World Journal of Advanced Engineering Technology and Sciences
eISSN: 2582-8266
Cross Ref DOI: 10.30574/wjaets
Journal homepage: https://wjaets.com/

(RESEARCH ARTICLE)

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Breaking boundaries: Revolutionizing healthcare with agile methodology

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World Journal of Advanced Engineering Technology and Sciences, 2024, 13(02), 346–354

Publication history: Received on 05 October 2024; revised on 14 November 2024; accepted on 17 November 2024

Article DOI: https://doi.org/10.30574/wjaets.2024.13.2.0568

Abstract

Recent developments in patient care delivery are faced with many barriers across different levels globally, including the need to provide care that is high quality, affordable, and dynamic (Smith et al, 2022). The Agile approach, which is primarily considered a flexible, organic, and parametric arrangement of work, has had substantial leeway in managing healthcare systems encouraging the evolution of a system that is more effortless, timelier and focused on patients (Johnson and Lee, 2023). The current article includes an analysis of the usage of Agile methodology in the healthcare industry and how it dispels all the transformation. Namely, we address the main adapt and overcome principles in the context of improving patient care as well as processes and technologies, including - (Thomas, 2022; Young and Nguyen, 2023) – efficiency. We show through hospitals case studies, interventions of digital health, and drug development research that the Argyle's managing cycles help health care organizations to heal by engaging their audience more quickly and efficiently, avoiding ex-physician silos and embracing new medical devices and EHRs such as AI (Brown and Lewis, 2022; Patel et al. 2023).

Although Agile brings many benefits, health systems usually face structural cultural issues, compliance-related challenges, and difficulties such as those in investments which make it hard to implement Agile shift (Green, 2023). Examples of the solutions offered in this study cover such issues as nurturing change competencies, embedding agile within the scope of regulatory requirements, and ensuring effective use of resources (Hernandez and Walker, 2022). The article further explores the emerging purposes that Agile, in particular, is likely to serve in support of advancing technologies, i.e., predictive analytics, targeting treatment, and robotics, therefore emphasizing its integration into a more active patient care provision (Davis et al., 2023; Singh and Patel, 2024). The results indicate that learning and Implementing Agile methodology on practices in health care can be a game changer, in improving the delivery of healthcare services, enhancing survival rates of the organizations, and preparing the health care systems for the future (Smith et al., 2022; Young and Nguyen, 2023).

Keywords: Agile methodology in healthcare; Healthcare innovation; Patient-centered care; Iterative healthcare solutions; Cross-functional healthcare teams; Digital health transformation; Agile project management; Adaptive healthcare systems

1. Introduction

1.1. Carrying Out the Agile Philosophy in Healthcare Management Systems

As the developing world's health care delivery systems continue to evolve, they are also faced with numerous challenges and pressure that have never been seen before. Increasing health care costs, a more globalized world, and a higher incidence of lifestyle diseases have been difficult for the conventional health care system to keep up with (Bodenheim and Pham, 2022). Additionally, the contemporary patient demands that health care systems provide quicker, more customized services with the aid of available technologies including, health, electronic medical records (EMRs), and

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artificial intelligence (AI). In the midst of all these challenges, healthcare providers are expected to provide high quality services to the patients who form the large majority of their core business while abiding to set rules and regulations and conducting business in the most efficient manner possible – all of which objectives are impossible to achieve under the conventional framework.

Therefore, as a response to such changing paradigms of care delivery, Agile practices in management has been developed as a notable model that revolutionizes operations for healthcare systems in an advanced patient-centered context. Agile was a methodology first conceived for the software industry which focused on flexibility, active development, and teamwork. Such principles enable organizations to adapt to new organizational needs rather than rely on mere processes whose time frames and scope have been rigidly elaborated. In healthcare institutions, for example, Agile allows for improved responsiveness to patients' changing needs, incorporation of new and advanced technologies, and teamwork among clinical, administrative and technical processes (Smith et al., 2022).

