



Advancing orthopaedic trauma care through WhatsApp: An analysis of clinical and non-clinical applications, challenges, and future directions

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Abstract

The integration of WhatsApp, a widely-used instant messaging application (IMA), into the realm of orthopaedics and trauma surgery has emerged as a significant development in recent years. This paper explores the multifaceted role of WhatsApp in orthopaedics, focusing on its clinical and non-clinical applications, advantages, disadvantages, and future prospects. The study synthesizes findings from various research papers, emphasizing the growing reliance on mobile technology in healthcare. WhatsApp's role in orthopaedics is notable for its ease of use, real-time communication, and accessibility. Clinically, it facilitates triage, teleconsultation, diagnosis, treatment, patient advice, and post-operative monitoring. Non-clinically, it supports telemedicine, teleradiology, virtual fracture clinics, research, and education in orthopaedic surgery. The application has proven beneficial in enhancing communication among healthcare teams, providing quick responses, and motivating junior physicians. Its use in educational settings has been shown to improve learner's understanding and patient care.

However, the use of WhatsApp in orthopaedics is not without challenges. Risks include the potential spread of misleading information, privacy concerns, and issues with image quality affecting diagnosis and treatment decisions. The paper acknowledges the importance of maintaining professional boundaries and the need for oversight measures to ensure content accuracy. Looking forward, the potential of WhatsApp and similar IMAs in orthopaedics lies in their ability to streamline data collection and retrieval, improve doctor-patient communication, and address challenges like bureaucratic red tape and limited resources. The paper suggests that future orthopaedic practice, particularly in emergency departments, will increasingly rely on such technologies for efficient patient management. This shift, however, must be approached with an understanding of the ethical, legal, and practical implications of integrating social media and mobile technology in healthcare.

Key Words: Social media; WhatsApp; Orthopaedics; Trauma; Research

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Core Tip: WhatsApp enhances healthcare communication, patient care, and medical education in orthopaedic trauma, offering speed and convenience. Despite its benefits, including efficiency and timely decision-making, challenges persist regarding data privacy, professional boundaries, and potential information mismanagement. We recommend developing standardized guidelines for secure and ethical app use in healthcare. Future research should focus on integrating WhatsApp more effectively into medical practices, ensuring it enhances patient care without compromising safety or professionalism, thus maximizing its potential in healthcare while addressing its inherent limitations.

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INTRODUCTION

The advent and proliferation of mobile internet devices over the past decade have revolutionized the landscape of healthcare communication, education, and patient management. In the dynamic field of orthopaedics, efficient communication among healthcare professionals is paramount for the effective management of patient care[1]. The emergence of instant messaging applications (IMAs) such as WhatsApp has offered a platform for the rapid and seamless exchange of information, thereby facilitating better patient outcomes and enhancing the learning experience for clinicians and students alike[2,3].

The role of social media and mobile applications in clinical education has gained prominence, enriching the curriculum and empowering students with a wealth of knowledge and preparedness beyond traditional classroom settings[4]. Furthermore, the coronavirus disease 2019 (COVID-19) pandemic underscored the importance of teleconsultation services, necessitating adjustments in hospital workflows and highlighting the critical role of technology in maintaining continuity of care[5]. WhatsApp, in particular, has distinguished itself as a versatile tool for text and multimedia communication within the medical community[6]. Since its inception by Brian Acton and Jan Koum in 2009, WhatsApp has become the preferred IMA across various regions including Africa, Russia, the United Kingdom, India, Europe, and South America[7]. Its ability to support group chats and the instant transmission of images, such as plain radiological images, has proven invaluable in clinical settings, allowing for immediate consultations and facilitating interprofessional collaboration[8].

In orthopaedics, the application of WhatsApp has been documented across several domains, including postoperative care management, fracture classification agreement, and enhancing the accuracy and timeliness of radiograph interpretation[9,10]. Despite its infancy in the clinical realm, a growing body of evidence supports the utility of WhatsApp in improving communication and decision-making processes among healthcare providers[11,12]. However, the integration of WhatsApp and similar technologies in healthcare is not without challenges. Concerns regarding the dissemination of misleading information, the need for oversight measures, and the limitations posed by the small screens of mobile devices have been identified as significant barriers to the effective use of these platforms[4]. These issues underscore the necessity for further research and development to optimize the use of WhatsApp in orthopaedics and trauma surgery as depicted in [Figure 1](#).

