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The establishment of a telemedicine center during the COVID-19 pandemic at a tertiary care hospital in Pakistan



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ABSTRACT

Background: Telemedicine involves the innovative application of technology to provide remote patient healthcare services especially those relating to emergency care and contagious disease spread. Telemedicine is less developed in low-and-middle-income countries like Pakistan and there is little published literature on its function and efficiency. Our institution was established to triage patients with COVID-19 symptoms to ease the load on emergency departments.

Objective: To conduct an analysis of the first month of function of a telemedicine/tele-triage center in Pakistan. To determine in which ways it was beneficial to hospital management during the COVID-19 pandemic.

Methods: This study was carried out at the newly established telemedicine/tele-triage center at the Shaheed Zulfiqar Ali Bhutto Medical University (SZABMU) in Islamabad Pakistan between the 26th March and the 25th April 2020. Data were collected over telephone interview using a proforma to provide each caller with a C-Score (a C-score of >3 indicated observe at home 3–5-indicated home isolation with confirmatory testing and >5 indicated testing and transfer to hospital) representing their COVID-19 risk and informing the nature of the advice given to them. Data were presented using descriptive statistics. **Results:** The center received total of 857 calls. Fever cough dyspnea and flu were present in 327(38.2%) 268(31.3%) 107(12.5%) and 124(14.5%) callers respectively. Based on the completion of the proforma 774(90.3%) callers had a C-Score of > 75(8.8%) callers had a C-Score of 3–5 and 8 (0.9%) callers had a C-Score of >5. We recommended COVID-19 testing in 83 patients (9.68%) based on C-score. Out of these 83 patients 64 underwent testing and only 1 tested positive for COVID-19.

Conclusion: In a one-month period the center was able to support patients by providing a triage service thereby preventing numerous unnecessary hospital visits and helping to protect healthcare professionals during a global pandemic. Telemedicine has great potential to help patient populations in low-and-middle-income countries.

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Introduction

The COVID-19 pandemic placed healthcare systems worldwide under an unprecedented burden. Without a vaccine or effective treatment social isolation the closure of public areas and quaran-

tine requirements have been introduced globally to reduce the spread of the virus. Despite the pandemic other diseases still require treatment and have been disproportionately left untreated due to the widespread suspension of outpatient services and non-urgent or elective treatment. To facilitate patient-friendly care maintain patient health records and sustain the provision of clinical services many service providers have turned to information and communication technology (ICT) solutions such as telemedicine e-health or telehealth.^{1,2}

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Tele-triage is analogous to traditional triage but uses technology to supplement or replace elements of the patient interaction. Tele-triage involves screening patients remotely to determine the patient’s condition and the care needed.³ Telemedicine may help to close the gap created by the andemic and increase the reach of healthcare services going forward lessening the social distance and helping those most in need.

The World Health Organization (WHO) have reported that telemedicine provides an economical use of ICT in healthcare services facilitating the provision of emergency care health monitoring education and research.² To contribute to the response to extraordinary events in the future the WHO launched an eHealth Strategy at the 58th World Health Assembly in May 2005.⁴ Telemedicine has the capacity to provide and improve healthcare services in areas where access to healthcare is inadequate.⁵

A reported 65% of smartphone users in the US have downloaded at least one medical app⁶ indicating that the public are open to online healthcare solutions.⁷ Telemedicine is often used in the fight against infectious diseases and be implemented at great pace and scale making it a frontline tool. While the effectiveness of telemedicine is already broadly accepted this article outlines the largest trial to date of patients-clinician interactions in the e-health setting..

With remote monitoring of chronic health problems and good quality access to existing network infrastructure the high-income countries are already benefitting from this technology but in low-and-middle-income countries the health infrastructure is less developed.^{8,9} Further there is little literature surrounding the development of such service platforms in countries such as Pakistan highlighting the need for the present study. The development and introduction of e-health services in low-and-middle-income countries requires a broad acceptance and efficiency of the relevant technology as well as a minimum level of knowledge and understanding among users and a working environment conducive to the adoption of novel technology. The goal of this research was therefore to analyze the function of a telemedicine center in Pakistan through assessing callers’ COVID-19 symptoms management and follow up. The triage system implemented in the present study was different from those reported previously such as a virtual medicine counselling system (VMCS)¹⁰ and as such the function of a system implemented in this way has not been previously assessed. The objectives of the study were to conduct an analysis of the first month of function of a telemedicine/tele-triage center in Pakistan and to determine in which ways it was beneficial to hospital management during the COVID-19 pandemic.