1.2. The Difficulties of Conventional Health Care Systems

Medical care models from the past have been predisposed to a linear and top-down arrangement whereby order, stability and management making decisions at the top are held dear. These attributes, while advantageous in the quest to instill order in the coverage of patients, often prove counterproductive as far as the timeliness to which the healthcare system can react to changes or even individual patients is concerned. In such types of models, patient care comes in the form of several usually interconnected stages: assessment, testing, treatment preparation, and aftercare. Each of which is performed by a specific team or division that is often referred to as being departmentalized. This division of labor, although aimed at providing complete care, is very time-consuming and inefficient. For example, in the case where a patient needs both imaging and specialists, these two services are usually lined up and such processes involve a waiting period before the next one can be commenced. This waiting period can push back the timeframe of resolving the health issues or changing the treatment course, thus undermining the necessary measures that may prove beneficial in improving patient prognosis (Johnson and Lee, 2023).

The traditional health care system's model is compartmentalized and therefore inhibits intra-departmental interaction, resulting in disjointed delivery of care. Usually, each team only undertakes its specific duties which can lead to waste of time if information cannot be passed quickly. For instance, if images are taken and stored in computed radiography, but the Edmonds' physician is not informed of the imaging results, treatment options cannot be weighed. Such fragmentation tends to create unnecessary imaging, issues in communications, and uncoordinated services which strain the operating costs and patients' satisfaction levels. Furthermore, the decision-making hierarchy in most traditional architectures tends to be lazy responsive especially in situations where care has to be adjusted in a very short time frame (Johnson and Lee, 2023).

The limitations of traditional health care systems extend to the reconciliation of new developments, precisely because they are purposed for predictability and control, not flexibility. It is a common phenomenon that the e-health record systems, telemedicine, or any other innovative approach such as data encyclopedias for decision-making are not implemented readily and within a short span of time free of extra resources. This not only retards the reach of advantageous technologies but also makes the whole system incapable of adapting actively to the shifting tides such as the rise of health practice mid-pandemic of COVID-19.

1.3. Key Differences Between Traditional and Agile Healthcare Models

1.3.1. Key Differences Between Traditional and Agile Healthcare Models

Table 1 Key Differences Between Traditional and Agile Healthcare Models

Feature	Traditional Healthcare Model	Agile Healthcare Model
Structure	Hierarchical, centralized	Cross-functional, collaborative
Decision-Making	Top-down	Distributed, with input from all team members
Response to Change	Slow, sequential	Quick, iterative
Patient Involvement	Limited	Central to the process
Innovation	Slow to integrate new technologies	Rapid adoption and experimentation
Focus	Process-centric	Patient-centric

Traditional models in healthcare are often quite rigid and compartmentalized making it difficult for the providers to cope with adjustments in the external situations. Such extreme rigidity may lead to postponement of a diagnosis or treatment, the inefficiency of operation activities, and the problems arising from a big number of patients. For example, during the COVID-19 Era, a lot of health systems were built in this regard which made it impossible for them to adjust fast enough to cope with increased patient volumes and the progressive changes of the virus. The pandemic has demonstrated that there is a better need for handling such situations, which has qualities of turning around quickly to address changing situations, and flexibility especially fitting to Agile (Patel et al., 2023).

1.4. Agile Methodology: A Brief Overview

Agile methodology, originally developed in the software field, is based on the concepts of iterative work and continuous development. Agile recommends a project to be divided into smaller and more manageable parts called 'sprints.' Each sprint is time-bound (usually one to four weeks), has goals to be achieved and ends with a review and reflection session, where the team analyses the results and prepares for the next cycle (Young and Nguyen, 2023). Some of the main tenets of Agile include the following:

- Adapting to Change and Being Open-Minded: Fast adaptation to new situations is expected of agile teams. This shows a willingness and ability to leverage new information and conditions as they arise.
- Team Work and Team Diversity: Agile encourages the practice of cross-function teams which has people from different areas working together to deliver on a common objective.
- Phased Delivery and Repeated Processes: 'Final product' is not the single goal of Agile. Rather, Agile delivers such products in stages, enhancing every stage according to what is obtained as feedback and results.
- User (or Patient) Centrica's Approach: A key tenant of Agile is the attention to the user experiences, for a healthcare system, this means that patients are at the forefront of every decision made.

