SAMVAD: SIBM Pune Research Journal, *Vol XVIII, (Special Issue), 110-116, September 2019*
ISSN (Print) : 2249-1880
ISSN (Online) : 2348-5329

Role of Mobile Technology in Emergency Medical Services: A Review

Subrat Sahu[1*] and Jayshree Jaiswal[2]

[1]Professor, Institute of Management, Nirma University, Ahmedabad - 382481, Gujarat, India; prof.subratsahu@gmail.com
[2]Institute of Management, Nirma University, Ahmedabad - 382481, Gujarat, India; jayshree.jaiswal@nirmauni.ac.in.in

Abstract

The importance of adoption of mobile technology in healthcare sector is well considered and has gained significant importance but most of the research is either context-specific or application specific. The literature is yet to explore and examine the factors affecting the adoption of mobile technology in Emergency Medical Services (EMS) and develop a theoretical understanding. Innovation has its own obstacles, this paper presents detailed review to identify when, where and for whom the use of mobile technology is important in EMS and also ascertain the challenges that are to be overcome to utilize mobile technologies to improve EMS performance. This knowledge is sparse in the body of literature which is reviewed and outlined in detail using a constructivist approach. Some of the outstanding applications in advanced countries in the context of this study are investigated and commented. The focus of the study is on emerging market context because of the urgent need of medical advancement to save the lives of people. The key challenges and barriers for the implementation of such applications in EMS in India and suggestions thereafter are presented for successful implementation of mobile technology applications in EMS to improve service delivery. The results of this study can provide clues to stakeholders to further the use of mobile technology in EMS for efficient and effective performance delivery.

Keywords: Emerging Markets, Emergency Medical Services, Healthcare, Innovation, Mobile Technology

1. Introduction

Time is money but in the certain context like Emergency Medical Services (EMS) where the matter is of life and death time is more than money. Eisele (2008) and other researchers acknowledged this time as the golden hour or the platinum ten minutes. This time is crucial because the early diagnosis could decide the fate of the patient by saving his life.

The state of EMS is significantly different in developed and developing countries (like India). The developing nations of the world are struggling to meet the urgent need of timely medical care. For example in India as per the World Health Organisations about 3 lacs women during pregnancy or childbirth died as they could not receive timely medical care during emergency. Besides road accidents in India is also rising at an annual rate of 3%. In addition, trauma related death takes place every 1.9 minutes in India and about 8% of trauma patient fails to avail the first aid treatment during those platinum ten minutes (Indian Society for Trauma and Acute Care). During a stroke about 2 million cells die each minute if time treatment is not received (Markus, 2005). The more the cell dies, the more devastating the outcome is. Thus a closer look at these figures reveals the urgent need of medical advancement and innovation to save the lives of people by providing timely care and improved performance. The role of EMS is crucial in improved healthcare service delivery for saving people's lives and thereby reducing mortality and morbidity rate (Nicholl et al., 2007). As a reflection, adoption of new innovative technology is crucial for the developing

*Author for correspondence

nations like India (Paul, 2012). More research is needed to understand the key factors crucial for the adoption of innovation especially in the emergency medicine. Such innovation adoption will lead to reduced costs, improved performance and quality and timely service delivery. In the developed nation the crucial role of mobile technology in EMS is well established and the increased adoption by the healthcare sector over the past decade has tremendously boosted the research in these areas (Arnold, 1999). However as noted by Tippett V., et al. (2003) adoption of mobile technology by EMS and pre-hospital care is growing at a very slowly compared to other health discipline and medical specialities specifically in developing countries like India in spite of the recognition of its use. Thus, the present study poses to review the role of mobile technology in EMS and factors affecting the adoption of mobile technology in the EMS.

2. Research Methodology

A review of existing literature with the aim of identifying studies related to the adoption of mobile technology in healthcare particularly EMS is being carried out in this paper and drivers and challenges of mobile technology adoption in EMS is reviewed. Research on the adoption of mobile technology for smart ambulance is scarce. Since it is an innovative idea, constructivist approach (Gaiani, 2010) is best suited. Previous research has used this approach in understanding the adoption of innovations (Jarvenpaa and Lang, 2005). We have selected India as the focus of our study primarily due to the unprecedented growth that the Indian healthcare sector has been witnessing. Telecom industry in India is also favourable in terms of infrastructure and penetration for rapid diffusion of new mobile technologies. The use of mobile technology in the emergency medical services of very few large hospitals was found during the initial part of this study and the widespread adoption of the same is at present found to be low. Therefore, it is of paramount importance to explore drivers and challenges for adoption in an emerging economy like India

