Towards Improving the Healthcare Services in Least Developed Countries: A Case of Health Needs Assessment for Telehealth in Yemen

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Abstract. Motivated by the need to improve the healthcare system in least developed countries, this paper aims to investigate the need for utilizing aspects of Telehealth by rural health facilities in Yemen as a case that represents the least developed countries. A qualitative approach has been adopted in this paper. The review of documents taken from the Yemeni Ministry of Public Health, among others, revealed the lack of health facilities, professionals, equipment, and funds; inequity in the distribution of health facilities, professionals, and equipment between urban and rural; and lack of unified health information system and unified database. The observation revealed three categories of needs: needs in the provision of healthcare services, health professionals' needs; and needs in health management information. Analysis of the findings shows that Telehealth is appropriate solution and has the potential to improve the current health status by providing quality health services and exchange health information among rural areas in Yemen.

Keywords: Telehealth · Least developed countries · Health information system · Health information · Healthcare services, and health management information

1 Introduction

Least developed countries (LDCs) have a population around *954* million, representing 13% of world populations, spread in urban, rural and islands [1]. LDCs suffer from poor healthcare systems, especially in the rural and underserved areas [2]. In fact, these areas represent the most areas of LDCs. Furthermore, around 69% of LDCs people live in these areas [1]. Health systems in least developed countries (i.e., low income countries) are facing challenges to provide high quality affordable healthcare and available for people. These challenges are lack of health facilities and professionals; bad health management, and geographical and financial barriers [3]. In addition,

F. Saeed et al. (eds.), *Recent Trends in Information and Communication Technology*, Lecture Notes on Data Engineering and Communications Technologies 5, DOI 10.1007/978-3-319-59427-9_63

challenges in some LDCs such as communicable diseases and non-communicable diseases, management of patients, and sharing of patient information [4]. However, it is important to find a suitable solution to overcome these challenges. Hence, literature showed that most of the developed, developing, and least developed countries use the Telehealth technology to improve the delivery of healthcare services to their people. Moreover, Telehealth has been found to provide accessible, affordable, and efficient quality health services and exchange health information at a distance in order to improve health systems in these countries [5–8].

Yemen is one of the 49 countries in the category of least developed and poorest countries in the world [9]. In addition, nowadays, it suffers from a poor health system due to political and economic crises [10–12]. Yemen is challenged by poor healthcare system, especially in rural and underserved areas which are resided by three-quarters of the population [13]. The Health Information Technology (e.g., Telehealth) is considered as potentially appropriate solutions to improve the health system [14]. However, there is a lack of research related to the use of technology in improving the Yemeni healthcare system. This is partly due to the lack of technology infrastructure in the vast areas of the country [15]. Therefore, this paper is undertaken as a ground work towards adopting the Telehealth to improve the Yemeni healthcare system, especially in the rural areas.

Literature reviews [16] revealed that most of health technology readiness assessments tools are focused on developed countries [16]. Yemen is one of the 49 least developed countries, reported by the United Nations [9]. Since there are vast differences in many aspects and circumstances between developed and developing, and least developed countries, the existing assessments may not be appropriate in the Yemeni case. Consequently, it is important to develop new ways that are appropriate to assess the needs of rural health facilities for using Telehealth particular for Yemen and that can be potentially used in similar least developed countries.

This paper reports on the first part of four connected research aimed at developing a framework suitable for improving the healthcare system in Yemen. Specifically, this paper (Part one of the research) will shed lights on the research undertaken in the assessment of Yemen health needs: It investigates the needs of rural health facilities for Telehealth in order to deliver quality health services to rural residents. Other parts of the research are: Yemen Telehealth Readiness Assessment Framework; Telehealth Acceptance by Health Professionals; and Telehealth Acceptance by Health Recipients. These parts are discussed in separate papers.

This paper is organized as follow: The literature review shares some important reviews: to shed light on the situation of Yemen which led to barriers and challenges in its healthcare; and the potential of Telehealth in overcoming the barriers and challenges. Then, the methods carried-out (i.e., observation and document). Following that, the findings are presented and discussed.

2 Literature Review

To appropriately address the needs of Yemen, one must first understand the background of the country. The complexity of Yemen's geography and dispersion of population are some of the challenges when implementing any integrated system at all. These have contributed to the current healthcare barriers and challenges.

