Efficacy of Knowledge Transfer and Exchange Between CHWs and Community Members in Low Resource Settings

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Abstract- **In the developing world, noncommunicable diseases are on the rise, contributing greatly to the double disease burden of infectious and noncommunicable diseases. However, as trusted health knowledge bearers, Community Health Workers (CHWs) have stepped in to help, serving as a modern resource to address these growing healthcare challenges. CHWs venture out into their towns, providing short health consultations to their community members in order to offer basic health education, screenings, and advice. In a world where it is constantly evolving, technology has attempted to enter its way into CHW programs. However, CHWs in the developing world, such as Kenya, face many technological challenges and have resorted to low cost and simple methodologies to educate their local communities on basic health information. This article takes a closer look at the short consultations of a CHW in low context settings, as well as the type of actionable knowledge retained once the CHW leaves the meeting site. Through this assessment of the knowledge transfer and exchange (KTE) between CHWs and community members, the valuable role of CHWs in the developing world shines through and offers insight into how CHWs can leave the greatest impact on their communities while leveraging practical and appropriate technologies.**

Keywords— Community health workers (CHWs); knowledge transfer and exchange (KTE); developing world

I. INTRODUCTION

The incidence of noncommunicable diseases (NCDs) such as cardiovascular disease, cancer, and diabetes is growing across the world. Low and middle-income countries with fledgling health care systems are quickly falling behind because of century-old challenges with infectious diseases. As a result, these developing countries have taken on a double disease burden, meaning that they lack the proper resources and funding to address both infectious and noncommunicable diseases [1]. For example, in Kenya, hypertension is the leading cause of cardiovascular disease, a common NCD in developing countries. Currently one in eight Nairobi slum adults suffer from high blood pressure. Fifty percent of these people have received treatment in the past year. Out of this number, eighty percent of them were unaware of their life threatening condition before obtaining medical attention [2]. It is imperative that people receive early NCD diagnosis and continued holistic support in terms of medication, diet and lifestyle choices.

Unfortunately, the endemic lack of doctors and nurses in developing countries makes it difficult to care for the growing populations. For example, in the United States, there is one doctor per 370 people, where as in Kenya, there is only one doctor for every 10,000 people [3]. This problem arises from the limited number of doctors and nurses produced by the educational system. Many of these highly educated professionals migrate abroad to obtain higher salaries and a better quality of life. Community Health Workers (CHWs) "have stepped in to meet these growing healthcare challenges, [4] " filling the gap between doctors and the local community with healthcare education and consultations. CHWs are trained volunteers who educate their communities and engage in the management and treatment of illnesses [5]. They are committed to visiting homes, providing treatment of simple and common illnesses, and offering education on nutrition. In addition, CHWs are a key source for maternal support and pediatric healthcare. They also contribute to the treatment and care of more serious illnesses and diseases such as tuberculosis, HIV/AIDS, malaria, and acute respiratory disease. Lastly, CHWs keep records and collect data on their communities for future patient reference [4].

Mashavu, a telemedicine system based in rural Kenya, employs CHWs to provide pre-primary healthcare services to the community. These CHWs offer Mashavu's "Know Your Numbers" consultation service where a patient pays to receive his or her height, weight, BMI, and blood pressure. Currently, the data obtained from patients is collected in paper receipt books and then digitized using netbooks and cell phones. Visuals and charts are shown on laminated pieces of paper to help educate the patient and create an interactive experience. As a telemedicine service, Mashavu has explored integrating more technology into its health consultations to facilitate knowledge transfer and data collection; however, the employed CHWs have not become accustomed to the idea and prefer using paper receipts and visuals instead.

Our research focused on the assessment of short health-related interactions in which knowledge is delivered from one individual to another. The goal of this study was to model the current CHW/patient scenario and analyze if the knowledge transferred between caregiver and community member holds

significance. This analysis is important because although CHWs take on many roles, their biggest responsibility is educating their communities. In most countries, CHWs volunteer to spend about four to eight hours every two weeks visiting the homes and families they are responsible for in the community. As a result, CHWs often have limited time to convey specific information regarding a health topic or disease. Therefore, it is imperative to identify whether or not these short health related interactions, which currently lack the use of tablet or netbook technology, leave behind a clear, actionable message for community members. Therefore, our research strived to answer the following question: Is knowledge retained when transferred and exchanged from a CHW to a community member? We applied the information gathered in order to explore whether or not the role of cellphones and tablets play a valuable part in the responsibility of a CHW.