3. Literature Review

3.1 Mobile Technology

Durlach & Johnson (2014), defined 'mobile technology as technology based on digital cellular telephone services. Services include Global System for Mobile Communications and Long Term Evolution (LTE) or 4G'. Mobile technology includes a technological device (like smart phones, mobile phones, tablets, etc.) which is ease to transport and can be accessed anywhere for obtaining real time information (Standing & Standing, 2008). The use of mobile technology by corporate is growing due to its features like availability, less cost (due to reduced data delivery cost), compact, physical factors like touch screen and resolution (Darstow & Listwan, 2011; Heinzelmann et al., 2005) and it is likely to grow exponentially in the next decade as a low cost medium (Park, 2011). Even in rural areas, the accessibility to mobile technology is well-established. As noted by Medhi and Ratan (2009), there is more mobile phone access than bank accounts across the developing nations like India.

3.2 Emergency Medical Services

Emergency medical services deals with a patient in distressed condition who urgently needs to be transported to an appropriate hospital for getting access to definitive hospital care. The term golden hour is used in the literature to emphasise the importance of EMS and its role in providing timely care and saving lives thereby reducing the mortality and morbidity rate. (Kobusingye, et al., 2006; Sharma & Brandler, 2014). A well organised and properly coordinated EMS is crucial for making important and sensitive decision by the healthcare professional and the Emergency Department (ED).

3.3 Role of Mobile Technology in Emergency Medical Services

The rapid use of mobile technologies has been into various medical related fields since its introduction in the early 1990s, and is recognised as a valuable and important tool for improved healthcare services (Ranson et al., 2007). The widespread availability of mobile devices, network capacity and its perceptual proximity to the users make them suitable for mobile health scenarios. The healthcare industry has led to the rapid innovations by improving the quality of care for patients by its use (Siau, 2003). Mobile technology allows improved quality and efficient patient care by allowing the access of real time information at the point of care where crisis happened from the static desk environment (Anuradha & Priya, 2005).

The skilled use of mobile communication and technology is very critical (Eriksson, 2010) in the

emergency context and is also given due importance to have quality care (Schooley & Hooran, 2015). The availability of portable tools essential for computing and communications allows its improved use in the field by the ED personnel. Emerging technologies like Wireless Sensor Networks (WSN) have the potential to have enormous impact on many aspects of emergency medical care (Hashmi, N., et al., 2005). The primary components of EMS are skilled manpower, communication, coordination, and transportation. Adoption of mobile technology in EMS can make these primary components efficient and effective and hence, this may ensure a significant value addition to all the stakeholders of EMS.

During emergency, with the help of mobile technology alerts from the first responders can be received on real time basis on the scene, community health communicators, and the reception of field information during events (Braun, et al., 2013). Mobile technology expertise is becoming highly desirable for ED workers (Federal Communication Commission, 2010) for improved quality and efficient patient care.

3.4 Adoption of Mobile Technology in Emergency Medical Services

In the organisation context, there is a need for patient-centric culture among employees and EMS department of hospitals. Emerging perspective like managing patient engagement, network and their experience have gained central role in hospitals as the organizations' long term strategy owing to rapid development of new technologies and increasing patients' expectations. Thus, it can be inferred that mobile technology plays an important role in delivering value to its patients.

Sheng (2005) concluded that organisations can be more efficient and effective by making the use of mobile technology which allows various benefits like better connectivity, more flexibility and improved interactivity. Kafeza, et al. (2004) found that the service provided by the Emergency Department (ED) is handled by the multiple and distributed personnel and is of flexible nature (i.e., quality care must be provide on the move to anyone at any time at any place). Therefore, the sharing of expertise and proper coordination among them is affected by the growing specialities, rapidly changing technologies and disease complexities and the role of mobile technology is profound in ensuring proper coordination to deliver quality care. In particular, EMS exemplify the a fore mentioned depiction because the crew members in the field, ED clinicians are performing multiple tasks separately and therefore the mobile technology can play the role in enabling effective and efficient services to foster patient management and preparation for incoming patient admissions (Levine et al., 2007). The mobile technology on-board in an ambulance service allows transfer of timely patient information to the hospital via wireless communication and updating it on real time basis, thereby enhancing the primary care for remote diagnoses and reducing the response time taken for rescue. Mobile technology can thus profoundly reshape the ambulance service in the context of EMS and is critical for a patient-centred and value-based care approach by the industry. Sharma et al. (2014), in his study, concluded that an organized, well-coordinated EMS is vital in saving lives in the 'golden hour' (Kobusingye et al., 2006). Handel & Hedges (2007) concluded the importance of mobile technology in providing time medical care to the rural areas too. The study also pointed out that despite constant advances in modern information technology, the use of such technologies in healthcare particularly in EMS is very slow. Hence there is an increasing need for cost-effective, time-effective and preventive systems in healthcare and EMS which can make full advantages of capabilities of mobile technology.

