

Original Research Article

Use of unified theory of acceptance and use of technology model for telemedicine services: an exploratory study

A. S. Irfanahemad¹, B. S. Nandakumar^{2*}, Radhika K.²

¹Rajiv Gandhi Institute of Public Health and Center for Diseases Control, Rajiv Gandhi University of Health Sciences, Jayanagar, Bangalore, Karnataka, India

²Department of Community Medicine, M.S. Ramaiah Medical College, Bangalore, Karnataka, India

Received: 20 June 2018

Revised: 01 August 2018

Accepted: 02 August 2018

*Correspondence:

Dr. B. S. Nandakumar,

E-mail: bsnandakumar@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: While quality health-care is considered a fundamental human right for all citizens; the challenge remains in making it accessible to all. Information systems have been identified as possible solution that can be used to alleviate disparity between rural and urban healthcare services and bridge the digital divide. Literature has suggested that one of the barriers for successful implementation of health information system is the user acceptance by health care personnel. The main objective of this study is to assess perceived usefulness, relative advantages of telemedicine technology among health personnel of selected district.

Methods: This is a cross-sectional study, using Semi-structured questionnaire. Data was collected from research participants from PHCs of Bijapur district, during July to November 2017.

Results: In general the health-care personnel were aware of the benefit of tele-medicine to improve effectiveness and efficiency of the health care system. The barriers to the effective implementation of tele-medicine include lack of knowledge and lack of awareness regarding use and usage of the tele-medicine system.

Conclusions: Health care personnel do acknowledge that tele-medicine can help to increase the effectiveness of the healthcare system. In general the acceptance of tele-medicine among healthcare personnel is positive. However in order to integrate it into standard work practices, specific training and capacity building for tele services is essential among health care personnel.

Keywords: Telemedicine, UTAUT model, User perception, Health care personnel

INTRODUCTION

Challenges in providing health care facilities

India is a geographically divided and diversified populated country. Therefore to provide equal and better medical care to every citizen of India is a major challenging task. However the government have succeeded in controlling and eradicated some of the major diseases like Polio, Leprosy, small pox, etc.

Nevertheless, these are not an indicators for the success level of the health care facilities in India.

The majority population of the country are facing many of the challenges and struggles such as infrastructure facilities including the manpower in the hospitals, approach road and transportation facilities, the people's own cultural and traditional way of medical practices, economic imbalance of the people, not affordable treatment cost of poor people and lack of awareness on

diseases and treatment and absenteeism of medical practitioners and supportive staff in the hospitals.

Although the 75% of doctors' practice in urban areas and 23% in semi-urban areas. The government takes efforts to place the Doctors in the rural areas but it has not fully implemented and the doctors are refused to work in the rural areas. But India is one of the rural area based countries, its majority of the population living rural.¹

Information and communication technology (ICT) is playing an important role to improve health care for both individuals and community levels. ICT systems are now being used to deliver healthcare across geographic distance through "Telemedicine". The purpose of introducing ICT is to provide decentralized health services. Integrating the use of ICT into existing health systems helps to improve health care in many ways although it is quite challenging for a developing country like India.² Information and communication technologies (ICTs) have great potential to address some of the challenges faced by both developed and developing countries in providing accessible, cost-effective, high-quality health care services. Telemedicine uses ICTs to overcome geographical barriers, and increase access to health care services. This is particularly beneficial for rural and underserved communities in developing countries – groups that traditionally suffer from lack of access to health care.²

Can telemedicine bridge the divide

Health information systems have been identified as a possible solution that can be used to alleviate the disparity between rural and urban health care services (Fichman, Kohli and Krishnan 2011 Kolodner, Cohn and Friedman 2008). Information systems can provide the tools to capture, store, processes and communicate information to the relevant decision makers to coordinate healthcare at the individual and population level.³ Telemedicine may turn out to be the cheapest, as well as the fastest, way to bridge the rural-urban health divide. Taking into account India's huge strides in the field of information and communication technology, telemedicine could help to bring specialized healthcare to the remotest corners of the country.⁴ Telemedicine offers great opportunities in general, it could be even more beneficial for under served and developing countries where access to basic care is of primary concern.⁵ The main objective of telemedicine is to cross the geographical barriers and provide healthcare facilities to rural and remote areas (health for all) so it is beneficial for the population living in isolated communities.⁶ Patients in rural areas do not have to travel long distances to urban hospitals in order to access specialist care, while waiting times and transportation costs are reduced (Wooton, Patil, Scott, & Ho, 2009) it is myth that to establish a telemedicine platform is an expensive.⁷ The basic system needs hardware, software and telecommunication link.⁶

