

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Can a mobile app improve the quality of patient care provided by trainee doctors? Analysis of trainees' case reports
AUTHORS	Webb, Katie; Bullock, Alison; Dimond, Rebecca; Stacey, Mark

VERSION 1 – REVIEW

REVIEWER	Melvyn Zhang Institute of Mental Health, Singapore. BIG HEART Center, National University of Singapore
REVIEW RETURNED	25-Feb-2016

GENERAL COMMENTS	<p>This manuscript describes an interesting innovation that helps to improve the quality standards of junior and foundation doctors who are new to their job. Whilst there appears to be no flaws to the current methodology described and presented by the authors, there could be further improvements in this academic piece if the following comments could be address:</p> <ol style="list-style-type: none"> 1. Are the authors able to explain the innovative nature of their current smartphone application? It seemed very much to me that the application just give links to other relevant applications out there in the market. 2. The introduction is well-written, but there should be the provision of some baseline information about the perception of doctors towards smartphone applications. There are numerous articles on this. Also it is important to provide an overview of the current literature of the application of smartphone applications in education and highlight their limitations and explain how this current research and academic piece add values to the other studies. 3. The methodology could be more extensively elaborated. Please provide more information about the application. 4. The results are limited to a qualitative analysis. It will be interesting to present user perspectives and quantitative data. Much of the results actually focus on quality and improvement, so I am not sure whether it is in-line with the objectives of BMJ Open. It might be more suitable for a medical education or a quality journal. 5. I do not think that the the results allows for external generalization and I feel that the authors have made broad sweeping comments about the potential of this application. <p>While there might be benefits of such an application, it is important to note that books are quickly outdated upon publication and hence the evidence base is of concern.</p> <p>Another smartphone application that include recent research and guidelines might be more relevant for practice. Have the authors considered that? Have they done a literature review of those applications out there in the app store and determine the limitations specific to those applications prior to embarking on their current</p>
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	<p>research .</p> <p>I recommend a major revision of the paper in order for further consideration.</p>
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REVIEWER	<p>Jeremy Hsu Westmead Hospital University of Sydney Australia</p>
REVIEW RETURNED	<p>10-Mar-2016</p>

GENERAL COMMENTS	<p>“Can a mobile app improve the quality of patient care provided by trainee doctors?”</p> <p>I am sure it can, but I am not sure that the authors have proven this in the manuscript provided.</p> <p>It is clearly obvious that junior doctors benefit from having easy access to clinical reference information. Idocs/Dr Companion appears to be a repository of text books only. Beyond searchability and reconfiguration of tables/diagrams, the app is essentially a portable library.</p> <p>In the authors’ previously published paper using the same cohort, changes in how junior doctors accessed and utilized reference resources was explored. I actually find this more useful and more convincing than this current manuscript.</p> <p>If the objective is to explore how junior doctors utilize an app, why exclude the “simple” cases? If this is indeed what junior doctors use the app for, then this should be explicitly recorded as an important use of the app. An earlier survey of junior doctors and medical students suggested that access to hospital specific guidelines would be useful [Payne KB, Wharrad H, Watts K. Smartphone and medical related App use among medical students and junior doctors in the United Kingdom (UK): a regional survey. BMC medical informatics and decision making. 2012;12:121]</p> <p>Although the use of the QI framework appearsto be an excellent method of classifying qualitative data, restricting the reported cases to “complex” does not provide the complete picture of app use by junior doctors.</p> <p>Maybe it is as simple as having an app to check doses? Maybe this is the most useful aspect of having access to an app.</p> <p>Isn’t there a level of selection and recall bias with the methodology? Junior doctors who have the app, submit a report when they use the app. When did they submit the case? Contemporaneously? What is the experience for those junior doctors who didn’t use the app?</p> <p>In the methods, part of case report included “...any obstacles to use, and reflections” What were the obstacles to use of the app?</p> <p>Overall, I do not think that the manuscript proves that the app improves the quality of care. I think that the perception of improvement is evidenced by the junior doctors’ statements in the case reports. Consideration should be made to altering the focus of</p>
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	the manuscript to how the junior doctors perceive the app improves the quality of the care they provide.
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VERSION 1 – AUTHOR RESPONSE

Reviewer 1: Melvyn Zhang

1. Are the authors able to explain the innovative nature of their current smartphone application? It seemed very much to me that the application just give links to other relevant applications out there in the market.

