direct and follow-up questions.

Students' Knowledge Levels of Telemedicine

The questionnaire included items that directly inquired about students' awareness of the telemedicine concept, its applications, and their perceived knowledge levels. When asked whether

they had taken any courses on telemedicine or telemedicine applications, only 5.2% (n=27) of the students responded positively. Regarding the question aimed at determining students' awareness of the concept of telemedicine, almost half (48.2%; n=251) stated that they had no knowledge of the telemedicine concept, and a third (33.4%; n=174) stated having partial knowledge of it. Only 18.4% (n=96) of the students indicated that they knew the concept of telemedicine (see Table 2).

Table 2. Students' Knowledge of Telemedicine (100.0%, n=521)

Item, n (%)	Yes	Partially	No
Taken a course on telemedicine or its applications	27 (5.2%)	-	494 (94.8%)
Have knowledge of telemedicine concept	96 (18.4%)	174 (33.4%)	251 (48.2%)

Those students who answered "no" to both questions were directed to an informative page to obtain information about telemedicine. Those who reported some knowledge of telemedicine (51.8%; n=270) rated their level of knowledge and opinions on a scale of Very Low (1) to Very

High (5), indicating a moderate level of knowledge (M=3.19). Students reported a low level of knowledge about telemedicine Technologies (M=2.54), benefits (Mean=2.45), disadvantages (Mean=2.37), and use in medical applications (Mean=1.63) (Table 3).

Table 3. Students' Knowledge Level of Telemedicine (51.8%, n=270)

Item, n (%)	M	SD	Interpretation*
Knowledge level of telemedicine	3.19	.68	average
Knowledge level of telemedicine technologies	2.54	.74	low
Knowledge level of benefits for using telemedicine technologies	2.45	.72	low
Knowledge level of risks or disadvantages for using telemedicine technologies	2.37	.70	low
Knowledge level of the uses of telemedicine in medical applications	1.63	.73	very low

**Interpretation= 1.00–1.80 very low, 1.81–2.60 low, 2.61–3.40 average, 3.41–4.20 high, and 4.21–5.00 very high*

Students, on average, seem to have a low level of knowledge about telemedicine when all questions in this section are combined (Overall Mean = 2.44, SD = 0.60). On the other hand, students who have taken a course related to telemedicine reported significantly more knowledge (M=3.74) than students who have not taken such a course but claim to have some knowledge (M=2.29), $F(1, 268) = 291.841, p < 0.01$.

Students' Perceptions of Telemedicine

As the next study objective, we asked students (who reported some knowledge of telemedicine) to share their thoughts about telemedicine and telemedicine applications to gain insights into their perceptions. To allow detailed responses, an open-ended response option was provided. Based on the content analysis of these qualitative data, students' perceptions of telemedicine were grouped into 5 categories, with 3 being positive and 2 being negative.

Most students perceived telemedicine as an innovative and technological advancement. They expressed that telemedicine could bring technological innovation to healthcare services (62.6%, n=169) and facilitate access to patient data (48.1%, n=130). In terms of accessibility and remote care, students also indicated that telemedicine could help patients to access medical services remotely (60.4%, n=163) and prevent patients' loss of time due to travel or waiting at a clinic, etc. (42.6%, n=115). Some students associated telemedicine with the efficiency of institutions and their functioning. They believed telemedicine could reduce hospital overcrowding (44.4%, n=120) and lower patient care costs (39.3%, n=106). Moreover, some students (31.5%, n=85) highlighted the potential for reducing doctors' workload and allowing doctors to dedicate more time, particularly to patients in need, when combined with telemedicine services. Table 4 summarizes these findings.