Need for the study

Quality health care is considered a fundamental human right for all citizen in India Judicially recognized under article 21 of Constitution.⁸ Karnataka is one of the state that have initiated the establishment of telemedicine facility for all district hospital.⁹ Based on the successful outcome of the pilots, the Ministry of Health and Family Welfare has now adopted telemedicine into the National Rural Health Mission, an initiative focused on improvement of the rural healthcare delivery system. All across the country, several telemedicine initiatives have been taken up by both government and private sector organizations with federal and state funding. Some have adopted a few modules into their health system⁹. The World Health Organization (WHO) has identified telemedicine as a possible information system that can simultaneously improve the quality and reduce the cost of health care (WHO, 2011).¹⁰ Telemedicine, literature has suggested that one of the barriers to successful implementation of health information systems is the user acceptance by healthcare worker of the system such as telemedicine. This study investigate the user acceptance of telemedicine in public health care system in Bijapur district making use of the unified theory of acceptance and use of technology (UTAUT).^{10,11}

Objective

- To assess perceived usefulness, extrinsic motivation, relative advantages of telemedicine technology among health personnel of Bijapur district using UTAUT model.

METHODS

Study area

Various PHCs of Bijapur district.

Table 1: Showing the number of respondent participated in the study from the each PHC.

Sl no	PHC	Number
1	Nagthan	19
2	Nidgundi	20
3	Mudebhial	18
4	Telgi	15
5	Bableshwar	10
6	Indi	15
7	Tadvalgal	11

The health care staff of the PHC working for minimum of 06 months or more willing to give Consent doctors, administrative officer/engineers/AYUSH/ Nursing staff/ Pharmacist/ Lab Technician/ x-ray technician) were included in the study. The study was carried out from 24 Aug 2017 to 30 Nov 2017. A total of 108 Respondents participated in the study.

Ethical clearance was obtained prior to the study from Institution Ethical Committee (IEC) of Rajiv Gandhi Institute of Public Health and Centre for Disease Control, Bangalore

The study instrument is semi-structured questionnaire which was pre-tested, the questionnaire consisted of three parts.

Part A: Consist of basic demographic details of the respondent like name, age, gender, mobile no etc.

Part B: Consist of 9 questions to know Computer Literacy of the respondent.

Part C: Consist of 33 question adopted from UTAUT model.

A formal permission was obtained from Department of health and family welfare Bangalore Karnataka and also District health office Bijapur. In-depth interviews were conducted after visiting respective PHCs of the district using semi-structured questionnaire.

RESULTS

Part A: Socio-demographic profile of study participants

The study was conducted in following 7 PHCs of Bijapur district. A total number of 108 Respondent were Interviewed. The results of the study are given below.

Table 2: Base line characteristics of study participants.

Characteristic	Number (%)
Gender	
Female	50 (46.3)
Male	58 (53.7)
Age	
Less than 25yr	05 (4.6)
26-36 yrs	62 (57.4)
37-46 yrs	29 (26.9)
47-56 yrs	12 (11.1)
Degree	
Diploma	92 (85.2)
Graduate	13 (12)
Post-graduate	03 (2.8)
Experience in present hospital	
Less than 1 yr	19 (17.6)
2-6 yrs	76 (70.4)
More than 7 yrs	13 (12)
Total experience	
Less than 1 yr	14 (13)
2-6 yrs	78 (72.2)
More than 7 yrs	16 (14.8)
Designation	
Medical officer	28 (25.9)
Staff nurse	70 (64.8)
Pharmacist	05 (4.6)
Technician	05 (4.6)

The total number of participants were one hundred and eight only (N=108) with 58 (53.7%) them being males. The proportion of participants with a diploma, under-graduation, post- graduation and were 92 (85.2%), 13 (12%), 13 (27.1%) and 03 (2.8%) respectively. Among them 28 (25.9%) were doctors, 70 (64.8%) nurses, 5 (4.6%) were technicians and 5 (4.6%) pharmacist. Around 76 (70.4%) of participants had experience of 2 to 6 years in the present hospital.

