

# An Analysis of WhatsApp Usage for Communication Between Consulting and Emergency Physicians

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**Abstract** The aim of this study was to evaluate WhatsApp messenger usage for communication between consulting and emergency physicians. A retrospective, observational study was conducted in the emergency department (ED) of a tertiary care university hospital between January 2014 and June 2014. A total of 614 consultations requested by using the WhatsApp application were evaluated, and 519 eligible consultations were included in the study. The WhatsApp messages that were transferred to consultant physicians consisted of 510 (98.3 %) photographic images, 517 (99.6 %) text messages, 59 (11.3 %) videos, and 10 (1.9 %) voice messages. Consultation was most frequently requested from the orthopedics clinic ( $n=160$ , 30.8 %). The majority of requested consultations were terminated only by evaluation via WhatsApp messages. ( $n=311$ , 59.9 %). Most of the consulting physicians were outside of the hospital or were mobile at the time of the consultation ( $n=292$ , 56.3 %). The outside consultation request rate was significantly higher for night shifts than for day shifts ( $p=.004$ ), and the majority of outside consultation

request were concluded by only WhatsApp application ( $p<.001$ ). WhatsApp is useful a communication tool between physicians, especially for ED consultants who are outside the hospital, because of the ability to transfer large amounts of clinical and radiological data during a short period of time.

**Keywords** Consultation · Communication · Online systems · WhatsApp · Emergency department

## Introduction

Effective communication between consulting and emergency physicians (EPs) is critical for patients in the emergency department (ED) [1]. Many hospitals still use outdated pager systems as the foundation for clinical communication between physicians and other health care professionals. However, pager systems contain several problems including long wait times for the return of a page, high costs, frequent interruptions, and the inability to identify the location or identity of the caller and place patient safety at risk [2]. Increasingly, hospitals are implementing mobile communication technologies and systems to optimize clinical communication and to improve the quality of patient care [3].

WhatsApp Messenger, which is a messaging program for smartphones, is most commonly used for communication. WhatsApp Incorporated announced that it served more than 900 million users in 2016, making it the most globally popular messaging application users [4]. WhatsApp Messenger has been used for clinical communication between physicians in healthcare [2, 5–8]. But, in the literature, no study regarding the use of WhatsApp for consultations in EDs has been conducted to date.

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The aim of this study was to analyze WhatsApp Messenger usage for communication between consulting physicians and EPs.

## Materials and methods

### Study design and setting

A retrospective, observational study was conducted in the ED of a tertiary care university hospital between January 2014 and July 2014. This urban hospital is formed by three different hospital complexes that are affiliated with two tertiary care state hospitals and a university hospital. The ED exists only at state hospitals and has approximately 140,000 patient visits per year. A coroner angiography unit is present only at the university hospital and is 2.5 km away from the ED which takes approximately 5 min by ambulance.

WhatsApp messenger is a real-time messaging application, and it allows smart phone users to send text messages and other types of media (such as photographs, videos and voice messages) to their contacts. Because WhatsApp messenger uses the same cellular data plans and wireless internet networks, there is no cost to use the WhatsApp messenger. For any message that is sent, a message information screen displays the details of when the message was delivered, read or played by the recipient. Two blue check marks and the time of contact appear next to a sent message, which indicate that the picture, audio file, or video message has been read by the recipient. All transmitted data in communication between persons is automatically saved to a WhatsApp messenger program folder in the smartphone memory.

### Data collection

Data were obtained from recorded data in the WhatsApp messenger program and hospital medical records. The message sending times and consulting physician responses when contact occurs were obtained from these records in the WhatsApp messenger program. The transmitted WhatsApp data include patient age; gender; EP preliminary diagnosis; consultation date; mechanism (medical illness or injury); patients' complaints; consultant specialty; radiographs, such as x-ray, computerized tomography (CT), magnetic resonance imaging (MRI) and electrocardiography (ECG) image, consultation outcomes; patients' data, such as images, text messages, and voice messages; laboratory results; and the consulting physician's response time to text message communications. Data sent via WhatsApp were noted by using a standardized form.