This review article aims to critically analyze the clinical and non-clinical applications of WhatsApp in advancing orthopaedic trauma care. It will explore the benefits and challenges associated with its use, assess the impact on patient management and interprofessional collaboration, and propose future directions for research and application in this field. Through this comprehensive analysis, we seek to bridge the knowledge gap and contribute to the ongoing discourse on leveraging technology to enhance orthopaedic care and education.

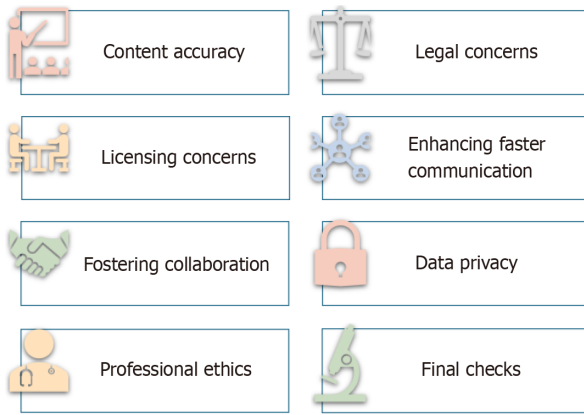


Figure 1 Strategies of WhatsApp in orthopaedic trauma care.

ADVANTAGES OF WHATSAPP IN CLINICAL SETTINGS

The integration of WhatsApp within clinical settings offers several distinct advantages that enhance the overall efficiency and effectiveness of healthcare communication. This mobile app-centric approach enables healthcare professionals to access and disseminate information rapidly and conveniently, irrespective of their location[13]. This mobility significantly enhances communication among team members, fostering a more collaborative and responsive environment. Furthermore, the potential for quick responses through WhatsApp facilitates timely decision-making and intervention, which are critical in acute care settings[14,15]. The immediacy of messaging encourages junior physicians to actively seek assistance and advice, thereby promoting a culture of learning and mentorship. This not only aids in the swift resolution of patient care queries but also contributes to the professional development of junior staff. The resultant increase in the team's sense of efficacy bolsters confidence and motivation, leading to improved patient outcomes and team dynamics.

CHALLENGES AND RISKS ASSOCIATED WITH WHATSAPP USE

Despite its numerous benefits, the use of WhatsApp in clinical settings is not without its disadvantages. A primary concern is the unequal urgency with which messages may be treated. The informal nature of instant messaging can lead to prioritization issues, where non-urgent communications inadvertently compete with critical alerts, potentially delaying timely care[16]. Unprofessional behavior is another risk associated with the use of WhatsApp, as the informal communication platform might encourage casual or inappropriate exchanges that undermine professional standards[17,18]. Additionally, the increased workload resulting from a constant stream of messages can be overwhelming for healthcare providers, leading to burnout and reduced efficiency. Privacy and data protection issues represent a significant challenge, as the transmission of patient information *via* a platform not specifically designed for healthcare use raises concerns about confidentiality and compliance with data protection laws[19-21]. The reliance on WhatsApp may inadvertently diminish the autonomy of junior doctors. By facilitating constant oversight and easy access to senior advice, there is a risk of stifling independent decision-making and critical thinking skills, which are essential for professional growth and the development of clinical acumen. The advantages and challenges are summarized in Table 1. We propose that future iterations of WhatsApp and similar platforms incorporate features tailored for medical contexts. For instance, introducing a hierarchy of message urgency could help mitigate the risk of critical information being overlooked due to the volume of less urgent messages. Additionally, developing dedicated interfaces that integrate seamlessly with existing electronic health record systems could help preserve data integrity and ensure compliance with medical confidentiality regulations.

EVIDENCES OF WHATSAPP IN MEDICAL CARE AND MEDICAL TEACHING

The studies reviewed span a range of contexts, from clinical attachments and teleconsultations to the use of WhatsApp for communication within medical teams and as a supplementary tool in medical education. For instance, Raiman *et al*[22] demonstrated that WhatsApp could significantly enhance clinical attachment teaching for medical students, facilitating instant communication and access to recorded conversations which aided learning and comprehension. Similarly, Sahu *et al*[23] explored patient opinions on teleconsultation *via* WhatsApp for shoulder rehabilitation during the COVID-19 lockdown, finding a high level of patient satisfaction with the platform. Moreover, Coleman and O'Connor[7] highlighted the role of WhatsApp in medical education, showing how it could improve learners' understanding through its use for educational purposes, both with and without a pre-established curriculum. Ellanti *et al*[24] provided evidence of WhatsApp's utility in improving communication within orthopaedic surgery teams, indicating significant time savings compared to traditional communication methods. The application of WhatsApp in facilitating communication about patient care and educational objectives in orthopaedic surgery was found it to be a fast, inexpensive, and simple com-

