Implementing point-of-care medical information systems into surgical practice in a middle-income country: a qualitative study utilizing the Consolidated Framework for Implementation Research

Stephanie N. Wilson (ASHBOARD wils9231@gmail.com)
Applied Worldwide  https://orcid.org/0000-0002-2304-5944
Helen Noble
  UW: University of Washington
Willy Jesús Neumann Ordoñez
  Sociedad de Cirujanos Generales del Perú
Gabriela Zavala Wong
  Universidad Peruana Cayetano Heredia
Manuel J Rodríguez
  Universidad Peruana Cayetano Heredia
David Ortega Checa
  Hospital Rebagliati, Department of Surgery
Maria Warne
  University of Colorado Health
Kirsten Senturia
  UW: University of Washington
Lacey Nicole Lagrone
  UCHealth: University of Colorado Health

Research Article

Keywords:

Posted Date: October 25th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-2041860/v1

License: ☭  This work is licensed under a Creative Commons Attribution 4.0 International License.  Read Full License
Abstract

Background: Point-of-care medical information systems (POCMIS) can provide an efficient and effective means of strengthening health systems globally through their encouragement of continued medical education. Using the consolidated framework for implementation research (CFIR) as a guide, this research provides suggestions for improved implementation of POCMIS in low- and middle-income countries informed by an intervention implemented across public and military hospitals in Lima, Peru.

Methods: Analysis is based on qualitative interviews conducted with 12 Peruvian surgeons who received an intervention that provided free-access to UpToDate and Google Translate. The post-intervention interviews were transcribed, translated, and analyzed for themes overlapping with CFIR constructs to expose barriers to implementation and suggestions for improved implementation of future interventions.

Results: Barriers included a lack of seniority buy-in and engaging leadership, an overabundance of personal preferences for multiple POCMIS, and a culture of assumption that inhibited open communication regarding access to and use of POCMIS. Suggestions focused on intervention adaptability including both locally relevant adaptations and visual representation of information available via POCMIS.

Conclusions: In addition to explicit suggestions provided by surgeons, we also suggest actionable steps to overcome barriers identified in our data. Cultural barriers, such as the culture of assumption that emerged in our data, should be identified using rapid assessment procedures (RAP) prior to implementing similar interventions to minimize their negative impact on successful implementation. RAP may also help researchers identify key leaders in the implementation climate, allowing them to engage those leaders in the implementation process and ensure the presence of a learning climate during and following the intervention. Using RAP to guide the planning, engaging, and executing stages of the implementation process may not only help eliminate cultural barriers prior to them inhibiting successful implementation, but may also encourage regional- and specialty-specific adaptations necessary for success.

Contributions To The Literature

- Point-of-care Medical Information Systems (POCMIS) such as UpToDate have been shown to improve patient outcomes. Yet, evidence to guide implementation of these resources for surgeons in low- and middle-income and non-English speaking countries is limited.
- Through qualitatively evaluating the implementation of POCMIS for surgeons in nine public hospitals in Lima, Peru, we provide insight on how the implementation process can be adapted and improved for future endeavors.
- Our findings bring to light important cultural and specialty-specific factors influencing implementation of POCMIS that have yet to be discussed in the literature.

Background

Quality improvement of surgical care in low- and middle-income countries (LMICs) has been on the World Health Organization's agenda since establishing the Global Initiative for Emergency and Essential Surgery Care in 2005 (1). Given the reported link between the use of information systems encouraging evidence-based medicine and improved patient outcomes (2), such information systems are of interest across resource settings. One cost-
effective path to global health equity is building strong surgical systems (3, 4), and continued medical education (CME) has potential to strengthen surgical systems. Information systems such as UpToDate (UTD) support CME, suggesting a pathway to stronger surgical systems (5, 6, 7).

With medical literature constantly evolving as new research is published, providers often cannot stay current for more than a few years after completing medical school (8). Evidence from one systematic review shows increased years of provider practice correlates with lower performance—measured as clinical knowledge and adherence to standards of practice—suggesting providers are less likely to follow updated clinical guidelines the further they are from their postgraduate medical education. This evidence held true across subspecialties, including surgery (9).

Safely applying primary literature to clinical practice is time consuming (10). When time is limited, point-of-care medical information systems (POCMIS) may help by efficiently and effectively encouraging CME (5, 11, 12). POCMIS refer to technological and informational tools that assist providers with clinical decision-making (13). Studies investigating POCMIS across medical specialties show high use of and satisfaction with POCMIS in healthcare settings globally (14) along with improvement in self-directed e-learning for CME (15).

Despite these known benefits, cost and language barriers to POCMIS remain for healthcare providers in non-English speaking countries and LMICs (16). Other barriers discussed in the literature include lack of: time, awareness of accessible resources, and information intake capacity, to name a few (17). In response to these persisting barriers, this short report provides recommendations for how we can encourage effective implementation of POCMIS for surgeons in LMICs.