Adult patients who were consulted via WhatsApp by EPs in the ED were eligible for inclusion. Cases with any of the following criteria were excluded from the scope of the study:

patients younger than 18 years of age, an undetermined response time from the consulting physician, missing data, more than one consultation, unavailable consultations, and undetectable consultation outcomes.

### Statistical analysis

The numeric data were expressed by mean  $\pm$  standard deviation (SD) or median (minimum-maximum (min-max)) and categorical data by rates. Both data regarding consultation frequency and the relationship between clinics requesting consultation and termination of consultation were analyzed using the Pearson's Chi-square or, Fisher's Exact Test where applicable. All the hypotheses were constructed as two-tailed tests. The study data were analyzed with SPSS v. 17.0. For all analyses, statistical significance was defined as  $p < .05$ .

The ID for clinicaltrials.gov was NCT02605317

## Results

We evaluated 628 consultations that were requested by using WhatsApp, and 109 patients were excluded from the scope of the study due to a variety of reasons. In total, 519 eligible patients were included in the study. The mean age of the patients was  $48.33 \pm 21.50$  years (range: 19–89 years).

Two hundred seventy patients (52.1 %) were admitted to clinics, 179 (34.5 %) were discharged as outpatients for follow up with a prescription, 61 (11.8 %) were transferred for primary percutaneous coronary intervention (PCI) to angiography unit at affiliate the university hospital, 8 (1.5 %) were referred to another hospital, and 1 (0.2 %) died in the ED following consultation. A delay in PCI and the loss of time or complication in patients transferred was not reported in medical records of patients transferred to angiography unit.

A total of 510 (98.3 %) images, 517 (99.6 %) text messages, 59 (11.3 %) videos, and 10 (1.9 %) voice messages were sent to the consultants via WhatsApp. The most common clinic that was consulted was orthopedics ( $n = 160$ ,  $\chi^2 = 230.18$ ,  $p = < .001$ ). Admission and discharge-related consultation requests ( $n = 266$ , 51.3 %) were statistically higher than other causes. Demographical and clinical characteristics of requested consultations via WhatsApp are showed in Table 1.

CT and MRI images were transmitted to consultants as video messages (Fig. 1, [supplementary video file](#)), and patient monitor rhythm sounds were transmitted to consultants as voice messages ([supplementary audio file](#)). After assessing the transmitted data, no resolution problems were reported to EPs by the consulting physicians regarding the WhatsApp messenger program. WhatsApp screenshots showing

**Table 1** Characteristics of the requested consultations via WhatsApp in Emergency Department

Variables	
Male, n (%)	349 (32.8)
Age in years, mean ± SD	48.33 ± 21.50
Arrival time of data to consultant (minutes)	3.94 (1–34)
median (min-max)	
Response time of the consultant (minutes),	2.83 (1–29)
median (min-max)	
Consultation time, n (%)	
Morning (07:00–16:59)	216 (58.4)
Evening and night shift (17:00–06:59)	303 (41.6)
Consultant location	
Outside hospital or mobile	292 (56.3)
In-hospital	227 (43.7)
Mechanism, n (%)	
Medical illness	248 (47.8)
Injury	271 (52.2)
Termination of consultation	
Only WhatsApp	311 (59.9)
Both WhatsApp and arrived ED	208 (41.1)
Type of WhatsApp message* n (%)	
Image	510 (98.3)
Text Message	517 (99.6)
Video	59 (11.3)
Audio Media	10 (1.9)
Transmitted patient data * n (%)	
Radiographic image as a photograph	304 (58.6)
Electrocardiography as a photograph	87(16.8)
CT/MR scan as a video message	59 (11.3)
Photographic image of an ultrasound report	52 (10.1)
Wound image as a photograph	101 (19.5)
Laboratory results as a photograph	184 (35.4)
Monitor rhythm as an audio recording	10 (1.9)
History and clinical finding as text message**	517 (99.6)
Radiographic images sent as a photograph* n (%)	
Extremity x-ray	173 (33.3)
Chest x-ray	75 (14.5)
Abdominal x-ray	45 (8.7)
Cranial x-ray	21 (4.1)
Vertebrae x-ray	20 (3.8)
Other	9 (1.7)
Clinics requesting consultation n (%)	
Orthopedics	160 (30.8)
Cardiology	90 (17.3)
Plastic and Reconstructive Surgery	72 (13.9)
Pulmonary and Critical Care Medicine	62 (11.9)
Thoracic Surgery/General Surgery	55 (10.6)
Internal Medicine	40 (7.8)
Neurosurgery	35 (6.7)
Other	5 (0.9)