Table 1 Advantages and challenges of WhatsApp in clinical setting

Advantages of WhatsApp in clinical settings	Challenges and risks associated with WhatsApp use
Elimination of the need for a computer: Enables rapid access and dissemination of information without being tied to a computer, enhancing mobility and convenience	Unequal urgency of messages: The informal nature of messaging may lead to prioritization issues, with non-urgent communications potentially competing with critical alerts
Enhanced team communication: Fosters a collaborative and responsive environment through improved communication among healthcare team members	Unprofessional behavior: The informal platform might encourage casual or inappropriate exchanges, undermining professional standards
Quick responses and timely intervention: Facilitates timely decision-making and intervention, critical in acute care settings, by allowing for immediate messaging	Increased workload and burnout: The constant stream of messages can overwhelm healthcare providers, leading to burnout and reduced efficiency
Promotion of learning and mentorship: Encourages junior physicians to seek advice and assistance, promoting a culture of learning and mentorship, and aids in swift resolution of patient care queries	Privacy and data protection issues: The transmission of patient information <i>via</i> a non-healthcare-specific platform raises concerns about confidentiality and compliance with data protection laws
Increased sense of efficacy: Bolsters confidence and motivation among the team, leading to improved patient outcomes and team dynamics	Diminished autonomy of junior doctors: Constant oversight and easy access to senior advice may stifle independent decision-making and critical thinking skills

munication tool that met the expectations of consultants and residents alike. Giordano *et al*[11] conducted a broader review of the literature and found strong evidence supporting WhatsApp as a promising tool for telehealth and communication among healthcare professionals. The use of WhatsApp and other social media platforms by orthopaedic surgeons has been explored by Jildeh *et al*[25], who noted the advantages of such tools in enhancing patient-physician communication and disseminating accurate information. Studies by Pamuk[5] and Stahl *et al*[8] demonstrated the reliability of WhatsApp for teleconsultation and decision-making in orthopaedic trauma, respectively, with findings suggesting near-perfect agreement with traditional diagnostic methods. Further, Kapicioğlu *et al*[26] affirmed the safety and reliability of using WhatsApp for decision-making regarding paediatric supracondylar fractures, and Sumargono *et al*[27] reported high satisfaction rates with virtual clinics using WhatsApp for postoperative follow-up after total knee replacement surgery, emphasizing its potential continuity beyond the pandemic context.

The evidence compiled from these studies suggests that WhatsApp, as a digital communication tool, holds significant promise for enhancing medical care and education. Its advantages include improving learning outcomes, facilitating efficient and reliable communication among healthcare professionals, enhancing patient satisfaction with teleconsultation services, and offering a viable alternative to traditional communication methods. These findings underscore the potential of WhatsApp and similar technologies to play an integral role in the evolving landscape of healthcare delivery and medical education, warranting further exploration and integration into practice. The findings have been summarized in Table 2. Our analysis suggests that while WhatsApp significantly enhances communication and educational outcomes, there is a need for formalized training programs on its use in medical settings. Such programs should focus on ethical communication practices, secure data handling, and the importance of maintaining professional boundaries. By educating medical professionals on these aspects, we can maximize the benefits of WhatsApp while safeguarding against its potential drawbacks.

CLINICAL APPLICATIONS OF WHATSAPP IN HEALTHCARE

The advent of instant messaging services, particularly WhatsApp, has ushered in a new era of communication within the healthcare sector. This platform has been leveraged for a variety of clinical applications, demonstrating its versatility and effectiveness. From triage and teleconsultation to diagnosis, treatment, and patient monitoring, WhatsApp has proven to be a valuable tool in enhancing patient care and facilitating communication among healthcare professionals.

