

Research Article

Instant messaging application usage for clinical consultation among orthopedic surgery residents in Turkey: A survey study

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ABSTRACT

Objective: This study aimed to determine the characteristics of instant messaging application (IMA) usage for clinical consultation among orthopedic residents in Turkey and to explore their experiences and opinions concerning potential legal problems.

Methods: A questionnaire titled "Instant messaging for consultation among orthopedic surgeons" consisting of 21 questions was applied to orthopedic surgery residents, and the results were analyzed. The questions were designed to obtain information on 4 categories: 1) demographics and professional experience, 2) attitudes on the use of cellular phones, 3) IMA usage for clinical consultation purposes, and 4) problems and comments on smartphone application usage for clinical consultation purposes. The participants who had no experience with a smartphone or IMA usage were excluded at the final analysis.

Results: A total of 860 orthopedic residents (849 males [98.7%]; mean age=28.6 years; age range=22-44 years) participated in the survey (participation rate: 97.3%). The distribution of residency years was as follows: 1st year, 27%; 2nd year, 21.4%; 3rd year, 18.4%; 4th year, 17.4%; and 5th year, 49.9%. The most frequently used IMAs were WhatsApp (99.3%), Facebook Messenger (14.8%), Viber (8%), and Tango (1.3%). The rate of IMA usage for consultation was 95.3%. The most common reasons to prefer IMAs for consultation were being "fast" and "easy," but only 26.3% of the residents reported that they prefer the use of IMAs because they find them "reliable." Moreover, 41.7% of the respondents reported that they had an experience of misdiagnosis owing to the use of IMAs; 81.2% of the participants used the personal information of the patients during the consultation; 57.6% of the respondents considered that legal problems may arise because of the use of IMAs during the consultation; and 51.4% believed that an electronic platform, solely for consultation purposes, is required.

Conclusion: This survey has shown that it is necessary to make some legal regulations regarding the use of IMAs for consultation purposes and to develop applications only for medical consultation purposes. Most of the trainees make decisions using IMAs without a proper examination, putting the patients at the risk of misdiagnosis. Moreover, the confidentiality of the patient's personal information appears to be in danger when IMAs are used.

Level of Evidence: Level IV, Diagnostic Study

Introduction

Instant messaging applications (IMAs) have become indispensable for orthopedic consultations because they provide rapid and easy exchange of information (1). There are reports warning against the use of these software, as they compromise the confidentiality of personal information and may cause legal problems (2, 3). In addition, validity and reliability studies are being performed in many subspecialties, especially in orthopedics and traumatology, considering that sent images may cause misdiagnosis owing to technical inadequacies (4, 5).

Orthopedic surgeons and residents are the most frequent users of such applications during consultations (1). Turkey is one of the countries with the highest number of both orthopedic surgeons and residents in Europe (6), but the number of residents per 100,000

population is also one of the least (6). Therefore, orthopedic surgery residency in Turkey requires intense work and long work hours; therefore, saving time during clinical consultations and handovers is critical, as provided by IMAs (7). Most of the popular IMAs such as WhatsApp, Facebook Messenger, Viber, and Tango are free to use. There are also several paid IMAs that promise more secure information exchange and anonymous usage. However, their usage is limited because they require regular payment and are not preferred widely. In addition, the superiority of the paid IMAs in terms of security also remains unproven.

This study aimed to determine the characteristics of IMA usage among orthopedic surgery residents in Turkey, which constitute the most dynamic step of the consultation network (8), and to gain information and opinions in terms of misdiagnosis-mis-treatment rates and legal problems that may arise.

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It also aimed to raise awareness for required legal regulations and the need for a new electronic platform, solely for consultation purposes.

Materials and Methods

A descriptive questionnaire titled “Instant messaging for consultation among orthopedic surgery residents” consisting of 21 questions was prepared to evaluate the usage characteristics of IMAs for clinical consultations by orthopedic surgery residents. A total of 21 questions were divided into 4 subgroups: 1) demographics and professional experience, 2) attitudes on the use of cellular phones, 3) IMA usage for clinical consultation purposes, and 4) problems and comments on smartphone application usage for clinical consultation purposes (Appendix 1). The Likert scale method was used in questions numbered 8, 10, 15, 17, 18, and 20 (9). The choices were determined according to the pilot study in questions numbered 9, 11, 12, 13, and 16.

