GADSA: Decision Support App for Antibiotics Prescribing in Nigeria

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ABSTRACT

GADSA (Gamified Antimicrobial Stewardship Decision Support App) is a decision support tool to improve evidence-based prescrib- ing, designed to be used at the point-of-care to help clinicians com- ply with guidelines in their everyday practice. The app represents a novel cross-platform, mobile decision support tool, integrating principles from serious games and gamification, to improve compli- ance with prescription guidelines of Surgical Antibiotic Prophylaxis (SAP) in Nigeria. This paper focuses on the decision support com- ponent of the mobile application, integrating the World Health Organisation and Sanford guidelines for SAP prescriptions.

CCS CONCEPTS

• **Human-centered computing** → **Smartphones**; *Mobile phones*; • **Applied computing** → **Health informatics**; • **Software and its engineering** → **Interactive games**.

KEYWORDS

Antimicrobial Resistance, serious games, decision support, behaviour change, antibiotic prescribing, gamification

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1 ANTIBIOTIC RESISTANCE AND GADSA

Bacterial diseases and infection remain one of the most common, yet preventable, causes of death in lower-middle income coun- tries (LMIC) [4, 6]. Infection spreads rapidly and easily in hospital settings. This represents a significant challenge for low-income countries where the incidence of contracting a Surgical Site Infec- tion (SSI) is high compared to that of similar procedures carried out in developed countries [1]. Antimicrobial Resistance (AMR) is a prominent worldwide threat limiting our ability to treat common infections where digital interventions have proven successful in educating clinicians for over a number of years [3]. Reducing in- appropriate antibiotic prescribing by improving compliance with guidelines slows the spread of antimicrobial resistance by reducing selection pressure on constantly evolving bacteria. In this project, we focus on compliance with guidelines for surgical antibiotic pro- phylaxis (i.e. antibiotics administered shortly before, during or immediately after surgery). At the moment, there is no decision support app for antibiotics prescribing for surgeons at the point-of-care - GADSA aiming to cover this gap.

2 GADSA DECISION SUPPORT SYSTEM

The main support algorithm is implemented recommending antibi- otic prescribing guidelines by the World Health Organization [5] and Sanford [2]. Key principles are taken from the guidelines and transposed into two separate decision trees. The first decision tree

guides users in their selection of risk level for a specific surgery, while the second decision tree advises users on their choice of SAP and the duration of the prescription.

The decision support is strengthen by "immediate feedback" on surgeon's prescription decision at the point-of-care. prescription decisions. As they enter their decisions into the GADSA app, the structure of the trees indicates whether positive (compliant deci- sion), negative (non-compliant decision) or neutral (decisions where no guidance is currently available) feedback is given to the user, as shown in Figure 1. Receiving immediate feedback on their decisions, provides the user with either reassurance that their prescription is in line with guidance or a negative reinforcement and the op-portunity to change their non-compliant decision. Ultimately, the doctors have the final say on what to prescribe to their patients. However, surgeons need to choose a reason if they do not wish to change a non-complying decision, which provides invaluable evidence supporting the need for LMIC-specific guidelines.

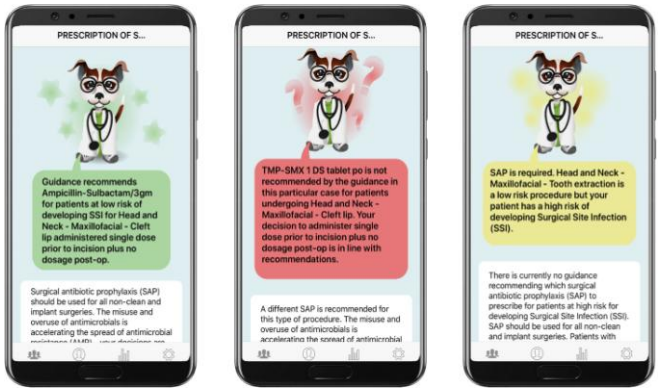

Figure 1: Positive, Negative and Neutral Feedback

3 APP DESIGN AND FLOW

Figure 2 contains the wireframe of the mobile application, based on the requirements gathered and the gamification features set for the application. The app launches with the "Home page". The user will choose the "Add Patient" option and then be able to complete the patient's details, add a new surgery and specify the surgery risk. Once the surgery risk page is completed, the surgeon's decision will be assessed, by running the first decision tree and the user is directed to "Feedback Page I".

Next, the user completes the surgical antibiotic prophylaxis (SAP) details. After inputting the SAP choice, the second feedback page ("Feedback Page II") shows the outcome of the second decision tree, which can be either positive, negative or neutral, including the rel- evant responses, as illustrated in Figure 1. Users have the option to change their prescription based on the feedback response. Finally, a summary page provides a review of the patient case: surgery de- tails and prescription choices, along with further recommendations. Since user's current prescription might have changed after the two feedback responses, the prescription choices are again verified in the two decision tree's algorithms, before the "Summary page" is loaded.

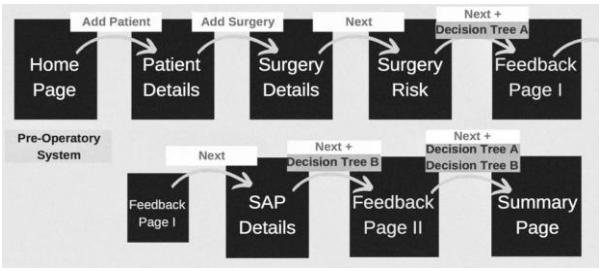

Figure 2: Wireframe of the GADSA app

4 PILOT CO-DESIGN AND EVALUATION

In the case of GADSA, the requirements are the result of a close col- laboration of local stakeholders, three partner hospitals in Nigeria. Both the functional and non-functional requirements were gathered and refined at several focus groups that took place in Lagos. The Evaluation stage takes place in three Hospitals in Nigeria, running from June to December 2019. By October 10th, 67 doctors registered and used the app for over 230 patients.

5 CONCLUSIONS

A new antimicrobial stewardship app was presented, aiming to improve compliance with prescribing guidelines and tackle the threat of antimicrobial resistance. The novelty of the app consists of providing decision support at the point-of-care, in order to increase compliance of SAP. Preliminary results from a pilot evaluation from three hospitals sites in Nigeria demonstrated the potential of the app for improving the antibiotic prescribing behaviour through the decision support tree and feedback, as well as a tool for collecting local reasons for why lack of compliance is justifiable.

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