Materials and methods

The Pakistan Institute of Medical Sciences (PIMS) in Islamabad is associated with the Hospital of Shaheed Zulfiqar Ali Bhutto Medical University. PIMS is the country’s premier postgraduate medical center housing 1 254 hospital beds and 32 medical and surgical specialties. The telemedicine center was established during the COVID-19 pandemic following a large investment in e-health in accordance with the HIPAA (Health Insurance Portability and Accountability Act) of 1996. This was the first telemedicine center established in Islamabad capital of Pakistan just like the tele-triage center established in USA.¹¹ This cross sectional retrospective study period comprised the first month of the facility opening 26th March to 25th April 2020. All calls made to the center in this period relating to COVID-19 symptoms and management formed the study sample. Data were retrospectively extracted from the register of all callers to the center. Data extraction was completed by the authors.

Table 1
The proforma used to calculate the COVID score of callers.

Risk factor	Score given	
Travel history to affected areas	Yes = 2 No = 0	
Shortness of breath	Yes = 1 No = 0	
Dry cough	Yes = 1 No = 0	
Fever	Yes = 1 No = 0	
Exposure to a known COVID-19 patient	Yes = 3 No = 0	
Family or friends with fever flu or cough	Yes = 1 No = 0	
Are you a health worker?	Yes = 1 No = 0	
Resulting C-Score:	Advice given:	
Less than 3	Less likely	Observe at home
Score 3–5	Suspected	Home isolation and confirmatory test needed
Score 6 or more	Strong suspicion	Testing and hospital transfer

Information was captured from callers including demographic information any COVID-related symptoms recent travel contacts and their occupation (Table 1). This information was then used to categorize callers based on the number of risk factors they answered “yes” to and their total score. C-score was devised by many local experts after various meeting and it was neither validated nor accredited. Callers were subsequently followed up by telephone call to determine whether they received a COVID test whether it was positive and whether their symptoms had abated. Callers were segregated based on the region from which they were calling: Pakistan as Punjab Sindh Baluchistan Khyber Pakhtunkhwa Azad Kashmir and Islamabad Capital Territory (ICT)..

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 22. Categorical variables were presented as frequencies and percentages. Descriptive statistics were used to estimate rates of telemedicine calls related and unrelated to COVID-19.

Results

During the study period the center received 857 calls relating to COVID-19 symptoms and management. The demographic information of callers is summarized in Table 2.

Using the scoring system outlined in the proforma in Table 1 frequencies of each item are given in Table 3. Fever cough dyspnea and shortness of breath were present as an indicator of COVID-19 symptoms in 327 (38.2%) 268 (31.3%) 107 (12.5%) and 124 (14.5%) callers respectively. History of travel to an affected area and contact with a COVID-19 patient were reported by 26 (3%) and 8 (0.9%) callers respectively. Table 3 also shows callers’ C-Scores whereby 774 (90.3%) callers had a C-Score of less than 3 75 (8.8%) callers had C-Score of between 3 and 5 and 8 (0.9%) callers had a C-Score greater than 5. The rates of callers taking various medications are also given in Table 3.

Among the 857 calls recommended COVID-19 testing in 83 patients (9.68%) based on their C-score. Of these 83 patients 1 person tested positive for COVID-19 and 63 (7.4%) tested negative. The remaining 19 (2.2%) patients were not tested. We advised 362 (42.2%) callers to isolate at home and 11 (1.3%) callers to attend hospital. At the follow-up call made by the telemedicine department 854 (99.6%) callers had fully recovered as shown in Table 4.

Discussion

During the COVID-19 pandemic it has been necessary to control and limit the spread of the virus and to protect doctors nurses and other healthcare workers. E-health programs including telemedi-

Table 2
Caller demographic information.

Age (Mean ± standard deviation)	35.39 ± 15.44 years				
Gender	Man = 654(76.3%)		Woman = 203 (23.7%)		
Age Categories					
less than 20 Years	20–50 Years		>50 Years		
48(5.6%)	699(81.6%)		110(12.8%)		
Region from where call received					
ICT	Punjab	Sindh	Baluchistan	KPK	Azad Jammu Kashmir
515 (60.1%)	237(27.7%)	34(4.0%)	27(3.2%)	22(2.6%)	22(2.6%)

Table 3
Symptomology Variables with Covid Scoring and Basic treatment advised.

Item	Present n(%)	Absent n(%)
Fever	327(38.2%)	530(61.8%)
Cough	268(31.3%)	589(68.7%)
Dyspnea	107(12.5%)	750(87.5%)
Flu	124(14.5%)	733(85.5%)
Diarrhea	14(1.6%)	843(98.4%)
Travel History	26(3.0%)	831(97.0%)
Contact History	8(0.9%)	849(99.1%)
C-Score		
Less than 3	3–5	>5
774(90.3%)	75(8.8%)	8(0.9%)
Medication history		
Anti-pyretic	277(32.3%)	580(67.7%)
Antihistamine	131(15.3%)	726(84.7%)
Antiemetic	8(0.9%)	849(99.1%)
Anti-diarrheal	14(1.6%)	843(98.4%)

Table 4
Management of callers.