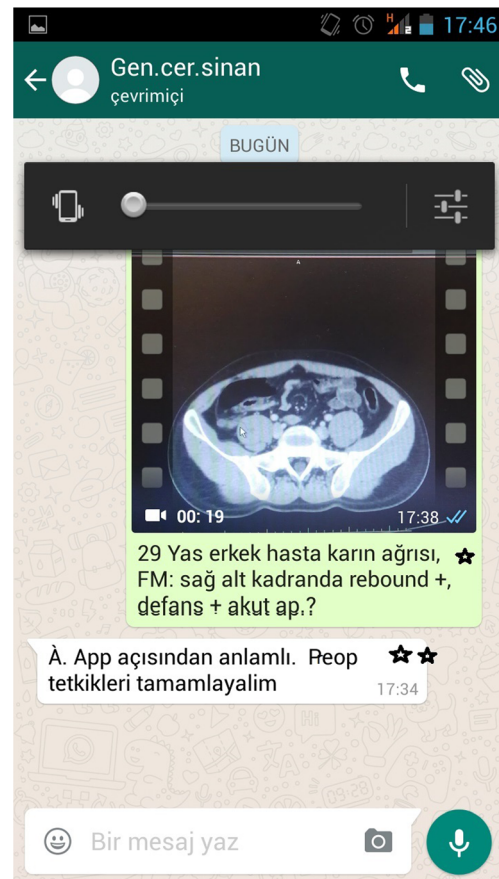
CT/MRI: computerized tomography/magnetic resonance imaging

\*Variables with multiple responses

\*\* Brief patient history, blood pressure, breath rate, heartrate, fever, and Glasgow coma score

communication between an emergency physician and a consultant are showed in Figs. 2 and 3.

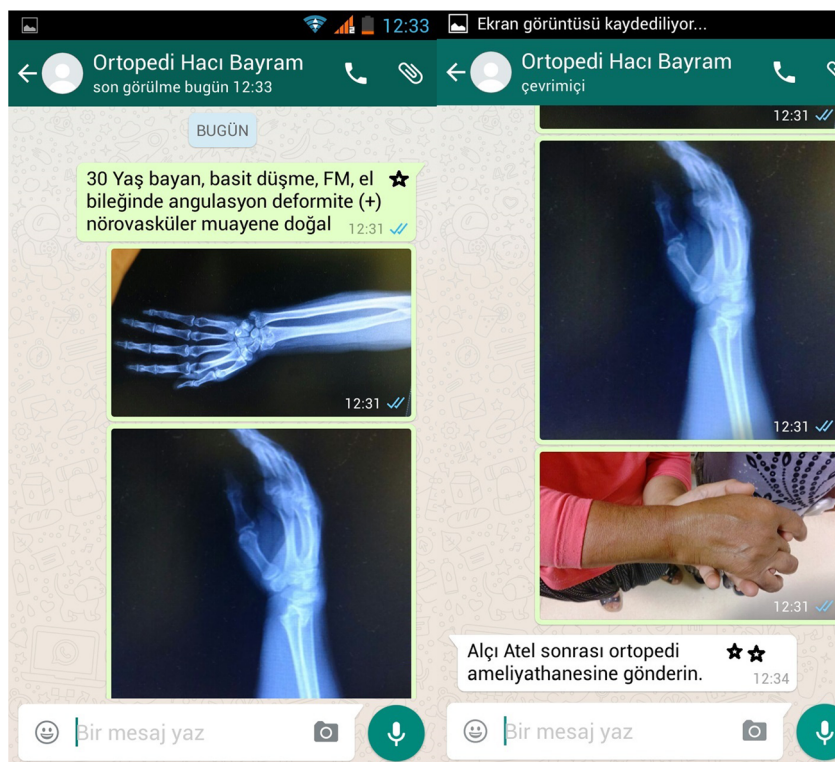
The median arrival time of data to consultant was 3.94 min (min-max: 1–34 min). The median response time of the consultant to WhatsApp messages containing preliminary diagnoses, laboratory test results and radiographic images was 2.83 min (min-max: 1–29 min). Regarding consultation



