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Relevance and Usability of a Computerized Patient Simulator for Continuous Medical Education of Isolated Care Professionals in Sub-Saharan Africa

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Abstract. Objective: to explore the relevance and usability of using a computerized patient simulator as a tool for continuous medical education and decision support for health professionals in district hospitals in Sub-Saharan Africa. Methods: based on the diagnosis pathway and decision analysis in uncertainty context, interactive clinical vignettes are developed using VIPS, a computerized patient simulator, taking into account clinical problem situations whose relevance was identified. Vignettes were adapted to take into account local epidemiology, availability of diagnostic and therapeutic resources, and local socio-cultural constraints. The evaluation on VIPS software was made by care professionals and students. Results: a computerized patient simulator can be used to provide initial and continuing medical education in Sub-Saharan Africa. But many challenges exist. Conclusion: further research is needed to measure potential improvements in knowledge, skills, decision-making abilities as well as patient outcome.

Keywords. Computerized patient simulator, Telemedicine, Clinical reasoning, Capacity building, Isolated healthcare professionals, Africa

1. Introduction

« How do we adapt and teach medical guidelines in our local context? »

Many guidelines exist in the field of healthcare aimed at reinforcing the capacity and harmonize the practices of health professionals. Generally, this knowledge is distributed through continuing medical education [1, 2]. The tools traditionally used for the dissemination are medicals journals, books, seminars, conferences, and symposia. Despite the availability of this medical knowledge, there are many difficulties in harmonization and application of these guidelines in different countries with respect to the local conditions such as logistic, humans, technical and economic resources, social and cultural factors [3]. The situation is especially felt in developing countries by health professionals situated in isolated and rural areas.

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Furthermore, guidelines do not take sufficient consideration of the operating environment of the health professionals which entails the continuous assessment of diagnostic pathways (ability to ask the right questions, ability to correctly interpret the answers) and decision pathways (ability to make good decisions in uncertainty). They are therefore frequently ineffective as to the reinforcement of health care professionals.

For decades, information and communication technologies communication have also been recognized as having significant implications for medical education [4]. Indeed, many studies outline the importance and the potential of computer simulations as tools for medical education [5, 6, 7, 8]. Simulation offers clinicians a secure practice environment for learning how to react to difficult situations [9]. It has also been demonstrated that defects in clinical data collection can lead to wrong diagnosis and consequently bad decisions [10] with the risk of potential harm to patients. Recent studies have demonstrated the contribution of computerized-based clinical reasoning simulation as a complementary way to increase the experience and skills of learners [9, 11, 12] or as a mean to assess the physicians' exploration of socio-cultural and demographic factors during a patient consultation [13].

The aim of this paper is to explore the relevance and usability of using a computerized patient simulator as a continuing medical education and decision support tool for health professionals situated in rural areas of French-speaking Sub-Saharan Africa, for improving diagnostic processes and decision-making in the management of patients. This study takes place in the context of the RAFT network, a continuing medical education and tele-expertise network active in 15 countries of French-speaking Africa [3].

2. Materials and Methods

VIPS (Virtual Internet Patient Simulator, www.swissvips.ch) is built as a Web application, accessible via the internet through a Java applet. It is based on diagnosis pathways and decision analysis tools developed for improving skills of general practitioners in Switzerland [14]. This computerized patient simulator presents patients and have a query-reply interface simulating the various aspects of a consultation, including history, physical examination, laboratory tests, clinical investigations, and recording of various decisions, including the prescription of medications, patient education and other management decisions [15].

In order to define the clinical cases to be simulated, senior clinicians familiar with the practice in Sub-Saharan Africa indentified clinical situations associated with common diagnostic, treatment or management errors. Each vignette was adapted to reflect the reality of a typical district-level hospital, i.e., a basic secondary care setting with limited laboratory and technical equipments. After the validation, each clinical vignette was introduced into the VIPS program and completed with reference educational material based on review articles, interviews with the local experts and implementation of multimedia teaching materials needed taking into consideration the local environment.