**Methods**

The educational intervention for this research included a didactic on evidence-based practice (EBP) and use of Google Translate, along with provision of application for free UTD access to surgical providers at nine hospitals in Lima, Peru. Participants were interviewed after receiving the intervention and their responses were analyzed for this short report, which conforms to the consolidated criteria for reporting qualitative research (COREQ [See Additional File 1]).

**Intervention**

Surgeons practicing in the U.S. (L.N.L.), Peruvian General Surgery Society board members (M.R., G.B., D.O.C., J.H.), a medical educator (J.L.R.), and graphic designer (W.L.R.) developed a one-hour presentation reviewing theories of EBP from previously published EBP courses (26, 27, 28, 29, 31, 32, 33), used interactive clinical practice questions alongside UTD articles, and explained Google Translate. The study team invited 12 of the largest hospitals from the military, public and social security systems in Lima to participate. In the end, nine of those hospitals were enrolled (25). After the presentation, participants applied for a grant to receive free, individual access to UTD for one calendar year via the Better Evidence UTD Donations Program (35). Upon closure of data collection, the control group also received the intervention.

**Data Collection**

Following the intervention, we conducted qualitative interviews with 10 attending surgeons and 2 residents. The interview sample consisted of 8 general surgeons, 2 trauma surgeons, 1 laparoscopic surgeon and 1 combined
general surgeon/surgical oncologist. Of the 12 providers, 3 identified as women and 9 as men.

We used the Consolidated Framework for Implementation Research (CFIR) to create a semi-structured interview guide focused on how surgeons find information to answer their clinical questions and about their experiences using UTD (see Additional File 2). Interviews were conducted via phone by a Peruvian researcher with an extensive practical background in qualitative research, lasted an average of 41 minutes, and were recorded on the interviewer’s laptop for transcription and translation by a bilingual researcher.

Analysis

Data were uploaded into Dedoose Version 7.0.23 (Sociocultural Research Consultants, Los Angeles, California) for coding and analysis by H.E.N. and M.W. following procedures outlined by Braun and Clarke (39). Transcripts were open coded, coders were blind to each other’s coding, and differences were resolved by discussion until 100% agreement was reached. A second qualitative methodologist (S.N.W.) further analyzed specific code excerpts from the initial analysis to compile findings for this report. See Additional File 3 for detailed methods.

Results

Findings from the interviews expose barriers to implementation and provide suggestions for improved implementation of the POCMIS intervention. We present those barriers and suggestions using constructs identified in CFIR (18 [see Appendix A for CFIR diagram]).

Barriers to Implementation

Thematically, barriers to implementation emerged as three separate themes in the data: seniority buy-in and engaging leadership, personal preference, and culture or assumption. Seniority buy-in and engaging leadership relates to the construct of implementation climate within the hospitals. Personal preference relates to CFIR’s other personal attributes construct. Culture of assumption is explained through CFIR constructs culture and networks and communication. See Table 1 of Additional File 4 for a summary on how barriers identified correlate with CFIR constructs, themes from the analysis, and particularly illustrative quotes from the interviews.

Seniority Buy-in and Engaging Leadership

Assumptions specific to senior surgeons and those with authority came through in the interviews as a motivator for action—or inaction—and in doing so exposed implementation climate barriers. For example, about a previous chief of service at their hospital, one surgeon said,

It was different a few years ago when Doctor [redacted] was the chief of service, he was constantly looking up new studies, new information. He guided us and gave us orientation, he motivated us to keep looking up information. We lost all of that since he retired. (INT-01)

Another surgeon further demonstrated the impact individuals have on organizational culture and medical practice when discussing another senior physician, telling us,

I read, double check, and follow what evidence-based medicine says, but unfortunately I live in a “obedience-based medicine” system...my boss says “you have to do this with the patient”, “but doctor, this drainage is not
recommended”, “no, you have to do it”, “but literature has shown meta-analysis where this doesn’t work on certain patients”, “I don’t care, you have to do it, I have more experience with many more patients.” (INT-09)

In the same way an engaging chief of service can motivate colleagues to continue learning and growing as surgeons, a leader resistant to change can impede growth. As yet another surgeon put it,

Sometimes the senior workers are more reluctant to change…They don’t accept the changes that come with technology. It’s a constant battle. It gets a little tedious because they take it personally. (INT-04)

Notably, the same interviewee who commented on an association between seniority and reluctance to change acknowledged the value of collaboration with more experienced partners in certain clinical scenarios:

If I’m dealing with a difficult case, I usually turn to more experienced people who can give me some advice on how to solve the problem. (INT-04)

**Personal Preferences**

When discussing surgeons’ preferences during interviews, we were met with a long list of personal preferences for a variety of search engines, including UTD, PubMed, Google, YouTube, and more. For instance, one surgeon told us “it’s up to each other’s preferences. Some are still using the regular system (unintelligible), others have PubMed. It depends on what they like” (INT-10). Providers having pre-established preferences for POCMIS made universal adoption of the intervention challenging.

