EFFECTIVENESS OF DIGITIZED CARE CONTINUUM PROGRAM IN A MULTISPECIALITY HOSPITAL

by

Devanand Kolothodi, BSc., MBA, PGDHM

DISSERTATION

Presented to the Swiss School of Business and Management Geneva

In Partial Fulfillment

Of the Requirements

For the Degree

DOCTOR OF BUSINESS ADMINISTRATION

SWISS SCHOOL OF BUSINESS AND MANAGEMENT GENEVA

OCTOBER, 2024

EFFECTIVENESS OF DIGITIZED CARE CONTINUUM PROGRAM

IN A MULTISPECIALITY HOSPITAL

by

Devanand Kolothodi

Supervised by

Dr. Atul Pati Tripathi, PhD

APPROVED BY

Vasiliki Grougiou__ ___ ____
Dissertation chair

RECEIVED/APPROVED BY:

____
Admissions Director

Acknowledgements

I am highly grateful to my supervisor Dr Atul Pati Tripathi for his invaluable guidance provided during this research work. His precious support and encouragement helped me manage the struggle from commencement of idea till final conclusions. This work would not have been possible without his expertise, patience and unwavering support.

I thank the faculty and staff of SSBM, Geneva for their support, consistent follow-up and encouragement. I have been truly inspired by their dedication to education and research.

I would like to thank the management and ethics committee members of Aster Prime Hospital, management of HEAPS AI System for sharing the data and expertise related to care continuum program.

I am also grateful to the participants who shared their time and knowledge for this work. Without their willingness to share their experience, this research would not have been possible.

To all my colleagues and batchmates who have given me feedback, insights, opinions throughout my academic journey. I highly appreciate their encouragement and interaction throughout this project.

Lastly, I want to thank my family and friends for all their love, support and encouragement for their constant source of motivation.

ABSTRACT

EFFECTIVENESS OF DIGITIZED CARE CONTINUUM PROGRAM

IN A MULTISPECIALITY HOSPITAL

Devanand Kolothodi

October 2024

Dissertation Chair: <Chair’s Name>
Co-Chair: <If applicable. Co-Chair’s Name>

This study was conducted to assess the efficacy of digitized care continuum program in multispecialty hospital. The intervention was designed to improve communication, coordination and teamwork across healthcare sectors in order to provide smooth post-discharge patient care. Data from 500 patients were collected to evaluate the effect of the program on patient satisfaction, clinical outcomes, patient loyalty, reduction in readmission rates and workload.

The Net Promoter Score (NPS) for patient satisfaction was 92, reflective of a very high level of positive interest in the program during the semi-structured interviews. Overall, the results indicated that patients were satisfied with their experience of continuity care despite a few neutral suggestions for improvement. According to the research, 47% of patients were loyal promoting retention and the remaining were between neutral feedback flagging a strategy for more patient engagement.

The program also reduced readmission rates, exhibiting better clinical outcomes after discharge. A comparison of data from 2022 to mid-2023 found significant reductions in readmissions among patients treated through the program compared with those who were not enrolled. This highlights how the program effectively reduced readmissions.

The program also had beneficial effects in all the clinical specialities promoting the widespread of use of such programs in multi-speciality hospitals. This improvement in clinical outcomes, patient satisfaction and retention visibly seen in all the clinical specialities underscore the fact that the usage of care continuum should not be limited to certain specialities.

It also had a positive effect on employee workload, with 90% of staff reporting that their time could be spent more efficiently. The improvement was due to increased collaboration among healthcare workers and reduced paperwork because they used digital technology. However, 10% of employees thought that training and awareness can be improved indicating areas where targeted intervention could prove effective.

According to the study, this digitized care continuum results in higher levels of patient satisfaction and clinical outcomes, productivity growth among staff as well as lower readmissions. To ensure optimal results, it is also crucial to continue training and customization while generating buy-in from staff members. On the basis of the preliminary results, future work should center on long-term benefits and be extended to other geographies with additional personalization and augmented training aimed at maximizing patient care quality.

LIST OF ABBREVIATIONS

AI	Artificial Intelligence
APN	Advanced Practice Nurse
CDSS	Clinical Decision Support Systems
COPD	Chronic Obstructive Pulmonary Disease
CRM	Customer Relations Management
CSAT	Customer Satisfaction Score
CSV	Comma Separated Values
CT	Computed Tomography
DCC	Digitized Care Continuum
DICOM	Digital Imaging and Communications in Medicine
EHR	Electronic Health Records
EMR	Electronic Medical Records
FCC	Follow-up, Care, and Coordination
FHIR	Fast Healthcare Interoperability Resources
GPDR	General Data Protection Regulation
HIV	Human Immunodeficiency Virus
HIPAA	Health Insurance Portability and Accountability Act
HL7	Health Level Seven International
HRB	Health Related Behaviour

IBM	International Business Machines Corporation
IDS	Integrated Delivery Systems
IRB	Institutional Research Board/Committee
ICU	Intensive Care Unit
IML	Interpretable Machine Learning
LMIC	Low and Middle-Income Countries
MDS	Myelodysplastic Syndromes
ML	Machine Learning
MRI	Magnetic Resonance Imaging
NCD	National Coverage Determinations
NLP	Natural Language Processing
NPS	Net Promoter Score
PCFFC	Patient-Centered Family-Focused Care
PROM	Patient Reported Outcome Measures
R&D	Research and Development
SDM	Shared Decision Making
SVM	Support Vector Machines
TB	Tuberculosis
WFO	Watson For Oncology

TABLE OF CONTENTS

LIST OF TABLES

List of Figures

CHAPTER 1:

1. INTRODUCTION

1.1 Introduction

Health is wealth and prevention is better than cure. However, humans in general give the least priority to health and wellness thus ending up in illness. Once hospitalized, the patient undergoes various treatment modalities under Medical or Surgical management and eventually gets discharged. Hospitals have adopted highly efficient patient care processes during the hospitalization but lack control and access into the patient's health updates and outcomes once the patient is discharged from the hospital.

Most patients are discharged with very specific medications for follow-up, or in some cases no prescription. After a period of time, the patient will be asked to come in for a follow-up visit at hospital. According to Baker et al. (1998), the comprehension of a patient with follow-up treatment will determine their course towards healing or relapse, more complications, disabilities and at times even death.

To ensure delivery of quality care and better clinical outcomes for the Hospital, it is essential that care management and coordination should be focused not only during hospitalization but also post discharge from the hospital. Discharge interventions were further divided into 3 domains (Hansen et al., 2011) including pre-discharge interventions (e.g., patient education, medication reconciliation and discharge planning), post-discharge intervention (e.g., follow-up phone calls, timely ambulatory follow-up – post discharge care) and bridging interventions (such as transition coaches by physicians through inpatient to outpatient continuity) with each domain representing different aspects that can potentially have an impact on reducing rehospitalization risks.

Thus, Care Continuum is an integral part of the patient journey that not only improves patient satisfaction, improvement in quality of life and clinical outcomes but also reduces complications, costs, and re-admissions. The study by McBryde-Foster & Allen (2005) found that the concept of a continuum of care had discernible characteristics. However, this study mainly focused on chronic diseases and was limited to chronic disease management (such as Cancer, HIV, Stroke) and speciality areas like elderly care or maternity care where a continuum of care is widely implemented.

In another research conducted by Hu, J., Wang, Y. and Li X (2020) the main factors that were found are (a) continuity of care; (b) relationship factors on how an individual patient engages with their medical team using various capabilities to share information on their health state with them over time; (c) information transfer including sharing relevant clinical data between different people within each person's healthcare environment through interactions mediated by a set of communication services such as messaging platforms or discussion forums; (d) coordination by making it easier than ever before possible via integrating these new methods together and (e) comprehensive systems adapted specifically toward understanding evolving needs. However, acute care is usually left out of the scope of most care continuum programs and in many cases are little studied.

The inpatient journey in a care continuum system is beautifully captured in Figure 1 where the follow-up calls and remote monitoring becomes an integral part of the discharge process. Post discharge care and continued follow-up visits along with proper patient education and medication reconciliation closes the loop.

According to Dadosky, A. et al. (2018), utilizing post-acute tele management could potentially lower rehospitalization rates, even among high-risk elderly populations with heart failure. However, mostly the acute conditions are not covered under any care continuum program and are not seen being part of any major research works. Past studies were primarily focused on limited chronic conditions and follow-ups were done mostly using human involvement. Only limited progress has been made on applying the program to other acute medical conditions like Orthopedic surgeries, Cardiovascular procedures, Neuro procedures, Otolaryngology, General Surgeries, etc. Thus, vast majority of patients undergoing general procedures in multi speciality hospital settings have been neglected. Information exchange between providers and patients also has been found to be lacking.

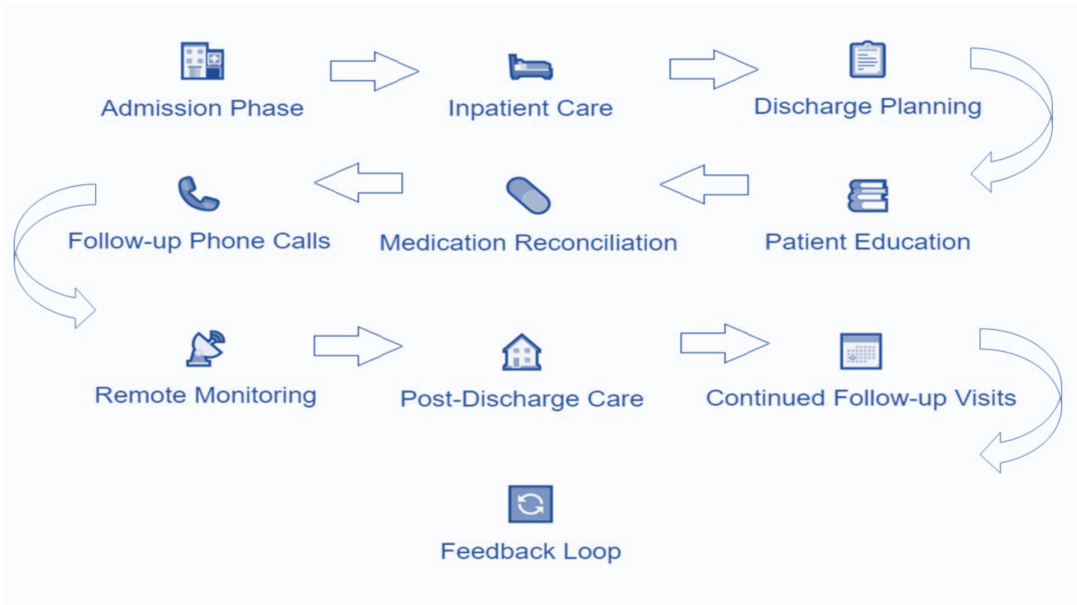


Figure 1:

Inpatient Journey in care continuum

Tang, N., Fujimoto, J., and Karliner, L. (2014) noted in their research that differences in patient characteristics between those contacted and not contacted significantly influenced attendance at follow-up appointments and readmission risk. Missed appointments primarily included patients who were marginally housed or facing psychosocial challenges, hindering practice nurses' ability to reach them.