**Fig. 1** WhatsApp screenshots showing communication between an emergency physician and a consultant. Because physicians’ main language is Turkish, all communications is Turkish. Meanings in English are showed in figure legends. (Meaning in English)- Message sent to general surgeon S.H., \*29-year-old male patient with acute abdominal pain, patient history; congestive heart failure, hypertension and chronic pulmonary disease, physical examination (PE); rebound tenderness and rigidity on right upper quadrant. \*\* “Evidence of appendicitis on computerized tomography, make preoperative preparation

termination, there was a statistically significant difference according to the frequency distribution ( $\chi^2=20.44, p=<.001$ ). In 311 (59.9 %) cases, consultation was terminated only by WhatsApp messages; in 207 (40.1 %) of the cases, consultation was terminated after consulting physicians arrived at the ED. When clinics requesting consultation and termination of consultation were considered, it was found the termination of consultations by only WhatsApp messages was more frequent in orthopedic consultations than in any other clinic consultations. ( $n=119, p=<.001$ ) (Table 2). Sixty-three (52.9 %) patients were discharged after a plaster splint application, 43 (36.1 %) were admitted to orthopedics, 10 (8.4 %) underwent a surgical operation, and 3 (2.5 %) were transferred to another hospital. The second most common service that was consulted was the cardiology clinic ( $n=90, 17.3$  %). Sixty-one (67.8 %) cases were directly transferred from the ED to PCI units, 27 (30 %) were admitted to the coronary intensive care unit

**Fig. 2** WhatsApp screenshots showing communication between an emergency physician and a consultant. Because physicians' main language is Turkish, all communications is Turkish. Meanings in English are showed in figure legends. (Meaning in English) -Message sent to orthopedist HB. T.; \*30-year-old female patient, low fall, on physical examination (FE) there is wrist angulation, neurovascular intact \*\* Bring the patient to the operating room after a plaster splint



**Fig. 3 a.** (Meaning in English)-Message sent to cardiologist M.C.; \*70-year-old male patient with chest pain beginning 1 h ago, on physical examination (FE) vital findings are stable, \*\* Send to our coroner angiography unite the patient. I am waiting. **b.** (Meaning in English) Message sent to plastic surgeon F.D.; \*30-year-old male patient with left foot injury, restricted extensor movement of distal interphalangeal joint in 1. phalanx, extensor tendon laceration \*\* Bring the patient to the plastic surgery operating room for tendon repair



**Table 2** The relationship between clinics requesting consultation and termination of consultation

Services requested consultation, n (%)	Only WhatsApp (n = 311)	WhatsApp and arrived ED (n = 208)	p-value
Orthopedics	119 (74.4)	41 (25.7)	
Cardiology	61 (67.8)	29 (33.2)	
Plastic and Reconstructive Surgery	56 (68.0)	16 (40.2)	
Pulmonary and Critical Care Medicine	26 (41.9)	36 (58.1)	<.001†
Thoracic Surgery/General Surgery	17 (30.9)	38(69.1)	
Internal Medicine	18 (45.0)	22 (55.0)	
Neurosurgery	12 (34.3)	23 (65.7)	
Other	2 (40.0)	3 (60.0)	

†Fisher’s Exact Test

(ICU), and 22 (24.4 %) were discharged from the ED to an outpatient setting. Sixty-one (67.8 %) cardiac patients had consultation termination by only using WhatsApp data (Table 2). Of these cases, 42 patients (68.9 %) were transferred to the PCI unit, 11 (18.1 %) were admitted to the coronary ICU, and 8 (13.1 %) were discharged from the ED.