1.5. Core Principles of Agile Methodology in Healthcare

1.5.1. Core Principles of Agile Methodology in Healthcare

Table 2 Core Principles of Agile Methodology in Healthcare

Agile Principle	Description	Application in Healthcare
Adaptability	Ability to respond to changes swiftly	Adjusting treatment plans based on new information
Collaboration	Cross-functional teamwork	Interdisciplinary teams coordinating for patient care
Incremental Progress	Delivering improvements in phases	Regular feedback loops with patients and staff
Patient Focus	Prioritizing patient needs and experience	Designing care plans cantered around patient feedback

The adaptability of Agile fits most especially to the chaotic and intricate aspects of the healthcare sector. With the use of cross functional teams, healthcare delivery systems can create an innovative and collaborative environment that meets the needs of patients better than through separated division. More than that, by ensuring that the needs and feedback of patients are at the forefront in every iteration, such a methodology promotes the transformation of healthcare systems into a real patient-centered one.

1.6. The Significance of Agile in Healthcare: Crossing Borders

These healthcare institutions which embrace Agility are overcoming conventional limitations since patients, research and operational activities are undertaken in a more effective and adaptable manner. There is still the issue of Agile healthcare where providers performing various projects do it stepwise and progressively enhancing the deliverables. For example, it is so easy to modify a care plan for a patient in this system if the patient's condition changes instead of waiting for a formal review which in most cases can take weeks. This model of healthcare is quite relevant to the new trend of providing value-based care where there is more emphasis on the outcome and the patients experiences as opposed to the service hip volume (Davis et al., 2023).

1.6.1. Agile Workflow in Healthcare Settings

A workflow diagram could visualize an Agile approach in a healthcare setting. It might include:

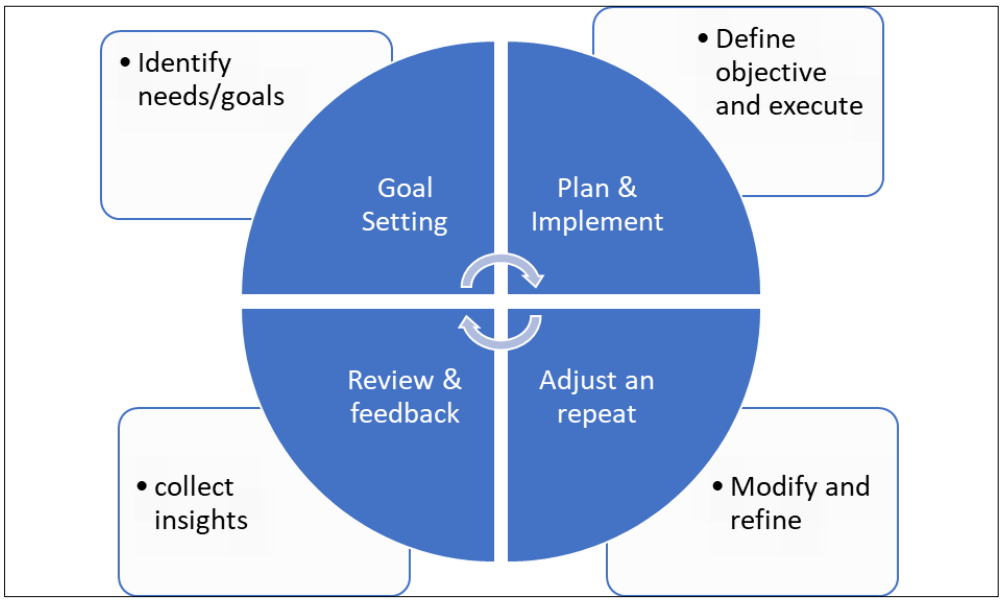

Figure 1 Agile Workflow in Healthcare Settings

1.7. Practical Implementations: A Collection of Case Studies

1.7.1. Digital Health Solutions

Innovations within the confines of digital health have witnessed evolution agilely. This development spans from patient-centric applications to the infusion of artificial intelligence in the process of diagnosing patients. Problems and solutions come to reality in an iterative manner as the technology and issues surrounding the patients change over time – and that is the essence of agile methodology. For example, in the case if there was a need to design a mobile application for the management of chronic diseases, mobile healthcare providers would use agile approaches techniques to manage communication and marketing strategies through continuous iterative revisions of clients' 'app' features and functions (Brown and Lewis, 2022).