The care coordination at different stages has been captured in Figure 2 where the older patients were assessed before pre-admission, during hospitalization and post discharge. Assessment before admission was conducted to identify the risk factors and classify the patients accordingly. During hospitalization prior discharge, proper readmission risks were assessed, and focus was given to patient education and medication reconciliation. Home tele-monitoring, scheduling follow-up visits and telephone communication were done post discharge to improve the care continuum.

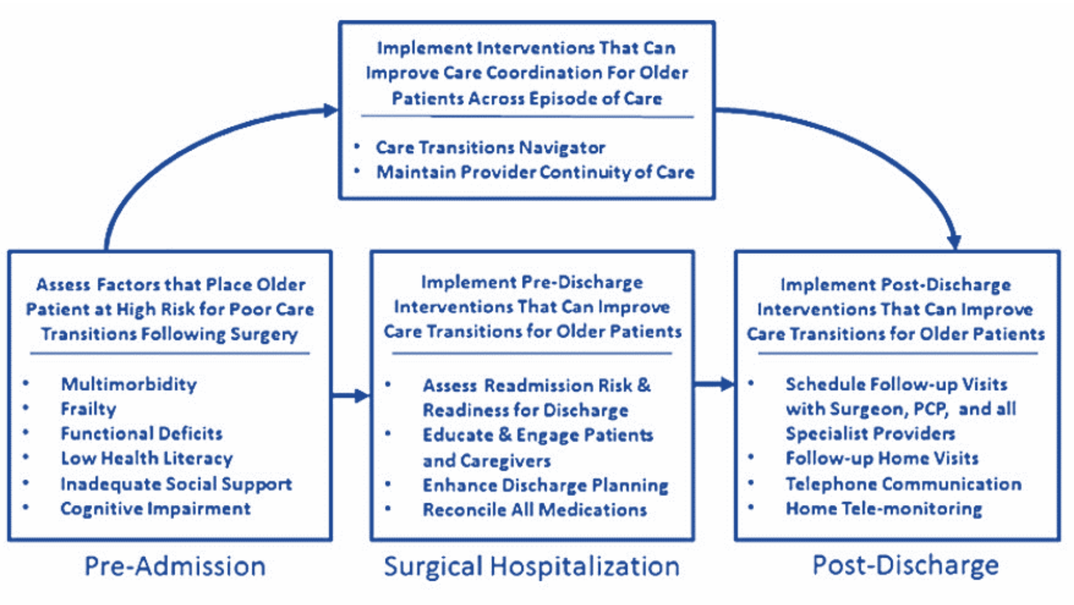


Figure 2:

Care Coordination at different stages in a surgical case (SpringerLink - Brooke, 2019)

As the Anatomy of every patient is different and the treatment modalities for the same condition and the post discharge care or follow-up differs based on various parameters, it is essential that there should be customized care continuum program for every patient. According to Tang, N. et al. (2014), the design of the nurse phone call intervention was intentionally broad, as it addressed a variety of medical and nonmedical needs that could be apparent after discharge; but such comprehensiveness made patient interactions lengthy. Volpp, K.G. and

Mohta, N.S. (2016) noted that an increased attention in leveraging machine learning and business rules engines to advise focused interventions across the care-delivery spectrum.

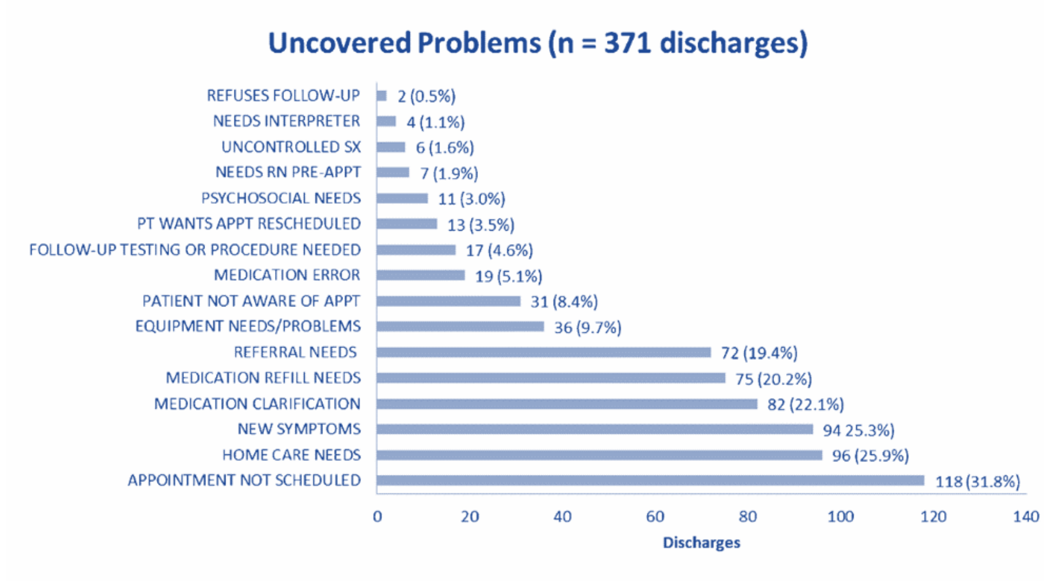


Figure 3:

Type of problems uncovered in post-discharge phone call (Tang et al. 2014)

The above Figure 3 indicates the types of patient problems or needs discovered during post-discharge calls in a study by Tang et al. (2014). The most common major unmet needs identified were non-scheduling of appointments, home care requirements, new post-discharge symptoms and medication reconciliation/refill needs followed by subsequent referral requirement out-of-system need support. During the study, needs other than medical emergencies were identified (e.g. equipment, psychological and clarification for Medication errors). This study unequivocally proves the importance of such post discharge calls given that a sizeable percentage of patients wishes to avail these requirements.

With this kind of data being captured and the customization that went into creating these algorithms, the output to be evaluated post discharge would have been voluminous demanding more workforce. AI driven digital care continuum platforms support both the customization & call sequencing capabilities with better view of call logs and follow-ups needed and hence it reduced reliance on workforce. Patient engagement and adherence (Davenport, T. & Kalakota, R., 2019) has often been described as the ‘last mile’ problem of healthcare – that is what differentiates between ineffective health outcomes from good ones. The more that patients are activated to take an active role in their own health and care, the better — utilization, financial outcomes and experience. Big data and AI are solving these factors.

The healthcare industry has been transforming rapidly over the past few years and digital technology is allowing it to incorporate new innovations more effectively into those systems. Healthcare services have become digitized, making it possible for different healthcare providers deliver good quality care to their patients and also reduce the stress behind filling manual form as ease of service provision has improved. One of them is to roll out a digitized care continuum program at hospitals. AI driven digitized care continuum program used for customization, call sequencing, call logs and follow-up action to be managed efficiently thus reducing the dependency on workforce.

Artificial intelligence or digitized systems has already become a powerful tool in health care with many applications as shown in Figure 4. It has been able to bring in a wave of change with disease diagnostics, digital consultation and personalized treatment along side managing medical data as well as monitoring health. The data generated, ease of operations and better outcomes has led the healthcare administrators adopt digitized systems for their hospitals.

A care continuum program is designed to provide patients with a seamless, coordinated experience when they move from one healthcare provider and setting of care to another. The digitized version of care continuum programs further extend this by using digital technology to better deliver the model of care. The digitalized care continuum program in question specifically requires the institution of electronic health record (EHR) and post discharge patient- monitoring systems. EHRs facilitates quicker and more accurate access to patient information by health care providers which in turn leads to a reduction in errors & improved quality of care provided. Health monitoring systems help monitor patient's health condition from the distance, supporting on-time intervention and responsibility in case of any acute events or complications after discharge.

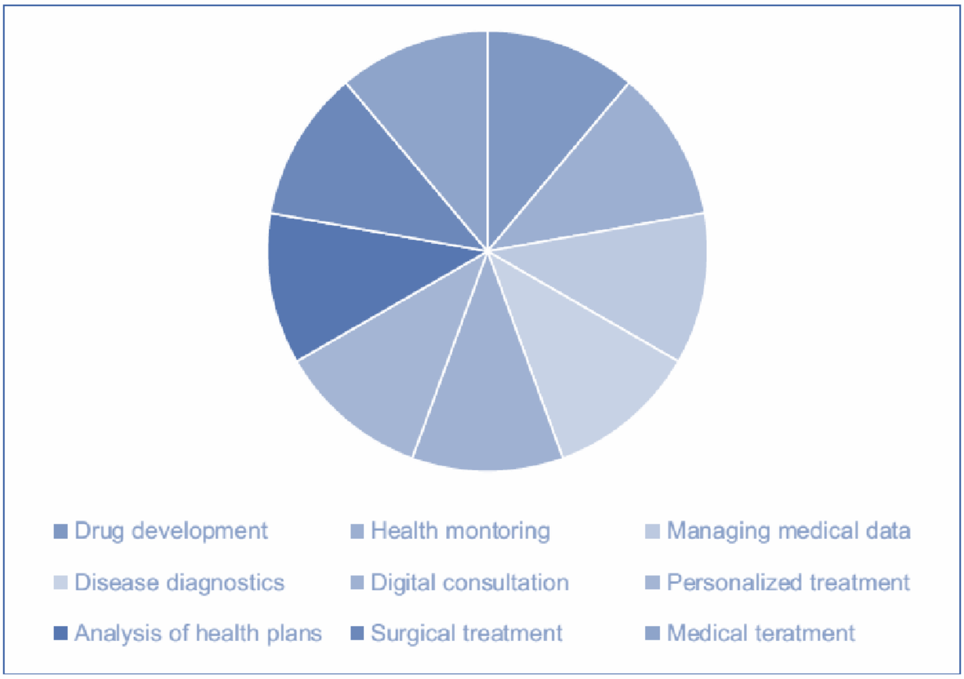


Figure 4:

Applications of artificial intelligence in health care (Amisha et al., 2019)

This study is investigating the effectiveness of a digitized care continuum program in a multi-speciality hospital, addressing the critical gaps in post-discharge care for both acute and chronic conditions. There are several reasons being hyper-focused. The post-discharge period is one such vulnerable phase, in which patients experience (1) major challenges related to medication adherence and attending follow-up visits or other specialist care, as well as inherent risks of developing complications. Not having a care continuum creates more problems, because it is hard to build trust in other providers to provide the quality of services that they can.