The Ministry of Public Health is faced with difficulties in carrying out its responsibilities to provide quality health services in some rural areas as well as even the essential health services to the rest of rural areas [17]. These difficulties fall into four parts, firstly, health shortages of facilities, professionals, equipment [15, 18, 19], secondly, geographic barriers (i.e., big mountain range and wide deserts), thirdly, issues such as poor governance in health system, concentration of health facilities and human resources in urban areas, and the scarcity of health budget allocations [11, 17], and lastly, lack of health information system and the culture of using health information [15]. As a result, Yemen's health indicators are among the lowest in the region.

From the other side, Yemen is heading towards improving the healthcare status. However, it is still lagging behind other Middle East and North African countries in health factors such as life expectancy, child mortality, immunization, and malnutrition [20]. Besides, the sector is plagued with many challenges such as limited spread of health services [19].

The rapid development of ICT has produced many technologies that became useful for humans such as Telehealth. Despite the rapid diffusion and using of Telehealth to some extent now, there is no single agreed-upon definition of Telehealth. The most common and used definition is '*Telehealth is the use of advanced telecommunication technologies to exchange health information and provide health care services across geographic, time, social, and cultural barriers'* [21]. Furthermore, Chowdhury, Chien [22] highlighted that telehealth is utilizing telecommunication infrastructure to exchange electronic information and real-time videos for remote diagnosis, remote monitoring and another kinds of health services.

Practically speaking, Telehealth is used to promote healthcare delivery, create health plan for the individual, transfer healthcare effectively and efficiently, prevent disease and continuing education [7]. It depends on two ways to deliver healthcare services synchronous such as video-conferencing and asynchronous store and forward such as e-mail [23]. It has many application such as teledermatology, teleradiology, telecardiology, and telepathology [24]. Overall, it has the potential to improve healthcare [5–8]. Therefore, this paper proposes to use Telehealth. Consequently, the main objective of this paper is to investigate the needs of rural health facilities for Telehealth in order to deliver quality health services to rural residents. Moreover, ascertain if Telehealth is the best solution.

[25] study has assessed the health institutions' needs for using eHealth in Afghanistan. The result has divided the needs into three parts: provision of care, learning, and information management.

3 Methodology

In the research a qualitative approach has used which divided into two parts. The first part is to assess the rural health needs by reviewing official documents. Moreover, international reports and assessments which related to health needs in Yemen. 19 documents have been collected and then analyzed using Thematic Analysis [26]. The Second part is to assess the needs of rural health facilities for using Telehealth by using observation method. Site visits have been conducted to health facilities in the rural areas of three governorates, which are Sana'a, Ammran, and Dhamar. Nine health facilities were observed to identify the health needs via the observation method.

3.1 Document

Documents are excellent sources of data that can be governmental reports or statistics [27]. In this paper the, documents review is the collections of public documents and private documents in order to collect data. In addition, the intention of using documents is to get a better overall picture of how Yemeni health facilities operate. Sure, there is a lot of Yemeni rural health information that cannot be retrieved from the Internet and not all internet data can be taken as valid or authentic. For this, the authors have collected data only from authentic documents provided by the Ministry of Public Health libraries, archive, and departments. Official documents, studies, and unpublished reports have been analyzed.

The results will be used to have a better in-depth understanding of the health system in Yemen. Some classified reports have been read by the authors after taking permission from the concerned officials. However, these were not analyzed or used due to research ethical considerations but they helped in depicting a deeper understanding of the health needs of rural areas.

3.2 Observation

Observation is "*the systematic description of events, behaviors, and artifacts in the social setting chosen for study*" [28]. Observation involves the researchers taking notes while observing activities of individuals and groups. Observation method will be useful in diagnosing current situation in rural and underserved areas of Yemen because the researcher will take his data direct from the field. Hopefully, since the adoption of Telehealth in Yemen is pioneer and being done for the first time, practical results will be obtained.

The researcher chooses observation method for several considerations: there are not enough documents about health needs in rural areas to understand the situation clearly; using observation as a method that will make the result more realistic and appropriate to the context of Yemen.

The participants of the observation method were the health recipients and health professionals who live in rural areas. The duration of the observation was 7 months that started in June 2014 and ended in January 2015. Site visits to health facilities in rural

areas of three governorates (Sana'a, Ammran, and Dhamar) were conducted. Nine health facilities, three in each governorate, were observed to identify the health needs through using observation method.