**Culture of Assumption**

Cultural barriers and networks and communication barriers came through in the data as one theme: culture of assumption. For example, one surgeon told us “I think it’s useful to have this technology handy. If they didn’t have the motivation to use it before, they have it now, I believe they have it now.” (INT-08). When followed up with a question about what search engines colleagues use, the surgeon then said, “we have talked about it when [the researcher] came here, she did a presentation, but I couldn’t say,” referring to the presentation from the intervention.

This surgeon’s response indicates a common theme among interviewees’ assumptions about POCMIS culture among their colleagues, i.e., a culture of assumption, rather than a culture of discussion. Take the following interview excerpt:

**P:** …They say “ok, I’m going to do it!,” but I don’t ask them later if they did it or not. It’s usually a conversation in the moment and I don’t do a follow up later, like “hey, did you check this?, did you login on UpToDate?” None of that.

**I:** You didn’t overhear any comments if they did it either?

**P:** Not really. We haven’t talked about that. (INT-07)

**Suggestions for Improved Implementation**

In addition to demonstrating barriers to implementation, our interviews with surgeons also revealed practical suggestions for improved implementation. We present explicit suggestions in the results section while extrapolating further suggestions from the data in the discussion section. See Table 2 in Additional File 4 for a summary on how suggestions correlate with CFIR constructs, themes from the analysis, and particularly illustrative quotes from the interviews.
### Suggested Adaptations

Adaptability was a prominent area for suggested improvements throughout the data. Suggestions for improved adaptability touch on two areas: regionally specific adaptations and specialty specific adaptations.

#### 1. Regionally Specific Adaptations

Adaptations related to the specific region of practice are vital based on interview responses. For example, one surgeon told us, “since we’re here in Lima, we do have resources to diagnose patients, but we fall short when it’s about treatment. We don’t have too many resources.” (INT-09). Similarly, another surgeon mentioned how the evidence they find through POCMIS may not be applicable to their region:

Since they are taken from literature produced in other countries, I’ve found out about other treatment options and even though it doesn’t apply to what I do here, now I know about new and different treatments I could use if they were available here, mostly in the surgical field. (INT-07)

One participant also noted how financial resources differ by region, saying “probably in the United States [UTD is] affordable, but here it’s a lot of money” (INT-03).

#### 2. Specialty Specific Adaptations

Participants also noted their desire for more visual presentation of information via POCMIS, rather than written information with one surgeon saying “compared to other medical specialties...we go for another type of information: graphic and visual information.” (INT-06). Another surgeon told us, “solutions for surgical problems are not written down and I can tell you that [from] experience” (INT-04). Surgeons also noted the uniqueness of the production of medical knowledge in surgical specialties saying “experiments cannot be performed on human beings and...a complex surgery performed in an animal cannot be extrapolated to a human being” (INT-09).

### Discussion

The research presented here aims to provide a roadmap for future interventions focused on increasing access to POCMIS for surgeons in LMICs. Our interviews with surgeons who received the UTD intervention suggest culture and climate are prominent barriers for successful implementation. Those culture- and climate-related barriers included a lack of seniority buy-in and engaging leadership, an abundance of personal preferences, and a culture of assumption inhibiting open discussion about access to and use of POCMIS.

Results also highlight which factors of the intervention surgeons wanted to be more adaptable, including regionally specific adaptations and specialty specific adaptations. Regionally specific adaptations call for increased attention to resources, or the lack-there-of, in the specific setting where the intervention is to be implemented. Specialty specific adaptations took surgeons’ desires for visual and graphic information into account. Turning to the evidence-based pyramid (42) can help us understand why surgical research may require a unique approach to presentation of information. With most surgical studies being toward the bottom of the pyramid where validity is lower and more traditional experiments like randomized control trials being toward the top, it is not surprising that varied methods of research would require varied presentation formats.

Though many surgeons requested more visuals which are easily accessible with limited time, the user experience of UTD was generally positive with participants reporting plans to use UTD in the future as well as positive
feedback regarding its ease of use.

**Suggestions for Encouraging Seniority Buy-in and Engaged Leadership**

In addition to explicit recommendations from surgeons themselves, we also suggest necessary steps for ensuring both seniority buy-in and engaged leadership within the implementation process. We can see just how important colleagues’ influence can be by revisiting participants’ statements about their seniors. Recall one surgeon’s quote about how a previous chief of service guided colleagues, gave them information, and motivated them to keep looking up information. Knowing who those motivating colleagues are for a given organization and directly involving them in the implementation process may be one way to encourage successful implementation.