Historically, healthcare models have been focused on inpatient care primarily and when the patients exited a hospital there was often discontinuity. A digitized care continuum program will necessarily be focused on extending care management and coordination beyond the hospital walls. The approach combines EHRs with remote patient monitoring, ensuring a smooth hospital to home transfer without it disrupting the flow of care.

The continuum of care is well recognized for chronic diseases but neglected in research and program development related to acute medical conditions. This study aims to address this knowledge gap by evaluating a digitized care continuum program for management of acute conditions across multiple specialties seen in a multi-specialty hospital. The focus is on individualized treatment, understanding the anatomy of a patient and recognizing that different patients require various treatments.

Digital technology has had a revolutionary impact on healthcare, addressing inefficiencies in care delivery. Error prevention and outcomes improvement by Machine learning is increasingly applied along the care continuum. The digitalized care continuum program aligns with this trend, providing a novel and technologically advanced answer to post-discharge care hardships.

Figure 5 (Sunita Nadhamuni et al., 2021) demonstrates the power of digital technology or digitized systems in data analytics that help develop better patient outcomes. The data captured during the assessment as per NCD coding is pushed to the system where the Doctor updates the diagnosis. This status update triggers an alert for change event for new and old patients. The data is automatically validated with recent guidelines or clinical data pulled from different sub systems. Proper analytics and visualizations are created by the program with comparison of indicators across various systems. These processes not only reduce the human workload but reduce the data and statistical errors that aid the clinicians and healthcare administrators take timely decisions.

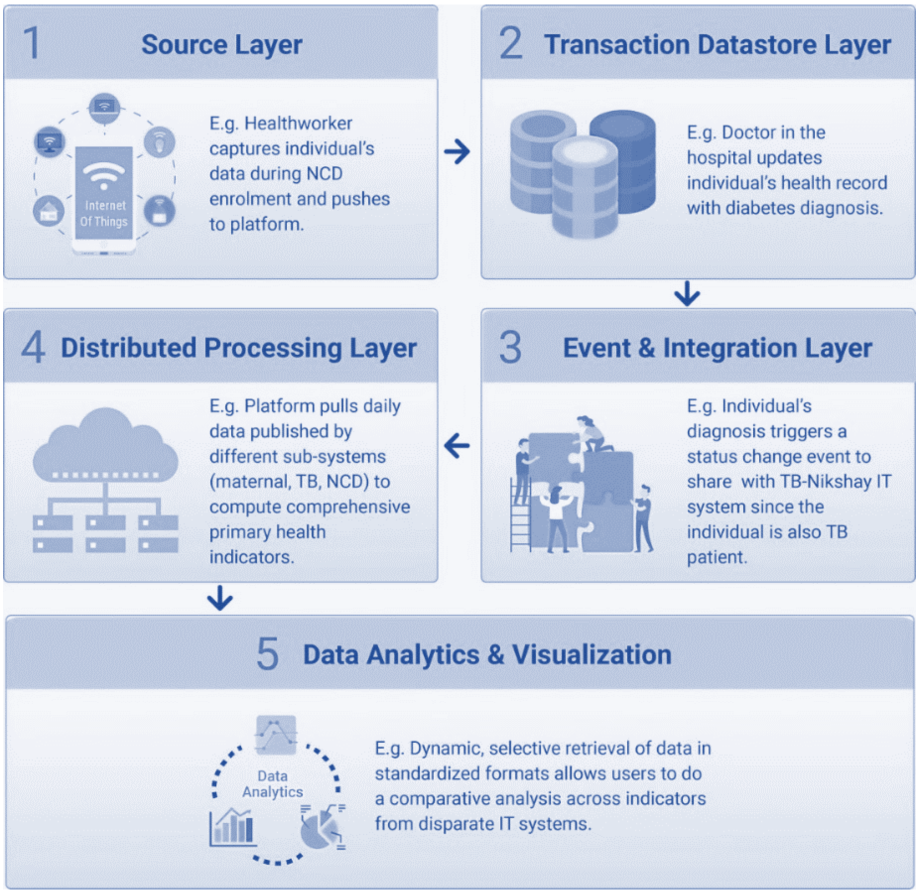


Figure 5:

Distributed Data Architecture for diabetic patients

The Figure 6 outlines admissions that are planned, direct transfers (through prior planning), emergencies and represents how important care planning is from admission. Hospitalization care is reviewed and discharge process/hand over is optimized. The follow up activities will be based on the initial plan of action prepared through the program.

The current trend of patient-centered care focus to recognize that the patients are active in their health status. As such, patient engagement and adherence are viewed as essential to good health outcomes. The answer is a digitized care continuum program, which not just solves the 'last mile' problem but allows patients to play an active role in their healthcare surpassing outcomes/utilization/experience markers.

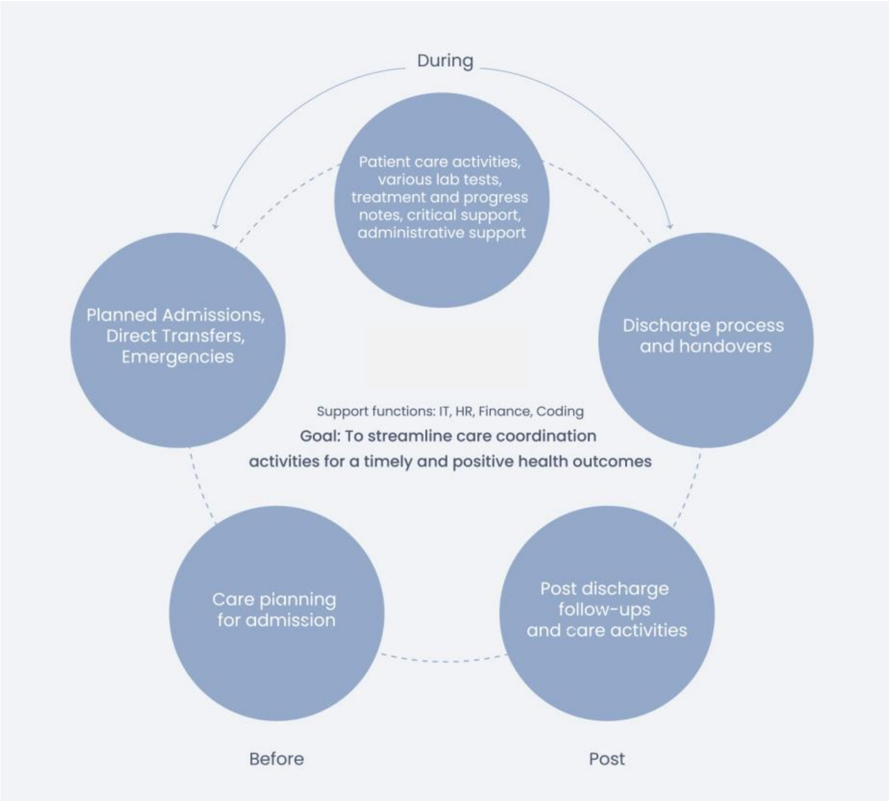


Figure 6:

Care Coordination for positive health outcomes (Source: www.Taliun.com)

Not only does a successful digitized care continuum program benefit the patients and caregivers who use it directly, but providers also have much to gain from leveraging this approach toward improving both patient experience and overall system functionality. The cost saving from a lower number of complications, readmissions and related costs can impact the financial viability of the hospital. The greater the loyalty and retention of patients, particularly those with complex healthcare needs requiring ongoing treatment from multiple specialists, the better a hospital's reputation as well as its ability to compete.

This study uses a mixed-methods design, combining quantitative and qualitative methodologies. This full-scale review includes analysis of patient records, hospital data provider questionnaires and interviews. The results of the digitized care continuum program in a multi-speciality hospital setting involved, based on its potential efficacy across settings could serve as an example for imitation or influence further evidence saving and implementation at other healthcare institutions resulting an overall betterment in quality of health delivery.

This study will give a glimpse of evidence how much effective a digital care continuum program in a hospital for patients with acute & chronic conditions. The research will assess whether the program influences patient outcomes, patient satisfaction and hospital efficiency. Moreover, the benefit to both patients and care givers will be measured in term of medical and social gain. This study will enable the healthcare providers improve strategies for patient loyalty and retention along with reducing complications and readmissions.

A combination of quantitative and qualitative data collection will be employed in the study which represents a mixed-methods approach. Quantitative data will involve evaluation of patient records and hospital data. This study will involve the collection of qualitative data via interviews with healthcare providers and patients.

The results of this study will also serve the healthcare providers in improving patient loyalty and retention as well providing them with a tool to address critical issues such readmissions and complications. Implications of this study can help implementation of similar programs in other hospitals. This study can be used as a blueprint for positively improving patient outcomes while increasing patient satisfaction and hospital efficiency.

1.2 Research Problem

The rising tide in healthcare is making it very evident that it needs innovation to fix problems and create novel solutions for care. Artificial intelligence (AI) or Digitized systems is one of the new technologies can be helpful in healthcare. While the full roll out of digitized systems is yet to be realised, it is clear that it will greatly improve multiple areas in healthcare; saving precious time and getting efficient results. The integration of digitized systems can provide truly remarkable support for clinical applications and beyond making care protocols and strategies even more distinguishing from an operational perspective. Today digitized systems are in use across health plan, medication adherence, and health system enterprises demonstrating the capabilities of this technology.

As integrated, global and secure data systems continue to pave the way for a new era of AI-based digitized services that promise to influence every aspect of analytics and insights at work. This transformation would allow businesses to generate an instant decrease in costs among other economic gains, providing grounds for even further advantages as organizations deploy digitized synchronization within their offerings and habits.

