

## Factors Influencing Implementation of Health Care Innovation: a Review of Literature

<sup>1</sup>Titilayo Olubunmi Olaposi & <sup>2</sup>Collins Ouma

<sup>1</sup>Obafemi Awolowo University, Ile-Ife, Nigeria

<sup>2</sup>African Institute for Development Policy, Nairobi, Kenya

---

### Abstract

---

The purpose of this study was to examine factors inhibiting implementation of innovation in a variety of settings in healthcare systems. This study was designed as a literature review. A literature search was performed using a search engine to identify studies describing the conditions limiting successful innovation implementation in various healthcare settings. Twenty-two studies were included. Twelve themes were discovered and those include: i. clinicians job-related factors, ii. user characteristics, iii. innovation-related factors, iv. Organization-related factors, v. implementation strategies, vi. Resource-related factors, vii. linkages, partnerships, networking and collaboration issues, viii. Knowledge-sharing issues, ix. External and social environments, x. insurance issue, xi. source of the innovation, and xii. Age of respondents. The factors were discussed with illustrations in the paper. In conclusion our review supports a better understanding of factors that can hinder successful adoption or implementation of innovation in healthcare systems. This study is important in that our findings extend the existing knowledge base on factors that are affecting innovation implementation in a variety of healthcare settings. Healthcare organizations that want to adopt or implement innovations need to recognize the factors identified in this study and find a way to prevent their occurrence.

**Keywords:** *Adoption, Healthcare, Implementation, Inhibiting and Innovation*

---

Corresponding Author: Titilayo Olubunmi Olaposi

## **Background to the Study**

The ability to innovate is considered as a major competitive advantage in organizations, enhancing their effectiveness, efficiency, and thus their potential for long term sustainability (Bessant, 2009). Innovation is one of the core processes that every organization must nurture in order to retain its viability. The importance of innovation in healthcare cannot be overemphasized. Innovative products, interventions, practices, and guidelines are designed to improve human health. Various studies have shown the benefit of innovation to healthcare providers, patients and the society as a whole. A good example of beneficial healthcare innovation is telehealth, an innovation that can substitute traditional encounters based on patients visiting physicians' offices or hospitals, provide specialist consultations in emergency rooms in remote or rural areas, and enable pre-hospital diagnosis for critical patients in transit (Chau and Hu, 2004; Cho and Mathiassen, 2007). The realization of the importance and benefits of innovation in healthcare has led to willingness to spend on innovation. Each year, billions of dollars are spent in countries around the world to support the development of evidence-based health innovations (NIH, 2010; Cooksey, 2006).

Innovation process extends beyond its development. When an innovation is developed by an organization it has to be implemented before it can achieve the purpose for which it is developed. In some organizations innovations that have been developed elsewhere are adopted and implemented. The implementation process is a very crucial stage in the innovation process. Innovation implementation is defined as “the period following adoption during which employees ideally become proficient and consistent in their use of an innovation” (Klein & Sorra, 1996). This stage has proven to be challenging in healthcare systems. It was observed that healthcare policy-makers, clinicians, and managers invest substantial time and resources in hospital quality improvement efforts, but many organizations fail to integrate new practices into organizational routines (Stirman, et al. 2012; Bailie et al. 2006; Brand et al. 2005; and Buchanan, 2005). Only a small fraction of such innovations is ever implemented into practice (Haines, Kuruvilla and Matthias, 2004). According to Berwick (2003)

*Healthcare systems in developed countries continue to encounter considerable difficulties in implementation, and experience major delays in diffusing novel initiatives, despite the perception that healthcare organizations are arguably among the most knowledge-rich and scientifically-based institutions*

Also, Balas and Boren (2000) submit that efforts to implement some healthcare innovations can take many years; and, some innovations that could secure better outcomes for patients never make it to the bedside. It is saddening that the implementations of innovations that are of proven value sometimes fail. This occur due in part to poor implementation. According to Alexander (2008), the rate of successfully implemented quality improvement initiatives is less than 50 percent. In addition to this, other studies have established that the failure rates for implementing complex innovations are high. Estimates range from 30% to 90% depending on the scope of the

organizational change involved, the definition of failure, and the criteria to judge it (Alexander and Hearld, 2011; Alexander, Weiner, Shortel, et al. 2006). Factors such as high uncertainty, risk, and the clinical discretion required to practice medicine have been pointed out to influence poor innovation implementation in healthcare systems.

Many studies have been carried out on the subject of implementation of implementation (Shortell, Bennett and Byck, 1998; Alexander, 2008; Nembhard, Alexander, Hoff and Ramanujam, 2009; U.S. Congress; 2010). The implementation of evidence-based health innovations is a complex process. It involves attention to a wide array of multi-level variables related to the innovation itself, the local implementation context, and the behavioral strategies used to implement the innovation (Greenhalgh, Robert, MacFarlane, Bate, and Kyriakidou, 2004; Shortell, 2004). When attempting to implement innovations, organizations face challenges such as misaligned incentives, professional barriers, competing priorities, and inertia (Shortell, Bennett, and Byck (1998).