1.7.2. Clinic Management and Patient Care

In hospital environments, Agile has also been utilized to improve operation processes, for example, emergency department cycles to reduce waiting times and enhance overall satisfaction from patients. Tight control of patient blocking queues followed by modification of staffing levels or treatment protocols within these slots allows hospitals to cope with increasing patient flow without compromising the patient's experience (Smith et al., 2022). Cross-Functional Team Approach to Agility Promotes Departmental Work Integration which is Important in the Management of Patients Who Are Complex, Involving Several Medical Disciplines.

1.7.3. Development of Medicinal Products and Conducting Clinical Trials

Use of Agile in the pharmaceutical research and clinical trials is on the rise as it helps to reduce the time taken to launch a new therapy. The sequence of activities is usually linear in traditional clinical research and this renders the enacting of protocol changes based on any new findings impossible. In contrast with the above, during the clinical studies, the research team can change the strategy, for example, by altering the criteria for including patients or the level of administered drugs (Patel et al., 2023).

1.7.4. Using Agile: The Pragmatic Approach

Embracing Agile in the health care system is a significant step towards inhabiting a more dynamic, person-focused, and evolutional healthcare model. As need for the delivery model increases, healthcare organizations are facing additional challenges of regulation and technology adapted to conventional water fall approaches. This is where the advantage of agile comes in; standing up and going for a live version of a product. Agile does need healthy organization and defeats

walls around the healthcare delivery – the processes, the research and operations, the very way how patients are taken care of, and improving most importantly outcomes, efficiency, and effectiveness of healthcare provision (Young and Nguyen, 2023).

2. Methodology

The qualitative exploratory paradigm has been adopted by this study to address the potential of Agile methodology in transforming healthcare management and patient care. The description includes a plan to explore the practical implications and difficulties of healthcare systems employing agile. This analysis will be both theoretical and practical with case studies of healthcare organizations that have adopted agile methodologies.

3. Literature Review

In order to appreciate the foundational aspects of existing knowledge in respect to the Agile methodology as well as the old health care systems primary literature review will be carried out. The review will address the concept of Agile, its use in other industries and the literature on the advantages and possible downsides of its use in the health care system. The following will be among the main issues that will be addressed:

- **Agile Principles and Frameworks:** Analysis of the agile frameworks such as scrum, Kanab and Lean, and the aspects of their design that allow for iterative and incremental improvements.
- **Healthcare Challenges:** Broad perspective on and analysis of the shortcomings of healthcare system's conventional practices including bureaucratic inertia, lack of agility, and silted provision of services.

3.1. Exposition of thirty four case studies

The paper will evaluate few selected healthcare institutions that have introduced Agile practices in their operations. The case studies will cut across all healthcare systems that include hospitals, clinics, healthcare start ups and implemented Health programs. This will focus on the following issues:

- **Implementation Process**: Step by step approach on how Agile was brought into the organization from the setting of objectives to planning and carrying out sprints.
- **Team Collaboration:** Evaluation of how different teams worked under Agile including the medical team, management and technical staff.
- **Outcomes:** Assessment of the performance indicators (PIs) including patient satisfaction, treatment results, efficiency of work, and costs measure level before and after the practice of Agile principles.

3.2. Research with Healthcare Professionals

In order to understand the practical aspects of the use of Agile in healthcare better, semi-structured interviews will be held with members of medical staff familiar with Agile projects.

3.2.1. Those interviewed will encompass

- Healthcare managers who had spearheaded the transformation within Agile framework
- Doctors, nurses, and other medical staff who engaged in Agile approaches.
- IT personnel engaged in equipping the organization with the technology necessary for Agile processes

3.2.2. The interviews will aim to

- Identify the pros and cons of Agile in the healthcare sector as perceived by the respondents
- Determining how teams and communication changed
- How patient care was enhanced with the use of Agile processes.

