

Survey Paper on Pediatric Care Mobile Applications

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Abstract- Despite the surge in mobile health (mHealth) applications (apps) about pediatric care in commercial app stores, to our knowledge, reviews of the quality of such apps are lacking. Consequently, it is a great challenge for health care professionals (HCPs) to identify appropriate and reliable mHealth apps for delivering health care services. Thus, we performed a structured review of the extant literature about mHealth apps in pediatric care and quality assessment of selected apps found in commercial app stores. A review and comparison of mHealth apps in pediatric care found in Google's Play Store (Android system) and Apple's App Store (iOS system) were performed.

Keywords: *Mobile health applications, health care professionals, pediatric care.*

I. INTRODUCTION

Pediatrics is the branch of medicine that involves the medical care of infants, children, and adolescents. Essential care of the normal healthy neonates can be best provided by mothers under supervision of nursing personnel. Childcare may simply be defined as non-parental care in a child's own house.

The Global Observatory for eHealth of the World Health Organization defines mobile health (mHealth) as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices." Mobile health (mHealth) applications (apps) are software that are incorporated into smart phones to improve health outcome, health research, and health care services. The use of mHealth apps among healthcare professionals (HCPs) has been rapidly increasing every year because of the apps' handy features that can be used anywhere anytime. These apps could thus facilitate the care processes of HCPs. However, the reliability and quality of mHealth apps remains the biggest concern to HCPs when using mHealth apps to deliver health care services, although evaluation of mHealth apps is taught in formal university courses. This is to ensure therapeutic effectiveness and patient safety, particularly in special populations such as pediatric and geriatric patients. Despite the high usage on the quality of mHealth apps among HCPs, official regulations on the quality of mHealth apps is lacking.

To our knowledge, there is no published review of mHealth apps for pediatric care. Hence, we performed a structured review of the extant literature on mHealth apps found in the commercial app stores. The present study may guide HCPs

in selecting the appropriate and reliable pediatric care applications based on their needs.

A. Goals or Objectives:

- To provide theoretical knowledge about baby's growth, development, and responses.
- To provide reminder about medication and vaccination.
- To allow user to track baby's growth, development, behavior, feeding and sleep.
- To allow user to export the records for consultation.
- To provide user the emergency contact details of the hospitals open 24*7.

II. LITERATURE SURVEY

"Waheb A. Jabbar and Hiew Kuet Shang et al presented the IoT-BBMS: Internet of Things-Based Baby Monitoring System for Smart Cradle". The current number of working mothers has greatly increased. Subsequently, baby care has become a daily challenge for many families. Thus, most parents send their babies to their grandparents' house or to baby care houses. However, the parents cannot continuously monitor their babies' conditions either in normal or abnormal situations. Therefore, an Internet of Things-based Baby Monitoring System (IoT-BBMS) is proposed as an efficient and low-cost IoT-based system for monitoring in real time. We also proposed a new algorithm for our system that plays a key role in providing better baby care while parents are away. In the designed system, Node Micro-Controller Unit (NodeMCU) Controller Board is exploited to gather the data read by the sensors and uploaded via Wi-Fi to the AdaFruit MQTT server. The proposed system exploits sensors to monitor the baby's vital parameters, such as ambient temperature, moisture, and crying. A prototype of the proposed baby cradle has been designed using Nx Siemens software, and a red meranti wood is used as the material for the cradle. The system architecture consists of a baby cradle that will automatically swing using a motor when the baby cries. Parents can also monitor their babies' condition through an external web camera and switch on the lullaby toy located on the baby cradle remotely via the MQTT server to entertain the baby. The proposed system prototype is fabricated and tested to prove its effectiveness in terms of cost and simplicity and to ensure safe operation to enable the baby-parenting anywhere and anytime through the network. Finally, the

baby monitoring system is proven to work effectively in monitoring the baby's situation and surrounding conditions according to the prototype. [2].

“Musab A. M. Ali and Nooritawati Md Tahir et al presented the Monitoring Healthcare System for Infants”. In this research, infants and new-born mortality can decrease significantly to 50% by monitoring vital signs and early intervention. Real time care is indeed vital for sick baby in ensuring the appropriate treatment is given and thus more attention are required to detect any symptoms or signs of infants' diseases. Hence, a system is proposed that integrates several functions in one single device and analyses the data from sensors along with the interaction of the device that will inform the conditions which will be determined by standard based clinical studies. The proposed system could be able to reduce the burden on hospitals and parents, with less direct intervention for un-serious conditions and allow early intervention for serious conditions. The integrate system will offers technology to assist for existing medical practices and for real-time monitoring system for newborn, special treatment, and assistance for new-born.[3].