Most of the consulting physicians (56.3 %) were outside of the hospital or were mobile at the time of the consultation; this finding was significantly higher than the in-hospital consultation rate (n = 292,  $\chi^2 = 8.14$ ,  $p < .001$ ). Two hundred nine (67.2 %) of the requested consultations from outside the hospital or mobile consultations were terminated by only an evaluation of WhatsApp messages ( $p = .004$ ), and 258 (88.4 %) of those consultations were requested during evening and night times ( $p < .001$ ) (Table 3).

**Discussion**

Smartphones have begun to dominate communication in our daily life. Almost all health professionals in the United States of America, the United Kingdom now carry smartphones [3, 4]. This study is the first study to evaluate the WhatsApp messenger application in smartphones for consultations in the ED.

In traditional ED consultations, the most frequently used method is a verbal report via telephones. However, with this method, transferring all patient data to the consulting physician correctly and objectively remains dependent on the experience and knowledge of the referring physician [5]. A study conducted by Dorwal et al. [6] reported that a patient’s laboratory test results can be shared objectively as a photographic image by senior colleagues via WhatsApp. In this study, laboratory test results and all patient data, including x-rays, ultrasound results, electrocardiography, and wound images, were transferred objectively and precisely to the consultants as photographic evidence. Moreover, we sent a large number of CT and MRI videos and cardiac rhythm in patient’ monitoring to the consultants through WhatsApp. In our study, it was demonstrated that all patient data, including large-sized video images and voice messages, can be transferred to a consultant seamlessly via WhatsApp.

It is possible that patient data, such as clinical findings, laboratory results, and radiographic test results, can be sent to physicians by a short message service (SMS) method. In meta-analysis, the use of SMS is modest benefits for clinical diagnosis and other health care [9]. However, it is a time consuming and inconvenient technique to transcribe all of the patients’ clinical, laboratory and radiographic results to smartphones using keyboards. Additionally, while SMS charges a fee per message, WhatsApp is free [10]. Because

**Table 3** Consultation time and conclusion of consultation regarding consultant’s location

	Out of the hospital or mobile consultant (n = 292)	Inside the hospital (n = 227)	p value
Termination of consultation, n(%)			
Only WhatsApp	209 (71.6)	102 (44.9)	.004
WhatsApp and arrived ED	83 (28.4)	125 (55.1)	
Consultation time, n(%)			
Morning	34 (11.6)	182 (80.1)	<.001
Evening and night	258 (88.4)	45 (19.8)	

WhatsApp is a simple, fast, and free communication tool, we believe that it will be a common consultation method in the future.

Clinics requesting consultation in the ED vary from hospital to hospital, depending on the hospital region and if the hospital is a trauma center [1]. The present study was conducted at the most crowded, busy and unique ED, which is a first level trauma, stroke, and emergency medical illness center. Although we used WhatsApp messenger for consultations in the cases of injury and emergency medical illnesses, Orthopedics was the most common clinic that used WhatsApp. We believe that because clinical assessment with radiographic images is important for orthopedic patients in the ED, WhatsApp may especially useful in providing the transmission of patients' radiographs for consultation with orthopedics clinic.

