TRANSFORMATION OF TELEMEDICINE PRACTICES THROUGH THE USE OF MULTIFUNCTIONAL EXAM DEVICES: CASE OF GEORGIA

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Abstract: In the last decade, digital health has captured special interest of healthcare systems and stakeholders, worldwide. Particularly, in times of COVID-19 pandemics, importance and utilization of telemedicine has increased dramatically. Nevertheless, for the effective utilization of telemedicine services, confidence of medical professionals and acceptance from the side of patients carries critical importance. To achieve same quality of consultation, utilization of digital technologies, such as symptom checkers and multifunctional telemedicine exam kits became increasingly popular in digital health. The purpose of this study is to evaluate usefulness of multifunctional telemedicine exam devices, in scope of perception, attitudes and satisfaction of patients and providers (nurses and doctors). The overall objective is to identify barriers and lessons learned for successful transformation of primary healthcare and implementation of digital health, in developing country contexts. In scope of the study, evaluation pilot has been conducted with duration of five months. For the research purposes qualitative research methods were applied. In particular, focus group discussions (FGDs) were conducted with nurses operating in villages and with doctors providing virtual consultations. Furthermore, in-depth interviews were conducted with patients who received virtual consultations during the pilot project and partners of the project (administrators and coordinators). Overall, thirty-five respondents were surveyed via video/audio call. Convenience sampling was used for the selection of respondent patients and all administrative personnel (six persons) was interviewed. According to the opinions of respondents, multifunctional telemedicine devices improve effectiveness of telemedicine consultation. However, barriers and challenges were also revealed. More specifically, selection of right motivational system for providers, adequate training of involved personnel and well aligned schedules for consultations are needed. Moreover, communication issues (nurse-to-doctor and doctor-to-patient) also represent a challenge and require proper approaches.

Keywords: Telemedicine devices, multifunctional exam kits, transformation of telemedicine, telemedicine in rural areas.

INTRODUCTION

Georgia is a developing country with population of 3.7 million citizens (The World Bank, 2022). Healthcare system of Georgia, currently, is in a transitioning phase, transforming to serve better needs of population. According to the WHO reports, as well as appraisals of other respectful international organizations and experts, Georgia is making progress with regard to its healthcare system's performance indicators. However, still there are many challenges to consider (World Health Organization, 2020). One of the major challenges of Georgia's healthcare system is weak primary healthcare (PHC) (World Health Organization, 2023). Currently, it is widely acknowledged that primary health care (PHC) is a foundation of health systems. Countries with strong PHC timely respond to community and individual needs, their populations have better access to and higher satisfaction with health care services.

Furthermore, PHC is a highly cost-effective mechanism in keeping people healthy via using preventative measures, managing chronic disease, and encouraging self-care. Strong primary healthcare system is patient's first point of contact which should provide integrated care - comprehensive, accessible, community-based services throughout the entire life and can satisfy the majority of patients' needs (Langlois, 2020). In Georgia, this kind of comprehensive services and integrated care are inaccessible especially for the population living in villages (Mikava&Gabritchidze, 2019). More specifically, there is a lack of accessibility to various specialists (qualified specialists, such as cardiologists, endocrinologists, psychologists etc.) and even village doctors. This is especially problematic in villages and rayon centers due to shortage of qualified specialists. The report issued by International foundation "Curatsio" – "Healthcare Barometer's 10th Issue"- outlines that 15,000 doctors work in Tbilisi (where 30% of Georgia's population lives), whereas only 8,000 doctors serve the other 70% of the country's population (Curatsio International Foundation, 2019). For instance, many towns, rayon, regions do not have children's endocrinologists at all. Because of this reason parents of the children having type I diabetes have to take their children to big cities to visit the specialist (Mikava&Gabritchidze, 2021). This is turn is related with a need for time and financial resources and puts additional burden on families. To illustrate, for medical examination or for the consultation with specialist village residents need to visit rayon medical center. In case if there is a queue or if the patient needs several consultations with various specialists or tests he may be late and miss the transport as the transportation to the village is hardly available in evening hours. For this reason patient may need to visit rayon medical center several times to complete needed medical investigation. This in turn results in additional time and financial expenditures (Rukhadze, 2018).