4. Drivers of Adoption of Mobile Technology in EMS

4.1 Top Management Support

The top management of organisation plays an inevitable role in adoption of any new technology. According to Rogers (2003), the felt need and problems give an impetus to the adoption of new technology. Dependency on heuristics such as no need felt by top management affect the decision of mobile technology adoption. Use of new technology allows the organisation to be more efficient and effective in the service delivery. Efficiency and effectiveness leads to economic profit which is the one of the objectives driving the mission and vision of each organisation. In the EMS context, optimum resource allocation i.e. availability of ambulance and trained personnel at the right time and the right place leads to efficiency and effectiveness.

Social influence affects the decision to adopt new technology. When other peers are setting global benchmark by providing quality care, there is a gap identified which drives the adoption of technology for providing better service. When there is growing awareness among top management about the increased use of mobile technology in providing quality care to its patients due to globalisation and cross pollination of ideas across multiple nations, it increases the credibility of use of mobile technology. Encouraging learning among the employees is the area where the management play an instrumental role (Nonaka, 1994; Nonaka & Takeuchi, 1995). Researchers and practioners believe that healthcare is a people processing system. Therefore, it is important for the top management to motivate the employees for bringing the desired change through the implementation of new technology among its employees. The administration and management systems are centralised in large hospitals which do not support the distributed nature of work and patient care. Therefore, in order to facilitate the adoption of mobile technology in EMS, it is essential have a system which is flexible to support the distributed nature of patient care and mobility required. Top management can govern the intention and behaviour of the people involved in the adoption process. The emergency department is quite conservative in nature and is not open to change and fewer risks are taken when changes to a system are needed. This risk aversion and lack of innovation affects the adoption of mobile technology. Also the lethargy to change does not lead to create the necessary investments in infrastructure, manpower, etc. Unless the top management recognise that adoption of mobile technology in EMS lead to increased efficiency and improved effectiveness, their positive attitude to its adoption is difficult. Regulated healthcare environment, high growth rate, increased rivalry affects the healthcare sector, therefore initiatives by government to the increased use of wireless technology may influence the decision to its adoption. Profitability is one of the core dimensions in the vision and mission of the organisation.

4.2 Organisation Environment

In the early stage of adoption, trust is one of the most crucial and complex dimensions for its deployment which can be attained with familiarity and experience (Luo, et al., 2010). In the organisation context, it is equally essential to gain the trust of its customers with the use of a particular new technology for having a long-term relationship. Two important issues with regard to privacy and security in the wireless trust environment need to be handled strategically to win the confidence of its stakeholders. In the case of emergency medical context, it is important for hospitals to take care of the security and privacy concerns of its patients' crucial data because of rise of hacker activities and vulnerability in uncertain environment of mobile channels. Privacy and security concern with the use of mobile technology in the business applications across the globe is high. There is a threat associated with the access of patients' confidential data by an unauthorised person raising the concerns related to security and privacy.

4.3. Transfer and Integration

For taking the full advantage of mobile technology, timely data access and proper integration is crucial. However, healthcare systems are complex in nature, large but poorly integrated and fund is always a constraining factor. Therefore, it is difficult to take benefits of the core applications of mobile technology. Recent work in the practice of mobile technology adoption in healthcare reported four dimensions that poses challenges in its transfer and integration as part of the organizational landscape namely availability of infrastructure, skilled resource, complexity in data capture and compatibility of data type. It is well-recognised among the top management that use of mobile technology increases productivity but the emphasis on costs is an impediment in the adoption of mobile technology. As noted by Biesdorf, Court, and Willmott (2013), the need for a proper data planning system is mandate for ensuring high levels of data productivity. Implementation of wireless technology requires overcoming difficulties of hand-wired systems in old infrastructure.