Triage and initial consultation

The utility of WhatsApp in emergency surgery teams has been highlighted by Johnston *et al*[28], who analyzed over 1000 h of WhatsApp communication, concluding that the platform is both effective and safe for use. It has been particularly noted for breaking down communication barriers among doctors, as detailed by Ellanti *et al*[24]. In the context of emergency departments (EDs), WhatsApp facilitates swift consultations with mobile or out-of-hospital consultants during night and evening shifts, an approach supported by Gulacti and Lok[29]. The integration of teleradiology *via* WhatsApp allows for the treatment of simple fractures and dislocations by general practitioners after consultation with orthopaedic surgeons or radiologists. This practice not only reduces the incidence of missed fractures but also minimizes unnecessary trips to tertiary hospitals for specialist X-ray evaluations, as demonstrated by Stahl *et al*[8].

Teleconsultation for rehabilitation

The COVID-19 pandemic has significantly boosted the adoption of telemedicine, with patient satisfaction playing a critical role in the ongoing development of telehealth practices. Studies by Sahu *et al*[23] and Grandizio *et al*[30] found high levels of patient satisfaction with telehealth services for shoulder rehabilitation and general consultations,

Table 2 Overview of studies on the use of WhatsApp in medical care and education

Ref.	Study context	Sample/methodology	Main findings	Conclusion
Raiman <i>et al</i> [22], 2017	Clinical attachment teaching <i>via</i> WhatsApp	Six WhatsApp groups; thematic analysis of interviews	Benefits in learning, enhanced accessibility of conversations	WhatsApp is a feasible enhancement to problem-based learning
Ellanti <i>et al</i> [24], 2017	WhatsApp for communication in orthopaedic surgery teams	Of 1916 communication events; 5492 messages	Time savings, reliable communication	Superior to traditional pager systems
Stahl <i>et al</i> [8], 2019	Instant messaging app reliability in paediatric orthopaedic trauma	Of 73 cases; evaluation by five paediatric orthopaedic surgeons	“Near perfect agreement” with traditional radiograph interpretations	Reliable for evaluating paediatric limb fractures
Giordano <i>et al</i> [11], 2017	WhatsApp as a supplementary tool for telehealth	Literature search in PubMed, EMBASE, Cochrane library	Of 30 studies identified	Promising for learning and healthcare communication
Jildeh <i>et al</i> [25], 2019	Social media use by orthopaedic surgeons	Analysis of online surgeon-patient contact and ethical adherence	Enhances patient-physician communication	Valuable for practice development
Kapicioğlu <i>et al</i> [26], 2019	WhatsApp use for paediatric supracondylar fractures	Retrospective analysis of 90 X-rays; evaluation by orthopaedicians and PACS reevaluation	High intra and inter-observer reliability	Reliable for emergency decision-making
Coleman and O'Connor[7], 2019	Role of WhatsApp in medical education	Review of 23 articles	Improved learners' understanding	Effective for educational purposes
Dittrich <i>et al</i> [12], 2020	Smartphone apps in trauma and orthopaedic surgery	Survey of 206 doctors	Positive view on medical apps' future potential	Significant future role anticipated for medical apps
Sahu <i>et al</i> [23], 2021	Patient opinions on teleconsultation for shoulder rehabilitation during COVID-19	Of 30 patients; Telemedicine Usability Questionnaire	High patient satisfaction; preference for Zoom	Patients satisfied with teleconsultation
Sumargono <i>et al</i> [27], 2022	Virtual clinics for postoperative follow-up after TKR surgery	Of 546 TKR procedures; WhatsApp video calls	High patient satisfaction with online consultations	Effective during and potentially after the COVID-19 pandemic
Pamuk[5], 2022	Teleconsultation for proximal humerus fractures	Of 83 patient radiological scans; interobserver and intraobserver analysis	High reliability of WhatsApp images compared to PACS	Teleconsultation is dependable

PACS: Picture archiving and communication system; TKR: Total knee replacement; COVID-19: Coronavirus disease 2019.

respectively. These studies emphasized the benefits of telemedicine, including shorter visit durations, reduced travel expenses, and the simplicity and helpfulness of online communication.

Diagnosis, treatment, and patient advice

For orthopaedic consultations, a combination of a patient's history, physical examination results, and radiographic examinations typically suffices for a final diagnosis. WhatsApp facilitates this process by allowing for the remote sharing of radiographs and clinical information, leading to good inter- and intraobserver agreement in assessments, as found by Giordano *et al*[11]. This application of WhatsApp not only expedites patient management in specialties such as plastic and reconstructive surgery but also enhances the remote assessment capabilities through mobile imaging technologies[6,31]. Moreover, the provision of patient advice *via* WhatsApp has been underscored by Mouelhi *et al*[32], who advocate for the availability of medical material on social media to keep patients well-informed. The platform enables consultants to make expedient clinical judgments based on photographic examination images, clinical results, and brief medical histories, thereby facilitating decisions on patient admission or discharge.