Figure 7 displays the different stages of care where advanced digitized or AI based systems are applied with a variety of applications portfolio from cognitive care to cure solutions. AI or digitized-based care continuum has the potential to revolutionize the way healthcare is delivered by providing timely and accurate diagnoses, improving treatment plans, and reducing costs. The goal of a care continuum program in a hospital setting is to reduce the disease burden, lower re-hospitalizations and improve patient satisfaction and retention. While the hospitals are dealing with a variety of disease conditions, the care continuum program is exposed only in a few departments. Hence, most of the previous studies were focused either on chronic conditions or in very few acute conditions.

Comprehensive studies involving care continuum program covering all the clinical departments in a multi-speciality hospital are very limited in number. In addition, most of these studies relied on human involvement in data collection, customization, sequencing, follow-up, and feedback collection. Mostly Microsoft Excel, Microsoft Word, CRM tools, etc. were used which made the process very laborious.

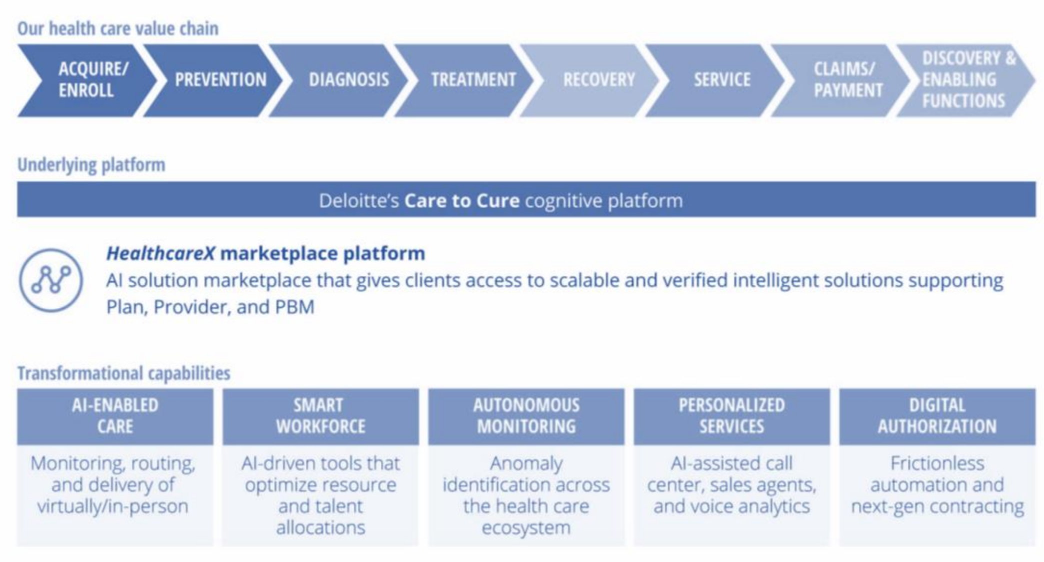


Figure 7:

Cognitive Care to Cure solution and healthcare value chain (Source: Deloitte)

Consequently, the research question on the improvements in patient outcomes using AI or digital-enhanced care continuum is of utmost importance. To investigate the efficacy of utilizing digitized systems for better patient care and outcome, explore challenges associated with deploying these solutions in healthcare, potential risks and ethical concerns around using digitized systems to optimize quality of health delivery especially care continuum. The results of this research will help in exploring the advantages and limitations related to digitized care continuum, which can then be utilized by healthcare professionals for making better strategic decisions before implementing such systems.

As the anatomy of each patient is different, the disease conditions may vary impacting the onset of post discharge complications. As this is highly person dependent, it requires customized or structured follow-up with standardizations based on the disease. An AI or digitized driven system can reduce human errors or oversights. However, the effectiveness of the use of AI or digitized driven care continuum program was not performed in any of the major studies in a multi-speciality hospital setting. This research will fill the gap and focus on the effectiveness of a digitized system covering major clinical departments in a multi-speciality hospital.

1.3 Purpose of Research

The study aims to determine the efficacy of a digital care continuum program in enhancing patient outcomes and healthcare quality in a multi-specialty hospital. This study explores how a digitized care continuum program affects patient satisfaction, hospital readmissions and patient retention. The study will also explore the implementation barriers and facilitators in a multi-specialty hospital, for an integrated care continuum program. This study will evaluate care continuum program over digitized driven versus manual process of a multi-speciality hospital.

The main purpose of the study is to:

1. Establish the effectiveness of a care continuum program in reducing the re-admissions post discharge.
2. Determine the improvement in patient satisfaction levels from an effective care continuum program.
3. Determine the effectiveness of a care continuum program in improving patient retention and loyalty.
4. Determine the importance of a care continuum program in a multi-speciality hospital.
5. Assess the improvement in employee satisfaction levels of digitized care continuum system.

The results of this study may have implications for hospital administrators, policymakers, and healthcare providers on the advantages to digitized care continuum programs as well as how best to navigate some challenges during their implementation.

1.4 Significance of the Study

Preliminary literature reviews show that past studies were primarily focused on limited chronic conditions and mostly using human involvement. Only limited progress has been made on applying the program to other acute medical conditions like Orthopedics surgeries, Cardiovascular procedures, Otolaryngology, General Surgeries, etc. Thus, the vast majority of patients undergoing general procedures in multi speciality hospital settings have been neglected. Information exchange between providers and patients also has been found to be lacking.

There is a pertinent evidence-based example of the linkage between continuity with patient satisfaction from studies conducted by Mechanic (2005). According to Béland (1989), some patients begin non-adherent behaviour or disengagement from care of responding to discontinuity in practice mode. As noted by Dietrich and Marton (1982), the link from continuity of care to clinical outcomes requires more exploration of data. As per Naithani et al. (2006) and Christakis (2003), better continuity may also improve efficiency and reduce health care costs by reducing the need for over-investigation, that would entail further tests being requested or scans and referrals.

For example, in a study led by Saultz and Albedaiwi (2004) findings clearly suggested that family caregivers were more satisfied with nursing care as offered under the treatment provided by with Advanced Practice Nurse-directed management than novice and expert by experience nurses. Key stakeholder views on the benefits of APN practice were a common theme throughout the findings.

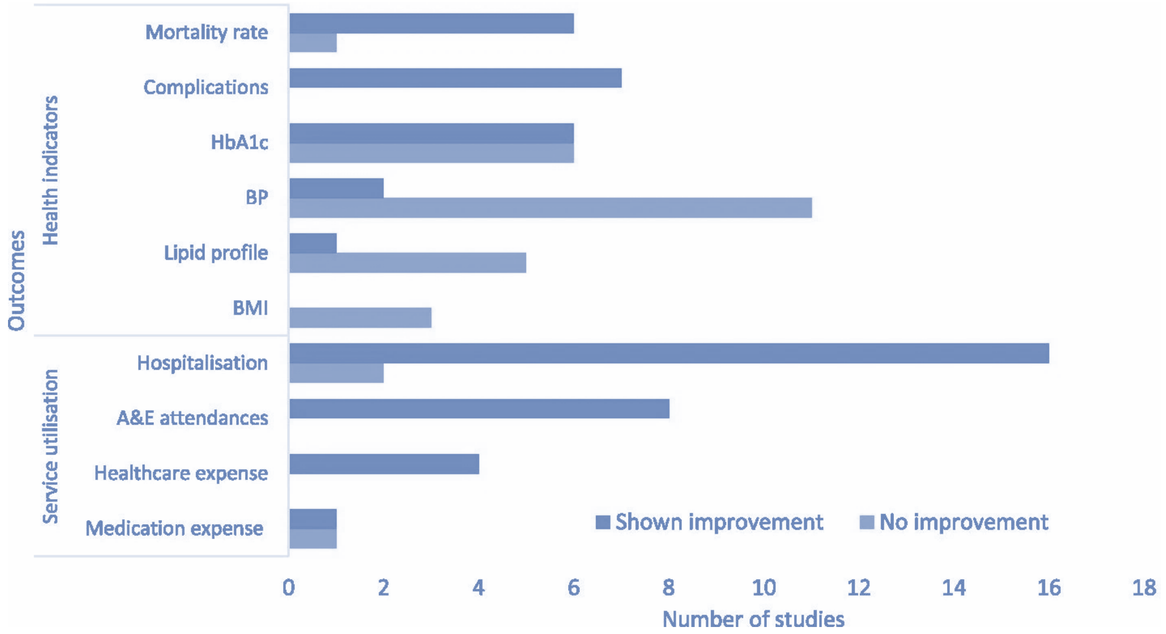


Figure 8:

Continuity of care on various outcome measures in various studies

According to the study by Chan et al. (2021), continuum of care reflects the various positive influences such as increased service utilization (hospitalization rate, attending costs and health services) along with some health indicators (Figure 8). Positive outcomes of the program included fewer deaths and complications.

In fact, a study done by Jeangsawang et al. (2012) showed significant reductions on both 1-month and repeated (3 months) hospital admissions via the implementation of targeted program.

Another study by McDonald et al. (2001) completed a review of the occurrence, severity, preventability, manageability of adverse events post-hospital discharge and devise strategies to improve patient safety during this period.

A secondary study Forster et al. (2003) was conducted to establish the incidence and severity of adverse events affecting patients after hospital discharge to identify avoidable harm. The primary outcomes focused on three aspects – adverse events defined as injury resulting from medical management; preventable adverse events, defined as adverse events in which the injury was caused by a medication error; ameliorable adverse events or those of moderate to serious severity and preventability. The patients' course of recovery after discharge was evaluated via medical record review and structured telephone interview at approximately 3 weeks following their hospitalization. Outcomes were defined by independent physician adjudication. Adverse events were common in the peri discharge period, many of which could possibly have been avoided or managed by simple strategies.

The detailed literature review clearly demonstrates the importance of care continuum programs, especially post discharge care. The complexity of the disease burden and the necessity to avoid complications post discharge have been the focus area of many studies. Any complications post discharge may lead to readmissions and significantly affect the mental and physical state of the patients in addition to the cost impact. Various studies presented in this review clearly indicated that an effective care continuum program can clearly bring a difference in terms of patient readmissions and satisfactions. The various indicators required for proper assessment of care continuum program were evaluated by few studies by involving integrated care pathways.

Although there has been more thorough development of integrated pathways for different patient conditions, manual interpretations demonstrate only modest efficiency. The variety of these different conditions make the algorithms to manage these complex situations a possibility only through some machine learning. Despite the possibilities, there is limited application to properly judge these other new health technologies in care continuum programs. Even when digital tools are available, patients face challenges to use them effectively as they may lack access or skills. The follow up calls by counsellors / facilitators often fail to address all psychosocial aspects, necessitating better training for this role and strategies for dealing with a wide range of medical (and non-medical) issues. These concerns also reveal the need to use automation like machine learning tools and artificial intelligence, to offset human errors and biases when overseeing overwhelming and complex care continuum pathways.