“Lakshmi P and Lalitha K G et al presented the Design and Development of Infant Care System Using Arduino Technology”. In the Present era, with changing lifestyles of families, infant care is one of the most challenging tasks faced by parents. The parents either must work or have household chores to take care of so it's not easily possible to keep an eye on their babies. A baby monitor becomes very helpful in these scenarios to make sure of their child's safety. The device will help to detect the sound produced by the baby and keep the parents well informed about the baby's condition. However, some monitors do not satisfy safety requirements, especially when it comes to hearing impaired parents. Therefore, this research paper aims to fulfill the above requirement by developing a baby monitoring system to help the hearing- impaired parents to attend to their child(ren). The device will consist of an Arduino Uno, few sensors and a small hardware device which will display the infant's condition. This hardware device can measure the temperature, moisture content as well as the child's voice. This device will vibrate, and messages will be displayed on the LCD. This proposed prototype is convenient for hearing impaired parents to aid their child. [4]

“Aslam Forhad Symon and Nazia Hassan et al presented Design and development of a smart baby monitoring system based on Raspberry Pi and Pi camera”. This project presents a baby monitoring system for busy parents so that they can ensure the proper care and safety of their babies. This system can detect the baby's motion and sound; especially crying and video output of baby's present position can be displayed on a display monitor so that the mother or another responsible person can watch the baby while away from him or her.

This baby monitoring system can detect motion and crying condition of the baby automatically. The Raspberry Pi B+ module is used to make the total control system of the hardware, condenser MIC is used to detect baby's crying, PIR motion sensor is incorporated to detect baby's movement and Pi camera is used to capture the baby's motion. A display is used to have video output of sleeping baby. Finally, the developed hardware is tested to analysis the capability of detecting the motion and crying sound of baby as well as the video output. This proposed system can provide an easier and convenient way for busy parents in terms of taking care of their babies [5].

“Ming LC, Hameed MA, Lee DD, et al”. In this, dosage recommendation was also one of the evaluation criteria. The treatment information in some of the mHealth apps assessed did not include dosage recommendation. Therefore, this criterion was evaluated separately from the available treatment information. Dosage recommendation is especially important for pediatric care since the dosage for pediatric in different from adults. It helps to save time for HCPs to decide on the dosage. [6]

“Design and Development of Infant Care System Using Arduino Technology”. The proposed system could be able to reduce the burden on hospitals and parents, with less direct intervention for un-serious conditions and allow early intervention for serious conditions. The integrate system will offers technology to assist for existing medical practices and for real-time monitoring system for newborn, special treatment and assistance for newborns. [7]

“Translating technology into patient care: smartphone applications in pediatric care health”. It focuses on the study period between the birth until age 2 years, a time of rapid growth and changes in the body. Infancy is where babies need to be observed a lot to ensure that the growth is proper. New parents and caregivers often have questions about several aspects of their infant's health and well-being. The baby's first exam will either happen in the nursery. It includes measuring weight, length, and head circumference.[8]

“Assessment and Intelligent Analysis Tools for a Systematic Investigation in Pediatric Care Applications”. The development of intelligent software in recent years has grown rapidly. Mobile health has become a field of interest as a tool for childcare, especially as a means for parents of children with diverse diseases and a resource to promote their health conditions. Current systematic review was conducted to survey the functionalities of available applications on the mobile platform to support pediatrics intelligent diagnosis and children healthcare [9].

“Creating safer decision support systems for pediatric emergency care: the Paeds ED project”. Pediatricians are aware that parents have difficulty complying with

infants' proper growth. An application should be developed to remind parents when medications should be administered, allows parents to keep records of a variety of measurements, or any measurements appropriate for a condition being treated. Newborn babies go through some health issues as they adapt to a new world and a new environment. These problems activate their immune system, and eventually, they disappear. Infants are vulnerable just after birth and as they make a transition from the safety of the womb to this world. It is the time when they learn to breathe, feed, and more. It is also the time when their lungs, heart, brain, kidneys, liver, etc., learn to coordinate. [10]

Apps	Reviews / Findings	
	Pros	Cons
1. FirstCry Parenting	Q&A: Avail pregnancy tips, planning, parenting, baby care & pregnancy advice from experts & fellow parents on India's largest parenting community.	The application does not allow users to export the entered data of the baby to consult the user's choice paediatrician. The application does not record behavioural growth of the baby.
2. Shishu Poshan	In this app Immunization schedule & Growth chart is provided where one can get age & gender wise chart growth to track their child's overall growth.	The application provides on the information about breastfeeding and baby care. It does not give use the permission to enter the records.
3. PREto3	This app is all-in-one childcare management software and marketing service provider, developed by former childcare professionals.	The features are very much time consuming to use. There is no proper way to track baby's growth. Vaccination reminders are not there.
4. Care4cute	It is the best app for Pregnancy Tracker & Baby Care. You will receive daily updates on your baby's development, expert tips, helpful articles, and the latest parenting news.	This app is exceedingly difficult to use. The application does not have much clarification on the ideal values for growth, development, and behavioural milestones.
5. Parent: A childcare app	Parent is an all-in-one application for everything you need: billing and invoicing, attendance tracking, events with automatic reminders, and daily reports.	The application is difficult to use for the first-time users. There are lots of technical issues in Logging in, registrations and OTP verification.
6. Healofy	This app is related to planning of the baby. It allows women to track their pregnancy & it is also useful in tracking health growth of infant.	App is having too much content; all the charts are wrapped up together which is making application too much difficult to use. No weekly report is generated.
7. Mylo	It has baby & pregnancy tools, help community. Shopping for mother & baby and daily health tips.	The app doesn't allow users to enter data. Also, it doesn't allow parents to record growth, reaction, and response of their baby.