Our response: We are aware that the BNF is available as an app. The novelty of the iDoc app is the library of cross searchable medical texts which are updated regularly (pushed to the library within days of national release when users enter a wifi zone) and that once downloaded it is internet-free.

2. a) The introduction is well-written, but there should be the provision of some baseline information about the perception of doctors towards smartphone applications. There are numerous articles on this. Also it is important to provide an overview of the current literature of the application of smartphone applications in education and highlight their limitations and explain how this current research and academic piece add values to the other studies.

Our response: In this manuscript we are focusing on the use of case reports to demonstrate how use of the app directly affected patient care and the clinical practise of newly-qualified doctors. Our focus is not on perceptions of doctors towards smartphone applications in general.

However, we agree that critical engagement with smartphone apps in the workplace and clarity on what our study adds would be a valuable addition. We refer to literature which draws attention to limitations of smartphone applications in the workplace (see p.4 “Concern about doctors using unregulated apps containing out-of- date content has been recognised as challenge with implications for patient safety.12 13”). We then explain what our study adds.

b) The methodology could be more extensively elaborated. Please provide more information about the application.

Our response: We have added more information about the application, see p.5 “The iDoc app, powered by Dr Companion© software provides internet-free access to a library of cross-searchable medical texts used routinely in hospital departments in the UK. They are updated regularly and pushed to the app within days of national release when users enter a wifi zone, thereby avoiding the dangerous pitfalls encountered by doctors using apps that house unregulated or out-of-date content.”

c) The results are limited to a qualitative analysis. It will be interesting to present user perspectives and quantitative data. Much of the results actually focus on quality and improvement, so I am not sure whether it is in-line with the objectives of BMJ Open. It might be more suitable for a medical education or a quality journal.

Our response: We consider that the BMJ Open is exactly the right home for this manuscript as the remit for papers specifically includes qualitative and medical education research and any other field that directly addresses the practice of health care delivery and patient outcomes, all of which are addressed in our manuscript. In the guidance for BMJ Open it states:

We consider papers addressing research questions in clinical medicine, public health and epidemiology. We also welcome studies in health services research, health economics, surgery, qualitative research, research methods, medical education, medical publishing and any other field that directly addresses patient outcomes or the practice and delivery of healthcare.

d) I do not think that the results allows for external generalization and I feel that the authors have made broad sweeping comments about the potential of this application. While there might be benefits of such an application, it is important to note that books are quickly outdated upon publication and hence the evidence base is of concern. Another smartphone application that include recent research and guidelines might be more relevant for practice. Have the authors considered that? Have they

done a literature review of those applications out there in the app store and determine the limitations specific to those applications prior to embarking on their current research.

Our response: We have reviewed our conclusions to make sure that they are appropriately justified by the data analysis.

As noted in point 1, this application is one that provides access to the key accredited medical textbooks routinely used in hospital departments in the UK and that the texts on the app are regularly updated, thus negating the concerns that exist for their hardcopy counterparts. Further, many other medical applications are unregulated and are not able to provide most of these particular textbooks due to licensing contracts. We take the point that this could be made clearer in the manuscript, and we acknowledge the lack of regulation and out-of-date content with regard to medical/health apps, see p.4 2 “Concern about doctors using unregulated apps containing out-of- date content has been recognised as challenge with implications for patient safety.12 13”