Still another problem, emphasized by the respondents of the research is a lack of trust towards village doctors, which is a main reason why patients do not refer frequently to them. One of the causes of distrust frequently cited by the population is a lack of professional qualification in doctors. Problems related to qualification, in turn, are caused by the absence of continuous medical education/continuous professional development system.

Above-mentioned problems, such as specialist accessibility and patient education can be solved by telemedicine. Through the utilization of electronic platforms virtual, online consultations can be conducted for patients leaving in villages. The same platform can be used for online education of doctors and patients, as well.

The role and importance of digital health has been rapidly increasing in many countries of the world, in the last decade. Furthermore, its uptake dramatically accelerated during Covid-19 pandemic and is under the spotlight. In particular, telemedicine has become an only alternative for the management and prevention of non-communicable diseases and their complications, during lockdowns and social distancing. In many countries, telemedicine was effectively used to manage COVID-19 patients, as well. For the effective utilization of telemedicine services confidence of medical professionals (providing service to patients) and acceptance from the side of patients has critical importance (Monaghesh&Hajizadeh, 2020). Moreover, telemedicine service is equally effective, compared with in-person consultation, when doctor can gather the same data/information about patient's health status as during face-to-face meeting (Romanick-Schmiedl& Raghu, 2020). Accordingly, utilization of digital technologies, such as symptom checkers, became increasingly popular in telemedicine.

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1. Telemedicine Project

Currently, Ministry of Healthcare (MOH) implements telemedicine project in the regions. The purpose of this project is to strengthen primary healthcare to improve quality of medical services through quality telehealth and telemedicine services. It should be noted, that project implementation started without a clear strategy. MOH is working on strategy development at present. This project is implemented by four UN partners – WHO, UNFPA, UNICEF, UNOPS under WHO leadership. At present, telemedicine equipment (symptom checker) is installed, in fifty locations (rayon centers) (UNICEF, 2021). According to the scientific literature, sustainability and continuity of telemedicine represents even greater challenge than the initial implementation in regions. Consequently, sustainability requires relevant expertise, consideration of specific issues, utilization of change management approaches etc. Successful realization of Ministry's initiative is very important to improve outcomes in reality. In scope of previous studies our team encountered challenges with regard to initiation and set up of the above-mentioned project. During interviews, village doctors were skeptical about its successful implementation, citing number of challenges and barriers. Therefore, we decided to conduct an evaluation pilot (case study) with introduction of telemedicine examination devices in Georgia's villages.

For this purpose, Tytocare devices were chosen. Israeli firm TytoCare has invented telemedicine device, which includes an otoscope, stethoscope (for heart, lungs, and abdomen), basal thermometer, and digital camera (for skin and throat examination) and is designed to provide healthcare provider with the same type of examination data he or she would use in the office. The TytoCare Stethoscope was cleared by the FDA (U.S. Food and Drug administration) and all other devices comply with FDA requirements. TytoCare devices have passed multiple performance bench tests versus comparable devices to ensure quality results. It has obtained FDA and CE clearances, has partnered with over 150 health organizations and insurers worldwide, and strategic partners in the US, Europe, Asia and Israel. More than 6,000 clinicians use this telehealth solution and in 2020, the company performed over 650,000 telehealth examinations, globally. TytoCare device provides high-quality digital sounds of the heart and lungs, high-quality digital images and video of the ears, throat, and skin and measures heart rate and body temperature. This examination data is transferred from the device to mobile phone and through the digital application is transferred to doctor on the other end, who can provide a patient with a diagnosis, treatment plan, and prescription accordingly (Banning et al., 2022). There are several case studies demonstrating effectiveness of TytoCare in increasing access to medical services and quality of telemedicine services, in various countries. Uptake of these devices further increased during COVID-19 pandemics, as hospitals and health organizations in the US, Europe and Israel utilized them to remotely examine and diagnose quarantined patients and isolated patients at home, providing health professionals the clinical data required to make treatment decisions from a safe distance and minimizing physical contact.