Table 4. Students' Perception of Telemedicine Reflected in Their Open-Ended Responses (51.8%, n=270)

Category / Item*	n (%)
Positive	
Technology and innovation	
Technology innovation in healthcare delivery	169 (62.6%)
Easy access to health data	130 (48.1%)
Access to healthcare and tele visit	
Enable patients to access care via tele visits	163 (60.4%)
Prevent loss of time for patients (en route to or at a clinic, etc.)	115 (42.6%)
Benefits to institutions and physicians	
Alleviate high patient volume at hospitals	120 (44.4%)
Lower patientcare costs	106 (39.3%)
Lower physicians' patientcare responsibilities	92 (34.1%)
Allow physicians to spend more time with patients that need it	85 (31.5%)
Negative	
Technology related risks/drawbacks	
Risk or challenges associated with technology used in telemedicine	179 (66.3%)
Risks to data security	160 (59.3%)
Risks to ethics and patient privacy	147 (54.4%)
Communication and interaction	
Limit in person communication	175 (64.8%)
Limit physical exam opportunities	147 (54.4%)

*Multiple responses are possible.

Students expressing negative views about telemedicine have conveyed concerns about technological risks and, in addition, apprehensions related to human relationships. Particularly, they emphasized the existence of technology-related risks, such as issues with the technology used (connectivity problems, low image or sound quality, etc.) or the telemedicine application itself (software issues, non-functioning software, etc.) (66.3%, n=179). Within these technology-related risks, students also highlighted concerns about information security (59.3%, n=160) and ethical and

privacy-related concerns (54.4%, n=147). Students who emphasized potential changes in human relationships pointed out that telemedicine could lead to changes in face-to-face communication (64.8%, n=175) and limit doctor-patient interactions (54.4%, n=147). While students generally provided positive remarks about telemedicine, they frequently expressed their concerns following these positive expressions. This is exemplified in the following excerpt, "...it reduces the workload of hospitals and doctors... but it also reduces the contact between doctors and patients."

Medical Students' Willingness to Prepare for Telemedicine-Enabled Healthcare Delivery

As the final study objective, we gathered students' opinions on whether telemedicine should be included in medical education and their willingness to be prepared for telemedicine healthcare delivery. Before responding to questions in this section, all students were directed to an informational page to learn about telemedicine to ensure a consistent understanding, and thus responses. This approach provided an opportunity for students

who claimed to lack knowledge about telemedicine to acquire information and for those who were knowledgeable to refresh their understanding.

Most students, 67.8% (n=353), expressed that telemedicine should be included in the curriculum. About a quarter, 25.5% (n=133), were undecided or gave partial answers, while 6.7% (n=35) responded that it should not be included. Subsequently, students were asked to provide a rationale for their responses. (Table 5).

Table 5. Medical Students' Views about Adding Telemedicine Education to the Curriculum (100.0%, N=521)

Response	Reasons why*	n (%)
Yes	Telemedicine will continue to have a role in patient care in the future.	269 (76.2%)
	It can help during unexpected situations like pandemics.	248 (70.3%)
	It has a potential to reduce workload in our future career as physicians.	171 (48.4%)
	It should also be integrated into existing courses.	139 (39.4%)
Undecided/ Partially	It should be an elective course.	98 (73.7%)
	It should be integrated into existing courses, not a separate course.	69 (51.9%)
No	Current course load is already high.	28 (80.0%)
	I can learn about it after graduation.	14 (40.0%)
	I do not see the need for it.	10 (28.6%)

*Some responses were coded under multiple different themes.

Many students believe telemedicine education should be included in the curriculum for important reasons. The most common reason is the belief that telemedicine will continue to have a role in patient care as medicine progresses, and it is necessary to be prepared by receiving such education (76.2%, n=269). Other reasons to be prepared for telemedicine healthcare delivery included that it could help during unexpected disruptive situations like pandemics (n=248, 70.3%) and that it could also reduce their workload in their future careers (n=171, 48.4%). Furthermore, besides adding a standalone telemedicine course to the curriculum, some students also suggested

integrating telemedicine education into other courses (n=139, 39.4%).