At this point, the evidence is mixed concerning the effectiveness of an AI driven care continuum program and, therefore, the usefulness of such a system in reducing the post discharge complications and readmissions. Moreover, most of the studies were focusing only on the chronic conditions completing neglecting the acute conditions that constitute a major chunk of the medical conditions. Most of the studies were not able to provide effectiveness of a care continuum program in a multi-speciality hospital setting but focused only on certain specific medical conditions like heart failure, stroke, HIV, etc. There are always possibilities of complications arising out of acute cases that may lead to readmissions thereby impacting the patient satisfaction. By focusing on a care continuum program that comprehensively covers both acute and chronic conditions, the overall effectiveness can be measured. By involving an AI driven system can really help in dealing with the volume of patient data, customization, and parameters to be evaluated.

The proof illustrates the limitations of manual systems to address the problem and lacklustre efforts in tackling one of healthcare hardest challenges which is to close the healthcare last mile gap of the final hurdle standing between poor outcomes or good. Although attempts have been made to assess the effectiveness of care continuum, most of the models have focused only on outcomes while few have stressed on satisfaction. Few studies relied on pathways in preventing complications while some focused-on well-being. Consistency in applying the outcomes like readmissions and patient satisfaction is not visibly seen in many studies which clearly indicate the need for additional research.

Detailed literature review suggests that most of the studies have concluded with an overview and summary of the existing research, along with suggestions for future study requirements and dispositions. While using the fundamental approaches used by various studies, a comprehensive assessment of the effectiveness on an AI driven care continuum system in both acute and chronic conditions can really help the healthcare domain in effectively driving such programs that will not only help patients but healthcare providers as well.

Presented literature will contribute to overall concepts and this particular research is envisaged to bring in better understanding of the challenges of care continuum program and the effectiveness of an Artificial Intelligence system in bridging the gaps.

The positive consequences of a good care continuum program will be to decrease hospital re-admissions, reduction in costs, improve patient satisfaction, etc. as illustrated in Figure 9. Pursuing similar outcomes, this study could open doors for healthcare providers to focus more on the continuity of care in a simplest manner. In addition, the study can help identify the role of such a system in ruling out any possible risk factors, identifying complications early and alleviating growing issues, thereby helping patients out of the hospital. Study's findings can prove the effectiveness of the AI driven system in reducing readmissions that can have significant financial benefit to patients as well as to healthcare providers.

In recent times where employees deal with a lot of stress by managing enormous data, the study can contribute to the understanding that a digitized system can provide to the employees by reducing the load. The outcome of the study will point towards the use of continuity of care in acute conditions in addition to the chronic cases in a multispecialty setting.

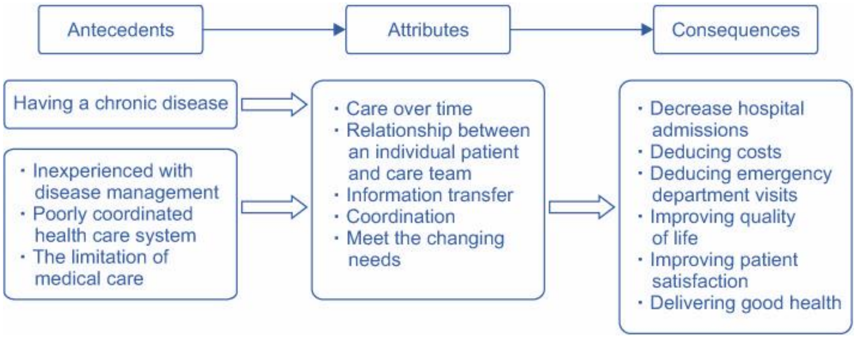


Figure 9:

Concept diagram of "continuity of care" (Hu et al., 2020)

For the researcher, the study will uncover gaps in the manual process involved in continuity of care that many researchers could not explore. Thus, a new, simpler and more effective method of Care Continuum may be arrived at. Above all, any such risk factors or complications can result in loss of life which can be prevented by early intervention.

1.5 Research Questions

The following research questions will serve as guidelines for the achievement of the stated objectives of the study. These include:

1. To quantify the effectiveness of a Digitized Care Continuum system by measuring patient satisfaction and assessing the reduction in re-admissions over a 6-month period.
2. To evaluate the effectiveness of a Digitized Care Continuum system in a multi-speciality hospital by measuring staff satisfaction.

CHAPTER II:

REVIEW OF LITERATURE

2.1 Significance of digitized systems in healthcare

The impact of AI or digitized systems is great in healthcare as it can change the way how the treatment is provided. A key area in which digitized systems can be transformative is improving diagnosis and treatment. Digitized technologies specifically machine learning and deep neural networks can examine through vast amounts of medical data such as patient records, images from various modalities or genetic details. This way, digitized systems can help healthcare professionals interfere with diagnoses through precise analysis in a timely manner and recognize trends to offer clinical decision assistance. This is how digitized systems help to give better diagnoses and individualize treatment strategies improving patient outcomes.

According to the study conducted by Davenport, T. and Kalakota, R. (2019) on the potential for artificial intelligence in healthcare, AI is not one technology but a collection of them. The plethora of these technologies are relevant for healthcare, where they all serve different processes and tasks. This study scrutinizes with great detail how AI is revolutionizing healthcare, and it includes ways to increase diagnostic accuracy, transform treatment plans as well as optimize patient care. AI helps healthcare professionals make more accurate and timely diagnoses in examining the vast amount of medical data, leading to better patient outcomes as well as resource optimization. Additionally, the study explores some of the challenges and risks in integrating AI within healthcare systems such as data fidelity, algorithmic bias reduction strategies and potential workforce implications. It examines ethical issues such as privacy of data, consent for use and retaining human oversight in decision-making processes that are now AI enabled.

This can be best inferred from the study by Panch et al. (2019) which cites the power of digitized systems. As per this study, health systems either drastically lower their expectations with respect to what digitized systems can do in everyday clinical work or they take on the challenging areas of data ownership and trust investing in the required infrastructure. The growing adoption of cloud computing in the wider economy is shrinking the computing gap, which presents a special chance to radically transform population health and enable digitized systems to fulfil its promise.

Digitized systems also help in predicting and preventing patient deterioration which allows for faster detection of high-risk patients, responds to them quickly thereby enhancing the overall care provided by healthcare providers. In real time, AI algorithms can analyse patient data to automatically intervene well in advance of an adverse event; this may not only help prevent downstream hospital readmissions but reduce overall health care costs. The use of this data not only improves patient safety but also the quality and organization as a whole.

A review paper by Jiang et al. (2017) also gives a comprehensive insight into digitized system use cases in healthcare. Brief introduction to the reasons of using AI in healthcare, discussing all types of healthcare data suitable for exploitation with AI and providing a survey across major diseases being already impacted by application of artificial intelligence. This paper illustrates key categories such as Machine Learning (ML) and Natural Language Processing (NLP). To this end, the authors address classical machine learning models (e.g., Support Vector Machines (SVM), and neural networks) as well state-of-the-art deep leaning based alternatives in context of IML. The article also provides and in-depth look at AI applications for stroke care.

Authors emphasize the extreme importance of an AI system that is both efficient on account of containing ML and NLP elements, as well being rigorously trained with empirical evidence from healthcare data points. The system only then assists the physicians to predict a disease and provide medical suggestions. The above article reveals the work of IBM Watson emerging in this area with its ML and NLP modules offering positive results, especially associated to oncology. It specifically claims a 99% accuracy rate in matching decisions of cancer treatment recommendations to those from the physician. The article also talks about Watson's ever-deepening ties with Quest Diagnostics to provide clinical decision support via AI Genetic Diagnostic Analysis. One of the impressive achievements is secondary leukaemia originating from myelodysplastic syndromes (MDS) in Japan, a rare complication found through genetic data analysis system.

According to Somashekhar et al. (2017), IBM Watson for Oncology (WFO) is an initiative towards personalized medicine. The study emphasized that WFO needs to be considered only as a helping tool and it cannot substitute the irreplaceable patient doctor relationship, so crucial in cancer patients care. Finally, WFO will become a trusted artificial intelligence tool for each cancer center and its multidisciplinary tumour board which will help in improving the quality-of-care practice across oncology.

Dilsizian and Siegel, (2014) examined another investigation, which hypothesizes that artificial intelligence (AI) with combined techniques of machine learning will assist in making a preliminary differential diagnosis of diseases as well identifying possible treatments along with proposed procedures or processes suggesting interpretation models for physicians to decipher medical image. Big data is now being used to mine and analyse healthcare information, which will not only move clinical research into the digital world but may also permit that diagnostic and therapeutic recommendations be based on empirical evidence in real-time. High performance computing related to fast access and advanced analytics applied on large-scale healthcare databases will continue to power the ability to deliver personalized medicine.

There had been a lot of advancement in the field of medical imaging and radiology through AI technology. These days, deep learning algorithms take an indispensable part of medical image analysis such as reading X-ray, CT-scans and MRIs thereby assisting detecting or diagnosing numerous diseases like cancer (lung early light stage), heart conditions or a range of cognitive problems. Artificial Intelligence has helped make the image reading process much faster and accurate by enabling AI models to recognize patterns from millions of images. The technology aids radiologists in providing an extra layer for greater accuracy while also enhancing their efficiency, allowing them to detect anomalies more quickly which means they can treat patients with critical conditions sooner than before.

According to a study by Yousef Shaheen (2021), Artificial intelligence (AI) is being deployed significantly in healthcare, as it modernizes the enterprise and ordinary action. Healthcare is a field where artificial intelligence can give many benefits to the institutions and patients, starting from treatment efficiency up to administrative aspects. Most AI and healthcare innovations have applications in the health sector, although they serve as typologically distinctive strategies. However, even though some of the AI in healthcare literature boasts that it can equal or improve upon human abilities (especially diagnoses), a wide range of physicians and other medical jobs will not be replaced by late-stage machine learning models for many years. Yet, until now AI is still a nascent discipline within healthcare. Ongoing research keeps pushing the envelope for even bigger developments in years to come for several sectors. The healthcare sector is one of the fastest in digital transformation, and AI/intelligent machine-learning solutions can lend a significant hand given that amenities are key to patient quality-of-life improvements.