The consequences of poor implementation are quite undesirable. These may include loss of time and money for the organization, and can also impact the quality of care patients receive. The need to investigate barriers to adoption and implementation of healthcare innovations have been justified by the huge interest that healthcare researchers have shown to the subject and the many journal articles that have been published on it. However, a study of those articles showed that each study focuses a particular innovation or group of related innovations. For example, Doran, Reid-Haughian and Cafazzo (2012) evaluated the implementation of an automated clinical information system (CIS) within a community nursing setting, while LeRouge, Styke, Seale, and Wright (2014) investigated readiness and barriers to the adoption of consumer health technologies. Although, those studies identified barriers to innovation implementation in healthcare systems, some of the findings are context-specific, while some can be generalized. We perceived a need for a review of some of those papers, to enable the provision of a holistic view of the generalizable factors that hinder rapid adoption and successful implementation of innovation in healthcare settings. This study sought to shed further light on the question of innovation adoption and implementation failure, drawing evidence from empirical studies from a variety of healthcare settings. The questions answered in this study are three: (i) what are the characteristics of the studies carried out on implementation of innovation? (ii) What types of innovation are implemented in healthcare service delivery? (iii) what factors affect implementation of innovation in the sector?

The remaining sections of the paper proceeds as follows: In the next section we present the methods used for the study and definitions for key terminologies. Thereafter we present the findings; next, the discussions, and lastly, a conclusion is drawn.

## **Methods**

### **Search Strategy**

A search of an electronic database was conducted in January and February, 2016 using data specific search terms and validated methods for retrieval from PubMed (NCBI). The

search was conducted for studies published between 2001 and 2015 (and 2016 in-press online articles). Articles not published in the English language were excluded. The review also did not include documents and reports that were not empirical studies.

Search terms included words or phrases relating to healthcare innovation adoption and implementation. Studies were included if they made reference to factors inhibiting healthcare innovation adoption or implementation. We included studies undertaken in any country (no specifications required) and any empirical study type (e.g. Qualitative, quantitative, case studies and mixed methods). Systematic reviews or any type of review was not included.

### **Study Selection and Screening**

All citations were assessed by title and abstract for potential relevance to the review. If there was any doubt to the relevance of the study or the abstract did not contain sufficient information for a decision it remained on the list. Results of screening were recorded and examined. Full citations were obtained for all potentially relevant abstracts (n = 141).

Full-text articles were reviewed and the outcome was examined for correctness. They were included if they fulfilled the inclusion criteria. To be included in the next review process papers had to be published in English, be an empirical study, address a specific healthcare innovation/group of innovations/new technologies or address issues related directly to healthcare innovation adoption/implementation, make reference to barriers to healthcare innovation adoption and /or implementation or identifies factors that inhibit success of innovation adoption and/or implementation. Articles meeting the eligibility criteria were included for data extraction (n = 22).

### **Data Extraction**

A data extraction form was created to assist in systematically identifying innovation(s) addressed, objectives of the studies, methods, study design, data collection method, setting and key findings. Data was extracted from eligible articles. The completed abstraction form was reviewed for accuracy and completeness.

### **Data Synthesis and Analysis**

Utilizing research synthesis by configuration 'entails the arrangement of thematically diverse individual findings ... into a coherent theoretical rendering of them (Sandelowski, Voils, Leeman, Crandell, 2012). Data were thematically analyzed (Noyes and Lewin, 2011)), organizing data according to recurrent themes identified in the studies and key factors inhibiting successful healthcare innovation implementation were summarized.

### **Operational Definition of Terms**

The technical terms used in this paper are defined as follows:

- i. **Healthcare Innovation**

Healthcare innovation is the process of turning ideas into reality, using a new concept, service, process, or product to improve treatment, diagnosis, education,

outreach, prevention and research, as well as enhancing quality, safety, outcomes, efficiency and cost (Omachonu and Einspruch, 2010).

ii. **Innovation Adoption and Implementation**

In this study, innovation adoption is used to mean the decision process leading to the purchase of an innovation (Ozanne and Churchill, 1971, 322) and/or an organization's decision to install an innovation within the organization (Conn and Sorra, 2001, 811). We adopted the two stages of Frambach and Schillewaert (2002) who explained that adoption starts by the organization's decision to pursue adoption and the staff's acceptance and initiation of their individual processes of accepting the innovation. Adoption will either move to initial implementation activities or revert to de-adoption.

iii. **Product Innovation**

Product innovation is introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics (UNESCO Institute for Statistics, 2005).

iv. **Process Innovation**

Process innovation is defined as the implementation of a new or significantly improved production or delivery method that is of value to the user. Process innovation includes significant changes in techniques, equipment and/or software (Ashok, Narula and Martinez-Noya, 2014).