Reviewer 2: Jeremy Hsu

1. If the objective is to explore how junior doctors utilize an app, why exclude the “simple” cases? If this is indeed what junior doctors use the app for, then this should be explicitly recorded as an important use of the app. An earlier survey of junior doctors and medical students suggested that access to hospital specific guidelines would be useful [Payne KB, Wharrad H, Watts K. Smartphone and medical related App use among medical students and junior doctors in the United Kingdom (UK): a regional survey. BMC medical informatics and decision making. 2012;12:121]

Our response: We understand this point about the importance of ‘simple cases’ and have included a brief report on these data, see p.7 “These ‘simple’ cases represented diverse use of the iDoc app and included routine checks of which drugs or dosage to use, treatment or management information and general learning or revision. Simple dosages checks were frequent. An example of a simple of drugs check is a trainee reporting: “I used the app to look up alcohol withdrawal finding out which drug was recommended to help settle the patient” C2013/14). A treatment or management information example is a trainee reporting: “I remembered the mnemonic but could not remember all the relevant parts of it. I used the iDoc app to assist me with gaps in my knowledge. This enabled me to score the patient appropriately and allowed me to remind myself of the management based on the different scoring system” C2013/14). Trainees also reported simple use of the app to further knowledge: “The app ... allows me to revise and learn when out and not at work... It is helping me to continue improving my knowledge base” C2012/13). The ‘complex’ case reports detailed instances where iDoc was used in diagnostic decision-making. Although sometimes including simple checks, these cases were not limited to such checks.”

2. Although the use of the QI framework appears to be an excellent method of classifying qualitative data, restricting the reported cases to “complex” does not provide the complete picture of app use by junior doctors.

Our response: We have included data on the simple cases to provide a more complete picture. We now report how many simple and how many complex case reports and provide further information on the simple reports including examples, see p.7 “In total, 568 case reports were submitted by 269 F1/F2s. Of these, 142 (25%) were ‘complex’ case reports submitted by 114 different F1/F2s. The remaining 426 (75%) case reports, submitted by 242 different F1/F2s, were classified as ‘simple’.”

3. Isn't there a level of selection and recall bias with the methodology? Junior doctors who have the app, submit a report when they use the app. When did they submit the case? Contemporaneously? What is the experience for those junior doctors who didn't use the app?

Our response: We do not know the time interval between the experience and the completion of the case report and note recall bias as a potential limitation. Although the data we report do not focus on

those who did not use the app, we did ask those returning case reports ‘what would you have done had you not had the app’ which provides some insight into what non-users might be doing. We include reference to these data, see p.16 “A limitation of our study is that we did not collect comparative data from trainees who did not have the app. This limitation is ameliorated by data from a question on the case report proforma that asked ‘what would you have done had you not had the app’. Responses included searching for a hard copy textbook (which may not be the latest edition), waiting for a member of staff to become available, trying to find an unoccupied ward computer and access the internet to “Google it”. These data provide some insight into what non-users might be doing. Use of iDoc prevents the risk of doctors’ needing to access potentially unregulated medical content.

Another limitation of our data is recall bias; we do not know the time interval between the experience as presented by the newly-qualified doctors and the submission of their case report. Furthermore, these accounts are newly-qualified doctors’ perceptions of how using the app improves care quality rather than observed practice. However, these accounts were salient to these doctors and as such are worthy of consideration.”

4. In the methods, part of case report included “...any obstacles to use, and reflections” What were the obstacles to use of the app?

Our response: Responses to these questions fall outside the focus of this manuscript. However, we have now included reference to obstacles, see p.17 “Of all those submitting case reports, only six trainees provided examples of obstacles to using the app these included using the app in front of patients, not having localised guidelines and the BNF being initially difficult to navigate.”

5. Overall, I do not think that the manuscript proves that the app improves the quality of care. I think that the perception of improvement is evidenced by the junior doctors’ statements in the case reports. Consideration should be made to altering the focus of the manuscript to how the junior doctors perceive the app improves the quality of the care they provide.