4.4 Perceived Value

According to TAM, two important dimensions namely perceived usefulness and perceived ease of use holds importance while determining technology adoption and in influencing one's attitude and behavioural intention (Venkatesh, 1999). Perceived Usefulness (PU) is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" and Perceived Ease of Use (PEOU) is defined as "the degree to which a person believes that

using a particular system would be free of effort" (Davis, 1989). The use of mobile technology allows booking an ambulance at any point of time, access of the patient and ambulance details can be made readily available with the use of mobile technology. The first hand information about the patients' condition allows deciding which type of ambulance and with which type of facilities is required to be dispatched. In remote areas, while transiting the patient an effective communication with the help of mobile technology allows continuous treatment to the patient in a critical condition.

4.5 Competition

The intensity of competition faced the organisation compels/encourages an organisation to adopt an innovation to have an edge over its competitors. In the emerging economies like India, this need is not perceived and significance of the use of mobile technology in providing effective service during emergency is not yet proved because industry has not yet set any benchmarks or any minimum standards or made significant investment in the use of mobile technology in EMS. Hence there is less influence of the activities by the competitors. We believe in the developing country like India the markets needs to be more mature to realise the benefits associated with the use of mobile technology during emergency. The relative advantage of mobile technologies to have a competitive edge included the efficiency due to optimum resource allocation, possibility to avoid queues and independence of time and place. Perceived independence of location is useful because physicians could be contacted remotely without having to move to a point of incident.

5. Challenges of Adoption of Mobile Technology in EMS

Taking into perspective developing nations like India, the EMS system faces number of challenges like lack of funds, poor coordination, fragmented, narrow vision of considering EMS as just a means of transportation etc (Radfar A., et al., 2017). There exist five models of functioning of EMS namely private, volunteer, fire, hospital, and public– and thousands of agencies of different sizes. Ensuring proper coordination and collaboration between these widely distributed agencies is difficult in India (Garg, 2012). Hence vast variability challenges of implementation of any novel innovation in EMS. Implementation of any innovation is governed by the policy or regulatory framework in most of the countries. For example, if medicine is to be prescribed online with the use of technology it would be regulated by the state or federal laws. Besides, the lack of awareness, technical expertise, necessary infrastructure, affordability, vision, culture, risk averse nature of top management of the medical fraternity, the application of mobile technology in EMS is yet a challenge (Subhan & Jain, 2010). The legal issue related to the data privacy of patient information and also requirement of infrastructure for transfer and storage of patient information poses challenge. Besides, ensuring authentication of patient and healthcare providers is another key issue to be dealt with. There is a need for the implementation of federal laws for overcoming these challenges (Sasidharan & Verma, 2013). A developing nation like India also faces issues of low literacy, high population density and widespread corruption hampering the use of mobile technology in EMS. Overcoming these challenges is important for building strong foundation for the use of mobile technology in EMS.

6. Experience of Use of Mobile Technology in EMS in Developed Countries

Germany already has 4G enabled EMS which exclusively are meant for serving the stroke patients. The special ambulances are carrying a portable CT scanner and on-board operators for scanning on patients and data/image transmission for immediate service delivery (Arthur D Little, 2012). United States of America has a national standardised electronic patient care record which helps the emergency department to gather and analyse patient data strategically for providing valuable insights thereby ensuring quality care (The National Academies Press, 2007). Europe has a Smart Ambulance European Procurers Platform consisting of experts who are designing and building a prototype emergency ambulance vehicle for addressing the need of high-level patient on scene care. In Florida, with the help of special software EMS can link directly to the stroke centre for staff to perform a virtual assessment of the patient and begin the preparation for treatment.

7. Discussion and Future Research Directions

The literature is yet to explore the adoption of mobile technology in EMS and develop a theoretical understanding (Scornavacca et al., 2006). As noted by Castells (2008) there is a research gap in understanding the emerging trend in communication pattern owing to the introduction of mobile technology and how it affects the social life. Adoption of mobile technology in EMS can be done at an organisation level and a user level considering the theoretical foundations like Theory of Planned Behavior, Technology Adoption Model, Diffusion of Innovation, Theory of Reasoned Action, etc to gain better insights. Standing et al. (2008) found that owing to the conservative nature and risk involved while handling the patient, changes in this sector diffuse at a slow rate and willing to take risks is also low. Therefore there is a need for better knowledge of how the rapid diffusion of mobile technology takes place in supporting the critical tasks in the healthcare sector especially in the Emergency Medical Services (EMS). It is of increasingly importance in order to understand the key influencing factors in its adoption. The results of such study would have several important social as well as economic implications (Smithson & Hirchheim, 1998). The evaluation of mobile technology adoption in EMS is crucial since it helps top management in the healthcare sector by providing feedback, ensure increased organizational learning and diagnose loopholes and assess future opportunities.