## **Results**

Twenty-two empirical papers were reviewed. All of them were very recent. Four (18.18%) were published between years 2006 and 2010 and the remaining 18 were published between years 2011 and 2016. One of the papers reported studies carried out in four post-conflict countries - Liberia, West Bank and Gaza, Sierra Leone and Somaliland, while the other 21 studies were carried out in 8 countries in the following proportion: USA (45.45%), UK (13.64%), Canada (9.09%), Australia (9.09%), Sweden (4.55%), Papua New Guinea (4.55%), Spain (4.55%), and Democratic Republic of Congo (4.55%). Most (81.81%) of the studies were designed as cross-sectional studies, while the remaining were case studies (13.64%) and multi-case study (94.55%). Personal interview was the most frequent (40.91%) method used, followed by mixed methods (31.82%), questionnaire survey (18.18%) and lastly focus group discussions (9.09%). Participants for the twenty-two papers range from patients to health practitioners and experts from other spheres such as education and social policy (Table 1). The 22 studies were carried out in 10 settings which include: hospital-based (2: 9.09%), primary care (1:13.64%), mixed care (1:4.55%), community health-based (2: 9.09%), country based (1: 4.55%), project/program-based (1:4.55%), innovators-based (1: 4.55%), patient/consumer based (4:18.18%), early adopter sites (1:4.55%) and health professionals (6:27.27%).

## Overview of Studies

**Table 1: Characteristics of studies**

Characteristics	Number of studies	%
<b>Year</b>		
2006 - 2010	4	18.18
2011 - 2015	18	81.81
<b>Country</b>		
USA	10	45.45
UK	3	13.64
Australia	2	9.09
Sweden	1	4.55
Papua New Guinea	1	4.55
Spain	1	4.55
Canada	2	9.09
Four post-conflict countries	1	4.55
Democratic Republic of Congo	1	4.55
<b>Study design</b>		
Cross-sectional study	18	81.81
Case study	3	13.64
Multi-case study	1	4.55
<b>Data Collection</b>		
Questionnaire Survey	4	18.18
Personal Interview	9	40.91
Focus Group	2	9.09
Mixed methods	7	31.82
<b>Settings</b>		
Hospital-based	2	9.09%
Primary care	3	13.64%
Mixed care	1	4.55
Community health-based	2	9.09%
Country based	1	4.55%
Project/programme-based	1	4.55%
Innovators	1	4.55%
Patient/consumer based	4	18.18%
Early adopter sites	1	4.55%
Health professionals	6	27.27%
<b>Type of health Professionals</b>		
Physicians	2	33.33%
Nurses	1	16.67%
Mixed	3	50.00%

**Table 2: Reviewed Studies' Titles, Authors, Source and Participants**

Serial no	Title	Authors	Source	Participants
1.	A Formative and Summative Evaluation of an Electronic Health Record in Community Nursing	Diane Doran, Cheryl Reid-Haughian and Joseph Cafazzo	Nurs Inform. 2012; 2012: 098	Nurses
2.	A qualitative study on clinicians' perceptions about the implementation of a population risk stratification tool in primary care practice of the Basque Health Service	Regina Sauto Arce, Amaia Saenz De Ormijana, Juan F Orueta, Marie-Pierre Gagnon <sup>1</sup> , and Roberto Nuño-Solinís	BMC Family Practice 2014, 15:150	Doctors and Nurses
3.	Baby Boomers' Adoption of Consumer Health Technologies: Survey on Readiness and Barriers	Cyuthia LeRouge, Craig van Styke, Deborah Seale, and Kevin Wright	J Med Internet Res. 2014 Sep; 16(9): e200	Subscribers to a large pharmacy benefit Management Company
4.	Facilitators and barriers to implementing electronic referral and/or consultation systems: a qualitative study of 16 health organizations	Delphine S. Tuot, Kiren Leeds, Elizabeth J. Murphy, Urmimala Sarkar, Courtney R. Lyles, Tekeshe Mekonnen and Alice Hm Chen	BMC Health Services Research (2015) 15:568 DOI 10.1186/s12913-015-1233-1	leaders of 16 diverse health care delivery organizations
5.	Barriers to Asthma Self-Management in Adolescents: Relationships to Psychosocial Factors	Hyekyun Rhee, Michael J. Belyea, Susan Ciurzynski, and Judith Brasch,	<i>Pediatr Pulmonol.</i> 2009 February ; 44(2): 183-191. doi:10.1002/ppul.20972	Asthma patients

6.	Diffusion of e-health innovations in 'post-conflict' settings: a qualitative study on the personal experiences of health workers	Aniek Woodward, Molly Fyfe, Jibril Handuleh, Preeti Patel, Brian Godman, Andrew Leather and Alexander Finlayson	Human Resources for Health 2014, 12:22	Health workers
7.	Exploring health practitioners' acceptability of a prospective semi-quantitative pfHRP2 device to define severe malaria in the Democratic Republic of Congo	Freek de Haan <sup>1</sup> , Marie A. Onyamboko, Caterina I. Fanello <sup>3</sup> , Charles J. Woodrow, Yoel Lubell, Wouter P. C. Boon and Arjen M. Dondorp	<i>Malar J</i> (2015) 14:503 DOI 10.1186/s12936-015-0963-1	health professionals – nurses, malaria researchers, an entomologist, a paediatrician, a tropical medicine specialist, an internist and one National Malaria Control Programme (NMCP) representative
8.	How Do Low-Income Urban African Americans and Latinos Feel about Telemedicine? A Diffusion of Innovation Analysis	Sheba George, Alison Hamilton, and Richard S. Baker	International Journal of Telemedicine and Applications Volume 2012, Article ID 715194. doi:10.1155/2012/715194	African American and Latino parents of school-aged children and seniors
9.	Introduction of shared electronic records: multi-site case study using diffusion of innovation theory	Trisha Greenhalgh, Katja Stramer, Tanja Bratan, Emma Byrne, Yara Mohammad, Jill Russell	BMJ 2008;337:a1786 doi:10.1136/bmj.a1786	Staff, patients and carers
10.	Improving treatment of depression in primary health care: a case study of obstacles to perform a clinical trial designed to implement practice guidelines	Linda Richter-Sundberg, Monica Elisabeth Nyström, Ingvar Krakau and Christer Sandahl	Primary Health Care Research & Development 2015; 16: 188–200 doi:10.1017/S1463423614000243	clinical trial researcher group and health care professionals

