

# Harnessing mobile technology to develop a sustainable on the go learning resource for junior doctors

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## Abstract

**Introduction:** At KK Women's and Children's Hospital's (KKWCH) Department of Obstetrics and Gynaecology (O&G), a junior doctor's handbook exists to guide safe practice. A challenge remains in ensuring relevant, current, and readily accessible content. The onus of re-editing is left to senior clinicians with heavy clinical and supervisory roles, leading to a lack of sustainability. Mobile applications (apps) can be a sustainable 'just-in-time' learning resource for junior doctors as they balance new responsibilities with relative inexperience.

**Methods:** The app was developed in-house with the Residency's EduTech Office. A focus group comprising junior doctors identified content deemed useful. The alpha version was launched in August 2017 and trialled amongst the wider junior doctor population. Data on usefulness were collected through serial focus groups and analysed using grounded theory.

**Results:** An online survey disseminated to all 100 junior doctors showed that 100% owned a smartphone. 97.1% supported this new resource. Consultative discussions recommended inclusion of (i) Procedural and consent information; (ii) Risk calculators; and (iii) Clinical pathways and management algorithms. Mobile learning apps entreat the user to immediately reflect and conceptualise their concrete experiences, and actively experiment with the content to build on his/her current knowledge. Learners become stakeholders in creating their own learning material. Qualitative feedback indicated a continued interest to contribute, underscoring the app's sustainability potential.

**Conclusions:** Apps can be a sustainable on the go resource developed by junior doctors, for junior doctors. Learners become stakeholders in creating their own learning material through continued reflection, conceptualisation and active experimentation. This can be scaled for wider clinical use.

**Keywords:** *Sustainable Mobile Learning, Mobile Applications, On the Go Resource, Junior Doctors, Obstetrics and Gynaecology*

## I. INTRODUCTION

Mobile technology is an integral part of an ongoing technological revolution within medical practice. Junior doctors are often the first-line medical staff in contact with patients, tasked to provide adequate patient counselling and uphold standards of care in the ambulatory and inpatient settings while negotiating a fresh learning curve. Harnessing this technology in the form of mobile apps serves as an on-the-go resource when needed, and supports the new doctors' preparation for patient encounters as they balance newly increased responsibilities with relative inexperience (Bullock et al., 2015; Guze, 2015).

At the KK Women's and Children's Hospital (KKWCH) Department of Obstetrics and Gynaecology (O&G), whilst a physical handbook of departmental guidelines currently exists to guide safe practice, there remains a challenge in ensuring sustainability on three levels: relevance to existing knowledge gaps, currency with new evidence, and accessibility on demand. In addition, the onus of re-editing was often left to senior clinicians, who had to undertake this portfolio in addition to heavy clinical and supervisory roles, leading to a challenge in sustainability. Given the widespread use of smartphones and apps in the workplace, harnessing this technology may change the learning ecology and transform this into

a sustainable on-the-go resource to access much-needed knowledge amongst junior doctors.

Thus, a pilot project aimed at developing a sustainable mobile app for junior doctors for easy consultation of key knowledge to support their clinical practice was mooted. Central to this was the basis that the understanding of common O&G procedures, their risks and complications, access to department-specific guidelines, algorithms and risk calculators will ideally translate into better counselling of patients and ensure standards of care. This is especially so now that the newly updated Singapore Medical Council (SMC) Ethical Code and Ethical Guidelines 2016 has identified the provision of informed consent to be a cornerstone of every new doctor's practice.

Following the proof-of-concept of this tool, this will be the first step towards making learning more accessible outside the conventional pedagogical setting, and be responsive to the juniors' developing knowledge. Learners can be engaged to take a stake in creating and sustaining their own learning material.

## II. METHODS

An online survey on the use of an app to replace the existing handbook was first disseminated electronically to all junior O&G doctors (House Officer, Medical Officers, Residents and Registrars) in KKWCH, which aimed to assess the feasibility of this new tool, and the receptivity towards it. An invitation was simultaneously extended to interested junior doctors to form a focus group to identify initial content deemed best able to fill existing knowledge gaps.

Preliminary discussions were then undertaken with the Programme Director, Academic Chair, SingHealth Designated Institutional Officer and Faculty. The app was developed in-house with the SingHealth Residency's EduTech Office with funding from the Academic Clinical Program (ACP). The focus group were asked to identify content deemed most useful for themselves and their peers. The alpha version was launched in August 2017 and was trialled amongst the wider junior doctor audience. Data on usefulness and weaknesses were collected through serial focus groups and analysed using grounded theory. Pre- and post-implementation surveys will be conducted to determine the usefulness of the app in daily clinical practice, with a view for broadening the scope of content and scalability to other departments.

## III. RESULTS

In September 2016, 100 KKWCH O&G junior doctors were invited to participate in an online survey, with a response rate of 70%. It showed that 100% of respondents currently own a smartphone, had experience of using apps and 98.6% use their smartphones at work. Of these, 77.1% use an iOS platform and the remaining 22.9% use an Android platform. An overwhelming majority (97.1%) supported the use of a mobile app for teaching of common O&G topics/procedures. 13 respondents agreed to participate in the working focus group to develop this resource.