Video consulting and monitoring

The increasing presence of WhatsApp in medical literature for patient involvement, particularly through video consulting, has been noted. The business edition of WhatsApp messenger, designed with professionals in mind, is recommended for these activities. Furthermore, the platform plays a crucial role in the monitoring of post-operative patients, surveillance, and remote monitoring and consultation[33-35]. In EDs, WhatsApp allows orthopaedic consultants to evaluate patient data remotely, offering medical decisions without the immediate physical presence of the consulting physician[36].

Virtual multi-disciplinary boards

The last decade has seen a growing dominance of web-based technology in scientific research and healthcare. The COVID-19 pandemic has further accelerated the adoption of electronic visits for cancer patients, offering immediate benefits by reducing infection risks and overcoming transportation barriers. The implementation of virtual multi-discip-

linery boards *via* platforms like WhatsApp underscores the potential for such technologies to facilitate comprehensive and collaborative patient care[37-39].

Its ability to streamline communication, facilitate remote consultations, and enhance patient engagement and satisfaction underscores its value in modern healthcare. As the healthcare sector continues to evolve, the integration of instant messaging services like WhatsApp will likely play an increasingly significant role in improving patient care and operational efficiency[40,41].

Implant discussions via WhatsApp

The integration of WhatsApp in discussing implant options and follow-up care represents a pivotal advancement in patient-centered care. This platform enables seamless communication between healthcare professionals and patients, facilitating the exchange of information regarding implant choices, surgical planning, and post-operative care instructions [42,43]. Through secure messaging, patients can easily share their concerns and receive personalized advice, while surgeons can provide updates, address queries, and monitor healing progress remotely. This method not only enhances patient engagement and satisfaction by offering immediate access to medical guidance but also improves the efficiency of care coordination, ensuring that patients are well-informed and actively involved in their treatment decisions.

Considering the rapid evolution of digital communication tools, it is imperative to continuously evaluate the impact of WhatsApp on clinical decision-making and patient management. We suggest a longitudinal study to track outcomes related to WhatsApp use in orthopaedic and trauma surgery, thereby providing data-driven insights that could inform both practice and policy.

NON-CLINICAL APPLICATIONS OF WHATSAPP IN HEALTHCARE

WhatsApp's impact on healthcare extends beyond clinical applications, significantly influencing non-clinical areas such as telemedicine, teleradiology, virtual clinics, research, education, and public health initiatives. This section delves into these various non-clinical applications, showcasing WhatsApp's versatility in healthcare settings.

Telemedicine and teleradiology

Telemedicine has been revolutionized with the advent of instant messaging platforms like WhatsApp, which facilitate remote healthcare services. A notable subset of telemedicine, teleradiology, utilizes WhatsApp for the remote viewing and analysis of radiological images. This approach has proven effective in reducing the number of missed fractures in patients examined in general or rural hospitals and in preventing unnecessary visits to tertiary hospitals for specialist X-ray consultations, as highlighted by Stahl *et al*[8].

Virtual fracture clinics

The COVID-19 pandemic underscored the value of virtual fracture clinics as a cost-effective strategy. Sumargono *et al*[27] and Kauta *et al*[44] demonstrated how virtual supervision and co-management by orthopaedic teams through WhatsApp referral groups enabled non-specialist physicians to successfully treat a significant portion of traumatic fractures at community health clinics. This not only facilitated timely and efficient care but also minimized the need for in-person consultations, which was particularly advantageous during the pandemic[45].

Research in orthopaedic surgery

WhatsApp has also emerged as a useful tool in orthopaedic surgery research, enabling researchers to collaborate, share findings, and discuss methodologies in real-time[10,43,46]. This fosters a dynamic research environment where data and insights can be exchanged swiftly, thereby accelerating the pace of research and innovation in orthopaedic surgery.