Students who were unsure or had mixed feelings about incorporating telemedicine education into the curriculum did not oppose it either. Instead, they suggested alternative methods for delivering the education. For instance, they proposed making it an elective course instead of a mandatory one (n=98, 73.7%). Additionally, some recommended integrating telemedicine education into other courses rather than having it as a separate course (n=69, 51.9%).

Students who responded negatively to the inclusion of telemedicine education in the curriculum primarily mentioned their already

heavy course load (n=28, 80.0%) as the most significant reason. Few indicated that they believed they could learn about telemedicine over time post-graduation (n=14, 40.0%), while others did not see the need for it (n=10, 28.6%).

DISCUSSION

This study assessed medical students' knowledge, perceptions, and willingness to prepare for telemedicine healthcare delivery before graduation. Although most students reported that they had not taken any courses related to telemedicine, almost half of them indicated that they had some level of knowledge about telemedicine or its applications. Similarly, another study also revealed that many students had some knowledge about telemedicine despite not having received formal telemedicine education (15). Our findings indicate that students possess an average level of knowledge regarding telemedicine in general but a low level of knowledge regarding telemedicine technologies. In addition, their understanding of the advantages and disadvantages of using telemedicine technologies is also limited, and their knowledge of the medical applications of telemedicine is even lower. Kunwar et al. (2022) showed similar results among Nepalian medical students, indicating that while students acknowledge the importance of telemedicine, they lack practical knowledge of its usage (15). Similarly, another group showed that most medical students and residents in France were unfamiliar with telemedicine regulations (84.8%) and felt that they had not received sufficient training (97.9%) (16). Collectively, these findings suggest that medical students' limited knowledge of telemedicine is generally attributed to the lack of comprehensive education in this field (12).

Based on a content analysis of the open-ended response, students' opinions about telemedicine were grouped into five categories: positive (3 categories) and negative (2 categories). Overall, most students approached telemedicine as an

innovation and technological advancement, expressing views that it could advance healthcare services by facilitating access to patient data and providing patients with access to remote medical services, which was also thought to prevent the loss of time for patients associated with travel and waiting in hospitals. Students also believed telemedicine would improve hospital efficiency by reducing patient overcrowding and healthcare costs. They also emphasized the potential for reducing doctors' workloads and allowing more time for doctors to spend with patients in need. Similarly, Berwick and colleagues (2008) have indicated that telemedicine has the potential to contribute to the improvement of patient care experiences and health outcomes, along with potential cost-reducing effects in healthcare services (17). In summary, medical students have positive attitudes toward telemedicine but lack knowledge and skills in this area.

However, students with negative opinions about telemedicine raised concerns about the potential risks associated with technology and thought it might also restrict in-person interactions and communication between doctors and patients. Students pointed out potential technical difficulties such as hardware or software malfunction, connectivity issues, low image or sound quality, and application access problems. Generally, these difficulties are fundamental issues in technology-focused processes and represent significant risk factors (18-22). Students raised concerns about ethical and privacy risks due to inadequate data security measures. They emphasized the risks of technology, software, and human error, which could lead to privacy issues. This finding is consistent with other studies (23-25), indicating that students know these risks before graduation. This highlights the need to prepare students for information security risks in telemedicine to prevent negative consequences in the future.

Some students have raised concerns about the impact telemedicine may have on human

interactions. They worry it could limit face-to-face communication and doctor-patient interactions, including physical exams. Wernhart and colleagues (2019) also found that medical students doubted whether telemedicine could enhance the doctor-patient relationship (25). Despite generally positive views on telemedicine, some students expressed concerns after initially expressing positive opinions. This indicates that while students may not have a negative attitude toward telemedicine, they recognize the potential risks that could impact its future use.