8. Conclusion

The use of mobile technology allows arriving on scene quickly and information exchange is also facilitated between incident scene, doctors and hospital emergency department thereby addressing the need of emergency care system in India to relieve the burden of disease from acute and emergent condition. A great deal of research on the adoption, utility, challenges and overall impact of mobile technology on EMS operation and service delivery is needed to demonstrate the use of mobile technology for improving patient outcome in terms of morbidity and mortality (Wilson MP. et al. 2007). More research is needed for comparing the traditional model of EMS with the one proposed with mobile technology in terms of quality of service offered by both. We expect that this study will provide some basis to evaluate the usefulness and implementation of mobile technology in EMS.

9. References

1. Anuradha D., Padma Priya N. (2005). Real time patient monitoring in a telemedicine system for emergency medical services using internet of things. *International Journal of Innovative Research in Computer and Communication Engineering, 4(5).*
2. Arnold J.L. (1999). International emergency medicine and the recent development of emergency medicine worldwide. *Annals of Emergency Medicine, 33, 97-103*
3. Arthur D. Little (2012). The Business Benefits of 4G LTE. Commissioned by EE. Retrieved from: http://www.adlittle.com/downloads/tx_adlreports/ADL_UK_Business_Benefits_01.pdf
4. Biesdorf S., Court D., & Willmott P. (2013). Big Data: What's Your Plan? *McKinsey Quarterly.*
5. Braun R., Catalani C., Wimbush J., & Israelski D. (2013). Community health workers and mobile technology: A Systematic Review of the Literature. PLoS ONE, 8(6).
6. Castells (2008). Afterword. In: KATZ, J. Handbook of mobile communication studies. Cambridge: MIT Press.
7. Committee on the Future of Emergency Care in the United States Health System. Hospital-Based Emergency Care: At the Breaking Point. Washington, DC: The National Academies Press; 2007.
8. Darstow M., & Listwan L. (2012). Corporate practitioners moving to mobile banking: Key factors driving adoption. Journal of Payments Strategy and Systems, 5, 360-372. Retrieved from: http://www.henrystewartpublications.com/jpss
9. Eisele C. (2008). The golden hour. Journal of Emergency Medical Services. Retrieved from: http://www.jems.com/articles/2008/08/golden-hour.html
10. Eriksson M. (2010). Conceptions of emergency calls: Emergency communication in an age of mobile communication and prevalence of anxiety. *Journal of Contingencies and Crisis Management, 18(3), 165–174.*
11. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.
12. Durlach, P. J., & Johnson, A. (2014). Advanced distributed learning initiatives. *Journal of Advanced Distributed Learning Technology*, 2(6), 35-48.
13. Gaiani S. (2010). Establishment of a finnish ICT rural village network. Retrieved from: http://ifsa.boku.ac.at/cms/fileadmin/Proceeding2010/2010_WS1.7_Gaini.pdf
14. Garg R.H. (2012). Who killed Rambhor? The state of emergency medical services in India. *Journal of Emergency Trauma Shock, 5:49-54.*

