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Prototype of Care Application for Obstetric Telemonitoring of Hypertensive Syndromes in High Risk Pregnancy

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Abstract

This article describes the development of a prototype application for obstetric telemonitoring of hypertensive syndromes during pregnancy. A workflow was elaborated with the conduct for gestational hypertensive syndromes. Subsequently, prototyping was performed using Balsamiq. The prototype presents daily monitoring of blood pressure, signs and symptoms, displays accompanying charts, and generates alerts when there are changes to more or less the normal values, which are sent to the pregnant woman and the health professional.

Keywords: Mobile applications; Hypertension, Pregnancy; Obstetrics.

Introduction

Pregnancy is a physiological and dynamic process that occurs most often without complications. However, a considerable number of women develop gestational problems or some health impairments during the gestational period. Gestational hypertensive syndromes (GHS) represent a high risk for maternal and fetal health [1, 2]. In addition to diseases such as hypertensive encephalopathy, cardiac and renal failure, GHSs are associated with severe perinatal complications [2].

GHSs are considered the second cause of maternal mortality [3]. They can often be avoided by screening family, personal, habits and lifestyles, as well as controlling and monitoring blood pressure levels. Thus, early screening of risk factors for the development of SHGs becomes essential in assisting the pregnant woman so that early detection of injuries to the mother-baby binomial is possible.

There are several strategies that the health professional can use to monitor the possible gestational risk factors for GHS. With the increasing use of the internet by pregnant women and family members for gestational follow-up, the use of applications for this purpose has shown to be a great potential [4]. As the Internet has become a tool of support for pregnant women in seeking information about pregnancy, the websites and applications available do not guarantee to provided the basis of scientific evidence [4].

Considering the importance of the screening of risk factors, monitoring pressure levels and detecting warning signs of complications due to hypertensive syndromes, as well as the increasing and positive use of technology in health by pregnant women and health professionals for maternal, this study aims to describe the development of a prototype of care application for obstetric telemonitoring of hypertensive syndromes during pregnancy.

Methods

The pressent study was conducted in the period from January to October 2018. This study describes an application prototype related to gestational hypertensive syndromes, which will be incorporated into an obstetric telemonitoring system.

First, a literature review of international guidelines, manuals and protocols of the Brazilian Ministry of Health (MS), the World Health Organization (WHO), health institutions and scientific evidence was conducted, followed by a search in the Play Store of gestational applications that deal with blood pressure monitoring and hypertensive syndromes. Then, a workflow for SHGs using BPMN in the Bizagi Modeler software was created with the specification of a clinical protocol with all the information. A prototyping of the GHS service module from Balsamiq software was developed. In this preliminary study, no usability testing has been performed, limiting only to prototyping. Thus, no ethical appreciation was required.

Results

The data collected from the materials were unified in a single flowchart that encompasses different aspects including screening, diagnosis, prevention, and management of hypertensive syndromes during pregnancy.

The search in the Play Store showed that only one application presented a feature of monitoring blood pressure. Regarding health education, 6 applications presented general educational information about the changes in blood pressure in pregnant women. None of them evaluated aspects related to antecedents and risk factors or allowed to fulfill obstetric telemonitoring data by health professionals.

A protocol was created containing the signs and symptoms, risk factors, explanations, possible diagnoses, behaviors for pregnant women and health professionals, as well as warning messages for both, when necessary.

The prototyping of the application was performed based this protocol using Balsamiq, a medium fidelity prototyping software, which allows the elaboration of functional interfaces and gives the user an initial impression of the application's operation.

Regarding the main functionalities, the prototype presents space for insertion and daily monitoring of the pregnant woman's blood pressure (BP) (Figure 1). The pregnant woman not only can insert the BP from a external device at home, but

also can register the data recorded on her prenatal card or follow the data recorded by the health professional.

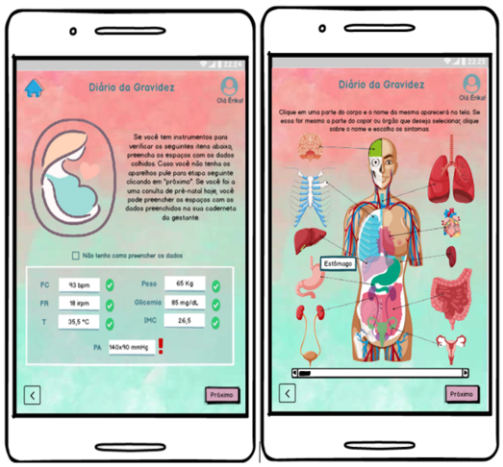

Figure 1- Prototype screens: data record of health and symptoms

The alerts are sent to both the pregnant woman and her health professional in prenatal care. The prototype also presents educational information on hypertensive syndromes in gestation, including gestational hypertension, preeclampsia, preeclampsia overlapping with chronic hypertension, eclampsia and hellp syndrome, emphasizing health education for pregnant women and health professionals.

Discussion

Blood pressure is a vital sign and thus needs continuous monitoring, especially during pregnancy. It is an indicator that allows the monitoring of health parameters that, when present or altered, predispose pathologies responsible for a large part of maternal and neonatal deaths and morbidity, such as pre-eclampsia and eclampsia [3, 5, 6].

The data entered are available for both personal and professional conferences, allowing for continuous monitoring of pregnant women's blood pressure values and early intercurrent screening, as well as better screening for high-risk pregnant women. To assist the health professional, the prototype of the hypertensive syndromes module, flowcharts and protocols on screening, diagnosis and management of SHGs are available.

The use of digital resources in preventive health presents itself as an opportunity to gather pregnant women, family and health professionals in a virtual and safe environment so that they can seek correct and relevant information and obtain a safe and continuous assistance among health professionals.

Conclusions

In this study we developed a prototype application that aims at hypertensive syndromes during pregnancy. The application will be incorporated into an obstetric telemonitoring system for prenatal follow-up. It is understood that the early identification of potential gestational complications through low cost and high impact interventions can reduce the number of morbidity and mortality among pregnant women worldwide.

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References

[1] World Health Organization. *WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia: implications and actions*, 2014.

[2] A.C.M. Oliveira, et al. Fatores maternos e resultados perinatais adversos em portadoras de pré-eclâmpsia em Maceió, Alagoas, *Arq Bras Cardiol* (2016), 106, 2, 113-20.

[3] J.M.G. Dias, et al. Mortalidade Materna, *Revista Médica de Minas Gerais*, (2015), 25, 2, 173–179.

[4] T.M. Calderon, et al. O uso da internet como ferramenta de apoio ao esclarecimento de dúvidas durante a gestação The use of the Internet as a support tool to clarify questions during pregnancy. *Journal of Health & Biological Sciences*, (2016) 4, 1, 18-22.

[5] Ministério da Saúde. *Protocolos da Atenção Básica : Saúde das Mulheres. 1a ed. Brasília - DF*: Ministério da Saúde. Secretaria de Atenção a Saúde. Departamento de Atenção Básica. Editora do Ministério da Saúde, 2016.

[6] World Health Organization. *Building a Future for Women and Children: The 2012 ReportWorld Health Organisation WHO.* World Health Organization, 2012.

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