Use of Agile Project Methodology in Health Care IT Implementations: A Scoping Review

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Abstract. Health care organizations are investing in system solutions that can be leveraged across the continuum of care (i.e. electronic medical records (EMR's); electronic health records (EHR's); health information exchanges (HIE's) and patient portals. The importance of these systems and how they have evolved over the past 30 years has been well researched. The value and benefits of these systems are therefore well known; however, it is estimated that most projects are typically 100% over budget and a year behind schedule [1, p. 2]. In this paper the authors examine what literature is available on agile project management methodologies in health care settings. A scoping review of the literature available specifically on agile methods use in implementing systems within health care was undertaken. Findings revealed there is very little literature available on agile project management methodologies used in health care IT systems implementations. The authors identify there is a strong need for research to look into project management methodologies and identify areas in the project lifecycle, where change is needed to increase clinical systems adoption.

Keywords. agile methods, agile implementations, health systems, implementations, implementation science, project management

1. Introduction

It is critical for research to be conducted in the health care project management field in order to address the number of project failures that drain scarce resources away from the health care system [1].   There is consensus emerging among policy makers and researchers that the problems with health care information technology (IT) projects are due to sociological, cultural and financial issues [2]. According to the literature, IT implementations in health care continue to be a struggle and challenge. As a result, there is a need to better understand project management approaches that are used in health care IT projects, as it is important that implementation practices change along with the ever-changing technologies being implemented.

2. Background

When the PMBOK guidelines were made available in the 1980's the common project management methodology at that time was the traditional "waterfall" approach [3]. The

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premise behind the traditional method is that of a "one size fits all" approach that does not hold true in today's health care industry. New project management approaches are needed. As a response to this, the agile approach was established in the late 1990's and specifically used for software development. A definition provided by Hoda et al., [4] is: "Agile methodologies follow a iterative and incremental style of development and dynamically adjust to changing requirements and that enable better risk management". Agile project management is considered to be an innovative and modern approach of the 21st century [5].

No one-project management methodology is suitable for all projects, regardless of how the Agile Manifesto authors feel about this. Health care IT projects are time and cost sensitive. Following a iterative approach and requiring end users to support continued improvement of a system are not well suited to health care as errors can be very costly from both a budget and risk to patient care perspective. Despite its potential importance, little peer-reviewed literature can be found to support the use of agile methods in health care IT implementations. It is time for a change to occur in IT implementations and this change could involve moving towards the concept of agile.

3. Method

3.1 Evaluation Framework

Arksey and O'Malley's framework [see 6] was used to conduct the scoping review.

Stage	Description
Stage 1:	Identify research question
Stage 2:	Identify relevant studies
Stage 3:	Study selection
Stage 4:	Charting the data
Stage 5:	Collating, summarising and reporting the results

Table 1: Arksey and O'Malley's framework

3.2 Research Questions

The paper answered the following question: "What literature is available on agile project management methodologies in health care settings?" The authors examined the research on health care IT systems' implementation and where in the project lifecycle the agile approach would add the most value.

3.3 Search Strategy

A search strategy was developed to retrieve relevant studies from the databases: MEDLINE, Psychinfo; IEEE Explorer and PubMed database. The databases were searched using two queries that combine terms agile methods, agile implementations, health systems implementations, implementation science and project management. The search was limited to full text, English language material between 01/01/2015 and 01/01/2018. These dates were used to collect more recent articles around agile use in implementation as IT processes and solutions change rapidly.

3.4 Inclusion and Exclusion Criteria

To be included in the review, a peer reviewed publication had to meet the inclusion criteria set out by the researcher. First, the study had to discuss agile methodology used in a health care setting. Secondly, the study was included if it provided a framework or guidance on how agile methodology could be used in health care, and thirdly, focused on any case studies of agile methodology implementations in health care systems. Articles that did not specifically discuss agile methodology application or use in health care settings, were not a full text article, were not in English, did not fall in the date range or could not be downloaded and accessed were all excluded from this study. A single reviewer performed an initial scan on all the results of the search and rejected those that did not meet the criteria based on an initial scan of the titles and abstracts (n = 176). Two researchers reviewed the titles and abstracts of the studies identified in the literature search to determine whether the inclusion criteria have been met. All disagreements between reviewers regarding the selected articles were resolved through discussion and consensus. A single reviewer extracted articles meeting the inclusion criteria for a full review. The selected studies were also examined for redundancy and duplicates were removed.

3.5 Data Extraction

Once a final set of studies was identified, general study characteristics were extracted. Next, the goals of the study were identified and extracted. The project approaches were extracted along with the benefits and barriers experienced and placed in a table. This information was helpful in informing what changes in a project lifecycle were needed for a successful implementation using agile.