At the point of writing, Yemen is plagued by political crises and war in several parts of the country. Therefore, rural areas have been selected based on the stability and safety and based on the Ministry recommendation. The Ministry of Health Public has defined three basic types of health facilities which are hospital, health centers, and health units [10]. Therefore, the study conducted the observation in the three types in order to enhance the impact of this study.

Observations were divided into three stages according to governorate, started from Sana'a, then Ammran and finally Dhamar. The Authors have started to visit the health facility to observe and gather data. They have used a recorder and a note book to write the important and interesting information during observation.

To achieve the objectives of this research, the authors have identified a set of specific questions which guide the process of the observation in selected areas. Also, a set of rules have been taken as follows: taking permission from the Ministry of Public Health to conduct the observation; prepare the observation paper forms; contact with people of the village; observing the following: health facilities, services, and activities in the village and district.

The observation process included: observing health professionals activities and explore their needs; explore health recipients' activities, needs, challenges; the reasons why health recipients' visit health facility, distance between the health facility and their homes; transportation; the way people act when they need health services; current health information system; conducting interviews with respondents in order to understand and to explain something unknown; record transcript and analyze data day by day; finally, observing any actions related to the study.

Unexpected problems were found during the observation such as: people resistance to be under the observation; difficulty communicating with some people; culture differences among people; identifying the influential people; rejecting the use of voice recorder; speaking Arabic and thinking in English by authors; some of them talkative; and difficult to gain the trust of some people. Therefore, the authors have applied a set of steps to overcome the problems and to complete the observation successfully such as: building a good relations with the rural people and health professionals in order to gain their trust; informing them of the purpose of the study so as to overcome their anxiety and tension; showing them of the consent letter of the study issued by the Ministry of Public Health; inform them that the study aiming to improve the current health status; inform them that the study not aiming to monitoring them; inform the health professionals that the need of given real information about the current health status in health facilities who are working in; living with them in the same village; and hold awareness sessions.

4 Analysis and Findings

This section presents data analysis and findings of Health Needs Assessment.

4.1 Document Analysis and Finding

The researchers have reported common challenges facing Yemen in delivering quality health care services to its people particularly those of rural areas. Among the challenges stated and reported in the literature reviewed which need to be improved for enhancing the current health status, which are: education, sanitation, access to clean water, roads, electricity, telecommunication, private sector development, financial sector reform, and legal reform [29]. Another study by [30] included: lack of coordinated management, drugs and equipment, strategic planning, monitoring and evaluation as well as poor access to health services. Furthermore, poverty and inequity in distribution of health professionals. Moreover, 65% of the rural population is not covered by essential health services. [15] mentioned that the challenges were the lack of mechanism in exchanging health information, lack of appropriate health information system legislation and policies, poverty and high illiteracy rates. Lack of health professionals and most of health facilities are closed [19].

From reviewing the Ministry of Public Health's documents, there are many challenges and barriers that face the current health improvement initiatives. Some of these are: lack of health facilities, health professionals and health equipment; lack of funding to build more health facilities, inability to employ more health professionals and to buy more health equipment; lack of equity in the dispersion of health facilities, health professionals and health equipment in urban and rural areas; lack of unified healthcare system and data base; lack of mechanism of exchanging health information; bad transportation and unpaved roads in the most of rural areas; the political and economy crisis; the war in many places in Yemen are also among the challenges. Furthermore, losing time and expensive cost of treatment in urban and overseas; most of rural areas not covered by healthcare services; only the minority of rural people have the accessibility of health services; and three-quarter of population living in rural areas. Furthermore, looking at the proportion of health professionals to the population clearly shows that there are large deficits in the coverage of the health needs of the population.

4.2 Observation Analysis and Finding

This paper aimed to assess the needs of rural health facilities for using Telehealth and ascertain Telehealth solutions to address these needs. Therefore, to achieve this, observation method has been used. Hence, thematic analysis has been used to analyze the observation data. Thematic analysis is a qualitative technique for *"identifying, analysing and reporting patterns (themes) within data. It minimally organises and describes your data set in detail. However, frequently it goes further than this, and interprets various aspects of the research topic."* [26].

This paper has developed themes based on the related literature and by considering the Yemen setting. It has utilized two ways for recording the data audio-tape and note taking. Observation (including interviews during observation) data that was collected using digital recording were transcribed into written form.