Our response: We explicitly indicate that the conclusions are based on junior doctor self-reported accounts of how the app improves care quality, see p.19 “On the basis of doctors’ self-reported accounts of more complex cases which we have analysed against the QI Framework, we have shown that the iDoc app supports quality improvement in healthcare services in multiple ways.”

VERSION 2 - REVIEW

REVIEWER	Melvyn Zhang National University of Singapore
REVIEW RETURNED	26-Jun-2016

GENERAL COMMENTS	<p>The authors have submitted a paper of clinical importance and demonstrate how a smartphone intervention could be of usage to support the training needs of a newly qualified doctor. The introduction is comprehensive, the methodology is clear and the results are clearly presented.</p> <p>Whilst the manuscript is well written, I hesitate to recommend publication of this manuscript. I noted that the same authors have previously published 2 other manuscripts of the same application as follows:</p> <p>How a mobile app supports the learning and practice of newly qualified doctors in the UK: an intervention study.</p>
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	<p>Bullock A, Dimond R, Webb K, Lovatt J, Hardyman W, Stacey M. BMC Med Educ. 2015 Apr 8;15:71. doi: 10.1186/s12909-015-0356-8.</p> <p>Mobile technology supporting trainee doctors' workplace learning and patient care: an evaluation. Hardyman W, Bullock A, Brown A, Carter-Ingram S, Stacey M. BMC Med Educ. 2013 Jan 21;13:6. doi: 10.1186/1472-6920-13-6. PMID: 23336964 Free PMC Article</p> <p>I am quite concerned that there are already 2 similar papers of the same application indexed, with the title of the current manuscript extremely similar to that of the previous papers. Also, after reading through the previously published papers, I do not think that the current paper, whilst methodologically sound would value add anything of interest to the current field of E-Health and M-Health. This is a field that is constantly evolving and the application to which they are recommending and using for analysis has been developed quite some time ago.</p>
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REVIEWER	Jeremy Hsu Westmead Hospital University of Sydney Australia
REVIEW RETURNED	13-Jul-2016

GENERAL COMMENTS	I would like to congratulate the authors on considering the review comments and providing a comprehensive response. I think the manuscript now provides a more complete insight into the utility of a reference app by junior doctors.
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VERSION 2 – AUTHOR RESPONSE

Reviewer comments and our response to comments (including changes made where applicable)

1. Please revise your title so that it includes your study design. This is the preferred format for the journal.

Our response: We have amended our manuscript title accordingly: CAN A MOBILE APP IMPROVE THE QUALITY OF PATIENT CARE PROVIDED BY TRAINEE DOCTORS? ANALYSIS OF TRAINEES' CASE REPORTS

2. Please confirm that you obtained written informed consent from participants in the methods section.

Our response: We have addressed your request regarding consent. The following has been added: "Participation was voluntary and written informed consent was obtained from all participants." (p.5)

3. Please justify why this study has been published separately from your earlier work, and to explain how the study is adding to/ building upon your previous work.

Our response: From reading our previous papers it is quickly apparent that they are significantly different.

- Cohorts of trainees are different (Hardyman et al 2013: Foundation Year 2 doctors in 2011; Bullock et al Foundation Year 1 in 2012/13).
- Both previous papers focus on the quantitative questionnaire data about trainees uses of information sources in general. While the Hardyman paper does touch on case report data, they are from different cohorts of trainees (Foundation Year 2 in 2011).

- Our current manuscript provides a rigorous analysis of case reports against the Quality of Improvement Framework. Our data are from two different cohorts of trainees.
- We accept that the concept of the app has been around for some time, however as Reviewer 1 rightly points out, mobile technology is constantly evolving and so has the platform, usability and the iDoc package itself over time.

Following the Francis Report, the Quality Improvement movement is widely recognised across the health service, with various sectors looking to implement its principles. We build upon our previous work by relating it to current NHS priorities and applying the Quality Improvement framework to app usage. This is a novel approach. Further, as a result of our analysis, we propose an extension to the framework. We evidence the advantages of using the iDoc app as a means of enhancing and supporting doctors to improve the quality of care.