The research work focuses on the technologies that are used to predict, understand, learn from and act upon tasks in modern healthcare through how Artificial Intelligence is changing or revolutionizing health. It has applications from discovering new links in the genetic code to monitoring surgical aides. It could identify patterns so subtle that they might evade the naked eye of a human beings. Accordingly, the paper explores and discusses various modern applications of AI in healthcare space essentially with respect to three core subjects: (a) AI-based drug discovery, (b) clinical trials and (c) patient care. This is clear in the results that pharmaceutical companies are using AI to shorten drug discovery and target identification. In addition, AI can streamline many laborious data monitoring techniques. The research also explains that AI-enhanced clinical trials are not only able to deal with large data but as well can get perfectly accurate results. The clinical intelligence focuses on providing actionable insights to enhance the quality of life while medical AI firms target to assist patient at various stages.

AI innovations in the four healthcare delivery areas as conceptualized by Reddy et al. (2019) is given in Table 1 below:

Table 1:

Application of AI Techniques in Healthcare

Machine Learning/ Deep Learning	:	Personalized Medicine, patient record management and information retrieval, patient monitoring, drug discovery, infectious disease surveillance
Natural Language Processing	:	Virtual Health Assistants, Note taking and transcription
Expert Systems	:	Knowledge based and non-knowledge based CDSS, prediction, diagnosis, and treatment of medical conditions

Computer Vision	:	Radiological and Histopathological image analysis
Robots	:	Elderly care, end of life care, robotic surgery, emergency medicine

In the study, the authors mention that this list is by no means a comprehensive list of AI innovations in the four healthcare delivery areas they have focused on, but it already suggests many potential capabilities of AI to automate and improve healthcare delivery. AI applications can extend beyond these healthcare delivery areas. Machine learning has been used to accelerate drug development and its entry to the market. AI has been used for syndromic surveillance to spot emergence of disease outbreaks and to predict outcomes for critically ill and cancer patients. AI has been used to reduce and, in some instances, eliminate tests thus reducing costs for health services. Perhaps the greatest potential is in the use of Robotics. Several types of robots including mobile autonomous, industrial and educational robots are being used in the health system.

Hence, considerable investment and research is occurring to develop humanoid robots because humans may feel less anxious in the presence of robots that look like humans. Development of realistic looking humanoid robots or computer-generated virtual health assistants may accelerate the incorporation of AI in healthcare. At this stage, human surgeons drive surgical robots, and many are still only sophisticated manipulation devices. However, there is much optimism about developments in the field of 'autonomous surgery' and it is not hard to foresee routine and minor surgeries led by robots in the future. They also mention about the rapid advances in AI research and the resources being provided by governments and industry make it highly likely that AI will be used extensively in healthcare delivery and there is immense potential for cost-saving as well as service quality improvement.

Bohr and Memarzadeh (2020) argue that big data and machine learning are now transforming distinct aspects of modern life from entertainment to commerce all the way through healthcare. Netflix knows what movies and series you like; Amazon can predict consumer behaviour accurately or Google sees authentic search queries for diseases. The data can then be used to create detailed personal profiles, for behaviour analysis and targeted interventions as well as predicting healthcare trends. Artificial intelligence (AI) is frequently spoken of optimistically when it comes to the healthcare industry, as its implementation holds promise for great strides forward in everything from diagnostics and treatment. AI tools are considered to be here so as to support and enhance the ability of health workers instead of replacing them entirely. There are number of tasks (Figure 10) which can be optimized with the help of AI to save time for healthcare professionals to manage administrative work, clinical records and patient communications as well as additional support functions that include image analysis (e.g. X-rays), controlled medical device operations or continual monitoring a patient's health data, etc.

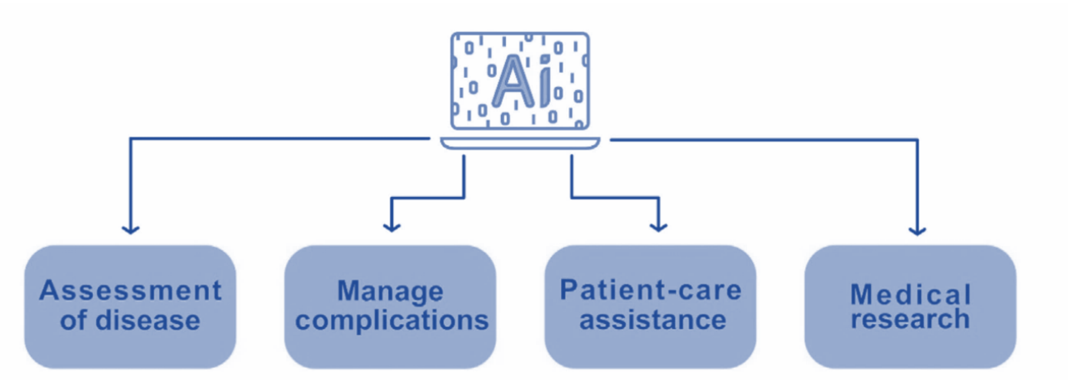


Figure 10:

The likely results that the AI-based systems produce

As the per the study by Guo and Li (2018), Medical AI technology not only could improve physicians' efficiency and quality of medical services, but other health workers could also be trained to use this technique to compensate for the lack of physicians, thereby improving the availability of healthcare access and medical service quality. This article proposes a multilevel medical AI service network, including a frontline medical AI system (basic level), regional medical AI support centers (middle levels), and a national medical AI development center (top level).

The study conducted by the Precise4Q consortium et al. (2020), explored the role of explainable AI in clinical decision support systems from the technological, legal, medical, and patient perspectives. Artificial intelligence (AI) promises to alleviate the impact of these developments by improving healthcare and making it more cost-effective. In clinical practice, AI often comes in the form of clinical decision support systems (CDSS), assisting clinicians in diagnosis of disease and treatment decisions. Where conventional CDSS matches the characteristics of individual patients to an existing knowledge base, AI-based CDSS's apply AI models trained on data from patients matching the use-case at hand.

As per Manne and Kantheti (2021), some of the important field in medicine is being used are treatment design, drug creation, skin cancer classification, MRI scans, assisted surgery etc. one important needs to be considered while using AI in medicinal field is strong data management. It is the primary step in revolutionizing healthcare. In healthcare industry, data of patients like their information, diagnosis information and new research findings are generated in massive volume each and every day. Using analytical data tools helped the organizations achieve the insights needed to collaborate effectively with patients, and take good decisions, and this can lead to benefits like hospital staff timing reduction, being able to remotely check patients. AI is helpful in doing repetitive jobs like analyzing tests, x-Rays, CT scans. The amount of time and data to examine in the fields of cardiology and radiology is some time complex and intense. AI presents them with an opportunity to only look at the typical cases in the future. The promise of AI in the health care industry is evidenced in the above study. AI is on its way to becoming more useful at many levels, which leads to better and faster patient outcomes. Artificial intelligence, machine learning, deep learning can help with proper care in assisting surgeries, diagnosing diseases like cancer at early stages etc. Some factors that need to be considered while doing research on AI are also mentioned in the above study. With the recent advancements in AI research, and with the help of support and resources from governments, it is highly likely that use of artificial intelligence in healthcare will grow extensively and there is immense potential for cost savings and improvement in the quality of service in healthcare.

With AI displaying its infinite potential, brighter days are ahead in achieving better patient outcomes through efficient healthcare delivery. Through the streamlining of various healthcare processes and automating administrative tasks, AI can directly improve workflow efficiency freeing up more time for the medical professionals. For instance, algorithms based on Natural Language Processing (NLP) may be used to pull critical content from medical records so that documentation can take place faster and with greater accuracy. In addition, AI driven chatbots and virtual assistants can take care of patients for assistance as per the need which include appointment booking or triaging thereby putting healthcare professional much more useful position to focus on their core work and spare a lot time.

The concept of precision medicine is another crucial part of AI contributions to the health sector. Combining data about genomes, clinical manifestations with artificial intelligence can help take precision medicine forward. Based on demonstrated knowledge of patients genetic profile, medical history and responsiveness to past treatments, AI is able determine the best in-class treatment strategy for an individual patient. This strategy customizes treatment for the unique combination of factors present in each patient, sparing those with socalled “bad” genetics from unnecessary treatments and providing a targeted tool against their malignant cells.

Dente et al. (2017) suggest that by determining the microbiological niches (biomarkers) in trauma patients, the healthcare experts could target these biomarkers for therapy to prevent subsequent wound infections. This additional insight might help those in health care to prepare for worst-case scenarios. Moreover, in a study by Hu et al. (2016) the authors reported that subjects with type 2 diabetes who may have severe complications (neuropathy) can be predicted using machine learning as well as earlier signs of cardiovascular irregularities. In addition, modelling to aid health care professionals in recognizing postoperative complications (e.g., infections) will make the system more efficient.

As reported by Schwalbe and Wahl (2020) many low and middle-income countries (LMIC) have been expanding their information technology infrastructure, sometimes with mobile computing capabilities; thereby providing hope in the ability to harness artificial intelligence for addressing health-related sustainable development goals. The challenge is how to justify AI-driven health interventions within formal decision-making processes, whether traditional tools methods and safeguards are appropriate when applied in AI technologies. AI implementation is already under way to tackle severe health burdens in LMICs, particularly where infectious diseases such as tuberculosis and malaria dominated. Standard techniques in the field are machine learning, including deep neural networks and signal processing for producing these AI technologies that can be used in health interventions. Various source separation algorithms are intertwined with machine learning or implemented in a same manner as signal processing techniques. The four primary areas of interest to global health researchers for AI-powered health interventions are diagnosis, assessment of individual risk or morbidity-mortality outcomes and prediction models in patients, forecasting/microbial tracking systems and public policy development/health planning.

However, much of the AI-driven intervention research in global health does not describe ethical, regulatory, or practical considerations required for widespread use or deployment at scale. Despite the field remaining nascent, AI-driven health interventions could lead to improved health outcomes in LMICs. Although some challenges of developing and deploying these interventions might not be unique to these settings, the global health community will need to work quickly to establish guidelines for development, testing, and use, and develop a user-driven research agenda to facilitate equitable and ethical use.