Low resolution and loss of data quality due to the conversion from analog to digital are problems in using technological tools for communication [10]. A study on the imaging evaluation of extremity fractures by using WhatsApp declared that plain radiographs sent as photographic images from WhatsApp messenger are considerably sufficient for the evaluation of orthopedic injuries [7]. In this study, the most commonly shared orthopedic images were extremity x-ray photographic images and the resolution problems with image assessment have not been reported. Additionally, in the present study, 74.4 % of orthopedic consultations were concluded via only WhatsApp messages; this ratio was highest among the clinics. To make a final diagnosis for patients undergoing orthopedic consultations, the following criteria are typically sufficient requirements: a brief clinical history; physical examination findings, such as the existence or lack of sensory-motor deficits, limitation of movement, or deformity; and a radiographic examination [10, 11]. According to a systematic review consultation in ED is usually performed due to admission or discharge rather than further examination [14]. We also observed similar results that are in agreement with the literature that discharge and admission requests were the predominant reason for WhatsApp consultation compared with other reasons in our study. We suggest that the clinical judgment of consultants, e.g., to admit or discharge a patient, can be easily decided in a short period by assessing a brief medical history, clinical examination findings, and a photographic examination image via WhatsApp.

To the best of our knowledge, there is only one study in the current literature that investigated the WhatsApp messenger usage for cardiology patients which is conducted by Astarcioglu et al. [8]; they claimed that the WhatsApp message system is a quick, inexpensive and easy method for sending early alerts regarding cardiac catheterization patient transfers. In our study, Cardiology was the second most common clinic requesting consultation via the WhatsApp messaging system, and 67.8 % of patients were transferred to the cardiac

catheterization laboratory from another facility outside of our hospital without the loss of time or complications. WhatsApp is a useful method for cardiology consultation, and it is useful for ensuring quick transfers to another facility, particularly out of the hospital setting.

Emergency consultations are the main steps for routine emergency service operation; delays in communication with consultants may lead to time loss for further patient management [12, 13]. We determined that the time interval between sending a WhatsApp message, a consultant accepting the message was 3.94 min; response time of the consultant 2.83 min WhatsApp has enabled EPs to send patients' primary complaints, clinical findings, radiographs, injury photographic images, and laboratory results to consultants in a short time period. In addition, 59.9 % of the total number of consultations was concluded by sending only WhatsApp data and without the consultant visiting the ED. Thus, although physical examinations are essential [12, 14, 15], consultation with WhatsApp can play a supportive and additional role for ED consultations.

Communication failures and insufficient data transfer to consultants are one of the primary mishaps that usually occur outside of hospital consultations, in referrals from hospitals or when the clinician may be mobile [3, 13–17]. Viewing all patient data, such as laboratory results, radiographs, injury photographs or other patient data, may not be possible for consultants immediately at the time of a consultation request, especially if the consultant is outside of the hospital or does not have access to a computer. [3, 18, 19]. In this study, most of the consultations were requested via the WhatsApp message system for consultants who were outside the hospital or who were mobile during night and evening shifts.

Increasingly, mobile Health applications have been developed by health care professional and application creators [20]. Sending data regardless of the time and location via a free and common network through the WhatsApp application or a similar application which will be created by the application developers to consultants may become unique communication method for EPs in the future.

### Limitations

This study has several limitations. Because the study data were analyzed retrospectively, the factors affecting the consultation process and flow, such as co-morbidities, total time consumed for consultation, time for sending a WhatsApp message, and consultant arrival time to the ED following a WhatsApp message were not evaluated. Additionally, patients requiring more than one consultation, and patients with long length of stay after admission in the ED could not be investigated. Finally, WhatsApp-related disadvantages including consultation delays, such as a lack of wireless internet accessibility and personal data security problems were not examined longitudinally.

## Conclusion

Because the WhatsApp messaging application shares common network and is a simple, fast, and free communication tool, patients' data can be sent to consulting physicians via WhatsApp in a short period of time. Moreover, WhatsApp usage in the ED can be useful for consultations requested during the evening and night shifts from consultants who are outside the hospital or who are mobile. We believe that WhatsApp will be a common consultation method for the ED in the future. However, to confirm these results, additional comprehensive studies comparing the advantages and disadvantages are needed.

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