11.	Understanding innovators' experiences of barriers and facilitators in implementation and diffusion of healthcare service innovations: a qualitative study	Julie Barnett, Konstantina Vasileiou, Fayika Djemil, Laurence Brooks and Terry Young	BMC Health Services Research 2011, 11:342	key organisational representatives who had developed and established a range of healthcare service innovations from a variety of healthcare sectors
12.	Innovation in patient-centered care: lessons from a qualitative study of innovative health care organizations in Washington State	Peter Reed, Douglas A Conrad, Susan E Hernandez, Carolyn Watts and Miriam Marcus-Smith	BMC Family Practice 2012, 13:120	health plans (health insurance providers), provider organizations, and clinics (two from each provider organization).
13.	Maternal Health Phone Line: Saving Women in Papua New Guinea	Amanda H.A. Watson, Gaius Sabumei, Glen Mola and Rick Iedema	<i>J. Pers. Med.</i> 2015, 5, 120-139; doi:10.3390/jpm5020120	health workers, women and community leaders
14.	Multi-level factors influence the implementation and use of complex innovations in cancer care: a multiple case study of synoptic reporting	Robin Urquhart, Geoffrey A Porter, Joan Sargeant, Lois Jackson and Eva Grunfeld	Implementation Science 2014, 9:121	Key informants
15.	Online Mental Health Resources in Rural Australia: Clinician Perceptions of Acceptability	Craig Sinclait, Kristi Holloway, Geoffrey Riley, and Kirsten Aurel	J Med Internet Res. 2013 Sep; 15(9): e193	rural clinicians (general practitioners, psychologists, psychiatrists, and clinical social workers).

16.	Perceptions of Video-Based Appointments from the Patient's Home: A Patient Survey	Matthew R. Gardner, Sarah M. Jenkins, Daniel A. O'Neil, Douglas L. Wood, Barbara R. Spurrier and Sandhya Pruthi	TELEMEDICINE and e-HEALTH, VOL. 21 NO. 4, 281 - 285 _ APRIL 2015 DOI: 10.1089/tmj.2014.0037	patients who had been seen in the outpatient setting at a single institution.
17.	Physicians' experience adopting the electronic transfer of care communication tool: barriers and opportunities	Chloe de Grood, Katherine Eso and Maria Jose Santana	Journal of Multidisciplinary Healthcare 2015:8 21-31	acute care physicians (AcPs) and CcPs (health care providers caring for patients discharged from hospital to the community).
18.	Quantitative assessment of barriers to the clinical development and adoption of cellular therapies: A pilot study	Benjamin M Davies, Sarah Rikabi, Anna French, Rafael Pinedo-Villanueva, et al.	Journal of Tissue Engineering, Volume 5: 1- 8, DOI: 10.1177/2041731414551764	Clinicians (specialists from Cardiology, Neurology, Ophthalmology, Orthopedic Surgery, Plastic and Reconstructive Surgery)
19.	Tailoring an intervention to the context and system redesign related to the intervention: A case study of implementing shared medical appointments for diabetes	Susan R Kirsh, Renée H Lawrence and David C Aron	Implementation Science 2008, 3:34 doi:10.1186/1748-5908-3-34	primary care providers - five nurse practitioners (NPs), one physician assistant, eight part-time attending physicians, and 60 resident physicians
20.	The work of local healthcare innovation: a qualitative study of GP-led integrated diabetes care in primary health care	Michele Foster, Letitia Burridge, Maria Donald, Jianzhen Zhang and Claire Jackson	BMC Health Services Research (2016) 16:11 DOI 10.1186/s12913-016-1270-4	stakeholders (endocrinologists and managers) and clinicians (clinical fellows, diabetes educators and allied health professionals)

21.	"They hear "Africa" and they think that there can't be any good services' – perceived context in cross-national learning: a qualitative study of the barriers to Reverse Innovation	Matthew Harris, Emily Weisberger, Diana Silver and James Macinko	Globalization and Health (2015) 11:45 DOI 10.1186/s12992-015-0130-z	experts in healthcare innovation, international health policy and health systems, including also experts from other spheres such as education and social policy
22.	What stands in the way of technology-mediated patient safety improvements? A study of facilitators and barriers to physicians' use of electronic health records	Richard J. Holden	J Patient Saf. 2011 December ; 7(4): 193-203. doi:10.1097/PTS.0b013e3182388cfa	Physicians