The questionnaire was applied to orthopedic surgery residents right before the nationwide exam named Residency Educational Development Exam, which took place on May 25, 2019. The preparation and application of the questionnaire were completed in collaboration with the Turkish Society of Orthopaedics and Traumatology (TOT-BID), the Turkish Orthopedics and Traumatology Education Council, and the Residents and Young Attending Council. The participants who reported no usage of either smartphone or IMA were excluded in the final analysis.

Results

A total of 861 orthopedic surgery and traumatology residents participated in the survey. Only 1 participant was not using a smartphone or IMA and was excluded, leaving 860 participants for the final analysis. In Turkey, the number of residents trained at the time of the survey was 884 (Personal communication: Halit Pınar-President of TOTBID). The sample size constitutes 97.3% of the targeted population nationwide. The mean age was 28.6 (Standard deviation=±2.3; range=22–44 years) years. A total of 849 men (98.7%) and 11 women (1.3%) participated. The distribution of residency years was as follows: 1st year, 27%; 2nd year, 21.4%; 3rd year, 18.4%; 4th year, 17.4%; and 5th year, 15.8%. Furthermore, 49.9% of the participants were working in a state-owned university hospital, 46.1% were in a state-owned training and research hospital, and 4% were in a private university hospital.

Moreover, 44.7% of the participants were using the Android operating system, whereas 55.2% were using the Apple iOS in their smartphone. Only 9.4% of the respondents were not using social media applications. The most frequently used IMAs were WhatsApp (99.3%), Facebook Messenger (14.8%), Viber (8%), and Tango (1.3%).

According to the data obtained, the rate of IMA usage for clinical consultation was 95.3%, while 72.7% of the residents were using these applications for consultation at least “several times a day” (Figure 1). The most commonly preferred data formats during the clinical con-

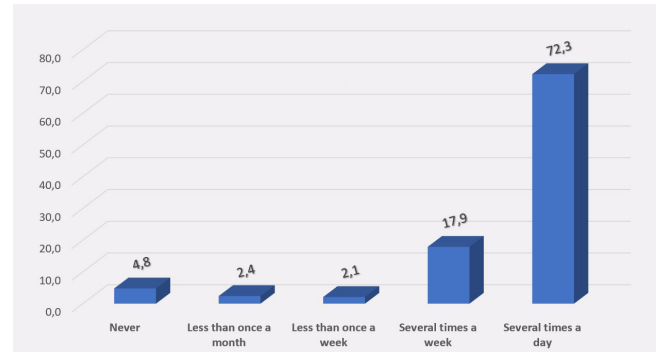


Figure 1. Percentages of the answers for the question numbered 10: “How frequent do you use instant messaging applications for clinical consultation purposes?”

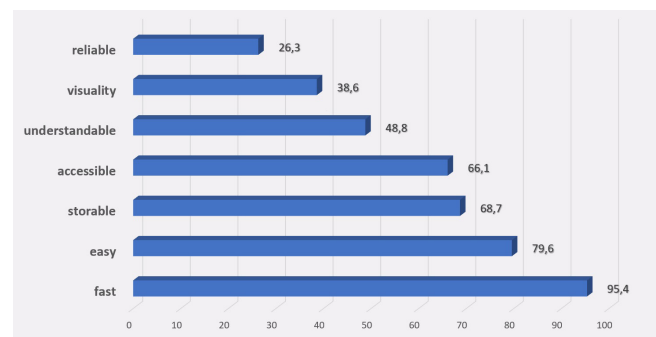


Figure 2. Percentages of the answers for the question numbered 12: “Why do you prefer instant messaging applications for consultation purposes?” (The participants were allowed to choose more than one answer.)

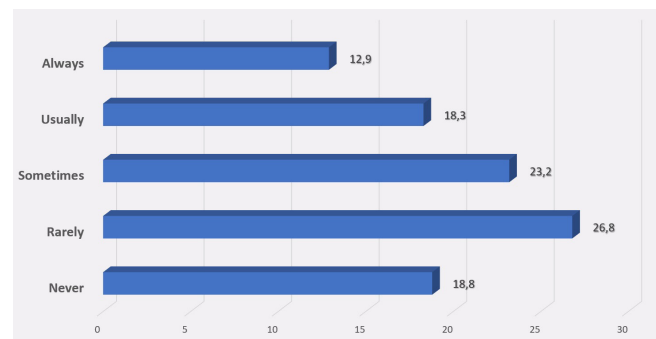


Figure 3. Percentages of the answers for the question numbered 15: “Do you use the identity or personal information of the patients during sending/receiving the messages?”