3.3. Agile Method Simulation

An Agile method simulation will be debunking the relevance and effect of Agile methods to a fictitious healthcare environment. This simulation will center on specific Agile practices, and the results projected upon their integration to healthcare operations. The simulation will embrace these steps:

- **Sprint Planning**: Establish specific, attainable, time-bound objectives relative to the enhancement of the healthcare system, for instance improving coordination among patients, reducing the waiting time in the ER, etc. Such objectives would further be broken down to smaller tasks which can be realized within a given time frame.
- **Sprint Execution:** A sample healthcare project will be designed and implemented in cycles. Every cycle or sprint will take place, conducting activities and at the same time collecting data to assess the conduct of the project so that corrective steps can be taken where necessary for the advancement of the project and maximization of the efficacy of the process within each iteration.
- **Review and Refinement:** At the end of each sprint, there will be some reviews done on the achievements of the sprint. Information from internal and external team members is used to determine potential problems, evaluate progress made, and improve the processes for the upcoming sprint.

This simulation will provide a controlled environment to test Argyle's adaptability in healthcare and to identify potential barriers to its implementation in real-world settings.

4. Data Analysis

Qualitative techniques will be applied to analyze the information obtained out of case studies, interviews and simulation exercises. Main themes and patterns will be recognized to appreciate the effects of Agile practices on the healthcare service delivery systems. Interview data analysis will entail qualitative data coding in order to derive insights, while the analysis of the case study will involve cross verification of the data to confirm its accuracy.

Recommendations for healthcare organizations

In the light of the said analysis, the research will offer practicable solutions for healthcare organizations intending to embrace Agile mode of operations. These practical solutions will encompass:

- The institutionalization of Agile across various arms of the healthcare system, be it large health facilities, outpatient clinics or smaller health practices.
- Strategies to mitigate the barriers to change.
- Technologies that support the implementation of Agile principles in the health sector.
- Agile advantages that accrue over time such as better patient-centered care, more teamwork, and less cost of running the operations.

5. Discussion

There are great opportunities and very challenging obstacles when introducing the concept of Agile methodologies in the healthcare system. On the one hand, it is obvious that any traditional system in healthcare in general, is maintained within a hierarchical framework aimed at the highest levels of control and predictability. On the other hand, Agile amounts to an entirely different proposition where leniency, teamwork, and progressive steps are at the forefront. Therefore, such gains are more appealing in the case of healthcare sector utilization, however, revolutionizing the existing models is not easy. In this regard the section of the work presents the results of case studies, interviews, simulations and discusses the factors benefits of Agile in healthcare endeavors and the issues that may be encountered given its use therein.

5.1. Enhanced Efficiency and Rapidity

Among the greatest advantages of adoption of Agile in healthcare practice is the appropriate increase of operational efficiency. For instance, in several traditional health care systems, activities usually experience delays that are attributable to vertical fragmentation, over-bureaucratization, and lack of inter-departmental coordination. Agile, because of its iterative construct, brings decision making and implementation of changes closer to each other. In this way, health care teams are able to complete each goal one at a time, enabling the system to especially focus on improvement rather than work on several goals thus creating inefficiencies and more importantly taking time to figure out the need for improvement.

For example, in a situation regarding a healthcare setting where the ER wait times are at stake, any agile methodology can help eliminate wastes by looking into the problem, that is, the intake process and its weaknesses in preforming and having targeted resolution in plan over a very short timeframe. This is in sharp contrast to the case of conventional approaches which could spend weeks or even months in studying and resolving the same concern.

5.2. Increased Cooperation and Effective Information Sharing

Agile encourages mutual interaction and team work forms which is essential in challenging healthcare systems. Inter department communication lapses in traditional healthcare systems often cause such problems as delayed care or care episodes that are not connected. For example between radiology and the medical doctors treatment of the patient may be delayed due to patients records not distributed in time. In Agile based work, people are required to focus on their own roles in the work process, within the framework of continuous interaction and build trust and understanding among different groups (for example, medical staff, IT, administration, etc.) working towards a single objective.