Our results indicated that a significant portion of the students expressed a positive opinion towards including telemedicine in the medical education curriculum. The most important reason students gave was the expectation that telemedicine would continue to play a role in patient care as medicine progresses, hence the need to be prepared for telemedicine healthcare delivery before graduation. Furthermore, students also emphasized the potential benefits of telemedicine for helping maintain uninterrupted healthcare services during disruptive events like pandemics and for reducing post-graduation workloads. Additionally, apart from including telemedicine education in the curriculum, some students have highlighted the need to integrate telemedicine education into other courses. Similarly, Jumreornvong et al. (2020) advocated for telemedicine education to be included in the curriculum and stated that basic telemedicine and clinical skills could be integrated with current clinical experiences (26). In this context, Frankl et al. (2021) stated that involving medical students in telemedicine visits is essential for clinical learning. (27).

Students who responded hesitantly to the inclusion of telemedicine education in the curriculum have suggested alternative methods of delivering the education while recognizing its importance. They suggested that such education could be offered as elective courses or integrated into other courses rather than a

standalone mandatory course. Similarly, a study by Neumann and colleagues (2021) showed that medical students consider digitization a necessary aspect of their education and are willing to be prepared for the digitization process in the healthcare (28). The same study also advocated that digitization should play a more central role in the curricula. Students who responded negatively to the inclusion of telemedicine education in the curriculum cited excessive course loads as the most important reason, stating that they could develop their skills over time or did not see a need for such a course. A study by Edirippulige and colleagues (2018) concluded that while preparing students for digital transformation is important, the presence of a busy curriculum driven by other priorities and systematic issues has hindered the integration of digital health content into the curriculum so far (29). Medical schools appear to have a limited ability to add new courses due to the broad range and intensive nature of their current curricula and training programs.

It is important to acknowledge certain limitations when analyzing the results of this study. The study's primary data collection method was an online questionnaire, which may have introduced response bias and limited response depth. However, we tried to address this using a mixed-methods approach with qualitative and quantitative questions for more in-depth responses and triangulation. Secondly, the study only included medical students in year 4 or above from 11 medical schools in Türkiye, so it may not fully represent all medical students in the country. Additionally, it's worth noting that using a convenience sample could have resulted in selection bias as the participants who chose to complete the questionnaire may differ from those who decided not to participate. We, however, feel this was mitigated to some extent by the high response rate of 74%. Lastly, it's important to consider that the study took place within a specific cultural and educational context in Turkey; hence, the findings may not be easily applicable to other countries or regions

with varying healthcare systems or educational structures.

CONCLUSIONS

As telemedicine becomes increasingly integrated into patient care, medical schools should consider incorporating telemedicine education into their curriculum (12). This will inform the students about the benefits and drawbacks of telemedicine and how to maintain a strong doctor-patient relationship, protect patient privacy, ensure equal access to treatment, and strive for optimal outcomes when using telemedicine platforms (26). Our study showed that many students already recognize the importance of telemedicine and the need to learn more about it during medical school. On the other hand, limitations in adding new courses are evident due to the heavy course load that student already face. This reality does not alter the fact that the future of the healthcare system is becoming increasingly digitized. Despite the uncertainties that the digitization process brings to the future careers of medical students, it is essential to provide the necessary education before graduation. To achieve this, medical schools must at least consider updating their curricula, incorporating courses that contribute to students' digital competencies, either as standalone offerings or integrated into other courses, to prepare them for the evolving digital healthcare landscape. Additionally, efforts should also include increasing awareness of the risks associated with telemedicine and its usage as the field progresses. Future research should explore the long-term impacts of telemedicine education on medical practice, as well as conduct comparative studies across different medical schools to identify best practices in telemedicine education. For example, telemedicine's effectiveness in improving patient outcomes or reducing healthcare costs over time could be studied. Additionally, longitudinal studies assessing the retention of telemedicine skills and knowledge over time would provide valuable insights into

the effectiveness of telemedicine training programs. Comparative research involving different medical schools could reveal best practices and help standardize telemedicine education across various institutions.

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