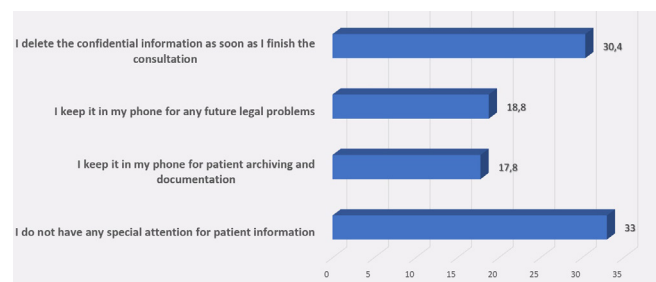


Figure 4. Percentages of the answers for the question numbered 16: “How do you manage the patient information in your personal phone after finishing consultation?”

H I G H L I G H T S

- Instant messaging application (IMA) usage during orthopedic consultation is high despite the low rate of reliance.
- Most of the trainees make decision through applications without a proper examination, putting the patients at the risk of misdiagnosis.
- The confidentiality of the patient’s personal information is at danger when IMAs are used.
- This survey highlights that it is necessary to make required legal regulations regarding the use of IMAs for consultation purposes and to develop applications only for medical consultation purposes.
- The policies and appropriate software are essential to protect both the patients and physicians.

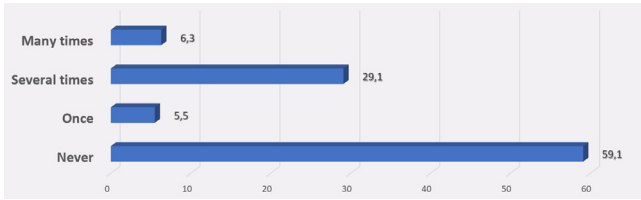


Figure 5. Percentages of the answers for the question numbered 20: "Do you or any of your colleague had any experience of misdiagnosis on an instant message consultation?"

sultation were photo (94.5%), text (85.1%), and video (11.5%), while only 0.1% of the respondents preferred voice messages. The most common reasons to prefer IMAs for clinical consultations were being "fast" (95.4%) and "easy" (79.6%), but only 26.3% of the residents reported that they prefer the use of IMAs because they find them "reliable" (Figure 2). The respondents chose "voice" as the most unreliable format with the rate of 41.5%, whereas this rate was 34.4% for "text," 13.9% for "photo," and 7.6% for "video." In addition, 63.2% of the participants answered "Yes" for the following question: "Have you ever based your diagnosis solely on a media (image or video) received through IMA without confirming with other systems and physical examination"? It was also determined that 81.2% of the participants use the personal information of the patients during the consultation, (Figure 3) and 69.6% of the participants do not delete the confidential information after finishing the consultation (Figure 4). It was also found that 5.3% of the participants (46 residents) lost their smartphone at least once in the last 5 years.

Only 22.4% of the participants thought that IMAs have no inadequacy for clinical consultations, while only 5.2% of the participants believed that IMAs do not compromise the diagnosis. A large proportion of the participants (41.7%) reported that they or their colleagues had an experience of misdiagnosis owing to the use of IMAs (Figure 5). Furthermore, 57.6% of the respondents thought that legal problems may arise because of the use of IMAs during the consultation, while 51.4% believed that an electronic platform, solely for consultation purposes, is required.

Discussion

The orthopedic surgery residents frequently use IMAs for consultation purposes. Three out of five residents tend to make a diagnosis without a proper physical examination, and two out of five residents had an experience of misdiagnosis or mistreatment owing to the use of IMAs during the consultation. It was determined that most of the participants did not take any precautions regarding the confidentiality of the patient's personal information. We believe that it is necessary to make the required legal regulations regarding the use of IMAs for consultation purposes and to develop applications only for medical consultation purposes.