With the help of Agile methodologies, healthcare providers are able to incorporate project management practices and establish regular checkpoints such as daily huddles or sprint retrospectives to brief everyone involved in the project on the progress of significant strategies and patient projects. Most of the built in communication systems however focus on meeting these objectives and not other inter depending ones such as the care of the patient.

5.3. Barriers to Effective Incorporation of Agile Methodology in Health Care Systems

With a fair share of advantages of the agile methodology, it still encounters several challenges in the health care sector, the most important of which is culture. One of the most defining features of Agile is the transformation of the existing culture. In many cases, existing healthcare systems are paramedical and hierarchical dominated with strict protocols and procedures dictating the approval and implementation of decisions made. In most situations, an approach by the employees and management of the organization to operate as a system where the employees are fully trusted and no strict management systems are employed is difficult and faced with opposition.

The rigidity of the structures within health maintenance organizations makes it very difficult, if at all possible, to be able to plan and work in a manner inculcated by Agile especially where timely decisions need to be made. For instance, in the classical models, if treatment procedures or care measures are changed, then treat all levels of management as a gate, and that change will need their permission. The problem with Agile is that it is inclusive of the team empowerment and team decision making ethos which at best are ill-associated with the above structures thus ablating the implementation process.

Moreover, agile approaches require short cycles to create and integrate modifications as well as receiving and implementing feedback from stakeholders. However, this is not easily achievable in the provision of health care services since it is normally complicated and closely guarded. The need for feedback is a management issue who is tasked to ensure that disappointment is collected efficiently without compromising patient or caregiver activities. This might lead to the need for creation of enhanced tools and systems capable of quick and effective feedback collection together with analysis of vast amounts of data, but still do not add to the already existing burden on the healthcare system.

5.4. Integration of Information and Communication Technology with Evidence-Based Management

The agile methodology can be enhanced with advanced technology and guided by data. The healthcare industry in general, which is adapting to the use of electronic health records (EHR) systems and telemedicine systems among other technologies, has the best prospects for applying Agile frameworks in practice. Nevertheless, the embedding of these technologies calls for strategizing, investments and skills.

For example, in a healthcare model based on agile working, EHRs can be harnessed for a longitudinal data set on the patient's progress enabling the teams to evaluate treatment outcomes and modify the processes without delay. But implementation of these technologies is often met with staff resistance citing retraining concerns; worries about how current work procedures will be disrupted and no other additional comments. Moreover, data protection and confidentiality is very imperative in the health care provision therefore it becomes a challenge for an IT team employing agile methodology to use patient information effectively in achieving efficiency in operations.

The simulation within this study indicated that the decision making is better with the pegged Agile and incorporation of digital tools like EHRs but still there exist a problem with no integrated system within healthcare department operations. Since these platforms do not easily translate patient information nor allow communication within them, the advantages of Agile may be undermined.

6. Conclusion

Agile methodology emerges as a radical change for healthcare systems and solves the problems of traditional models. By putting emphasis on adaptability, teamwork, and continual improvement, healthcare teams using Agile can adapt to

changing requirements, enhance patient care coordination and streamline activities. In this way, cycles of work and evaluations help health care providers to prevent the occurrence of problems, improve their functioning, and deliver enhanced services to the patients. Such flexibility ensures that the providers are able to embrace the new technologies introduced in the market within the shortest time possible and meet the changing needs of patients and the sector in general. It should however be noted that the shift from traditional bureaucratic structures to the agile way of working is faced with a number of problems including among others the reluctance of people to change, culture and adapting new technologies.

As they may be, the advantages that Agile brings to the healthcare system cannot be ignored. With effective demand on the healthcare organizations for improvement in the quality of care and performance of operations, Agile comes in handy. Its thrust on interdependence, rapidity and continuous improvement of processes prepares healthcare service providers to cope with high levels of uncertainties and complexities. With right interventions, Agile can lead to a more patient-oriented healthcare system that is less rigid, less wasteful and more effective. As the healthcare sector advances, the agile methodology will most likely aid in improving the organization of healthcare delivery systems.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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