It should be noted distinctly, that Tytocare has home version devices, as well (which can easily be used by households to examine children or adults, independently from medical professional, and contact doctor directly), further increasing accessibility to general physicians and various specialists for the population living in remote areas.

2. Research methodology

The purpose of this study was to evaluate usefulness of multifunctional telemedicine exam devices, in scope of perception, attitudes and satisfaction of patients and providers (nurses and doctors). The overall objective was to identify barriers and lessons learned for successful transformation of primary healthcare and implementation of digital health, in developing country contexts. Moreover, the vision was to increase awareness about telemedicine among beneficiaries and their families and engaged medical professionals.

In scope of the study, evaluation pilot has been conducted with duration of five months. More specifically, five exam kits have been imported in Georgia and distributed in five different villages. Nurses in the villages were examining patients using mentioned devices and sending collected information via mobile application to the specialists, in the capital city of Georgia. On the basis of received information doctors were conducting virtual consultations with patients remotely, or with nurses, who delivered doctor's prescription and diagnosis to patients.

For the research purposes qualitative research methods were applied. In particular, focus group discussions (FGDs) were conducted with nurses operating in villages and with doctors providing virtual consultations. Overall, three FGDs were held with nurses (in different periods throughout the pilot project duration) and six with doctors (two meetings per each group of doctors, with an interval). Furthermore, in-depth interviews were conducted with patients who received virtual consultations during the pilot project and partners of the project (administrators and coordinators). Overall, thirty-five respondents were surveyed via video/audio call. Convenience sampling was used for the selection of respondent patients and all administrative personnel (six persons) was interviewed. For each focus group question, 'main ideas' or 'themes' were summarized and highlighted using 'concept map' approach. The results of interviews were analyzed using content analysis method. The purpose of FDGs and in-depth interviews was to evaluate opinions and attitudes of professionals and patients with regard to research topic and identify needs.

3. Results and Discussions

Results of the evaluation were presented to broader audience including Ministry of Healthcare, international donor organizations assisting Ministry of Healthcare in digital transformation, insurance companies, teleclinics, clinics and hospitals, professional associations and pharmaceutical companies (those responsible on distribution of medical devices).

The target areas for the evaluation project were chosen according to the following criteria -most remote villages at the border of Georgia, in different corners/regions of the country. Overall, five different regions were chosen with several adjacent villages (Guria, Adjara, Kakheti, Shida Kartli, Samegrelo), with most need for accessibility towards doctors/specialists. The project was financed by the grant from the Embassy of Israel in Georgia.

The next step was recruitment of personnel locally responsible for examination of patients. For this purpose, four nurses were recruited and one village doctor- all residents of respective regions. The partner of the project was EKIMO – telemedicine clinic, responsible for the provision of specialists' remote consultations. Once Tytocare devices were imported

and distributed to medical personnel an online training was conducted for all involved parties. Since there is a lack of knowledge of foreign languages (English or Russian) among local medical professionals (and the general population) translation service was embedded in an online training. It should be noted, that devices and digital platform supporting it are very intuitive and easy to navigate, therefore one training conducted by Israeli specialists and another one held by organizers were sought to be sufficient. However, afterwards, individual training and online assistance were required per each nurse/doctor.

Nurses and village doctor were visiting patients at home (especially those having chronic diseases, unable to visit local outpatient cabinet etc.) and examining them, as well as those patients referring to village doctors. Overall, thousand unique patients were examined during five-month period.

According to the results of focus group discussions and in-depth interviews, major barrier for the initial stage of the project was internet problem. In some villages, due to the absence of broadband internet connection or unstable and weak connection, pairing of telemedicine examination devices with mobile phones represented a problem (Wi-fi or cellular internet is required to pair exam device with mobile phone to exchange images and recordings on a mobile application), therefore examination data couldn't be transferred. To correct this, special internet modems were purchased and distributed to nurses to enhance the connection.