### Types of Innovation

Out of the twenty-two papers, four did not address specific innovations, they focused various technologies. The first paper (serial number 3) (Table 3) titled Baby Boomers' Adoption of Consumer Health Technologies: Survey on Readiness and Barriers aimed at examining what *technologies* baby boomers are ready to use for health purposes, investigating barriers to baby boomers' use of technology for health purposes, and understanding whether readiness for and barriers to baby boomers' use of consumer health technologies differ from those of other younger and older consumers. The second paper in that category (serial number 6) titled Diffusion of e-health innovations in 'post-conflict' settings: a qualitative study on the personal experiences of health workers aimed at exploring the personal experiences of health workers using *e-health innovations* in selected post-conflict situations. The third paper (serial no 11) titled Understanding innovators' experiences of barriers and facilitators in implementation and diffusion of healthcare service innovations: a qualitative study aimed at shedding further light on the question of *process-level innovation* and to understand more about why diffusion is apparently so poor in healthcare. Lastly, the fourth paper titled 'They hear "Africa" and they think that there can't be any good services' – perceived context in cross-national learning: a qualitative study of the barriers to Reverse Innovation aimed at exploring the barriers and challenges to Reverse Innovation in the US. The remaining 18 studies focused on product (2: 11.11%) and process (16: 88.89%) innovations.

**Table 3: Names and Types of Innovation**

S/N	Name of Innovation	Type of Innovation
1.	BlackBerry hosted application enabling wireless documentation	Process innovation
2.	Population Risk Stratification (PRS) tool	Process innovation
3.	Various technologies	-
4.	Electronic referral systems	Process innovation
5.	Asthma Self-Management	Process innovation
6.	Various e-health innovations	-
7.	Semi-quantitative pfHRP2 device to define severe malaria	Process innovation
8.	Telemedicine	Process innovation
9.	Summary care record (SCR)	Process innovation
10.	Randomized clinical trial	Process innovation
11.	Various service innovations	-
12.	Patient-centered care innovation	Process innovation
13.	Childbirth Emergency Phone	Process innovation
14.	Synoptic reporting tools (SRTs)	Process innovation
15.	Online mental health resources	Product innovation
16.	Video appointment	Process innovation
17.	Electronic transfer of care (e-TOC) communication tool	Process innovation
18.	Cellular therapies	Product innovation
19.	Shared medical appointments for diabetes	Process innovation
20.	Integrated diabetes care innovation	Process innovation
21.	Various innovations	-
22.	Technology-mediated patient safety improvement	Process innovation

**Factors Affecting Innovation Implementation**

The barriers to innovation implementation identified in the twenty-two reviewed papers can be grouped into twelve themes. The twelve are presented below.

1. Clinicians job-related factors (increased staff workload and insufficient time)
2. User characteristics (knowledge and skill-related factors and other attributes such as negative perceptions regarding the value, relevance and benefits of the innovation and prior experience).
3. Patient attitude-related factors (resistance to change and psychosocial factors).
4. Innovation-related factors (ergonomics/ease of use/usability, innovation performance, perceived relative advantage, lack of enjoyment of using technology, appropriateness of technology, privacy issues, features of the innovation, ethicality, technical hitches, compatibility issues, cost-effectiveness, efficacy, safety, and complexity).
5. Organization-related factors (organizational settings, organizational relationships and contexts such as lack of administrative support, lack of trust in work relationships, resistance to change, social pressure, and disconnection. Another category of organization-related factors include implementation

- strategy used by the innovation promoter such as lack of user/stakeholder involvement in decision making, lack of integration of technology with existing platforms, role of negative champions, lack of focus, management of people and processes, quality of information, evidence-related factors and feedback issues.
6. Resource-related factors (financial resources, infrastructural resources, human resources, space)
  7. Linkages, partnership, networking and collaboration issues (poor linkage between technical developers and innovation users, inter-organizational connections)
  8. Knowledge sharing issues
  9. External environments (socio-political environment and social environment).
  10. Insurance issues
  11. Source of an innovation
  12. Age of participants

## **Discussion**

This paper reports on the systematic review carried out to identify generalizable factors affecting adoption and implementation of innovations in ten healthcare settings. To achieve the purpose of this study, twenty-two empirical studies were reviewed. Synopsis of the reviewed papers showed that more studies were carried out on the subject recently than before. This shows the relevance of technological innovation in achieving the goals of healthcare systems in the present age. Also, this study has shown that more studies on the subject were carried out in the United States of America than in any other country of the world. This calls for action from researchers especially in the developing world such as Nigeria.

Findings from the reviewed papers have shown that the mere presence of an innovation does not guarantee successful use of the system or of its specific functions. Innovation implementation requires the presence of certain user and system attributes, support from others, and numerous organizational and environment facilitators. Based on findings from the reviewed studies, the present study identified 12 categories of barriers to healthcare innovation adoption and implementation.