This article begins with a brief review of knowledge transfer and exchange along with its current applications within the healthcare field. It is then followed by a summary of current technological challenges that CHWs face when it comes to consulting patients. The methodology of this paper outlines a knowledge transfer study conducted in Nyeri, Kenya, which focused on the effectiveness of knowledge exchange between CHWs and community members in a short amount of time, using basic printed visuals. The article concludes with a discussion of the results discovered on the ground as well as future recommendations for CHW programs, specifically Mashavu.

II. Knowledge Transfer and Exchange

Knowledge transfer and exchange (KTE) is the process through which information is gathered and exchanged, through interactions with knowledge-users, to create positive products. This process leads to KTE applications, which are activities or practices focused on using KTE to achieve a specific goal [7]. KTE is used in a variety of different contexts and environments and is important for research dissemination. Methods of conducting knowledge transfer include the use of printed or electronic materials, training sessions, and interactive workshops [7]. Currently, research teams attempt to gauge the effectiveness of KTEs by collecting questionnaires and interviews from the people who are receiving the knowledge. Effective KTE requires long-term sustained relationships, which in turn require trust. This trust allows for a genuine exchange of information that results in some form of change [9,10]. In addition, all stakeholders involved in KTE should gain something from the process – no one should leave empty handed. CHWs are selected by their communities, and are trusted community members who create long-term relationships with those around them. CHWs actively engage in KTE on a daily basis whenever they go out into their communities, transferring knowledge to the local people in order to keep them informed and in good health.

The Institute of Health Economics in Alberta conducted a study in 2008, which attempted to rank current KTE methodologies in order of their effectiveness [6]. The most effective method was the combination of prompts and reminders used to help people recall the transferred knowledge. Interactive educational meetings were determined to be the next most effective method. It is important to note that these strategies were identified as consistently successful methods for knowledge transfer. Other methods tested in this study were printed educational materials, audit and feedback, and academic detailing, all of which proved to be much less applicable to KTE models by themselves. Face-to-face exchange has been identified as a crucial part of knowledge transfer because personal contact enriches the experience and allows a more valuable transfer to take place [10]. CHWs, especially those in the developing world, rely on these simple face-to-face interactions in order to spread knowledge. Through oral communication, CHWs easily exchange health information with their communities.

Establishment of an effective method of KTE can face many barriers. On an individual level, a major barrier is mutual mistrust between the educator and the person receiving the knowledge [10]. Inexperienced or incapable teachers present another barrier. Since there is only one person transferring the knowledge, it is important that they are effective teachers. There are also major barriers to KTE related to communication problems. Information overload can lead to the person forgetting most or all of the knowledge transferred [10]. Language barriers also play a role. If the educator and the person speak different languages, it will be difficult for them to communicate and important points may be lost in translation. There is also the risk that instead of using layman's terms, the educator uses language that is too technical [10]. Ineffective educators can cause these problems, hindering the transfer of knowledge.

The most typical methods of transferring health knowledge are presentations and printed educational materials, such as pamphlets. Despite being proven to be the most ineffective methods of knowledge transfer, they are unfortunately the most commonly used [8]. This highlights the growing need for new implementation strategies that can advance the field of public health. Recent trends favor knowledge transfer policies that promote direct interaction between the educator and knowledge receiver. Because this is a relatively new development, there has been little evaluation of the effectiveness of increased direct interaction [8].

The delivery method for health related KTE is an extremely important part of the knowledge transfer and exchange process [6]. If people are not satisfied with the form of the information presented to them, it is most likely that they will not read it, making this an ineffective means of health information transfer. It is important that other methods of knowledge transfer are explored and tested. Whatever method is chosen should be credible and reliable. The knowledge transfer strategy must be applicable to many different situations and customizable for specific topics and communities. For CHWs in the developing world, resources are limited. They depend heavily on oral communication, with an occasional chart or pamphlet to assist them in the educational process. When modeling the typical

CHW interaction on the ground, it is crucial to utilize the methods they currently use.

III. Face with Technology

The following technological and data digitization challenges have been identified from five years of fieldwork and ground research with the Mashavu venture and the CHWs it employs [11].

A. Infrastructure and Resource Limitations

Resource constrained environments lack proper access to electricity, mobile service coverage, and Internet access. These limitations can greatly affect the use of technology in developing countries amongst CHWs. Mashavu encountered this problem when it partnered with the United Nations Industrial Development Organization (UNIDO) to conduct a pilot. Due to the reliance of powering kiosks using renewable energy sources, Mashavu often experienced days without power. This lack of electricity affected data input greatly, causing employees to often resort to paper receipt recordings.