Teaching, training, and medical education

The integration of WhatsApp into the education and training of medical residents, especially in orthopaedic teaching centres, has significantly enhanced communication and learning. Residents, who often come from diverse backgrounds and possess varying skill sets, benefit from the platform's ability to facilitate interdepartmental communication regarding patient admissions, procedures, post-operative instructions, transfers, discharges, and reviews. Khanna *et al*[43] highlighted an increase in the effectiveness of handover procedures following the integration of WhatsApp in an orthopaedic teaching centre, illustrating the platform's potential to improve educational outcomes.

Online surveys, screening, and prevention

WhatsApp has been utilized to conduct online surveys and screening initiatives, offering a convenient and efficient method for collecting data from a wide audience. This application is particularly relevant in the context of public health, where rapid data collection and dissemination are crucial for disease prevention and health promotion efforts. WhatsApp's widespread availability and ease of use make it an ideal tool for engaging with the community in health-related surveys and screening programs[7,46-49].

The non-clinical applications of WhatsApp in healthcare demonstrate the platform's broad utility beyond patient care. From facilitating remote diagnostics and virtual clinics to enhancing research, education, and public health initiatives, WhatsApp serves as a pivotal tool in modernizing healthcare services and operations. Its ability to streamline communication, support education and training, and enable efficient data collection and analysis highlights the significant

potential of instant messaging platforms in transforming healthcare delivery and management. As healthcare systems continue to evolve and embrace digital technologies, the role of platforms like WhatsApp in supporting non-clinical healthcare functions is likely to expand, offering new opportunities for innovation and improvement in healthcare practices. To further harness the potential of WhatsApp for non-clinical applications, we recommend the establishment of virtual hubs that can serve as centers for excellence in digital healthcare communication. These hubs could facilitate the sharing of best practices, provide resources and support for healthcare professionals, and lead research on optimizing the use of digital tools in healthcare settings. The clinical and non-clinical applications of WhatsApp are tabulated in [Table 3](#).

LIMITATIONS OF WHATSAPP

Utilization of WhatsApp transcends mere communication, evolving into a pivotal tool for clinical consultations, sharing patient data, and facilitating swift decision-making processes. However, the employment of WhatsApp, while innovative and practical, is not without its caveats, as identified by Vukušić Rukavina *et al*[50], within the framework of accountability, confidentiality, professional boundaries, legal implications, and the perceived credibility of information shared, particularly concerning medical advisories such as vaccines. A primary concern associated with WhatsApp's integration into medical practice is the lack of formal accountability mechanisms[49,51,52]. In traditional medical communication channels, there are clear protocols and records, ensuring that all interactions can be audited and traced back to the involved parties. WhatsApp, by contrast, operates in a more informal domain, where such stringent accountability may be compromised, leading to potential discrepancies in patient care and clinical decision-making[53-55].

Furthermore, the breach of patient confidentiality emerges as a significant challenge. WhatsApp, though equipped with end-to-end encryption, still poses a risk when sensitive patient information is transmitted over a platform that is not exclusively designed for medical use[56]. This breach not only contravenes patient privacy laws but also erodes the trust between patient and healthcare provider. The blurring of professional boundaries is another critical issue. The informal nature of WhatsApp may lead to an erosion of the professional demeanor traditionally maintained in doctor-patient interactions[56]. This informality can result in misunderstandings, misinterpretations, and a potential decline in the perceived professionalism of healthcare providers.

Legal concerns and the risk of disciplinary actions are intertwined with the aforementioned challenges. The use of WhatsApp for clinical purposes places healthcare providers in a precarious position, navigating between enhancing care delivery and adhering to stringent legal and ethical standards[57-59]. Moreover, the credibility of information shared over WhatsApp is a matter of concern. Addressing these limitations necessitates a multifaceted approach, including the development of guidelines for the use of WhatsApp in clinical settings, training for healthcare professionals on maintaining professional standards while using social media, and enhancing the platform's features to better suit clinical needs. The future direction for integrating WhatsApp into orthopaedic trauma care thus lies in striking a balance between leveraging its benefits for immediate and effective communication and mitigating the risks associated with its use.

FUTURE DIRECTIONS

In envisioning the trajectory of application usage within the realm of healthcare, particularly in the advancement of orthopaedic trauma care, the landscape is marked by both burgeoning opportunities and formidable challenges. The potential for apps, including platforms like WhatsApp, to revolutionize data gathering and retrieval is substantial, offering streamlined processes for the accumulation, analysis, and dissemination of patient information. This technological evolution promises to enhance the efficiency of clinical operations, providing a robust framework for managing patient data and facilitating a more cohesive and integrated healthcare experience.