The possibility of photo transfer with the help of advanced mobile imaging technology increased remote evaluation of radiographic or clinical situations. Especially, emergency departments (EDs) and on-call surgical residents use these software to transfer images of X-ray or computed tomography (CT) scan videos to consultants at home or senior residents for evaluation. The physicians also use the photos to document the time-lapse of the patient, surgical site, or wound over time; to have a proof for legal situations; or even sometimes to make presentations in scientific meetings. These applications are being used everyday by doctors from all subspecialties, including radiological images, laboratory results, and clinical pictures. The small screen sizes of smartphones and reduced image and resolution quality can jeopardize the diagnosis and treatment decision. Inappropriately taken pho-

tos (loss of focus and screen reflection) are also a part of the problem, while most of the software also do not provide high-quality zooming and contrast settings as Picture Archiving and Communication Systems (PACS) do. PACS is a medical imaging technology that provides electronic storage and access to medical images from different sources (10). Chandhanayingyong (11) investigated the accuracy of teleconsultation via multimedia messaging service (MMS) in patients referred to ED with an orthopedic complaint. They found 40% overall misdiagnosis rate compared with X-ray. Ferrero et al. also analyzed MMS consultations and reported that the ulnar styloid fracture sensitivity is low (77%) compared with the distal radius (12). Goost et al. found a low concurrence ratio of thoracic and pediatric injuries for photos sent via e-mail or MMS (13). Loss of data quality owing to the low camera resolution was the most important problem in these studies. However, these studies are old-dated, and the technology has evolved since then; therefore, the latest studies report better results, and the use of instant messaging was shown to be effective, almost as standard PACS images with high accuracy (14). Because direct radiographs constitute a large proportion of musculoskeletal system imaging, inter- and intra-observer reliability of these software are being investigated for almost all parts of the body in both adult and pediatric population, and satisfactory intra- and inter-observer reliability in the assessment of radiological images were found, including the images of direct radiographs and the video clips of CT (5, 12, 15, 16). The use of IMAs has shown to reduce missed diagnosis of fracture or dislocation by general practitioners and avoid unnecessary trips of the patients to a tertiary hospital (17).

One of the most important advantages of these software is the possibility of free usage without any payment. Although there are several paid options, IMAs such as WhatsApp, Facebook Messenger, Viber, and Tango are the most widely preferred software because they are freely available. These applications also help to provide faster and more effective healthcare services. In a randomized study by Gulacti and Lok (1), the consultations made via the messaging applications and via telephone as verbal communications were compared prospectively in ED. The authors concluded that IMAs for consultation reduce the total length of stay and consultation time in EDs, while they also diminish ED consultation visits by other specialists. However, they did not make any analysis for a possible misdiagnosis or mistreatment owing to the diminished ED visits by the consultants. They revealed that IMAs lead to more consultations ending without the specialist attending the ED, and 61.8% of the consultations were completed using IMAs alone. Johnston et al. found that trainees are the speediest responders to communication for consultation through WhatsApp compared with interns and attendings (8). A study analyzing the WhatsApp usage between consultants and emergency physicians revealed that the highest consultation number belonged to orthopedics, and 74.4% of the orthopedic consultations were concluded via only WhatsApp messages, which was the highest rate among all clinics (18). These findings show the importance of such software during orthopedic consultations.

In a prospectively designed study, Khanna et al. investigated the effect of WhatsApp, which is the most commonly used IMA in most of the studies, on orthopedic care in a 300-bedded tertiary care teaching center (7). They revealed that IMAs help the trainees function efficiently for improving the communication and awareness regarding the admitted patients; however, they also emphasized that WhatsApp is not a substitute for clinical examination and can only play a supportive role in enhancing the level of healthcare.

Although there are many advantages of these software, concerns related to misdiagnosis and patient privacy do exist (19). The disadvantages of instant messaging software for clinical consultations include disparity in the emergency of the case, disturbance of professional relations, and diminished verbal communication, which can lead to

misunderstanding in some instances. The general recommendation is the development of applications in concordance with a governance framework to not to risk patient safety, confidentiality, and threats from cyber attacks (19). There are attempts to develop software without infringing health information privacy only for medical purposes for communication between physicians (20). It is also argued by some studies that the current practices are not compatible with professional and legal obligations and put the physicians at the risk of civil and disciplinary proceedings because the data are vulnerable to infringing patient privacy and confidentiality, which is prohibited under legislation (21). In our study, we were able to determine that 5% of the participants have lost their phones in the last 5 years, and 72% of those participants reported that they do not delete the patient information after consultation. Therefore, our study also shows that patient privacy can be infringed through a lost or a stolen phone.

Although the patient consent can be obtained to take a clinical photograph during the examination, it mostly does not include a consent to allow the transfer of the images to other medical professionals who can download them for further usage. The transfer of personal health information without a consent is prohibited by the Personal Data Protection Law (22) and subjected to a fine or imprisonment by Turkish Penalty Codes 135-140 (23). Another problem is the possibility of sending the images to an unintended recipient accidentally. National health services from different countries, including the United Kingdom, the United States, Canada, and the Netherlands, warned against the usage of these software for clinical information exchange because of the lack of appropriate security and considered them illegal (2, 24). Forensic analysis of such programs are being conducted (25), and frameworks to assess the risk of such software and to promote their safe use are being developed (26). In addition, the governance and legal framework of such applications are required (19).

