F'AI'R Hackathon

Project Proposal

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Project Specifications

Domain

NGO/Medical

UN Sustainable Development Goals

3: Good Health and Well-Being

Intervention Description

Application to enhance midwife training in developing countries.

Target Group

Maternal nurses in developing countries.

Problem Statement

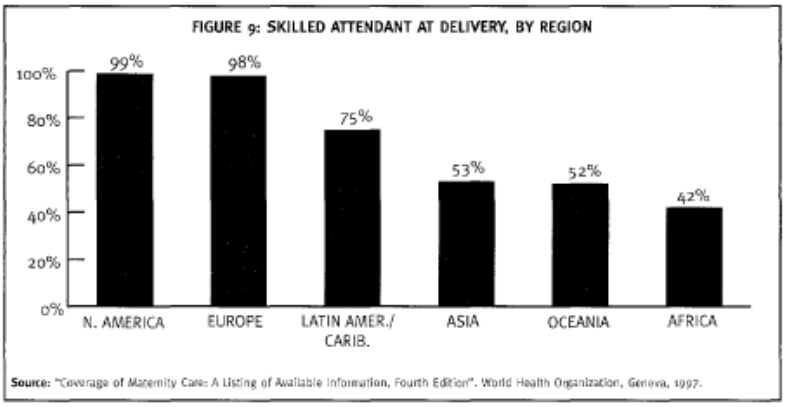
Ideal Maternity Scenario

1. -n Weeks: Sexual education. Family planning.
2. 1 Weeks: Pregnancy testing.
3. 7 Weeks: Prenatal appointment. Physical and pelvic exam. Prenatal labs.
4. 10 Weeks: Prenatal screening. Genetic screening.
5. 18-20 Weeks: Ultrasound. Second trimester blood. Child-birth preparation.
6. 26 Weeks: Diet and exercise management. Further labs. Breastfeeding training.
7. 31 Weeks: Discuss sterilization. Prepare for infant care.
8. 35 Weeks: Discuss birth plans. GBS culture. Infant safety and care training.
9. 37-40 Weeks: Assess potential complications. Plan for delivery.
10. Birth: Physician-monitored labor with access to experts
11. Birth+n Weeks: Postnatal care. Postpartum handling. Child care. Etc.

Maternity Scenario in Many Developing Countries

1. -n Weeks: Poor access to sexual education and family planning tools.
2. 1-40 Weeks: Informal consultation. Poor access to testing and consultation.
3. Birth: Potential for mishandled complications and inadequately skilled midwives.
4. Birth+n Weeks: Poor access to postnatal consultation.

Further Motivation

1. "Every year, approximately 600 000 women die of pregnancy-related causes — 98% of these deaths occur in developing countries. For every woman who dies, at least 30 suffer injuries and often, permanent disability." (Donnay, 2000)
2. "At present, one woman in 12 will die of maternal causes in sub-Saharan Africa, compared with one woman in 4000 in northern Europe." (Donnay, 2000)
3. “All women need access to antenatal care during pregnancy, skilled care during childbirth, and care and support after childbirth.” (WHO, 1997)
4. "The single most critical intervention for safe motherhood is to ensure that a health worker with midwifery skills is present at every birth … A sufficient number of health workers must be trained and provided with essential supplies and equipment, especially in poor and rural communities." (WHO, 1997)
5. 

6. "Someone who has been trained is not necessarily 'skilled.' … 'Skilled' implies the ability to provide competent care and assistance during pregnancy, labour, and childbirth, and the postpartum period." (WHO 1997)

Hackathon Proposal

Abstract

Android-based Python application to facilitate training for rapid diagnosis and treatment of obstetric emergencies during childbirth.

Interaction Scenario

1. During childbirth, many nurses are unprepared to face complications associated with certain obstetric emergencies.
2. Examples: Placenta praevia, Postpartum haemorrhage, Abruption of the placenta
3. Current solutions involve treatment manuals provided by health organizations. Although these provide many useful solutions, navigating such documents can be accelerated and made more dynamic to more effectively train nurses with the necessary skills to handle obstetric emergencies.
    a. "Nursing training and retention policies should be emphasized in maternal health improvement strategies … [this involves] upgrading the midwifery training." (Chimaraoke et al. 2017)
    b. Relevant areas: Nigeria, Thailand.
4. Some documents already present an algorithmic approach to diagnosis:
    a.