However, the application of such technology in enhancing doctor-patient communication, especially within ordinary clinical settings, remains a nuanced domain. Jildeh *et al*[25] underscore the imperative for physicians to recognize the demographic skew towards younger patients in their digital communication strategies. This demographic trend underscores the necessity for healthcare providers to navigate the digital divide, ensuring that the technological leap does not alienate older patient populations or exacerbate existing disparities in healthcare access and literacy. The ethical, legal, and practical ramifications of incorporating social media and messaging apps into clinical practice demand rigorous scrutiny[4]. While these platforms offer unparalleled immediacy and accessibility in communication, they also introduce complexities regarding patient confidentiality, data security, and the maintenance of professional boundaries. The deployment of such technologies necessitates a delicate balance, aligning the benefits of enhanced communication and data management with the imperatives of ethical practice and legal compliance.

Meinhart *et al*[60] highlight the potential of mobile technologies to cut through bureaucratic red tape and mitigate the constraints posed by limited human resources. This perspective envisages a future where the efficiency and responsiveness of healthcare delivery are significantly improved, leveraging technology to address systemic inefficiencies and resource scarcities. Envisioning the future of orthopaedic trauma care, the utterance "Please send to me *via* WhatsApp radiographic images of the patient", as projected by Gulacti *et al*[42], epitomizes the evolving interface of technology and healthcare. This scenario not only illustrates the practical applications of messaging apps in clinical settings but also signals a shift towards more agile and responsive modes of patient care. As the healthcare sector continues to navigate these technological frontiers, the imperative for comprehensive guidelines, ethical considerations, and continuous evaluation of clinical outcomes becomes increasingly paramount, ensuring that the integration of apps into healthcare enhances both the quality and accessibility of patient care. As we envision the integration of WhatsApp into routine

Table 3 Clinical and non-clinical applications of WhatsApp

Category	Clinical applications	Non-clinical applications
Communication & triage	Effective and safe for emergency surgery team communication. Facilitates swift consultations during off-hours	Enhances interdepartmental communication in educational settings. Improves handover procedures in orthopaedic teaching centres
Consultation & diagnosis	Allows remote consultations for simple fractures and dislocations. Enables remote sharing of radiographs and clinical information for diagnosis	Supports teleradiology for remote viewing and analysis of radiological images. Virtual fracture clinics reduce in-person consultations
Patient care	Teleconsultation for rehabilitation showing high patient satisfaction. Patient advice through easy access to medical material - monitoring of post-op patients	Virtual supervision and co-management of traumatic fractures. Online surveys and screening for public health initiatives
Education & training	Use in medical literature for patient involvement through video consulting. Facilitates remote assessments with mobile imaging technologies	Utilized for research collaboration and methodology discussions in orthopaedic surgery. Enables efficient teaching and training through real-time communication
Operational efficiency	Streamlines decision-making on patient admission or discharge. Virtual multi-disciplinary tumour boards for collaborative patient care	Conducts efficient data collection for research and public health surveillance. Minimizes unnecessary hospital visits and reduces healthcare costs

clinical practice, it becomes clear that regulatory frameworks must evolve concurrently. We advocate for the development of international standards for the use of instant messaging apps in healthcare, which could guide both developers and healthcare providers in optimizing these tools for patient care without compromising on safety or privacy.

CONCLUSION

The integration of WhatsApp into the realm of healthcare, and more specifically into orthopaedic trauma care, represents a significant advancement in the way medical professionals communicate, manage patient care, and facilitate education. The evidence reviewed underscores the potential of WhatsApp to enhance the efficiency and effectiveness of healthcare delivery through improved communication, timely decision-making, and facilitated learning and mentorship. However, this review also highlights the inherent challenges and limitations associated with its use, including concerns over confidentiality, professional boundaries, and the potential for information mismanagement. As the healthcare sector continues to evolve, the strategic incorporation of WhatsApp and similar technologies into clinical practice necessitates a balanced approach, taking into consideration the ethical, legal, and professional implications. Future directions should focus on developing comprehensive guidelines and protocols that ensure the secure and effective use of messaging apps, while also exploring innovative solutions to address the limitations identified. By doing so, the potential of WhatsApp to contribute positively to orthopaedic trauma care and beyond can be fully realized, enhancing both patient outcomes and the healthcare experience.

FOOTNOTES

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