The overall rate of participation in the survey was 97.3%, which is a major strength of this study. However, the lack of construct validity analysis of the questionnaire is an important limitation.

In conclusion, IMA usage during orthopedic consultation is high despite the low rate of reliance. Most of the trainees make decisions through application without a proper examination, putting the patients at the risk of misdiagnosis. Moreover, the confidentiality of the patient's personal information is at danger when IMAs are used, not only from a cyber attack but also because of the possibility of lost or stolen phones, giving access to the patient's private information to the people other than the original user. This survey highlights that it is necessary to make required legal regulations regarding the use of IMAs for consultation purposes and to develop applications only for medical consultation purposes. A team including the healthcare personnel and officials with application developers should create a new software with more strict and secure messaging software. The policies and appropriate software are essential to protect both the patients and physicians.

Ethics Committee Approval: N/A.

Informed Consent: Informed consent was obtained from the patients.

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Conflict of Interest: During 2018 UEGS Exam when this survey was conducted, the authors Bedri Karaismailoğlu, Serkan Erkuş, Niyazi Ercan and Alper Şükrü Kendirci were serving as the board members of TOTBID-AGUH Council, Tayfun Bacaksız was serving as the president of TOTBID-AGUH Council, Önder Kalenderer was serving as

a board member of TOTEK and İrfan Öztürk was serving as the president of TOTBID. Fatih Küçükdurmaz has no conflict of interest to declare.

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Appendix 1. Survey questions

Demographics and professional experience

1. How old are you?
2. What is your gender?
 Female Male
3. How many years have been since you started orthopedic residency program?
 1 2 3 4 5
4. What type of the institution(s) do you currently work for?
 Public training and research hospital Public university hospital Private foundation university hospital

Attitudes on the use of cellular phones

5. Has your cellular phone been lost or stolen in the last five years?
 Yes No
6. Do you use a smartphone?
 Yes No (Please go to question 21)
7. Which operating system does your smartphone have?
 iOS Android Other. Please state
8. How frequent do you use social media applications on your smartphone for any purpose?
 Several times a day Several times a week Less than once a week Less than once a month Never
9. Which instant messaging application(s) do you use? (Please select all that apply)
 None (Please go to question 21) WhatsApp Facebook Messenger Viber Telegram Other. Please state

Instant messaging application usage for clinical consultation purposes

10. How frequent do you use instant messaging applications for clinical consultation purposes?
 Several times a day Several times a week Less than once a week Less than once a month Never (Please go to question 21)
11. Which of the following formats do you use for consultation purposes in your messaging applications for your own patients? (Please select all that apply)
 Text Image Video Voice message Other. Please state
12. Why do you prefer instant messaging applications for consultation purposes? (Please select all that apply)
 Fast Easy Reliable Visuality Understandable Accessible Storable Other. Please state
13. Which of the following formats do you distrust most in consultation by instant messaging applications?
 Text Image Video Voice message Other. Please state
14. Have you ever based your diagnosis solely on a media (image or video) received through instant messaging application without confirming with other systems and physical examination?
 Yes No
15. Do you use the identity or personal information of the patients during sending/receiving the messages?
 Always Usually Sometimes Rarely Never (Please go to question 21)
16. How do you manage the patient information in your personal phone after finishing consultation?
 I delete the confidential information as soon as I finish the consultation
 I keep it in my phone for patient archiving and documentation
 I keep it in my phone for any future legal problems
 I do not have any special attention for patient information

Problems and comments on smartphone application usage for clinical consultation purposes

17. Do you think instant messaging applications are technically adequate for consultation purposes? (considering resolution, data transfer speed, universality etc.)
 Extremely Considerably Moderately Slightly Not at all
18. Do you think that consulting a patient through instant messaging applications compromises the diagnosis?
 Extremely Considerably Moderately Slightly Not at all
19. Do you think consultation via instant messaging applications can cause any legal problems?
 Yes No No idea
20. Do you or any of your colleague had any experience of misdiagnosis on an instant message consultation?
 Many times Several times Once Not at all
21. Do you think creating an electronic platform or an application exclusively for consultation is necessary?
 Yes No No idea