Primary findings are presented below: The analysis of the observation has summarized the rural health facilities needs in three categories: needs in provision of

Table 1. Thematic groups and sub-topics for the observation

Thematic groups and sub-topics	
Thematic group: health needs	
Sub-topic 1	Needs in provision of healthcare services
Sub-topic 2	Health professionals' needs
Sub-topic 1	Needs in health management information

healthcare services; health professionals' needs; and needs in health management information, as shown in the table below (Table 1).

Needs in provision of healthcare services: Data collected through observation showed a range of problems and challenges in provision of healthcare services in rural health system that can be overcome and solved by using telehealth such as:

There is a severe shortage of health professionals (e.g., specialists, general practitioners, dentists, nutrition physicians, community health doctors, health technicians, assistant physicians, pharmacists, nurses, and midwifes); A severe shortage of quality health services in rural due to many reasons: lack of health facilities, health professionals especially females, equipment, and medicines; Rural areas facing challenges in delivering ambulance service and ambulatory care to its people in remote and underserved areas due to many reasons such as: bad transportation system due to unpaved roads or even worse the inexistence of roads in some areas, no ambulances, and no trained teams or mobile health vehicles to serve urgent calls from patients or injured, respondents said that "*People are forced to travel a long distance from the village to urban cities to obtain healthcare services sometimes more than 50 km, 10 h due to bad transportation, also sometimes they could not find the vehicle or there is no road especially in the rainy season, where the roads are destroyed*"; Needs to change the current health policies that restrict rural health facilities to accept just a few of the basic health services; Lack of trust of patients in rural health facilities and professionals because of the large number of medical errors due to the lack of specialist doctors, laboratories, pharmacies, medicine, X-rays, and modern medical devices; Rural health facilities are not available 24 h; And, the need for: public awareness, guidelines, directions, and standard health practices, emergencies services, maintenance the health equipment, electric, and transportation.

Health Professionals' Needs: Data collected through observation revealed a range of health professionals' needs and challenges in rural areas such as:

Most of the health professionals who are working in the selected rural health facilities did not possess postgraduate degrees and experience; The health professionals tend to leave work in rural areas due to many reasons such as low salaries and inability to live in rural areas; Health professionals do not get follow up education while in service or access to up-to-date health information, respondents said that "*with using Telehealth, we can continue studying and enhance skills while we are working in rural areas.*"; They cannot store or retrieve patients' health information because there is no health information recording system; They cannot connect with other health professionals for consulting for the lack networking service, respondents said that

"*Health professionals are forced to travel a long distance for consulting others, or to obtain information or upgrade skills*"; Lack of awareness about good health practices among health professionals; And the need for training and continuous education programs.

Needs in health management information: Data collected through observation revealed the need for:

Health information system; Unified data base; Information to support policy makers to set plans and strategies based on true information; Medical record for each patient; Provide equipment and software necessary to facilitate communication between the Ministry and the provincial in order to speed access to information and data in the fastest time; Provide health statistical reports (e.g., monthly, annually and when needed); And issuing the unified health indicators at the Ministry level in order to unify information.

5 Discussion

Yemen uses the traditional health system that provides healthcare services to its population through the health facilities (e.g., hospital, health center, and health unit). Based on this system, government has been building health facilities across Yemen to cover all population health needs both in rural and urban areas. The government of Yemen has been using this traditional system as a solution to meet population health needs. However, the major problem of using this system is real access to the health services cannot be measured by the presence of health facilities but by the presence of health services within these health facilities. In fact, not all health facilities have the potential to provide healthcare services. Some of them are closed and some others cannot provide any health services due to the lack of health professionals or health equipment.

With the passage of time, the current Yemeni health system has exacerbated the problem of the health situation in Yemen. Hence, it became necessary to find an effective solution to overcome these problems. Consequently, the government has been attempting to build more health facilities, increase the number of health professionals and provide health equipment to improve the current health situation and to provide better health services. However, all these attempts have failed because of the political and economic crisis plaguing the country since the youth revolution in 2011, the political crisis and many repercussions have been led to the deterioration of the current health status in Yemen and the increasing the humanitarian crisis. Consequently, all rural residents became more desperate for life-saving health care services and the rural health professionals' needs for updated training and continuous education increased. As a result, the Ministry has been seeking suitable solutions to improve the current health status of Yemeni rural areas.

From the foregoing, this research suggests using Telehealth as one of the solutions. There are some important observations on the current health status in the rural areas that can be solved using Telehealth, as follows:

- It was observed that people do not trust health services provided by public health facilities and by health professionals who are working there. Consequently, people prefer to obtain costly health services in private health facilities located in urban

areas or overseas. However, since the majority of rural residents are poor, they have to go to public health facilities hoping to obtain affordable quality health services.

