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Use of a Smartphone Application (PaediCalc) to Improve Speed and Accuracy in Paediatric Body-weight Based Calculations in a University Anaesthesiology Department

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Introduction

Although we carry our smartphones everywhere, little have we done to fully utilize smartphones as a tool to promote medication safety and improve clinical management. When anaesthetizing paediatric patients, the drug dosages and equipment sizes must be tailored according to age and body weight; and mental calculations by reciting formulae can be prone to errors. The authors have developed a smartphone application ('the app'), which functions as a paediatric body-weight based calculator to improve speed and accuracy of these calculations, with a view to improve medication safety.

Objectives

(1) Improve speed and accuracy of paediatric calculations through an in-house developed app

(2) Compare the performance of our paediatric calculator with alternative methods by three hypothetical scenarios

Methodology

The app was written in HTML+Javascript and deployed as (i) an intranet webpage and (ii) a smartphone application. Anaesthesiologists in our department were invited to participate in pre- and post-implementation surveys (N=22). 14 trainees were recruited to participate in a calculation exercise, in which they were allowed to use their usual method of calculation (e.g. mental calculation & calculators) to calculate drug doses based on 3 hypothetical scenarios (2 simulating standard GA induction, 1 simulating emergency situations requiring adrenaline). The time and accuracy of their answers were recorded. Descriptive statistics were used, and Wilcoxon signed-rank test was used to compare pre- and post-implementation survey data, where applicable.

Result

In the pre-implementation survey, 100% of the staff felt that they definitely/probably will use the app. Apart from basic drug dosages and equipment sizes, staff members were interested to have emergency references (cardioversion/defibrillation, adrenaline, amiodarone), vasopressor dilution & infusion details. In the post-implementation survey, 80% of the participants answered they would use the app 81-100% of the time when anaesthetizing paediatric patients. The survey results showed the major advantages of the app were better accuracy and safety, whereas losing the ability to calculate by hand (deskill) was a disadvantage. Comparing pre- and post-implementation results, using the app improved the speed ($p=0.02$) and the accuracy ($p=0.01$) when compared to alternative methods. In the 3 hypothetical situations, trainees required a median of 60s(standard GA) and 40s(emergency) for calculations, and the overall accuracy of their answers was 87%. In comparison, the app required <1s to load all the data and the information was designed to be reliable and accurate.