Management of callers		
COVID testing	Offered a test [n (%)] 83 (9.68%)	Not Offered [n (%)] 774 (90.31%)
	Test conducted [n (%)] 64 (7.5%)	Not Conducted [n (%)] 19 (2.2%)
	COVID Positive [n (%)] 1 (0.1%)	COVID Negative [n (%)] 63(7.4%)
	362(42.2%)	495(57.8%)
Advise to isolate at home	11(1.3%)	846(98.7%)
Admitted to hospital	854(99.6%)	3(0.4%)
Recovered from symptoms		

cine can contribute to limiting the spread of infection by allowing patients to receive medical advice from their homes. Such telemedicine programs are common in higher-income countries especially China (upper-middle income group). This study demonstrates the effectiveness of telemedicine in providing patients with information and preventing unnecessary hospital visits. The ability of telemedicine to provide this service while protecting healthcare professionals demonstrates its usefulness as a clinical tool. This study showed that there was uptake of the telemedicine service with 857 patients calling the center for matters related to the symptoms and management of COVID-19 in a one-month period..

There is currently little published literature on the field of telemedicine. The absence of disseminated information outlining the implantation of telemedicine may in itself act as a deterrent preventing others from taking the leap themselves.⁹ Awareness of the existence of telemedicine is likely to be a significant facilitator in the adoption of telemedicine particularly among healthcare providers.¹² As such there is a need for training in telemedicine to be provided to healthcare professionals in Pakistan. Recent studies conducted in low-and-middle-income countries have reported that doctors are receptive to the idea of telemedicine.^{12–15} A study conducted in Karachi demonstrated that doctors were able to

understand the technology and learn to use it correctly without the rigorous training that is sometimes needed in the consumer population.¹⁵

The introduction of telemedicine system has provided a vital safety measure and decreased the impact of the pandemic on the emergency care setting. The use of telemedicine in non-urgent services has demonstrated that effective care can still be given while social distancing. Further the use of telemedicine has facilitated quarantined/self-isolating/shielding but asymptomatic clinicians to provide treatment and consultation from their home thereby reducing pressure on the system. Telemedicine has been reported to minimize “White Coat Syndrome” and the impact of reducing the frequency of hospital visits through the use of interactive medical videos and emails reduces patient anxiety. Further telemedicine provides an ideal platform for monitoring and follow up in communicable diseases such as tuberculosis.¹³

Moving patient consultation online increases the chance of a breach of patient privacy creating a potential threat to the principle of protection.¹² In low-and-middle-income countries telemedicine is still an emerging field and there is little knowledge experience or guidance on frameworks for its implementation.¹⁶ As mentioned previously the triage system implemented in Pakistan was different from that of a VMCS in that it involved greater financial investment in labor and video conferencing equipment and also made provision for taking online consent providing appointment reminders and reports on numbers of pharmacists etc.¹¹ Meanwhile patients in Pakistan were not well-equipped electronically and had a generally lower level of knowledge about ICT and telemedicine systems. As highlighted by a recent study in Karachi the absence of financial support reliable network access and public familiarity with ICT act as significant barriers to public understanding of the value of telemedicine. However many countries’ healthcare sectors have already taken the first steps in the direction of e-health.⁵

Limitation

This was a single-center study that aimed to address the lack of existing evidence around the implementation of telemedicine in Pakistan however being a single-center study it may not be generalizable to different settings. Further the duration of the study was too short to fully assess the impact of telemedicine on hospital practice more generally and the lack of follow-up of individual patients may further reduce the generalizability of the findings. Many aspects of investigation were beyond the scope of this study for example the reason for the low uptake of COVID-19 testing once offered patients’ access to conventional healthcare and the impact of religious or cultural factors and the political environment. Longitudinal studies covering multiple centers will be needed to understand how telemedicine can most effectively be used moving forward..

Recommendations

- Telemedicine may be a barrier to insurance companies' reimbursement inter-state medical permits and hospital credentials. This should be addressed to ensure a good uptake of the service.
- Issues around privacy of patient data should be addressed.
- Further study should be conducted into factors such as access to smartphones access to and stability of communication networks **and** ICT literacy rates of clinicians.
- Further study is needed to forecast the future demand for telemedicine in Pakistan.

Conclusions

These findings indicate that remote telemedicine services can be introduced in Pakistan with great success a promising level of uptake from the local population. An economic assessment must first be made and then the appropriate tools can be introduced into the COVID-19 pandemic plan for implementation..

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CRedit authorship contribution statement

Fibhaa Syed: Conceptualization, Data curation, Methodology, Investigation. **Muhammad Hassan:** Formal analysis, Writing – original draft, Writing – review & editing. **Aamir Shehzad:** Writing – review & editing, Investigation. **Salman Shafi Koul:** Writing – original draft, Writing – review & editing. **Mohammad Ali Arif:** Supervision, Writing – review & editing. **Rebecca Susan Dewey:** Writing – review & editing. **Tanwir Khaliq:** Writing – original draft, Software.

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