- Many rural areas are not covered by health services and it is so difficult to provide emergency services for them. Moreover, there are no emergency services such as ambulance services and blood banks.
- Travelling to urban cities is a solution for rural people who are in need of health care services or emergency services, but sometimes they could not travel because the roads are destroyed by the war airstrikes or by the rain. Telehealth could potentially improve the quality of health services and improve the access to services and information. Also, enhance the health professionals' education [31].
- In term of health professionals, currently there is a gap in health status and knowledge between health professionals in Yemen, However, to avoid this gap the Ministry of Public Health should assess and prepare health professionals to change before adopting telehealth [16]. Hence, this process referred to as "E-health readiness" [31].
- The researcher observed that the government health sector bears the greatest health burdens and its problems are exacerbated day after day due to the scarcity of resources and outdated facilities and the high cost of medication in addition to the high numbers of population in need for health service [19].
- Several things have also been observed causing the difficulty of access and obtaining health services such as the non-renewal of health facilities, failure to provide all health services at the health facilities and inadequate medical supplies.

Overall, the need of rural health facilities to use Telehealth can be categorized into three types of needs; the needs in provision of healthcare, health professionals needs and needs in the information system management, this findings are consist with [25].

Overall, as mentioned in the literature, Telehealth has the potential to meet and address most these needs.

6 Conclusion

This paper is part of a research study aimed to investigate the adoption of Telehealth in Yemen. This research has proposed that using Telehealth could improve the current health status in Yemen, especially, in rural and underserved areas. Therefore, this investigation was conducted. The findings of observation revealed that the rural health facilities were in need for using Telehealth in provision of quality health services, provision of health professionals' needs and information management needs. As mentioned, Yemen is one of the least developed countries. Therefore, findings can be generalized for least developed countries. Hence, this paper recommends that Telehealth can be a proper solution for providing better health services in the rural least developed countries. Further research is encouraged during the trial period as to assess its practicality in Yemen. In addition, further research on Telehealth readiness assessment, health professionals' intention to use Telehealth, and patients' acceptance are required.

References

1. IBRD-IDA: The World Bank, Least developed countries: UN classification (2016). Retrieved 01 Sept 2014 http://data.worldbank.org/region/LDC
2. UN-OHRLLS: The least developed countries, Things to KNOW, Things to DO, 2012, New York, USA (2012). Retrieved on 7 Nov 2016 http://www.unohrlls.org/UserFiles/File/LATEST%20IPoA.pdf
3. Lewis, T., Synowiec, C., Lagomarsino, G., Schweitzer, J.: E-health in low-and middle-income countries: findings from the Center for Health Market Innovations. Bull. World Health Organ. **90**(5), 332–340 (2012)
4. SADC: Assessment of the Status of Telehealth and its Potential as a Surveillance and Information Sharing Tool for HIV and AIDS, TB and Malaria in the SADC Region (2012). https://www.sadc.int/files/8814/1890/8459/SADC___ASSESSMENT_OF_THE_STATUS__OF_TELEHEALTH_AND_ITS_POTENTIAL_AS_A_SU….pdf
5. Broens, T.H., Huis in't Veld, R.M., Vollenbroek-Hutten, M.M., Hermens, H.J., van Halteren, A.T., Nieuwenhuis, L.J.: Determinants of successful telemedicine implementations: a literature study. J. Telemed. Telecare. **13**(6), 303–309 (2007)
6. Lacal, J.C.: Proposed framework to measure the ROI of mobile tele-health solutions in the management of chronic diseases. In: 26th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, IEMBS 2004. IEEE (2004)
7. Som, M., Norali, A., Ali, M.: Telehealth in Malaysia—An overview. In: 2010 IEEE Symposium on Industrial Electronics & Applications (ISIEA). IEEE (2010)
8. Van Dyk, L.: A review of telehealth service implementation frameworks. Int. J. Environ. Res. Public Health **11**(2), 1279–1298 (2014)
9. UNCTAD: The Least Developed Countries Report, Transforming Rural Economies. Geneva (2015). Retrieved 01 Sept 2016. http://unctad.org/en/PublicationsLibrary/ldc2015_en.pdf
10. MoPHP: Annual Statistical Health Report, Ministry of Public health and Population, Sana'a, Yemen (2013). http://moh.gov.ye/arabic/docs/Report2013.pdf
11. OCHA: 2014–15 YEMEN HUMANITARIAN RESPONSE PLAN 2015 Revision (2015). https://www.humanitarianresponse.info/en/system/files/documents/files/yemen_hrp_revised_2015.pdf
12. UNAIDS, UNGASS COUNTRY PROGRESS YEMEN Narrative Report (2012). http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=2E19A59021F4B7D555BCF002446679E4?doi=10.1.1.397.9535&rep=rep1&type=pdf
13. ten Hoope-Bender, P., Campbell, J., Fauveau, V., Matthews, Z.: The state of the world's midwifery 2011: delivering health, saving lives. Int. J. Gynecol. Obstet. **114**(3), 211–212 (2011)
14. Chumbler, N.R., Haggstrom, D., Saleem, J.J.: Implementation of health information technology in Veterans Health Administration to support transformational change: telehealth and personal health records. Med. Care **49**(Suppl), S36–S42 (2011)
15. Al-Ghaithi, A-G, Sheikh, A.F.T., Al-Kumaim, G., Taleb, A.A., Alwageeh, A.A.S.: Republic of Yemen and Health Metrics Network. Health Information Systems Assessment Report. The Ministry of Public Health and Population, Sana'a, Yemen (2009). http://apps.who.int/healthmetrics/library/countries/HMN_YEM_Assess_Final_2009_07_en.pdf
16. Khoja, S., Scott, R., Mohsin, M., Ishaq, A., Casebeer, A.: Developing a conceptual-framework for e-health readiness assessment tools for developing countries. In: International Hospital Federation, pp. 79–81 (2007)
17. WHO: Health Systems Profile- Yemen, Regional Health Systems Observatory- EMRO (2006). http://apps.who.int/medicinedocs/documents/s17314e/s17314e.pdf