Table: Key findings of Structured Literature Review on mHealth Apps in Pediatric Care.

I. PROPOSED WORK

A. Flow of the System:

The intent of our project is that the problem the new parents are experience should have a solution. The principle of the application is to analyze if the baby is healthy and is having proper growth and development. Our application will be a simple parenting application which will target the parent of children of age group 0-9 years. Our application will provide the platform where parents can track their baby's growth, development, sleep, feed, and health. Parents can also track the vaccination and medication. It will also give time to time reminder about the vaccination and medication if the baby is undergoing any.

B. Functional Modules:

The whole system is divided into two modules. They are as follows-

1) User Module:

In this module user can create an account. After successful login, the app consists of three sub modules based upon Child's age group-

- 0-3 years
 - Growth Records
Allow users to see the baby's progress and growth in terms of height, weight, and head circumference, weekly, monthly, and yearly.
 - Sleep tracker
Sleep tracking feature for baby can provide the sleep timer which can be easily started when the baby goes to sleep and stopped when the baby wakes up.
 - Feeding
Understanding the right feeding pattern can be tedious for new moms. This feature helps in monitor when the child was fed last, analysis of feeding to make sure it goes right.
 - Vaccines
This app should help parents stay on top of the baby's health and vaccines calendar by sending vaccination reminder.
- 3-6 years
 - Growth Records
Height and weight standard chart are provided for a healthy baby according to the guidelines of WHO. Also, it allows user to see the baby's progress and growth in terms of height, weight, and head circumference, monthly, and yearly.
 - Vaccines
This app should help parents stay on top of the baby's health and vaccines calendar by sending vaccination reminder.
- 6-9 years
 - Growth Records
Height and weight standard chart are provided for a healthy baby according to the guidelines of WHO. Also, it allows user to see the baby's progress and growth in terms of height, weight, and head circumference, monthly, and yearly.
 - Vaccines
This app should help parents stay on top of the baby's health and vaccines calendar by sending vaccination reminder.

2) Admin Module:

Admin can create, read, update, as well as delete user log activities.

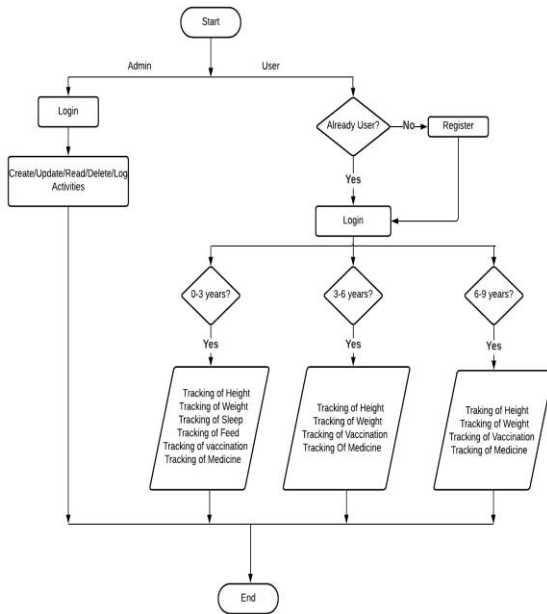


Fig. 3.2 Flowchart for the mobile application

IV. CONCLUSION

Apps are increasingly becoming an essential part of technologically savvy parents' life. However, the rapid growth of apps presents a challenge for parents and health care professionals to locate good quality apps. This study revealed that FirstCry, Healofy, and Mylo are the most comprehensive mHealth apps for HCPs as a quick reference for pediatric care. However, the limitation of FirstCry parenting app is the requirement of Internet connection for full content access. Moreover, Healofy and Mylo do not have a drug interaction checker function. The application provides support services for working parents to reduce their stress. The development of a pediatric care mobile application should be in such a way that it will act as personal assistant for a mother. It provides details of diet, ideal growth, and development details to be followed for the baby, vaccinations, and medications (if any) to be taken by the newborn baby with time-to-time reminder about the same. And In case of any emergency the parents can even contact pediatricians and the nearest hospitals. Health care professionals should be equipped with the strategies to guide parents safe use of technology. More studies about mHealth apps for pediatric care are warranted to ensure the quality and reliability of the mHealth apps.

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