Results of the pilot survey lent credence to the conceptualisation of a mobile learning app to meet the needs of the user population.

Following the launch of the alpha version in August 2017, serial 3-monthly focus groups were recruited to trial the alpha version for iterative improvements. This was not restricted to the original focus group members, and any junior doctor with suggestions could attend. Between 6 and 14 participants were present at each meeting, with a mix of recurrent and new focus group attendees. This represented an ongoing interest in the continued development of the app, and in future, may reflect the self-sustaining capability of the app with a constant inflow and outflow of junior personnel who will be able to access this knowledge base and contribute towards its expansion.

Topics of commonest reference amongst O&G junior doctors were identified and these key areas were recommended for inclusion:

- i. Procedural and consent information
- ii. Risk calculators for ambulatory counselling
- iii. Clinical pathways and algorithms for inpatient and ambulatory management

Practice guidelines unique to the department were deemed most pertinent, as this obviated the need for internet referencing, especially in filtering content that was not specific to their needs. These recommendations were incorporated into the beta version. Clinical content for the app was prepared by junior doctors from the focus groups. Technical changes were made to improve the ease and intuitiveness of use. Beta-testing is currently underway with ongoing qualitative data collection as part of post-implementation tracking.

#### IV. DISCUSSION

The development of this mobile app ties in with the theory of a learning ecology, where there is a diverse variety of learning options, allowing each clinician to access and learn according to their own immediate needs (Rashid-Doubell, Mohamed, Elmusharaf, & O'Neill, 2016). The use of technology has been noted as a key element of learning by the US-based Accreditation Council for Continuing Medical Education (ACCME). In their 2015 report, it has been estimated that physicians spend an estimated 993 hours of instruction on internet searching and learning, which may be better served by the use of a dedicated mobile app serving their area of practice. The provision of evidence-based information in a mobile app is in alignment with the Best Evidence Medical Education (BEME) Collaboration, in the development of evidence-based education in the medical and health professions. To date, leading medical institutions such as Johns Hopkins Medicine have put in place mobile apps such as the 'Hopkins Guides' – a medical mobile app with monthly updates, covering clinically relevant topics such as antibiotic stewardship, HIV, Diabetes and Psychiatry. The development of this mobile app is based upon previous successful use of technology in these hospitals.

Based on preliminary focus group findings, harnessing this form of mobile technology can be well utilised as a 'just-in-time' information resource in daily clinical practice, particularly when other sources are not available. This provides timely access to key facts and encourages learning in context.

While this should not be seen as a replacement for conventional pedagogical learning, mobile learning will complement the existing learning platforms through textbooks and e-learning portals in existence which may not be easily accessible on the ward or at the bedside.

This use of mobile technology is affiliated with Kolb's learning cycle (Bullock & Webb, 2015; Kolb, 1984) where the app is an adjunct to experiential and active learning. Mobile learning apps provide on-the go knowledge which allows the user to immediately reflect and conceptualise their concrete clinical experiences and then through active experimentation, using the content of the mobile app, come up with a decision and solution that he/she uses to build on his/her current knowledge.

In addition to its benefits on learning, this project allows learners to become stakeholders in creating their own learning material that is responsive to their knowledge gaps. Common themes extracted from qualitative feedback at the focus groups included the app being

'current and readily available', and the idea of taking ownership of their learning. The app can also overcome the issue of sustainability. Many have indicated interest in continuing to contribute and encouraging their peers to contribute as it is seen to be 'for the greater good especially for incoming juniors'. The consistent mix of new and experienced attendees at the 3-monthly focus groups underscores the potential of the app's sustainability, which is driven by the very users of the app.

Upon completion of Beta testing, the uptake of this app is expected to be seamless in view of the almost ubiquitous use of mobile and smartphones in the clinician population, with easy access to the internet and medical 'apps'. Its user rate and utility can be further assessed, and thus made scalable for use in other departments within our sponsoring institution. Continued funding for this project has been promised by the ACP.

#### V. CONCLUSION

App development can provide a sustainable on-the-go knowledge resource developed by junior doctors, for junior doctors. Following the proof-of-concept through the alpha version and focus group data, its use as an up-to-date knowledge resource tailored to the individual needs of junior clinicians is justified. Learners can be engaged to take a stake in creation of their own learning material through reflection, conceptualisation and active experimentation, and ensure its sustainability. This resource can be easily replicated and provide benefit to wider areas of clinical care.

#### Notes on Contributors

Z. W. Mok reviewed the literature, and co-wrote the article with J. C. S. Lee; M. Mathur reviewed the article. All authors approved the final version.

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### Ethical Approval

A waiver of ethical approval was obtained from the Centralised Institutional Review Board at SingHealth Research.

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### Declaration of Interest

There was no conflict of interest in this paper.

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