Also, this study has shown that most of the innovations implemented in the selected studies were process innovations. Since process innovation includes significant changes in techniques, equipment and/or software, it may mean that the healthcare organizations have seen the need to improve their service delivery techniques or change the technologies they employed in healthcare delivery. This is good for the enhancement of healthcare quality. However, the low level of product innovation needs to be looked into. Product innovation, which according to the definition of UNESCO Institute for Statistics (2005) means “introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses” has potential to contribute significantly, where they are available, to the improvement of healthcare delivery effectiveness.

The twelve categories of factors that were identified as affecting healthcare implementation in this study are crucial to achieving healthcare delivery quality improvement. As innovation is not beneficial to an organization unless it is successfully implemented, hence, the factors identified in this study have to be well taken care of by any healthcare organization intending to adopt and implement a healthcare innovation. This study has provided an insight into the importance of the characteristics of the innovation to be implemented. The innovation may be a barrier or an incentive, depending on its perceived advantages in terms of practice, feasibility, credibility, accessibility, and attractiveness (Grol and Wensing, 2004). It is imperative that any healthcare innovation be compatible with local needs of intended adopters; and be perceived as beneficial to the organization, clinicians and patients.

Another factor of importance is the role of healthcare professionals. Our findings support the submission of Grol and Wensing (2004) that for individual practitioners, barriers to change relate to their awareness, knowledge, attitude, motivation to change, and behavioral routines. Hence, there is need to involve clinicians from the earliest phases of conceptualization, design and implementation of the new technology, and to mount efforts to improve communication between clinicians and technology promoters. Also, from the studies reviewed, it is obvious that there is the need to frame the implementation of a new technology within a wider strategy encouraging clinicians to orientate their practice towards an approach that would favor the innovation.

Also, very obvious from the studies is the issue of resources. This is a very crucial factor. Submissions from the reviewed papers indicate that all innovation implementation require institutional investments for successful implementation, such as funding for program management, leadership and clinician incentives.

### **Conclusion**

Our systematic review supports a better understanding of factors that can explain low level of success in technological innovation implementation in many healthcare systems, both in developed and developing worlds. We characterized available recent previous studies on healthcare innovation implementation, the types of innovation implemented in the studies and identified key factors limiting successful implementation of healthcare innovations.

### **Implication of the Study**

This study has implication for practice. Identifying and addressing barriers in healthcare innovation implementation, based on those in published research, could inform strategies to improve innovation implementation in healthcare systems.

### **Recommendations**

Based on the findings of this study, we hereby recommend that healthcare leaders interested in implementing a technological innovation should begin with a clear understanding of their organization's challenges and what problems they are seeking to

address with the innovation. Further, key institutional investments and resources that are required for successful implementation should be identified and catered for prior to embarking on innovation implementation. Also, the innovation to be implemented should be compatible to the professionals' routines and acceptable to the users. Finally, the healthcare professionals, who are the end-users of the innovation should be well-informed, trained and motivated to implement the new method, approach or technology.

## References

- Alexander, J. A. (2008). *Quality improvement in healthcare organizations: A Review of Research on Implementation Institute of Medicine.*
- Alexander, J. A., & Hearld, L. R. (2011). The science of quality improvement implementation: Developing capacity to make a difference. *Med Care.* 49, S6 – S20.
- Alexander, J. A., Weiner, B. J., Shortell, S. M., Baker, L. C., & Becker, M. P. (2006). The role of organizational infrastructure in implementation of hospitals' quality improvement. *Hosp Top.* 84, 11–20.
- Anthony, D. S. & Quentin, R. E. (2012). Technology innovation for infectious diseases in the developing world. *Infectious Diseases of poverty* 1 (2) <http://www.idpjournal.com/content/1/1/2>
- Arce, R. S., De-Ormijana, A. S., Orueta, J. F., Gagnon, M., & Nuño-Solinís, R. (2014). A qualitative study on clinicians' perceptions about the implementation of a population risk stratification tool in primary care practice of the Basque Health Service. *BMC Family Practice* 2014, 15:150 <http://www.biomedcentral.com/1471-2296/15/150> Accessed 22-02-2016.
- Ashok, M, Narula, R. & Martinez-Noya, A. (2014). *End-user collaboration for process innovation in services: The role of internal resources.* Discussion paper number: JHD-2014-03 John H dunning centre for international business, HemeY Business School, University of Reading. [www.henley.reading.ac.uk/dunning](http://www.henley.reading.ac.uk/dunning)
- Bailie, R. S., Robinson, G., Kondalsamy-Chennakesavan, S. N., Halpin, S., & Wang, Z. (2006). Investigating the sustainability of outcomes in a chronic disease treatment programme. *Soc Sci Med.* 63 1661 – 70.
- Balas, E. A. & Boren, S. A. (2000). *Managing clinical knowledge for health care improvement In Yearbook of medical informatics 2000: Patient-centered systems.* Edited by Bemmell J, McCray AT. Stuttgart, Germany: Schattauer, 65 – 70.