18. Gollogly, L.: World health statistics World Health Organization (2009)
19. OCHA: Humanitarian needs overview, Yemen (2016). http://reliefweb.int/sites/reliefweb.int/files/resources/2016_HNO_English_%20FINAL.pdf
20. UNICEF: The state of the world's children 2015: executive summary. Reimagine the future: Innovation for every child. UNICEF (2015)
21. Reid: A Telemedicine Primer: Understanding the Issues. Montana: Innovative Medical Communications (1996)
22. Chowdhury, A., Chien, H.-C., Khire, S., Fan, S.-H., Jayant, N., Chang, G.-K.: Converged broadband optical and wireless communication infrastructure for next-generation telehealth. In: 2010 12th IEEE International Conference on e-Health Networking Applications and Services (Healthcom). IEEE (2010)
23. Deshpande, A.: Real-time (synchronous) telehealth in primary care: systematic review of systematic reviews2008: Canadian Agency for Drugs and Technologies in Health = Agence Canadienne des Médicaments et des Technologies de la Santé
24. Istepanian, R.S.H.: Telemedicine in the United Kingdom: current status and future prospects. IEEE Trans. Inf Technol. Biomed. **3**(2), 158–159 (1999)
25. Durrani, H., Khoja, S., Naseem, A., Scott, R., Gul, A., Jan, R.: Health needs and eHealth readiness assessment of health care organizations in Kabul and Bamyan, Afghanistan (2012)
26. Braun, V., Clarke, V.: Using Thematic Analysis in Psychology Qualitative Research in Psychology, vol. 3, pp. 77–101. University of the West of England, Bristol (2006)
27. Oates, B.J.: Researching Information Systems and Computing. Sage, Oxford (2005)
28. Marshall, C., Rossman, G.B.: Design Qualitative Research. Sage, Calfornia (1989)
29. Richardson, G., El-Saharty, S., Klingen, N.: Draft for Discussion, Republic of Yemen Comprehensive Development Review Health Sector – Phase 1 (2000)
30. Taher: Women and Men Health Care Workers in Yemen: Rights, Needs, and Responsibilities (2008). http://www.ilo.org/wcmsp5/groups/public/—dgreports/—gender/documents/publication/wcms_100278.pdf
31. Jennett, P., Jackson, A., Ho, K., Healy, T., Kazanjian, A., Woollard, R., Haydt, S., Bates, J.: The essence of telehealth readiness in rural communities: an organizational perspective. Telemedicine J. e-Health **11**(2), 137–145 (2005)