4. Findings

4.1 Selected Articles and Characteristics

Overall the search yielded 176 articles for consideration. Many articles were rejected during the initial title and abstract review because they were studies not related to agile projects of health care IT. From the 176 articles that were considered, 95 were not related to agile projects of health care IT, a further 11 could not be extracted, 42 were duplicates, and six articles did not meet the date criteria. After a full review a further 10 papers were excluded, as they were not about agile projects in health care. Therefore, 12 studies were included in the review.

4.2 Synthesis of Findings

There were a variety of study designs employed in the papers that were analysed, these included; hermeneutic systematic reviews, summative evaluations, mix method research design, action design research, qualitative analysis and the most popular was case study research. In the next section of the findings we outline the key themes that emerged. In general there is very little available literature on agile project management methodologies used in healthcare IT systems implementations. There were a few themes

or patterns that emerged during the review from the 12 papers that were analysed that will be described in greater detail below.

4.2.1   Literature Available on Agile Project Management Methodologies Used for Healthcare IT Implementations

Tolf et al. [7] suggested that for agile methods to be adopted in hospitals, project management activities would need to focus on building adaptive capacities instead of being operations based. Lodha [8] suggested that hybrid models must integrate with a quality management system. The authors provided no information about how hospitals would need to change their IT implementation strategies to move towards an agile approach. In Pitkanen et al [9] the summative evaluation was based on using an Agile Instrumental Monitoring (AIM) methodology [9] in order to determine if the user experience could be improved in health IT. The authors identified that there was a need to collect additional evidence and that the AIM methodology could be used to assess if the user experience could be improved.

Greenhagh and colleagues [10] develop a framework for predicting and evaluating the success of technology, to support health and social programs. Although the review did not provide information about where agile methods that have been used to implement health care IT, it did provide a new framework that could be used for evaluating the success of technology. Future use of this framework may provide further insights into how technology affects patient care and safety. As part of this work, several case studies were conducted. The case study papers provided some insights into health IT system implementation projects. However, little information was available on how agile methods are applied in the project lifecycle.

4.2.2   Impact to the Project Lifecycle on Using Agile Methods

Dafydd et al. [11] conducted a useful case study at the National Health System (NHS) in England, UK. The review discussed the usefulness of creating smaller teams of users and developers. The outcome of this project was a simple, effective and popular semiautomated, online information technology (IT) system that was achieved at a low cost. This is a useful observation for adopting agile methods. Health care organizations may consider creating smaller mixed professional, clinical and technical teams to work on projects taking a simpler approach to delivering complex IT solutions.

Although some case studies did reference agile methods, the impact of agile method use on the project lifecycle was not discussed; for example, one case study review [12] concluded that significant commitment and involvement is needed from business areas; however, the authors did not discuss at which points in the project lifecycle does this need to occur. Dafydd et al's [11] case studies did not provide clarity as to how the project lifecycle changed when using agile as opposed to traditional method. Albornoz et al [13] suggested that providing multiple mock-ups and testing was a useful method for ensuring user requirements are met. Tamblyn and colleagues [14] conducted a case study that used agile development cycles and concluded that the success of the project was related to obtaining support from leadership, having clinical champions, and providing an ongoing feedback mechanism from users to the development team. The researchers identified that this led to priority issues being resolved. From these case studies there is some direction provided on how and where the traditional project lifecycle could be changed to adopt the agile method. Lastly, Kushniruk and Borycki

[15] provided insight using qualitative analysis into how new approaches to usability testing are required to support agile processes. The paper discusses the importance of having the ability to rapidly collect data and perform analyses. In summary as, agile methods require testing to be conducted throughout the development cycle, tests need to be flexible and low cost.

5. Conclusion

Stave [5] stated that the authors of the Agile Manifesto had predicted that agile methods would replace traditional methods in the future. The replacement of traditional methods with agile methods in health IT has not been shown to improve the quality of health care IT implementations. Although there is discussion in the literature about the use of agile in health care, little evidence exits of its use in delivering health care IT solutions. There is also little research on how the project lifecycle is impacted and where agile methods could be incorporated Vrhovec [16] stated that agile methods are rarely studied and that additional research is needed where agile methods are used to deliver health care IT. Specifically, it is important to understand how agile methods are being adopted and if agile methods have an impact on the failure rate of health IT projects. Research is needed on all methodologies being applied, whether it is, the traditional approach, agile methods or hybrid methodologies. Lesmana et al [17] identify that combining traditional and agile methods into a hybrid project methodology not only improves the speed of project delivery, but also delivers high quality solutions to end users. This would be very helpful in health care. Delivering projects quicker would enable health care organizations to do more with their funding, which could improve health care service delivery. Delivering solutions that are high quality that meet user requirements would reduce the number of systems that are abandoned and contribute to improving health service delivery.

Health care IT projects would benefit greatly from additional research on how agile methods have been used to deliver health care IT projects, including an understanding of possible project outcomes. By assessing and evaluating agile methods and how they could be adopted for health care IT projects, one could help reduce the high percentage of IT project failures.

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