The study by Schwalbe and Wahl (2020) demonstrated the public health functions and associated types of AI in the above article which is given in Table 2 below:

Table 2:

Public Health Functions and associated types of AI

Applications	**Types of AI**	**Example**
Diagnosis	Expert system; machine learning; natural language processing; signal processing	Researchers applied machine learning and signal processing methods to digital chest radiographs to identify tuberculosis cases and drug-resistant tuberculosis cases
Mortality and morbidity risk assessment	Data mining; machine learning; signal processing	To quantify the risk of dengue fever severity, researchers applied machine learning algorithms to administrative datasets from a large tertiary care hospital in Thailand

Applications	Types of AI	Example
Disease outbreak prediction and surveillance	Datamining; machine learning; natural language processing; signal processing	Remote sensing data and machine learning algorithms were used to characterize and predict the transmission patterns of Zika virus globally
Health policy and planning	Expert planning; machine learning	Machine learning models were applied to administrative data from South Africa to predict the length of stay among health-care workers in underserved communities

AI also has a major position in data analytics and population health. AI can go through vast healthcare datasets that might reveal interesting insights, patterns of the disease and predictions on population health trends. This data-driven approach informs on public health strategies, disease prevention initiatives, and resource allocation results in better healthcare planning and policymaking. Hence, the importance of AI in healthcare lies in the value for improving accurate diagnostic, treatment decisions patient outcomes, healthcare delivery optimization and precision medicine. Incorporating AI technologies can revolutionize healthcare systems, making them more personal, sustainable and efficient. By allowing AI to run the show, providers can provide better care while also enriching people on both ends of healthcare.

2.2 Significance of Care Continuum

The care continuum is a broad concept in healthcare which refers to the range of services and interventions that patients receive over time, from initial diagnosis or referral through treatment and follow-up. It is systemic in nature, understanding that healthcare is not simply one-off incidents or engagements. The care continuously steps into the full range of services through prevention and early intervention to diagnosis, treatment, management. The broader spectrum leads to individual-centered support tailored throughout their healthcare journey.

Continuity which is one of the core features in a care continuum is important for providing seamless transitions between healthcare providers, settings and services. It puts an end to voids, overlaps and broken chain of healthcare delivery by providing continuous consistent quality care for patients with high coordination. Patients benefit from this continuity in the form of enhanced patient care management and is a critical aspect to improving health outcomes. Effective coordination among healthcare providers also contributes positively towards managing chronic conditions, reducing hospital readmissions, increasing medication adherence as well as improved satisfaction amongst patients.

As stated by Czerwonka et al. (2015), survivors of complex critical illness and their family caregivers need support post-ICU in adjusting to, recovering from, rehabilitating in this major life event/transition back into the community. However, it is unclear what type of support may be necessary in order to meet these requirements and how they might change with time. This qualitative pilot research sought to explore survivors, and their caregivers needs for care beginning at critical illness onset through recovery, across the Timing It Right framework. Supportive care needs of patients who survive complex critical illness, as well support required for their informal caregivers' may change over time from early in the intensive care unit (ICU) admission to after ICU discharge and transition through step-down or general ward transfer, rehabilitation services post-discharge and eventually home. There is a clear desire to understand the perspectives and needs of survivors, as well family caregivers in crafting an interventions directed at families rather than patient where might improve outcomes for both patients and their informal care partners.

Assuming an optimal situation, as described by Goldberg (2014), people ideally would migrate seamlessly between and among care settings in response to their evolving needs under the guidance of health professionals including physicians, nurses: alongside families; therapists; social workers; other experts. But in an emergency or other circumstances, the lack of awareness among both patients and professionals results to unorganized situation when individuals pass between home, hospitals, nursing homes. State or local aging departments in some areas can monitor, provide and oversee the safe course of appropriate 'transitions of care', a vital skill to prevent things like readmission back into hospital. Although there exists, in theory, a "continuum of care" that includes outpatient services (based on primary and specialty consultations), home care, nursing-home care when needed, and hospice - each operates relatively independently with its own set of regulations; funding sources; as well as inadequate coordination among the components. The future vision is that between EHRs, patients are accurately followed and their communication across care venues enabled to build a functional collaboration among sectors of healthcare. Education of the healthcare system for lay people and professionals, effective communication, as well identifying services available to meet local needs are fundamental steps that all systems should take in order to form a more unified healthcare body.

According to Cawley and Grantham (2011), by intentionally deploying a quality improvement framework constructed specifically for this purpose successfully joined programs across care settings focused on various parameters for patients with Heart Failure. The improved collaboration/communication, and the development of a shared vision, goals, and priorities supported coordinated, efficient and reliable system. It was observed that these efforts will work well long term if health systems are committed to continuing down the path toward a vision of fully integrated care delivery model.

Study from Toscan et al. (2012) highlighted how system-level innovations may support integrated transitional care. One of the first and most crucial steps is to recognize that integrated care needs supportive engagement by all components of the health system in practice. As demonstrated by Hannum Rose et al. (2007), this can be executed through amplifying financial and personnel resources toward care partners (e.g., designated time load for patient data compilation and sharing). Another option is to augment job roles to incorporate a dedicated role of integrated care team leader (e.g. creation an organisational model consisting of the partnership between a physician leader and non-physician administrator) as suggested by Vedel et al. (2011) or using integrated delivery systems (IDS).

Care continuum focuses on patient-centered care. It puts the patient in the limelight by giving preference to their personal requirements, tastes and goal. The concept brings patients to the forefront – engaging in health care, sharing decisions about their healthcare with providers and being active participants on a continuum of quality services. This patient-centric approach enables patients not only to feel satisfied but also ensures their adherence as well, building trust between the patients and healthcare providers.

The figure 11 shows the model of characteristics and objective burden with caregiver evaluations of Patient-Centered Family-Focused Care (PCFFC) by frail veteran care recipients.

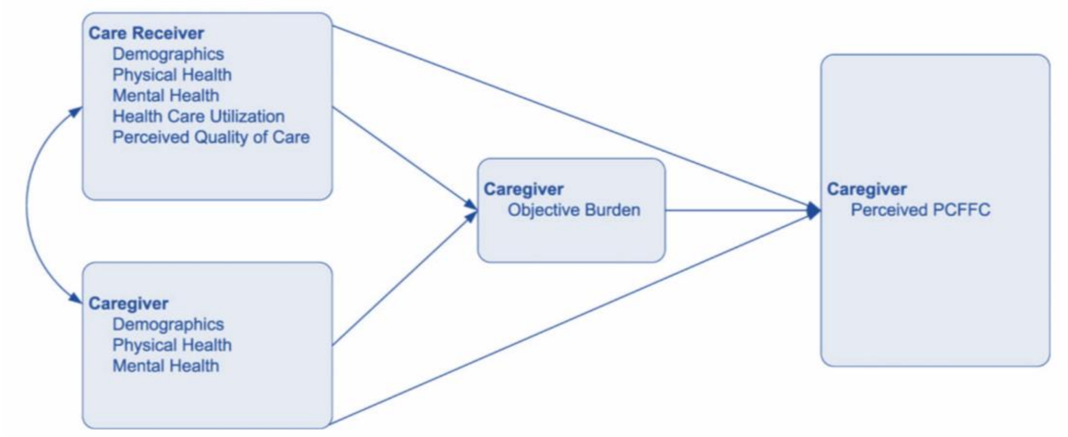


Figure 11:

Patient-Centered Family-Focused Care Model

As per McLeod et al. (2011), Patients' acuity changes across care settings, as do the goals and priorities of the provider organizations and the needs of the patient and their families. While the strategies to optimize informational continuity and care coordination vary accordingly, this study suggests there are fundamental elements which contribute to high quality transitions from the care providers' perspective as given in Figure 12. Further examination of standardized transitional care processes across the spectrum of possible care transitions might help to identify the necessary elements of a high-quality transition which need to be present regardless of the care settings involved.

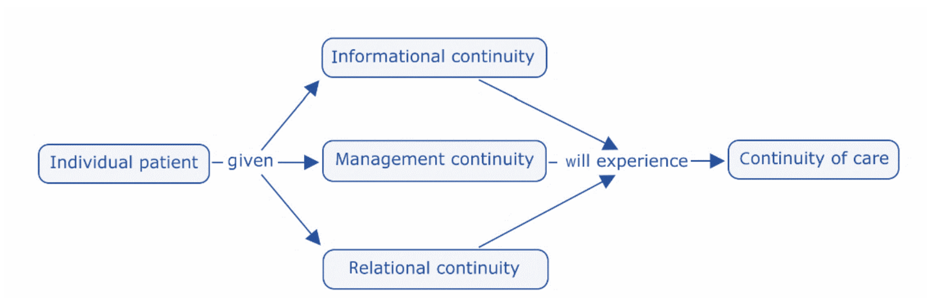


Figure 12:

Haggerty's continuity of care framework (Haggerty et al., 2003)

In the study conducted by Gagliardi et al. (2011), conceptual models for teamwork, interprofessional collaboration, integrated care delivery, interorganizational collaboration, continuity of care, and case management were described. All concepts involve two or more healthcare professionals that share patient care goals and interact on a continuum from consultative to integrative, varying according to extent and nature of interaction, degree to which decision-making is shared, and the scope of patient management (medical versus holistic). Ongoing development, implementation and evaluation of collaborative cancer management, in the context of both practice and research, would benefit from systematic planning and operationalization. Such an approach is likely to improve patient, professional and organizational outcomes, and contribute to a collective understanding of collaborative cancer care.

As per Rayner et al. (2020), structured and linkable EMR data provides opportunities to examine the patient journey through the care continuum in an innovative way. Using structured EMR data, linked with other databases, they were able to generate a cohort of patients with COPD, explore the complexities of their primary care encounters and follow them through the continuum of care, namely emergency department visits and hospitalizations.

Segal and Mortimer (2006) describe an economic model that explicitly takes account of resource allocation across modalities (medical; surgical; pharmaceutical; media etc.) as well as disease stages (primary prevention, early diagnosis, management of established disease and end stage care palliative process). The paper contends that if the focus of plans remains on optimal allocation or reallocation of resources across all health problems, one will achieve better overall efficiency compared to models simply devoted to intra program budgetary allocation.

Acute hospitalisation was a crucial point in the care continuum, but equally for those who were HIV and non-HIV positive according to Cichowitz et al. (2018). Before the index hospitalization, most participants reported receiving care in the community or being hospitalized within 6 months. These health care encounters may present a lost opportunity to prevent hospitalization, be it through treatment modification or initiation of additional support and earlier diagnosis of HIV and TB. More recently, significant focus has been given to designing care models that are stratified for intensity of need and management complexity – aligning resources around sick patients who really them while simplifying the experience for those who can be classified as stable or healthy.