Another barrier was delayed response from the doctors' side. From the first focus group discussion with nurses, reason for the low number of examinations compared to anticipated/scheduled number for the period was identified – late or no response from the telemedicine doctors. Evaluation of the reasons for delayed response led to the problem of a common account for the doctors. From the provider's side general physicians, cardiologists, oto-rhino-laryngologists, pulmonologists and dermatologists were assigned to the project, based on the device capabilities and data profiles. In an application, five nurse accounts and one doctor account were assigned for the evaluation pilot. To illustrate, once cardiologist entered the account another doctor (pulmonologist or dermatologist etc.) couldn't log in, simultaneously. After figuring out this issue, TytoCare added separate accounts for each profile doctors. This solved the previous problem; however, doctors weren't logged into the system all the time and were forgetting about the need to check whether new patient information was entered, requiring review and examination. Therefore, TytoCare took into consideration this fact and added notification function. More specifically, doctors were receiving notifications on emails, as well as, SMS on mobile once patient exam data was entered in the system. It should be outlined, that before the addition of notification function and after, telemedicine clinic partner had dedicated employee who was checking information in the system and contacting respective doctor/s reminding them for the need of consultation. This was resource and time-consuming.

As it was identified from the in-depth interviews with patients and FGD with nurses, patients in the villages were psychologically more confident, satisfied and trusting the process more, if they had synchronous (live) consultation with doctors, even though, from a medical perspective, when there was no emergency case outcome would be the same in asynchronous (store-and-forward) type of consultation (when doctor was reviewing exam data and information once he/she had free time for this and providing feedback, prescription afterwards).

To illustrate, approximately one-third of examined patients didn't have an opportunity to visit cardiologist and other specialists for more than three years. The reasons for this were various, financial constraints, immobility of patients, inability to leave family members under their care etc. Doctors and nurses during FG discussions were citing cases how emotional patients were getting once they were seeing doctor online in a real-time video-visit, crying with tears etc. However, as involved doctors/specialists were working in clinics and hospitals in a vast majority of cases there was an overlap between scheduled appointments in the clinic and entering requests for an online consultation. In the beginning of the project, it was anticipated that home examinations would take place during evening hours, after official working hours of involved doctors. However, afterwards, it was figured out that individuals in villages were busier in the evenings and first half of the day was more convenient for them to contact doctors. To solve this problem special schedules were developed and introduced to nurses/doctors, with indication of respective doctors' working hours and shifts. Throughout the evaluation pilot, we conducted two intermediate online meetings with doctors and nurses to discuss together all the existing challenges, problems and remind objectives of the project and find solutions. Furthermore, objective of these meetings was to bring together different stakeholders of the project and share perspectives, opinions. Administrative personnel were monitoring actively responsiveness to notifications and communication issues among doctors and nurses. However, despite all the measures, according to the results of Focus group discussions with nurses, they had the perception, as if they were disturbing doctors and were reluctant to remind them and tried to avoid additional contact. Furthermore, nurses demonstrated lack of motivation and initiative to outreach even greater number of individuals for exams because of this issue.

According to the results of interviews with patients, the overall satisfaction of them was high. They were satisfied because of increased accessibility towards high quality doctors/specialists working in the capital of Georgia (during interviews, they demonstrated greater trust towards specialists working in big cities). Another reason for the increased satisfaction was the multifunctional telemedicine device itself. When patients were listening to the recordings of their lung or heart sounds and observing images of otoscopy, they demonstrated amazement and increased trust in the telemedicine service.

To illustrate another perspective, several FDGs were conducted with telemedicine doctors, involved in the evaluation pilot project. Doctors also demonstrated high level of satisfaction with telemedicine exam devices and were confirming that collected information – sounds of heart tones and lung, as well as images of otoscopy, dermatoscopy and other were of the same quality as if they had examined patients in person. In scope of previous project, researcher had an experience and knowledge about the perceptions of these doctors. The results of mentioned study demonstrated lack of confidence and skepticism among the doctors towards teleconsultations (Mikava, 2022). According to the results of FGDs, utilization of telemedicine exam devices significantly increased the confidence and trust towards remote consultations among these doctors.