The assessment of relevance and usability of these VIPS tool was made with health professionals (physicians, nurses and medical students) active in district hospitals of two member countries of RAFT network (Cameroon and Mali). After every consultation of clinical vignettes by these health professionals on VIPS, they had to fill a questionnaire provided for each case, which was meant to evaluate the usability and

the utility of the vignette, its appropriateness to the African context. Also, the equipment and the access to Internet were assessed. Numeric analysis was made using EpiData Entry 3.1 and SPSS 17.0.

3. Results

3.1. Participants

Eighty-eight people took part in this study; 54 % were from Mali and 46% from Cameroon. These participants were divided into six groups: the medical doctors (59%), the fourth year medical students (12%), the fifth year medical students (9%), the sixth year medical students (2%), the medical students whose academic levels were not mentioned (10%) and the nurses (8%). Among the medical doctors, two thirds were from Mali. The average age of participants was 30.3 ± 7.1 years.

About 43% of the participants had a clinical experience between three and six years. We consider clinical experience like the number of years the participant spent in a medical care context either during his training or in his work.

3.2. Contents of Clinical Vignettes

We evaluated the relevance of the clinical vignettes content from a general perspective as well as for each step of the consultation. 96.1% of users found relevant the general content of clinical vignettes. The history, the physical examination, the paraclinical examination and the decisions were relevant respectively to 88.4%, 76.3%, 85% and 86.9% of the participants.

66.7% of users were able to find the questions they wanted to ask or the decisions they wanted to take. 94.8% found that the answers to the questions asked were appropriate. The vignettes were said to be complete by 76.8% of the users. Besides, 74.7% of users found that the cases submitted in the clinical vignettes were adapted to the local context and 67.5% of the participants had already faced a similar case.

Regarding additional information resources, 87.4% found that the bibliographic references were appropriate, 90.1% found that the references were useful to understand the errors made during the simulation, and 79.3% found that these references were useful to answer to the questions generated by the user.

3.3. Usability of VIPS

38.2% of participants needed less than thirty minutes to totally resolve one case on VIPS program, 51.9% of the users needed between thirty minutes and one hour, and 9.9% needed more than one hour.

The usability of VIPS program was evaluated with the users. 76.8% totally agreed that VIPS program was generally easy to use, 18.8% partially agreed and 4.3% partially disagreed. Regarding the ease to progress in the case, to navigate between the steps of the case and to ask questions and to take decisions, total agreement rates were 63.1%, 63.9% and 55% respectively.

Moreover, 96.3% of the users considered that VIPS was an entertaining way of learning, while 97.6% of the users enjoyed resolving the cases.

4. Discussion

An adapted computerized patient simulator can be used as an initial and continuous medical education tool and decision support of health professionals situated in rural areas of French-speaking Sub-Saharan Africa is both usable and relevant. We expect the deployment of this tool in district hospitals, supported by the operational team of the RAFT network and regular distance-education sessions will lead to an improvement of decision-making abilities of care professionals, but this will require further studies. The association with the deployment of innovative diagnostic tools, which have the potential to increase decision-making abilities in isolated areas, such as portable ultrasonography and microscopy may be even more effective for improvement of decision-making abilities of care professionals. Thus, sufficient training and ownership of tools and appropriation of these tools and concepts by health professionals, both at the local and academic levels are seen as keys for the success of this project.

However, these positive results for the usability of such a tool for the training of health professionals in French speaking Africa need to be put in the context of the constraints and local difficulties, including technical problems. Indeed, 29% of participants experienced internet connection problems while using the VIPS simulator, and many users complain about the low connection bandwidth. In addition, outside major cities, access to computers is often limited and is even harder when it comes to the internet. In some places, the frequent power interruptions also make the use computers difficult. One of the difficulties encountered is also a lack of computer skills of some health professionals.

This study has some limitations as to the interpretation of results. First, the number of participants in this study is low and they are from only two countries. Then, the generalizing of its results throughout Africa is difficult. This study only addresses the usability and relevance aspects, further work is required to measure potential improvements in knowledge, skills, decision-making ability, and, eventually outcome of care.

5. Conclusion

The usefulness of computerized patient simulator has been demonstrated in the developed world. The results obtained in this study are encouraging. They show that the adaptation of the concept to address issues encountered in the isolated sites of district hospitals in Sub-Saharan Africa is possible although additional efforts to better tailor to the African context are still needed.

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