Assess	Danger Signs	Consider
Airway and breathing	**LOOK FOR:** • cyanosis (blueness) • respiratory distress **EXAMINE:** • skin: pallor • lungs: wheezing or rales	• severe anaemia • heart failure • pneumonia • asthma See **Difficulty in breathing, page S-149**
Circulation (signs of shock)	**EXAMINE:** • skin: cool and clammy • pulse: fast (110 or more) and weak • blood pressure: low (systolic less than 90 mmHg)	**Shock, page S-1**
Vaginal bleeding (early or late pregnancy or after childbirth)	**ASK IF:** • pregnant, length of gestation • recently given birth • placenta delivered **EXAMINE:** • vulva: amount of bleeding, placenta retained, obvious tears • uterus: atony • bladder: full **Do not do a vaginal exam at this stage.**	• abortion • ectopic pregnancy • molar pregnancy See **Vaginal bleeding in early pregnancy, page S-7** • abruptio placentae • ruptured uterus • placenta praevia See **Vaginal bleeding in later pregnancy and labour, page S-21**

5. Proposal Specifics
    a. Nurses will use the proposed application during training to simulate delivery emergencies and more effectively practice treatment for a variety of emergency scenarios. Emergency scenarios are presented and nurses must input responses to rapidly diagnose the patient and identify treatment options. The application will provide:
        i. Necessary assessments.
        ii. Treatment procedures.
        iii. Additional considerations.

iv. [Ideally] Diagrams to explain the scenarios.
v. [Additional] Other learning materials to support the simulative training.

Implementation Proposals

Platforms

1. Python 3.
2. BeeWare
3. Android.
4. Heroku

Data Sources

1. Managing Complications in Pregnancy and Childbirth
2. Other Manuals
3. Biological Textbooks and Diagrams

Challenges and Concerns

1. Ability to implement full-development timeline within the current time limitations.
    a. Solutions: Reduce use-case scope. Limit front-end goals.
2. Application Usability - See Dalton et al. (2018)
    a. Solutions: Proper attention to UX design.
3. NLP of PDF manuals.
    a. Solution: Consult other resources. ??
4. Data structuring of complex treatment procedures.
    a. Solution: Study treatment 'cases' and identify a common structure that can be used to present the information.
5. Lack of 'expert' information.
    a. Solution: Use only established medical resources. Consult experts.
        i. University of North Georgia Nursing Department

Project Plan

Tasks

1. Get feedback on proposal.
2. Hone idea and make necessary adjustments.
3. Confirm project group.
4. Discuss timeline for the hackathon.
    a. Decide tasks.
    b. Divide tasks.
    c. Commit to work routines.
5. Work.
    a. Understand current training procedures and how the proposed intervention can assist.
    b. Process obstetric care manuals.
    c. Restructure treatments into a stable data structure.
    d. Conceptualize information-retrieval paradigm.
    e. Implement system to present correct treatment information based on treatment database.

Timeline

1. December: Finalize project goals, decide feasible Hackathon goals, plan.
2. January Wk 01: Extract data, background research, UX proposals.
3. January Wk 02: Data handling, preliminary interface implementation, UX finalize.
4. January Wk 03: Integrate data and UI. Deploy test application.
5. January Wk 04: Testing and debugging.
6. January 30th: Presentation of progress. Demo with specific emergency scenario.
7. Jan 30th-Feb 24th: Continue development.
8. Feb 24th-25th: Hackathon: Feature-specific scaling.
9. February 25th+: Continue debugging, scaling for additional features.

Work Division

1. Juanjuan - Research, UX design.
    a. What are relevant concerns.
    b. What data sources should we use.
    c. How should we present the information to the user.
    d. How should the user navigate the interface.
2. Christian - Management, presentation, NLP.
    a. Manage project timeline, milestones, etc.
    b. Present ideas clearly and convincingly.
    c. Process care manuals and organize appropriate information.
3. [Other] - Development.

    a. Application development.

Future Development Potential

1. Monitor and advise the full scope of maternity from sexually-active to child-care.
2. Allow nurses to manage the care of multiple mothers and provide them with key information and advice for the relevant stages of pregnancy for their current patients.
3. Facilitate connections between multiple nurses that emergencies and uncertainty can be managed via expert contact.

Additional Resources

1. Obstetric Emergency Resources
    a. Managing Complications in Pregnancy and Childbirth
    b. Obstetric emergencies
    c. POCKET BOOK OF HOSPITAL CARE FOR OBSTETRIC EMERGENCIES
    d. Guide for the Care of the Most Relevant Obstetric Emergencies
    e. Preparing for Clinical Emergencies in Obstetrics and Gynecology
    f. Protocols for Managing Obstetric Emergencies
2. Evaluative Studies
    a. mHealth Apps and Services for Maternal Healthcare in Developing Countries
    b. Training initiatives for essential obstetric care in developing countries: A 'state of the art' review
    c. Improving Maternal Health Through Education: Safe Motherhood Is a Necessity
    d. smart phone app to prevent maternal mortality
    e. The Role of Postpartum Complications Knowledge
    f. Women's Health in Africa
    g. What does quality maternity care mean in a context of medical pluralism?
3. UX Design
    a. How to Provide Education for Pregnant Women
4. Large Scale Studies // Background Research
    a. The Safe Motherhood Action Agenda
    b. The State of the World's Children 2009
    c. UN Sustainable Development Goals
5. Miscellaneous
    a. Data Science Approaches to Improve Maternal, Neonatal and Child Health