B. Security

It is imperative that medical records be kept private. Countries around the world have made specific laws to protect the rights of their people. These laws vary from place to place, and are even non-existent in some cases. In Kenya, the Ministry of Medical Services states that ventures dealing with electronic medical records must "maintain the validity, integrity, and confidentiality of health information; ensure security through integrated system checks that prevent access and misuse of data; and validate the accuracy of captured data" [12]. Mashavu encountered this challenge of security after the 2012 presidential elections when a perception of voter fraud through electronic ballot casting emerged. Mashavu patients refused to have their medical data entered electronically, and preferred that the CHWs use paper receipts and recording books instead.

C. Lack of Expertise

In resource constrained environments, there is not always a large availability of technology. As a result, many people do not have the expertise to operate certain equipment such as tablets, computers, and smart phones. Ventures may need to educate local employees on the usability of products, costing money and time. Sometimes these efforts might fail because the employees are not familiar or comfortable with the technology. The Mashavu venture has experienced this through the CHWs they employ – the integration of netbooks and smartphones into the overall consultation has failed and workers have resorted to simpler paper options instead.

D. Start Up Costs

Smartphones are not always in the working budget of a CHW. In Kenya, a smartphone can cost anywhere between 5,999 Ksh and 54,999 Ksh ($71.59 to $656.30 USD) [13]. For a typical unskilled agricultural worker who makes 4,918 Ksh per month, investing in a smartphone is impractical and not in his or her monthly budget [14].

E. Equipment Reliability and Theft

Equipping CHWs with technology, such as mobile phones or tablets, can at times lead to crime or theft in low context areas. Theft incurs several different costs, both monetary and nonmonetary. For example, a device will need to be replaced if stolen. If there are partnerships with the government or other organizations, relationships can be greatly affected when news of theft or crime arises with equipment that they may offer or fund.

IV. Methodology of Study

This study was conducted in the town of Nyeri, Kenya. The participants were community members of Nyeri chosen at random. Shopkeepers and street dwellers were the easiest people to approach. A short script, covering the definitions of blood pressure and hypertension, along with the effects, prevention measures, and risk factors, was presented to 93 participants, all of who claimed to have no previous knowledge of the subject matter. Local interpreters were trained to rehearse the script and tests were not conducted until they understood the material in its entirety. Basic paper visuals were incorporated into the script. These visuals included a blood pressure chart, a picture of blood flowing through the body, and a picture of plaque build up in the vein. Interpreters also aided in simplifying the content as well as gaining trust from participants and access to the local community. The presentation of the script lasted between two and four minutes, as it varied among the different interpreters. This presentation was meant to mimic the short and simple consultations that CHWs give to citizens regarding healthcare information.

One hour after the presentation of the script, we returned to the participants in order to ask several follow up questions based on what they were taught: (1) What is the reading for normal blood pressure? (2) What is the reading for high blood pressure? (3) What are the effects of high blood pressure on the body? (4) What can you do to prevent having high blood pressure? The answers to these questions were recorded for each individual. Each answer was inputted into a spreadsheet and analyzed using a specific grading method. For each correct answer, the participant received one point. For each incorrect answer, the participant received zero points. The questions were looked at individually in order to determine how many people truly understood the corresponding information presented.

Two issues that may have impacted the consistency of the interviews should be noted. The first one is the reliance on the local interpreters. These interpreters were from a different cultural background, and there was no previous relationship with them before conducting the study. Therefore, explaining the methodology of the study took longer than expected. We put our trust in the interpreters so that they would conduct the study exactly as it was outlined. If the interpreters did not follow the set list of questions or the outlined information

exactly as stated, then the results could vary from participant to participant. In addition, the community members who participated in the study had varying degrees of education. As a result, some may have been exposed to information in their past that could have assisted them in performing better during questioning.

V. Results and Discussion

Overall, participants retained practical rather than conceptual information using the low technological approach we took. Participants were most likely to remember cause-and-effect information, rather than numerical or conceptual definitions. Out of the 93 community members sampled, 98% of them were able to give at least one correct answer out of the four presented in the script for ways in which to prevent high blood pressure. In addition, over two-thirds (69%) of the particiapnts responded correctly when questioned about the effects of high blood pressure on a person's body and health. On the contrary, people were less likely to retain numbers and definitions. Only 48% of the sample size was able to reiterate that a reading of 120/80 is considered normal blood pressure; and, only 23% were able to remember that a reading of 140/90 is considered to be high blood pressure.