It should be emphasized, that throughout this project, there were several cases when serious health complications were encountered accidentally, by nurses. To illustrate, in one of this kind of cases, nurse was examining the oldest member of the household for cardiac complaints. She observed that another family member (55-year-old male) had inadequate red color on his face. When he was asked whether having any complaints, he denied having any

symptoms. However, nurse insisted and examined him with telemedicine device and forwarded collected information to the doctor. In this case, nurse realized that cardiac tones were abnormal and contacted cardiologist for synchronous teleconsultation. Cardiologist diagnosed serious arrythmia and instructed the nurse to immediately administer respective medication. According to the cardiologist, this was life threatening condition and it would be appropriate to call an ambulance. However, as nurse and other household members explained, it takes at least 50 minutes for an ambulance reach this village from rayon center and in the winter even greater time would be required. Other cases were alike, about patients not feeling symptoms and accidentally diagnosed having serious health complications.

In scientific literature, recommendations for the effective management of digital health transformation embrace utilization of change management principles. In this project, one of these principles – involvement of so called "champions" was used. One of the nurses, highly motivated, very active and most enthusiastic about telemedicine was chosen as a "champion". Furthermore, she was asked to train other nurses in utilization of the devices, to share success stories and findings with others, on a weekly basis and she was a contact person for her colleagues to refer in case of questions or difficulties (of course administrative personnel were available as well). This approach showed to be successful, as the other nurses were more freely contacting their peer and she understood better their needs.

It should be mentioned, that in scope of evaluation pilot nurses were teaching households how to use the device to examine their family members autonomously. As a result, households were learning and adapting very quickly and demonstrating substantial interest to possess the device and utilize, in the future.

CONCLUSIONS

To summarize major findings of the evaluation pilot, telemedicine exam devices increase trust and confidence in telemedicine services among doctors and patients and improve quality of remote consultations. Tytocare devices as an example of lightweight, easily portable telemedicine exam kits are highly recommended for developing country contexts, where deficit of highly qualified medical professionals in rural areas represents substantial problem. Mentioned devices should be considered as an addition and not as substitution of stationery symptom-checkers/telemedicine equipment implemented in scope of WHO/UN coordinated telemedicine project, in Georgia. Thereby, these devices increase accessibility towards medical services for the population of villages and periphery. Another comparative advantage of these portable telemedicine kits is that it can improve access and thus health condition of those patients who have restricted mobility and cannot visit rayon centers or even village ambulatories. Furthermore, availability of telemedicine exam devices for households living in rural areas and on a periphery of the country can further increase access to specialists and doctors, especially in case of children and chronic patients, thus ensuring continuity of treatment and integrated care.

To continue with the lessons learned, firstly, schedules and shifts of the doctors should be considered to assure adequate availability of respective doctors and specialists for synchronous/ live teleconsultations. In case of asynchronous consultations, patients also should be contacted by specialists to increase their satisfaction and trust; as, specialist-to-nurse

feedback loop does not seem to satisfy patients' needs fully. Moreover, adequate time should be allocated for the trainings and individual instructions for the nurses/households, despite the fact that devices are easy to use. Assigning "champion" nurses to assist peers and facilitate the processes is recommended. Special attention should be paid to the socialization among telemedicine provider doctors and local nurses, to overcome status difference and other barriers in communication. Even more, special emphasis should be put on communication aspect in telemedicine. The role and importance of adequate, sufficient communication should be explained clearly to all the stakeholders. In particular, nurses/local personnel should feel that they are important stakeholders of the process and their role is significant. Furthermore, telemedicine providers - doctors, specialists should advance their communication skills for remote consultations, accentuating clear explanation and patience with patients and/or nurses. To conclude, according to the opinions of respondents, multifunctional telemedicine devices improve effectiveness of telemedicine consultation. However, barriers and challenges were also revealed. In particular, selection of right motivational system for providers, adequate training of involved personnel and well aligned schedules for consultations are needed. Moreover, communication issues (nurse-to-doctor and doctor-to-patient) also represent a challenge and require proper approaches.

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