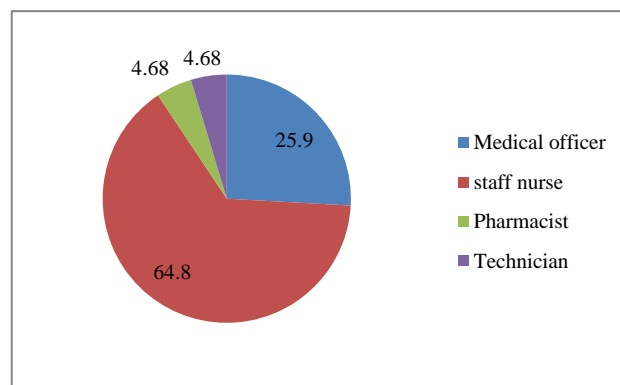


Figure 1: Showing proportion of medical staff in study.

Among the study participants 64.8% were staff nurses, 25.9% were medical officers and 4.68% were pharmacist and technician.

Part B: Computer literacy

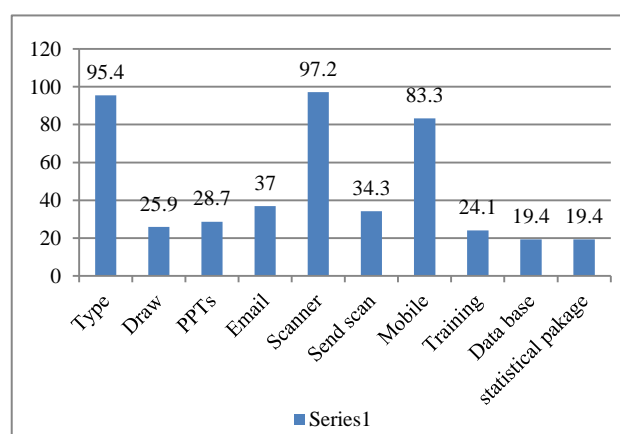


Figure 2: Showing computer literacy of the participants.

Of 108 total participants 95.4% were knowing how to type letters in computers. Around 25.9% were knowing how to draw graphs and 28.7% knew about Power point presentation. 37% were using Email to Communicate. 97.2% replied they had scanner in Office. 34.3% can scan and send files. Around 83.3% were using smart mobile phones with touch screen. Only 24.1% had a formal training in computer and only 19.4% knew about database and statistical packages.

Part C: Construct from UTAUT

Performances expectancy of the study participants for telemedicine use

Among the participants (N=108) 97.2% answered that TM could help to improve care that they give to patients. 97.2% replied that telemedicine help to increase there efficiency and 90.7% replied TM will help to improve job, 99.1% say TM will increase there job productivity.

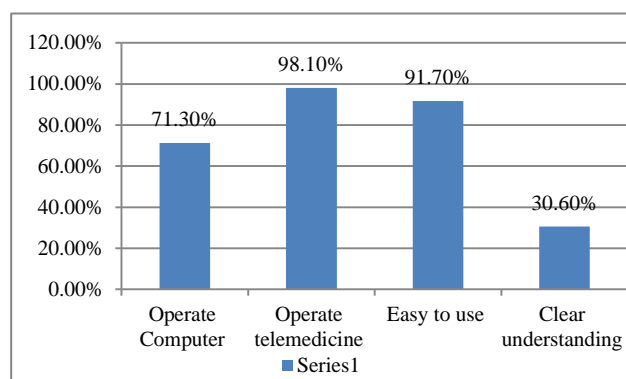


Figure 3: Showing effort expectancy of the study participant for telemedicine use.

Among the participants (N=108) 71.3% answered that computer training is most for TM operation. 98.1% said TM can be operated TM, 91.7% answered TM will be easy to use could help to improve care that they give to patients. 30.60% said they have clear understanding of TM.

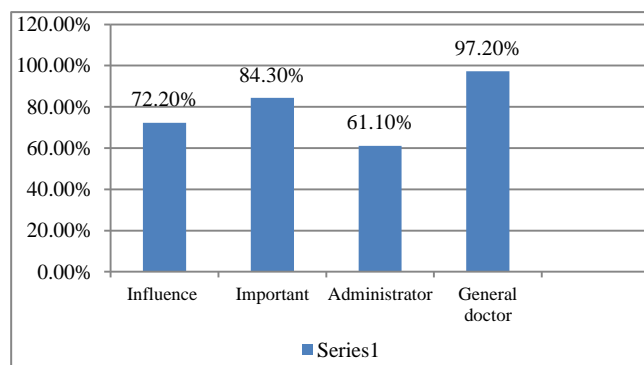


Figure 4: Showing social influence of the study participants for telemedicine use.

