

Development Of A Mobile Application For Anaesthesia Emergency Guidelines - A Proof-Of-Concept

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This mobile application is not endorsed by The Association of Anaesthetists.



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Introduction

The Association of Anaesthetists Quick Reference Handbook (QRH) (available at www.anaesthetists.org/qrh) is an invaluable collection of guidelines for emergencies in anaesthesia. Printed copies are ideally made available wherever anaesthesia takes place, acting as an aide-memoire for crisis situations. It is also a useful training resource for the rehearsal of responses to uncommon critical incidents, such as malignant hyperthermia and local anaesthetic toxicity.

Smartphones and mobile applications ('apps') may offer convenient and expedient access to such resources; even 5 years ago, 99% of surveyed UK doctors owned a smartphone and 93% found them useful when undertaking their clinical duties [1]. The QRH is not currently available as a mobile app, though its Creative Commons CC BY-NC-SA 4.0 License allows for modification and redistribution within set terms [2]. Successful utilisation of a digital platform for deployment could widen access to the QRH whilst reducing printing costs and associated environmental burden. In the COVID-19 era, it is also prudent to minimise physical items – such as QRH folders – at risk of aerosol contamination.

We aimed to explore the feasibility of deploying the QRH in such a format by first developing a proof-of-concept app as the initial step towards refining and releasing emergency guidelines software sanctioned for clinical use.

Method

Five technical and ergonomic prerequisites for the app were determined, as elaborated opposite. The proof-of-concept native Android app was created in July 2020 using the Kotlin programming language and the Android Studio 4.0 integrated development environment. It was intended to be widely compatible and should run on 99.8% of Android devices in current use. Guidelines were transcribed from the August 2019 Microsoft Word version of the QRH into the JavaScript Object Notation (JSON) syntax and data structure processed by the app. Content underwent minor formatting, punctuation and structure tweaks that did not meaningfully alter the guidelines, along with the introduction of TALLman Lettering to improve the readability of certain words.

Results

The app and source code – meeting all five prerequisites – were made available for download in late July 2020; released under the same CC BY-NC-SA 4.0 license with content attribution given.

As it was neither professionally developed nor tested, the app has initially been offered for demonstration, evaluation and training purposes, and carries disclaimers including a recommendation against clinical use.

Initial feedback was unanimously positive with comments such as "excellent app, very useful reference ... fast and reliable" and "excellent app, well formatted to be easy to use ... also useful for exam preparation". No bugs or errors have been reported to date.

The open-source nature of the project allows for anyone to scrutinise, improve or adapt it for their own needs. It also provides a transparent 'audit trail' of any changes or updates, retained in the repository at github.com/mtrnd/qrh. Offers of collaboration have been received, including interest in developing an equivalent adaptation for iOS.

Requirement	Rationale	Outcome
1. Mobile-friendly but faithful adaptation	Preserve familiarity and consistency with original handbook; easy to browse on small phone screen	Single-column layout; design cues reminiscent of original QRH; expandable inline call out boxes
2. Ergonomic design for rapid browsing	Easy location and retrieval of information in a time-pressured scenario; no unnecessary steps	All content accessible within two clicks of main screen; search function; links between guidelines
3. Works without internet access	High availability; unhindered access in a clinical setting without reliable mobile network or WiFi	Simple, fully-offline architecture; not web-based; once installed, no internet access required to run
4. Small size	Infrequently-accessed app should not consume excessive resources (which may deter retention)	Minimal device resource use; under 4 MB to download; typically around 12 MB once installed
5. Easy to update	Quick reflection of QRH updates; modifications & updates by someone other than original developer	Guidelines stored as JSON assets; can be added, edited & removed independently from main code

Discussion

Whilst prototyping has been successful in terms of producing a functional QRH app, regulatory and governance considerations must be addressed before further maturing the project and proceeding with clinical deployment. Using software that has not been suitably appraised could pose risk to both patient and clinician, e.g. though difficult-to-read text, content errors, or crashes that prevent timely access.

Under current Medicines and Healthcare products Regulatory Agency guidance [3] this app would not be considered a medical device and should not require CE marking, as it only reproduces existing reference information to enable a healthcare professional to reach their own clinical decision. Nonetheless, other aspects such as stability, accessibility, data security and interoperability remain relevant.

Moving forwards, we will seek approval to begin formal testing of the app to try and evidence its safety, usability and utility. In time, we hope that we may be able to demonstrate necessary regulatory compliance for sanctioned clinical rollout, such as through NHS Clinical Risk Management standard DCB0129 and the NHS Digital health app technical assessment process.

References

- Mobasher MH, King D, Johnston M, et al. *The ownership and clinical use of smartphones by doctors and nurses in the UK: a multicentre survey study*. *BMJ Innovations* 2015;1:174-181.
- Creative Commons. *Attribution-NonCommercial-ShareAlike 4.0 International - CC BY-NC-SA 4.0*. [Cited Aug 2020]. (Available from: <https://creativecommons.org/licenses/by-nc-sa/4.0/>)
- Medicines and Healthcare products Regulatory Agency. *Medical devices: software applications (apps)*. [Cited Aug 2020]. (Available from: <https://www.gov.uk/government/publications/medical-devices-software-applications-apps>)

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REC	Advice not sought
R&D department	Advice not sought
Audit department	Advice not sought
Caldicott Guardian	Advice not sought
Consent	None