Such efforts may also positively impact the implementation climate by fostering a *learning climate*. Two major components of a *learning climate*—including leaders’ expressing fallibility and a need for colleagues’ assistance, and team members feeling they are a valuable part of the change process—were missing in the implementation climate, creating barriers to successful implementation. In line with previous literature on implementation (43), ensuring those in leadership roles and with organizational influence support the intervention is an essential first step in ensuring success.

**Suggestions for Eliminating Cultural Barriers**

In carefully choosing leaders with both formal and informal influence in an organization to champion an intervention, we recognize the power of individuals as carriers of culture and their influence on implementation climate (18). In doing so, we also recognize culture as an enabling force in addition to the constraining force it seemed to be (40).

To harness culture as the enabling force it has the potential to be, we suggest future implementations begin with rapid assessment procedures (RAP) to assess the organizational culture (41). Other researchers have successfully used RAP for implementing health informatics, such as electronic health records (44) and computerized provider order entry (45), in healthcare settings. While researchers have identified limitations of RAP, such as difficulty gaining rapport with participants (44), the benefits of introducing RAP to implementation efforts in healthcare settings far outweigh those limitations.

**Limitations**

Toward the end of the study, COVID-19 spread across the world, requiring our team finish data collection virtually. Therefore, it is reasonable to assume our sample included less representation of ideas across surgeons involved in the intervention. Also reasonable is the assumption that participants were distracted by the emerging global pandemic, inhibiting their ability to fully reflect on the intervention. While the interview data we collected are rich and provide important suggestions for improved implementation, we recognize the limitations in our sample.

**Conclusion**

With a worldwide agenda for quality improvement of surgical care in LMICs, interventions will continue to be implemented across settings and cultures (1). Whether those interventions include POCMIS or not, cultural barriers and the adaptability of the intervention will be important factors. This research provides practical advice
for improved implementation of those interventions based on one randomized control trial conducted in Lima, Peru.

**Abbreviations**

- POCMIS: Point-of-care medical information systems
- LMICs: Low- and middle-income countries
- UTD: UpToDate
- CME: Continued medical education
- CFIR: Consolidated Framework for Implementation Research
- PGSS: Peruvian General Surgery Society
- EBP: Evidence-based practice
- RAP: Rapid assessment procedures

**Declarations**

**Ethics Approval and Consent to Participate:** This study was approved by the University of Washington and the Universidad Peruana Cayetano Heredia institutional review boards. Researchers gained informed consent per guidelines from the approving institutional review board from all participants in the study.

**Consent for Publication:** Not Applicable

**Availability of Data and Materials:** The qualitative datasets generated and analyzed during the current study are not publicly available given the need for specific context to grasp their usefulness. However, code reports from the qualitative interviews are available from the corresponding author on reasonable request.

**Competing Interests:** The authors declare that they have no competing interests.

**Funding:** The research reported here was funded by a Fogarty Fellowship awarded to HN. The fellowship was provided through the Global Health Program for Fellows and Scholars at the National Institutes of Health's Fogarty International Center (Sponsor's Funding ID: D43TW009345, Grants Office ID: A145171).

**Authors’ Contributions:** Conceptualization of this research was led by HN, WN, GZW, MJR, DOC, KS, and LNL. The data was curated by HN, WN, GZW, MW, KS, and LNL. The investigation portion of the research included collaborative efforts from HN, WN, GZW, MJR, DOC, KS, and LNL. Funding for the research was contributed by HN, MJR, and LNL. Methodology for the study was developed by HN, MJR, MW, KS, and LNL. Three of the nine authors acted as supervisors for the study, including MJR, KS, and LNL. Analysis for this report was performed by HN, MW, KS, and SNW. Project administration duties were handled by HN, WN, GZW, DOC, and LNL. The original draft of this paper was compiled by SNW with major contributions from HN, LNL, and KS. All authors contributed to review and editing of the paper and approved the final manuscript.

**Acknowledgements:** Dr. German Málaga and Dr. José Luis Rojas, professors of evidence-based medicine at Universidad Peruana Cayetano Heredia (UPCH), helped brainstorm and review didactic session materials. Mr. Walter Limaco Romero, graphic designer at UPCH, helped creatively detail our didactic session for presentation.
Ms. Marcela Quispe, medical student at UPCH, aided in cluster 2 presentations and data collection. Ariadne Labs’ Better Evidence Grant provided our qualifying participants with funds for free one-year UpToDate access, which can be re-applied for each year. Lastly, Mercy Díaz Añazgo, provided transcription and translation services for our qualitative interview data.

References


Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- COREQchecklistAdditionalfile1.pdf
- AdditionalFile2InterviewGuide.docx
- AdditionalFile3DetailedMethods.docx
- AdditionalFile4DetailedResults.docx
- AppendixA.docx