Among the participants (N=108) 72.2% and 84.3% considered people who influence them and are important consider that TM should be used by these people respectively. 61.1% and 97.2% answered that they get support administrative officer and doctors respectively.

Among the participants (N=108) 70.4% answered that they have sufficient resources, 41.7% replied they have knowledge about TM, 78.70% answered they will get support if required during using TM.

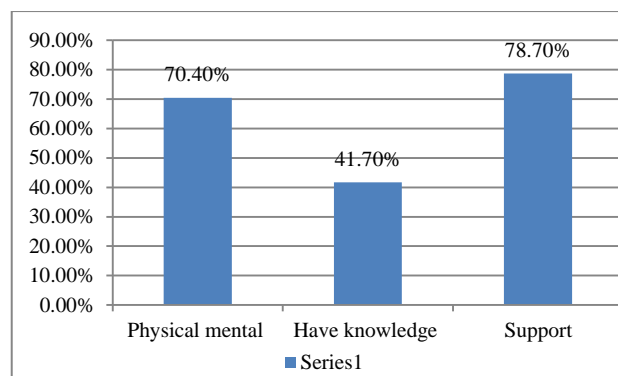


Figure 5: Showing facilitating conditions of participants for telemedicine use.

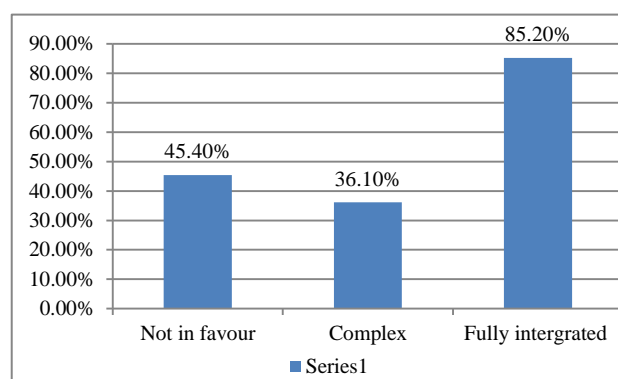


Figure 6: Showing attitude of the study participants for telemedicine use.

Among the participant (N=108) 45.40% were not in favor of TM as it lacks face to face interaction, 36.10% were not in favor because of its complexity in use, 85.20% were in favour because as it is fully integrated in providing patient care.

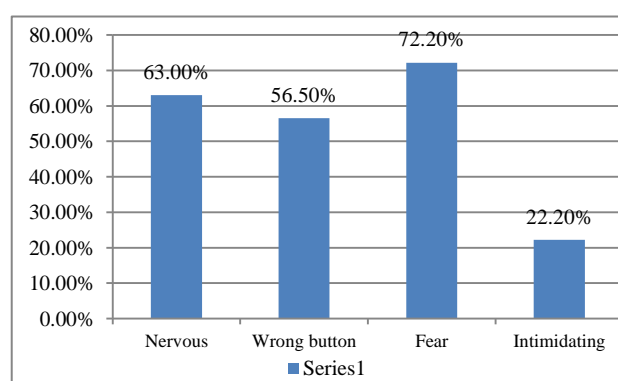


Figure-7 Showing Anxiety of the study participants for Telemedicine use.

Among the participants (N=108), 63.0% answered they are nervous while using TM, 56.50% are in fear if they press wrong button, 72.2% fear of losing information, 22.20% considered TM as intimidating.

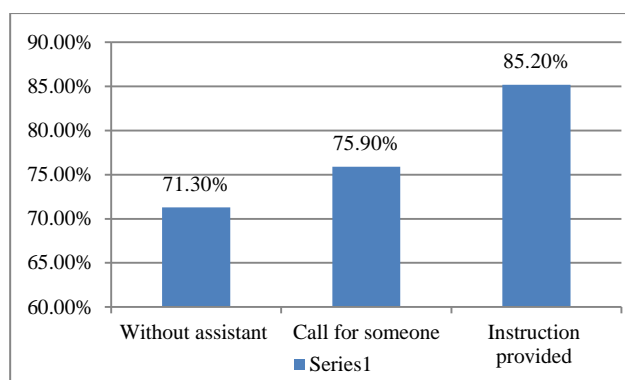


Figure 8: Showing self efficacy of study participants for telemedicine use.