- Barnett, J., Vasileiou, K., Djemil, F., Brooks, L. & Young, T. (2011). Understanding innovators experiences of barriers and facilitators in implementation and diffusion of healthcare service innovations: A qualitative study. *BMC Health Services Research* 11, 342 <http://www.biomedcentral.com/1472-6963/11/342>
- Berwick, D. M. (2003). Disseminating innovations in health care. *J Am Med Assoc* 289 (15):1969-1975.
- Birken, S. A., Lee, S. D. & Weiner, B. J. (2012). Uncovering middle managers' role in healthcare innovation implementation. *Implementation Science* 7 (28). <http://www.implementationscience.com/content/7/1/28>
- Brand, C., Landgren, F., Hutchinson, A., Jones, C., MacGregor, L. & Campbell, D. (2005). Clinical practice guidelines: Barriers to durability after effective early implementation. *Intermediary Medical Journal* 35 162-9.
- Buchanan, D, Fitzgerald, L, Ketley, D, Gollop, R, Jones, J. L, Lamont, S. S. et al. (2005). No going back: A review of the literature on sustaining organizational change. *International Journal of Management Review* 7 189 – 205.
- Chau, P. Y. K., & Hu, P. J.-H. (2004). Technology implementation for telemedicine programs. *Communications of the ACM* 47 (2) 87-92.
- Cho, S., & Mathiassen, L. (2007). The role of industry infrastructure in telehealth Innovations: A Multi-Level Analysis of a Telestroke Program. *European Journal of Information Systems* 16 (6) 738-50.
- Cooksey, D. (2006). *A review of UK health research funding*. London: HM Treasury.
- Davies, B. M., S. Rikabi, A. French, et al. (2014). Quantitative assessment of barriers to the clinical development and adoption of cellular therapies: A pilot study. *Journal of Tissue Engineering*, 5 1- 8,
- De-Grood, C., K. Eso & Santana, M. J. (2015). Physicians' experience adopting the electronic transfer of care communication tool: barriers and opportunities. *Journal of Multidisciplinary Healthcare* 8 21-31.
- De-Haan, F., Onyamboko, M. A., Fanello, C. I., Woodrow, C. J., Lubell, Y., Boon, W. P. C. & Dondorp, A. M. (2015). Exploring health practitioners' acceptability of a prospective semi quantitative pfHRP2 device to define severe malaria in the Democratic Republic of Congo. *Malar J*, 14, 503.

- Doran, D., Reid-Haughian, C. & Cafazzo, J. (2012). A formative and summative evaluation of an electronic health record in community nursing. *Nurs inform 098* <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3799176/> Accessed 22-02-2016.
- Foster, M., Burridge, L., Donald, M., Zhang, J. & Jackson, C. (2006). The work of local healthcare innovation: A qualitative study of GP-led integrated diabetes care in primary health care. *BMC Health Services Research* 16 (11) DOI 10.1186/s12913-016-1270-4.
- Frambach, R. T, Schillewaert, N. (2002). Organizational innovation adoption: A multi-level framework of determinants and opportunities for future research. *Journal of Business Research*. 55 (2) 163–176.
- Gardner, M. R., Jenkins, S. M., O'Neil, D. A., Wood, D. L., Spurrier, B. R. & Pruthi, S. (2015). Perceptions of from the patient's home: A Patient survey. *Telemedicine and e-Health, Video-Based Appointments*. 21 (4), 281 - 285 DOI 10.1089/tmj.0037
- George, S., Hamilton, A., & Baker, R. S. (2012). How do low-income urban African Americans and latinos feel about telemedicine? A diffusion of innovation analysis. *International Journal of Telemedicine and Applications* Article ID 715194. doi:10.1155/2012/715194.
- Greenhalgh, T, Robert, G, MacFarlane, F, Bate, P, Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Q*, 82 581– 629.
- Greenhalgh, T., Stramer, K., Bratan. T., Byrne, E., Mohammad, Y., & Russell, J. (2008). Introduction of shared electronic records: multi-site case study using diffusion of innovation theory. *BMJ* 337 (17) 86 doi 10.1136/bmj.a1786
- Grol, R, & Wensing, M. (2004). What drives change? Barriers to and incentives for evidence-based practice. *Med J Aust* 180, S57-S60.
- Harris, M., Weisberger, E. Silver, D. & Macinko, J. (2015). They hear Africa and they think that there can't be any good services' - perceived context in cross-national learning: A qualitative study of the barriers to Reverse Innovation. *Globalization and Health* 11, 45 DOI 10.1186/s12992-015-0130-z
- Haines, A., Kuruvilla, S, & Matthias, B. (2004). Bridging the implementation gap between knowledge and action for health. *Bull World Health Organ*, 82, 724 – 731.