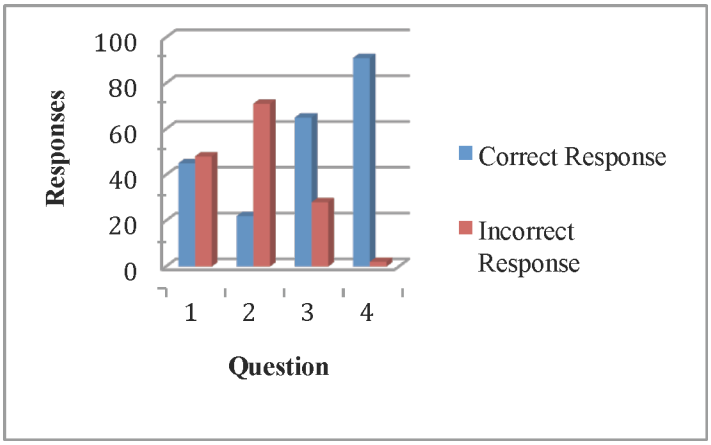

Figure 1. Results for the following four questions: (1) What is the reading for normal blood pressure? (2) What is the reading for high blood pressure? (3) What are the effects of high blood pressure on the body? (4) What can you do to prevent having high blood pressure?

During the follow up period, participants did not always answer every question and had the choice to skip it if they so pleased. Only two community members could not formulate a response for the question regarding prevention of high blood pressure. Thirty-five people gave no answer for the question pertaining to the definition of a high blood pressure reading, which involved numbers. Community members retained information that was more applicable to their everyday lives and less conceptual in nature.

As seen from the results, the quick knowledge transfer from CHW to patient is not effective in passing along numerical information, especially when using simple paper visuals. It is important to note that this study was designed for a community in a developing world where health literacy levels are extremely low. In rural and developing nations such as Kenya, many people lack the skills to understand written and oral information given by healthcare workers [14]. However, the study proved that knowledge transferred between CHW and patient is beneficial for relatable, personal health information. For example, a patient in the developing world simply might not understand what high blood pressure means because they are unfamiliar with words such as 'pressure,' or perhaps they are uneducated with basic physiology such as heart function. However, these people are very familiar with words and actions that they use in their everyday life, such as eating more fruits and vegetables or drinking less alcohol. Therefore, cause-and-effect situations that deal with day-to-day practices are where we can see this short-framed transfer of knowledge involving little to no technology to be the most practical, valuable, and actionable in low resource settings.

Based on our results, current Kenyan CHWs could increase the amount of knowledge transferred to their patients by focusing less on educating particular readings or numerical information and instead honing in on more practical and actionable knowledge. It is important that if numbers are mentioned they are not only described, but also linked to a practical lesson. For example, a CHW visits a household and finds a woman and child. The CHW conducts her routine health screening on the child and finds that he falls below the fiftieth percentile in height. According to the results in this paper, simply leaving the mother with height measurements might not be as beneficial as presenting a lesson, or piece of advice, for keeping the child healthy and on the right track towards growing healthy and strong. As observed on the ground in Kenya, these community participants will be excited to learn more about both their health and their families' health in order to live more prosperous lives.

VI. Conclusion

CHWs have an extremely important role as health educators on the frontlines of healthcare for millions of people in the developing world. As volunteers, the amount of time they can spend on their community health responsibilities is limited and precious to those they serve. This study validated the efficacy of their health education efforts conducted during brief encounters. The results indicate that knowledge transfer from the CHW to community members happens as long as the information presented is applicable to their daily life. While people tend to retain such practical and actionable knowledge, specific numbers or conceptual definitions are often vague and not retained. Also, the current consultation methodology of a CHW in rural Kenya is valuable – technology does not hold a place in CHW knowledge transfer and exchange, and simple paper visuals suffice. In developing world settings with predominantly oral traditions, community members are likely to share their new health knowledge with friends and family. While CHW training regimens should integrate fundamental

conceptual knowledge, it is recommended here that the messages designed for brief health encounters with community members should be extremely practical and applied. As CHWs continue to transfer practical and relatable knowledge to their local communities, they have the potential to gradually address the double disease burden affecting developing countries around the world.

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