Among the participants (N=108) 71.30% said can use TM without any assistant, 75.9% said will call for someone for help if needed, 85.20% replied can operate TM with instruction provided.

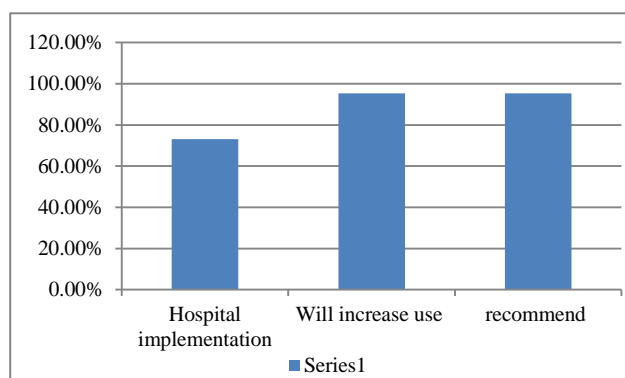


Figure 9: Showing behavior intention of the study participants for telemedicine use.

Among the participants (N=108) 73.10% they use TM because there hospital implemented TM services, 95.40% said will increase use of TM in near future and will recommend to others.

DISCUSSION

We employed unified theory of acceptance and use of technology (UTAUT) as theoretical foundation to understand the behavior intention of health care personnel in the study conducted by Holla et al” utilization pattern, current and future challenges. it was concluded that the telemedicine services has been largely under utilized and has failed to deliver the promise in Karnataka state.¹² One of the reasons for the failure noted was most (52%) of health care personnel reported they had never undergone training in telemedicine. In a similar study by Zailani et al “Determinants of telemedicine acceptance in selected public hospital in Malaysia indicated that government policies, top management support, perception of usefulness and computer self efficiency have a positive and significant impact on

telemedicine acceptance. Both the study findings are almost same as that of study that we conducted¹³.

From a study done on telemedicine centers from Karnataka, Ugargol AP had found that physician characteristics that influenced utilization included awareness, physician attitude, need for incentives, satisfaction with the consultation, highest education, training and rapport with other physicians. At the center level, staffing issues, inability to ensure proper scheduling of duties for physicians, lack of incentives, poor technical support and connectivity were issues that influenced utilization and hence need addressing even this study deals with most of same components.¹⁴

In the similar study “Awareness, attitude and readiness of clinical staff towards telemedicine“ by Taheri et al. It was found that clinical staff had little knowledge about telemedicine services, however they had a positive perception similar to present study finding.¹⁵

CONCLUSION

We found that most of study participants had never undergone training for telemedicine Government policies, top management support, perception of usefulness and computer self efficiency have a positive and significant impact on telemedicine acceptance.

Staff had little knowledge about telemedicine services, however they had a positive perception. Most of study participants were having knowledge to operate computer system. Most of study participants were also using Smart (mobile) phones.

Most of the participants were voluntarily willing to adopt new technology (Telemedicine) and also recommend others to use. The health care personnel in the bijapur district found telemedicine to increase their productivity, quality, and efficiency of work. The behavior intention of health care personnel was found to be favorable for future use of system. Most of the participant found system easy to use. Social influence and facilitating conditions were also found to influence acceptance of health care personnel of telemedicine.

Telemedicine a new technology in developing countries that has a great potential to bring about paradigmatic change to healthcare can be consider as significant service sector in both national and global economy. The widespread adoption of telemedicine most especially in developing countries is very limited. The challenges are numerous but not insurmountable. There is a need to channel obvious identified telemedicine challenges through new research direction in the context of IS field.

While telemedicine adds a new paradigm in the health care system and promises to address some of the most basic and critical problems (cost, quality, and accessibility) of the current system, its ultimate success depends on removing the serious obstacles facing its

optimal implementation. At present these obstacles reflect both inherent limitations in technology and also improper use of human resources’.

However in order to integrate telemedicine in standard work practice, specific training and capacity building for teleservices is essential among health care personnel.

Recommendations to improve telemedicine services

The following are the recommendations that we want to recommend after this study.