- Holden, R. J. (2011). What stands in the way of technology-mediated patient safety improvements? A study of facilitators and barriers to physicians' use of electronic health records. *J Patient Saf.* 7 (4), 193–203. doi:10.1097/PTS.0b013e3182388cfa
- Kirsh, S. R., Lawrence, R. H. & Aron, D. C. (2008). Tailoring an intervention to the context and system redesign related to the intervention: A case study of implementing shared medical appointments for diabetes. *Implementation Science*, 3 (34) doi:10.1186/1748-5908-3-34 <http://www.implementationscience.com/content/3/1/34>
- Klein, K. J. & Sorra, J. S. (1996). The challenge of innovation implementation. *Academy of Management Review*, 21 (10) 55–1080.
- LeRouge, C., Van-Styke, C. Seale, D. & Wright, K. (2014). Baby boomers' adoption of consumer health technologies: Survey on readiness and barriers. *J Med Internet Res.* 16 (9) e200.
- National Institutes of Health (NIH) (2010). *Dissemination and implementation research in health (R01)*, Bethesda, MD: NIH; <http://grants.nih.gov/grants/guide/pa-files/PAR-10-038.html>.
- Nembhard, I. M., Alexander, J. A, Hoff, T. J. & Ramanujam, R. (2009). Why does the quality of health care continue to lag? Insights from management research. *Acad Manag Perspect* 23 24 – 42.
- Noyes J, Lewin, S. (2011). *Chapter 6: Supplemental guidance on selecting methods of qualitative evidence synthesis, and integrating qualitative evidence with Cochrane intervention reviews.* In *Supplementary guidance for inclusion of qualitative research in Cochrane systematic reviews of interventions.* Edited by Noyes J, Booth A, Hannes K, Harden A, Harris J, Lewin S, Lockwood C. The Cochrane Collaboration Qualitative and Implementation Methods Group; [<http://cqrmg.cochrane.org/supplemental-handbook-guidance>] accessed.
- Omachonu, V. K, & Einspruch, N. G. (2010). Innovation in healthcare delivery systems: A conceptual framework. *Innovation Journal, The Public Sector Innovation Journal* 15 (1) Article 2.
- Reed, P., Conrad, D. A., Hernandez, S. E, & Marcus-Smith, M. (2012). Innovation in patient-centered care: lessons from a qualitative study of innovative health care organizations in Washington State. *BMC Family Practice* 13 (120) <http://www.biomedcentral.com/1471-2296/13/120>
- Rhee, H., Belyea, M. J., Cieurzynski, S. & Brasch, J. (2009). Barriers to Asthma Self-Management in Adolescents: Relationships to Psychosocial Factors. *Pediatr Pulmonol.* 44 (2) 183–191. doi:10.1002/ppul.20972.

- Richter-Sundberg, L. M., Nyström, E., Krakau, I. & Sandahl, C. (2015). Improving treatment of depression in primary health care: a case study of obstacles to perform a clinical trial designed to implement practice guidelines. *Primary Health Care Research & Development* 16 188–200 doi:10.1017/S1463423614000243.
- Sandelowski, M., Voils, C. I., Leeman, J., Crandell, J. L. (2012). Mapping the mixed methods – mixed research synthesis terrain. *J Mix Methods Res*, 6 (4) 317 – 331.
- Shortell, S. M. (2004). Increasing value: A research agenda for addressing the managerial and organizational challenges facing health care delivery in the United States. *Med Care Res Rev* 61, 12S – 30S.
- Shortell, S. M., Bennett, C. L., Byck, G. R. (1998). Assessing the impact of continuous quality improvement on clinical practice: what it will take to accelerate progress. *Milbank Q* 76, 593 – 624
- Sinclair, C., Holloway, K., Riley, G. & Aurel, K. (2013). Online Mental Health Resources in Rural Australia: Clinician Perceptions of Acceptability. *J Med Internet Res*. 15 (9) e193.
- Stirman, S. W., Kimberly, J., Cook, N., Calloway, A., Castro, F, & Charns, M. (2012). The sustainability of new programs and innovations: A review of the empirical literature and recommendations for future research. *Implement Sci* 7 (17).
- Tidd, J, & Bessant, J. (2009). *Managing innovation: Integrating technological market and organizational change. 4 edition*. Chichester: John Wiley & Sons, Ltd.
- Tuot, D. S., Leeds, K., Murphy, E. J., Sarkar, U., Lyles, C. R. Mekonnen, T. & Chen, A. H. (2015). Facilitators and barriers to implementing electronic referral and/or consultation systems: A qualitative study of 16 health organizations. *BMC Health Services Research* 15, 568 DOI 10.1186/s12913-015-1233-1
- UNESCO Institute for Statistics, (2005). *Oslo manual, the measurement of scientific and technological activities, 3rd edition*, pp.34.
- Urquhart, R., Porter, G. A., Sargeant, J. Jackson, L. & Grunfeld, E. (2014). Multi-level factors influence the implementation and use of complex innovations in cancer care: a multiple case study of synoptic reporting. *Implementation Science* 9, 121 <http://www.implementationscience.com/content/9/1/121>
- U.S. Congress. Patient Protection and Affordable Care Act, 42 U.S.C. § 18001. Washington, DC: U.S. Congress; 2010.

Watson, A. H. A., Sabumei, G., Mola, G. & Iedema, R. (2015). Maternal health phone line: Saving women in Papua New Guinea. *J. Pers. Med.*, 5, 120-139 doi 10.3390/jpm5020120.

Woodward, A., Fyfe, M., Handuleh, J., Patel, P., Godman, B., Leather, A. & Finlayson, A. (2014). Diffusion of e-health innovations in 'post-conflict' settings: A qualitative study on the personal experiences of health workers. *Human Resources for Health* 12, 22 <http://www.human-resources-health.com/content/12/1/22>