15. Handel D. A., Hedges J. R. (2007). Improving rural access to emergency physicians. *Academics of Emergency Medicine, 14: 562-5.*
16. Hashmi N., et al. (2005). A Sensor-based, Web Service-enabled, Emergency Medical Response System. Retrieved from: https://www.usenix.org/legacy/event/mobisys05/eesr05/tech/full_papers/hashmi/hashmi.pdf
17. Jarvenpaa, S. L., & Lang, K. R. (2005). Managing the paradoxes of mobile technology. I*nformation Systems Management*, 22(4), 7-23.
18. Kafeza E., Chiu, D.K.W., Cheung, S.C. & Kafeza, M. (2004). Alerts in mobile healthcare applications: Requirements and pilot study. IEEE *Transactions on Information Technology in Biomedicine, 8(2)*.
19. Kobusingye O.C., Hyder A.A., Bishai D., Joshipura M., Hicks E.R., Mock C. (2006). Emergency Medical Services, Disease Control Priorities in Developing Countries. Disease Control Priorities Project, WHO pp.1261-1279.
20. Levine A.C., Goel A., Keay C.R., Lay C., Melnick E.R., Nielson J.A., Becker J., Khaleghi M., Chicharoen N., Johar S., Lippert S., Tebb Z.D., Rosborough S. & Arnold K. (2007). A review of the literature from 2006. *International Emergency Medicine: Academic Emergency Medicine, 14: 1190-1193. doi:10.1197/j.aem.2007.08.00.*
21. Markus H.S. (2005). Current treatments in neurology. Journal of International Stroke, 252, 260–267.
22. Luo W., Feng W., He W., Wang N.Y., & Luo Y.J. (2010). Three stages of facial expression processing: ERP study with rapid serial visual presentation. *Neuroimage*, 49, 1857-1867.
23. Medhi I., Ratan A. & Toyama K. (2009). Mobile-banking adoption and usage by low-literate, low-income users in the developing world. In: Aykin, N., Ed., Internationalization, Design and Global Development, Springer, Berlin, 485-494.
24. Nicholl J., West J., Goodacre S., Turner J. (2007). The relationship between distance to hospital and patient mortality in emergencies: an observational study. *Journal of Emergency Medicine; 24, 665-668.*
25. Nonaka I. & Takeuchi H. (1995). The knowledge-creating company. New York, Oxford: Oxford University Press.
26. Nonaka I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5(1), 14-37*.
27. Park Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *International Review of Research in Open & Distance Learning, 12(2), 79-103*.
28. Paul B. (2012). New technologies help improve patient care, ease burden on staffers. Retrieved from: http://www.modernhealthcare.com/article/20120616/MAGAZINE/306169961
29. Radfar A., Chevalier C., Rouse N., Patriche D., Filip I. (2017). Telemedicine: New horizons in healthcare. *Journal of Hospital Administration; 6(2).*
30. Ranson S., Boothby J., Mazmanian P., & Alvanzo A. (2007). Use of Personal Digital Assistants (PDAs) in reflection on learning and practice. *Journal of Continuing Education in the Health Professions, 27, 227-233.*
31. Rogers E.M. (2003). Diffusion of Innovation. New York: The Free Press, 5.
32. Sasidharan S., Verma D. (2013) Emergency medicine: The emerging medical field in India. *International Journal of Health Allied Science, 2: 298-9.*
33. Schooley B., Horan T.A. (2015). Emerging Digital Technologies in Emergency Medical Services: Considerations and Strategies to Strengthen the Continuum of Care. Department of Telecommunications HS 811 999c. Washington, DC: National Highway Traffic Safety Administration. Retrieved from: www.ems.gov.
34. Sheng, H., Nah, F. F. H., & Siau, K. (2005). Strategic implications of mobile technology: A case study using Value-Focused Thinking. *The Journal of Strategic Information Systems*, 14(3), 269-290.
35. Scornavacca E., Prasad M. & Lehmann H. (2006). Exploring the organizational impact and perceived benefits of wireless personal digital assistants in restaurants. *International Journal of Mobile Communications, 4(5)*.
36. Sharma M., Brandler E. (2014). Emergency medical services in India: The present and future. *Prehospital Disaster Medicine, 29(3), 307-10.*
37. Siau K. (2003). Health care informatics. IEEE *Transactions on Information Technology in Biomedicine, 7(1)*.
38. Smithson S., & Hirschheim R. (1998). Analyzing information systems evaluation: Another look at an old problem. *European Journal of Information Systems, 7(3), 158-174.*
39. Stabilizing the Emergency Medical Services in India. Retrieved from: https://faculty.maxwell.syr.edu/jomcpeak/PAI897/EMS%20in%20India%20paper.pdf
40. Standing S., Standing C. (2008). Mobile technology and healthcare: The adoption issues and systemic problems. *International Journal of Electronic Healthcare; 4(3/4), 221-235.*
41. Subhan I., & Jain A. (2010). Emergency care in India: The building blocks. *International Journal of Emergency Medicine, 3, 207-11*.
42. Tippett V., Clark M., Woods S. & FitzGerald G. (2003). Towards a national research agenda for the ambulance and pre-hospital sector in Australia. *Journal of Emergency Primary Health Care, 1(1-2).*
43. Venkatesh V. (1999). Creating favourable user perceptions: Exploring the role of intrinsic motivation. MIS *Quarterly, 23(2), 239-260.*
44. Wilson M.P. & Itagaki M.W. (2007). Characteristics and trends of published emergency medicine research. *Academics of Emergency Medicine, 14, 635-640.*