- Training of doctors to raise awareness regarding the telemedicine.
- Training of the technical staff at the peripheral telemedicine services.
- Dedicated staff to co-ordinate/manage the project to provide hassle free appointments.
- Making telemedicine equipments accessible to doctors’ offices and consultation rooms.
- To establish specialized telemedicine units in each hospitals in which doctors are posted on rotation
- Medico-legal issues need to be sorted through legislation or policy. Written informed consent and confidentiality issues needs to be addressed at the earliest.
- Incentives need to be given to the doctors utilizing these services for specific time period.
- Incentives for referring cases needs to be considered.
- To make sure the availability of the medicine and basic laboratories at each hospital.
- Specialist needs to be posted in rotation to provide services.
- Maintenance of the hardware and software is an important issue at all sites.
- Regular upgrading of the software and hardware.
- Telemedicine can be utilized for public health and public health administration.
- Telemedicine needs to utilize for training purpose also.
- To consider using smart phones for smart telephone medical services so that patient can contact doctor easily without needing to physically go for the consultation.

Limitations

A significant limitation of this study was small sample size of health-care personnel and not including end beneficiary i.e. patients. Future research could include larger sample size.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Baernholdt M, Yan G, Hinton I, Rose K, Mattos M. Quality of life in rural and urban adults 65 years and older: findings from the National Health and Nutrition Examination Survey. *J Rural Health*. 2012;28(4):339-47.
2. Gund A, Lindecrantz K, Schaufelberger M, Patel H, Sjöqvist BA. Attitudes among healthcare professionals towards ICT and home follow-up in chronic heart failure care. *BMC Medical Informatics Decision Making*. 2012;12(1):13
3. Bergmo TS. A cost-minimization analysis of a realtime teledermatology service in northern Norway. *J Telemedicine Telecare*. 2000;6(5):273-7.
4. Dossani R, Misra DC, Jhaveri R. Enabling ICT for rural India. Asia-Pacific Research Center, Stanford University, memo. 2005.
5. Baldwin LP, Jones RW. Telemedicine and its role in improving communication in healthcare. *Logistics Information Management*. 2002;15(4):309-19.
6. Sanders JH, Bashshur RL. Challenges to the implementation of telemedicine. *Telemedicine J*. 1995;1(2):115-23.
7. Cilliers L, Flowerday S. User acceptance of telemedicine by health care workers: a case of the eastern cape province, South Africa. *The Electronic J Information Systems Developing Countries*. 2014.
8. Reddy KS, Patel V, Jha P, Paul VK, Kumar AS, Dandona L, Lancet India Group for Universal Healthcare. Towards achievement of universal health care in India by 2020: a call to action. *Lancet*. 2011;377(9767):760-8.
9. Holla B, Viswanath B, Neelaveni S, Harish T, Kumar CN, Math SB. Karnataka state telemedicine project: Utilization pattern, current, and future challenges. *Indian J Psychological Med*. 2013;35(3):278.
10. World Health Organization. The world health report 2006: working together for health. World Health Organization; 2006.
11. Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: Toward a unified view. *MIS quarterly*. 2003: 425-78.
12. Holla B, Viswanath B, Neelaveni S, Harish T, Kumar CN, Math SB. Karnataka state telemedicine project: Utilization pattern, current, and future challenges. *Indian J Psychol Med*. 2013;35(3):278.
13. Zailani S, Gilani MS, Nikbin D, Iranmanesh M. Determinants of telemedicine acceptance in selected public hospitals in Malaysia: Clinical perspective. *J Med Systems*. 2014;38(9):111.
14. Ugargol AP. Telemedicine Utilization in a Southern State of India Focusing on Physician and Telemedicine Center Characteristics (August 19, 2008). Available at: <https://ssrn.com/abstract=1236902> or <http://dx.doi.org/10.2139/ssrn.1236902>
15. Sheikhtaheri A, Sarbaz M, Kimiafar K, Ghayour M, Rahmani S. Awareness, Attitude and Readiness of

in Mashhad, Iran. Exploring Complexity in Health:
An Interdisciplinary Systems Approach:
Proceedings of MIE 2016. 2016;228:142.

Cite this article as: Irfanahemad AS, Nandakumar BS, Radhika K. Use of unified theory of acceptance and use of technology model for telemedicine services: an exploratory study. *Int J Community Med Public Health* 2018;5:4112-8.