As per Lüdecke (2014), integrated care partnerships should rely on structures that ensure self-organization. In this sense, collaborative networks can solve the problem of lack of self-organization. Therefore, integrated care partnerships should be based on autonomy (from the systems or organizations perspective) in the context of reliability (from the networks or environmental perspective). Patient-centered care can be achieved in such kinds of integrated care partnerships. Evaluation criteria in terms of good patient centeredness evolve from the reciprocity and self-organization in such networks. Hence, reflexive awareness in networks becomes a quality indicator that promotes health care quality and patient centeredness.

As per van der Weijden et al. (2010), one-for-all guidelines do not account for differences in patients' characteristics and for their preferences for medical interventions and health outcomes, suggesting a need for flexible guidelines that facilitate patient involvement in clinical decision making. The question is how this can be achieved. This study is not about patient participation in guideline development, a closely related and prominent issue that does not however substitute for or guarantee individual patient involvement in clinical decisions. The study results provided the needed background for recommendations about potential effective and feasible strategies to ensure greater responsiveness of clinical practice guidelines to individual patient's preferences in clinical decision-making.

Another advantage of the care continuum is efficient delivery of care. It promotes streamlining of care by optimizing healthcare processes and prevent unnecessary delays and duplication of services. The system appropriately uses evidence-based guidelines, care protocols, and standardized approaches to a well-coordinated delivery system.

Study by Braun et al. (2012) articulated the variety of tasks that cancer patient navigators perform across the cancer care continuum—from education/outreach through end-of-life care—recognizing that different programs sponsor navigators who address various phases of the continuum. The case examples illustrated how, in performing these tasks, navigators make sure their clients find cancer care understandable (by providing education to improve knowledge, attitudes, and practices regarding cancer), available (by knowing about services and linking clients to them), accessible (by removing structural and cultural barriers to services), affordable (by enrolling clients in insurance, free, and low-cost programs for which they are eligible), appropriate (by offering culturally competent services and educating mainstream providers about the needs and cultures of their clients), and accountable (by participating in efforts to improve and expand services).

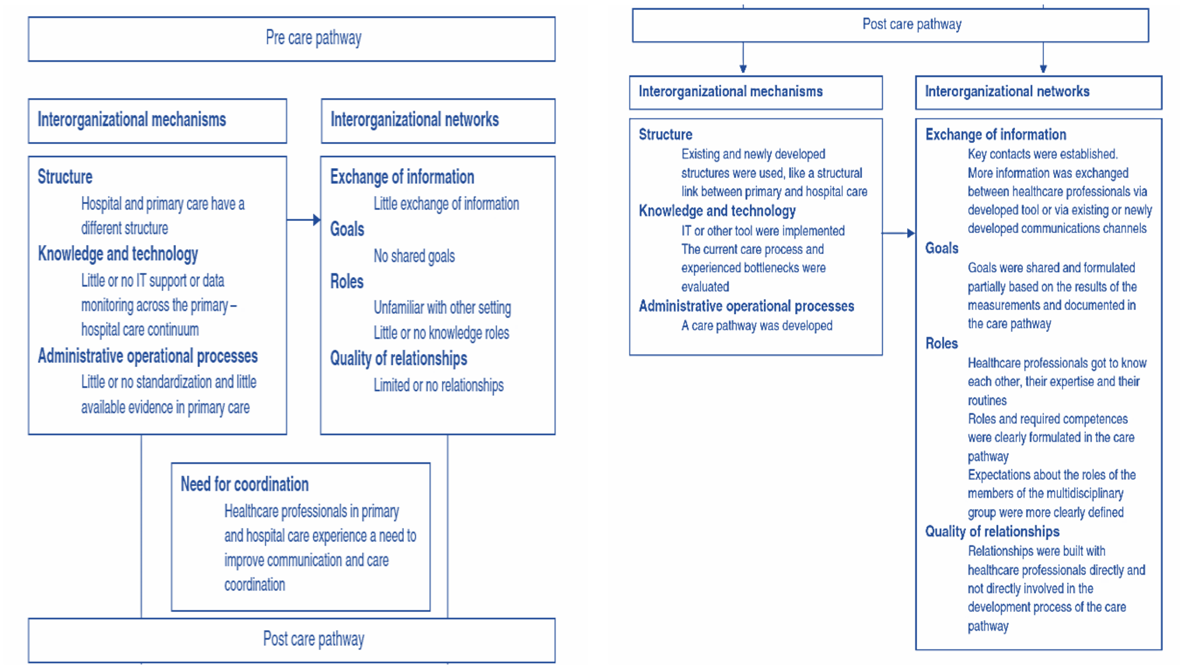


Figure 13:

Relationship of pathways across the primary-hospital care continuum & coordination

Van Houdt et al. (2013) in their study has observed that the standardization of the care process by developing a care pathway across the primary and hospital care continuum led to the definition of goals, roles and required expertise. The results are illustrated with anonymous fragments of the collected data as given in Figure 13. The development of a care pathway across the primary hospital care continuum, supported by a step-by-step scenario, led to the enhancement of inter-organizational mechanisms and network components of the multi-level framework. Healthcare systems recognizing the importance of primary care to coordinate care, who are regionally organized (including hospital care) and have their own resources to respond to their experienced need, will have more structural support available for developing and implementing care pathways. The results focused on the existing elements of the multilevel framework and the impact of a care pathway on these elements.

Care continuum is considered as a base for providing integrated healthcare with responsible care and proactive planning across the full spectrum of patient needs. Care continuum promotes prevention, detects early or timely diagnosis, treatment of diseases and promotes long-term care. This is addressing the holistic nature of healthcare, recognizing that it does not exist in isolation as an episodic event.

The care continuum demonstrates its value by enabling well-rounded, patient-centered and coordinated healthcare. However, there are knowledge gaps in understanding the changing needs of patients and their care givers as well as the components that link to high quality transitions; systematic organization for a coordinated care pathways amongst teams; operational guidelines accommodating patient preferences and implications regarding healthcare coordination/outcomes due to care pathways. Additional research is needed to fill these gaps in order to improve the care continuum and health outcomes for individuals and populations.

Another major consideration for the care continuum is its influence on cost-efficiency. The care continuum seeks to ensure that preventive and early intervention in the community alleviate pressure on expensive acute services for those who are living with chronic conditions. It saves resources, and when unnecessary health expenditure is reduced, it leads to cost savings for both healthcare systems and payers.

The care continuum also spans beyond just taking care of an individual patient, to managing population health. It allows health care providers to identify what the community needs are around them and implement prevention at a higher level by looking at population trends. Hence, this population health management strategy results in better public outcomes and the most efficient resource utilization.

In short, the care continuum is a necessary step to provide better patient-centered and team-based offerings in healthcare. It improves patient outcomes, supports continuity of care delivery and cost-effectiveness contributes to the promotion of a system that delivers quality clinical services in an effective patient focused sustainable manner. The care continuum helps to improve health outcomes for individuals and populations by creating a comprehensive approach that recognizes the differing needs of people over their journey through healthcare.

2.3 Leveraging AI for Care Continuum in healthcare

It has been proven beyond doubt that Care Continuum and Artificial Intelligence bring immense potential for enhancing patient care. Leveraging the power of both, especially in areas like continuity of care will prove to be extremely useful for the patients and family. Jayakumar and Bozic (2020) in their study observed that AI provides an opportunity to learn and adapt to different data pools including those relating to an individual's physical and psychosocial health and wellbeing. Patient reported Outcome Measure (PROM) provides a means of quantifying various domains, including those that may be more challenging to measure in routine clinical practice. This allows for an array of Patient Reported Outcome (PRO)-enabled functions ranging from tracking and monitoring to advanced Shared Decision Making (SDM) as given in Figure 14.

It also enables learning from differences in populations and practices. For instance, patients in one country or region are shown to reflect upon their health status using PROs differently, irrespective of their disease severity. Further, there are international and intraregional variations in the sociodemographic and clinical characteristics of populations, alongside system-level variations in terms of surgical practice.

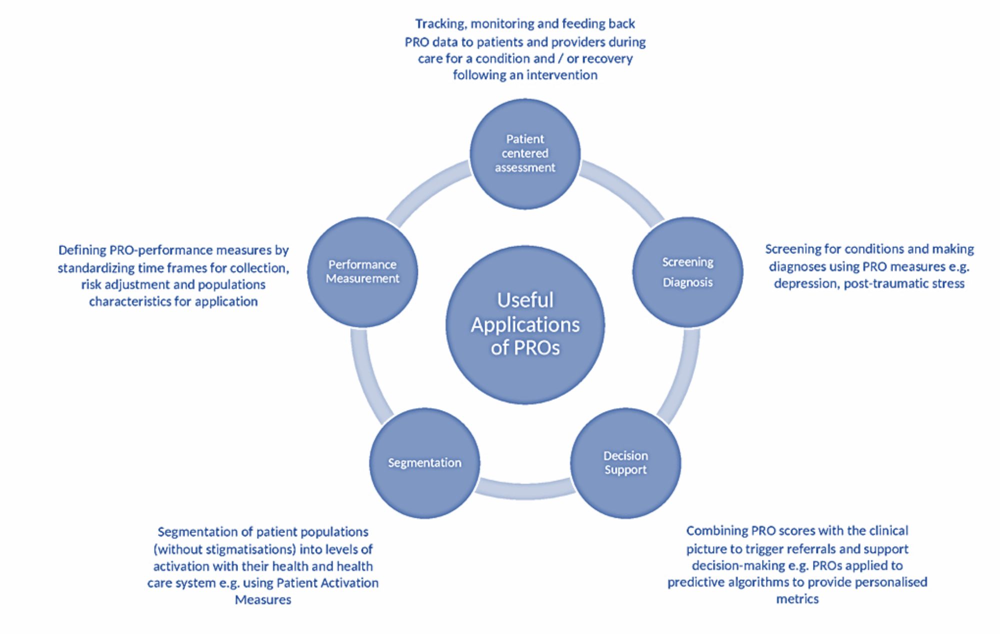


Figure 14:

Useful applications of patient reported outcome measures

AI may enable a better global understanding of the key drivers of these variations, identifying predictors of outcomes, and recommendations for change—facets that may otherwise be difficult to realize through traditional analyses. Evaluating the minimal clinically significant difference, and substantial clinical benefit of different treatments for hip and knee for different population profiles is one such opportunity.

This technology may also provide great predictive insights into the performance of organizations, surgeons, and multi-disciplinary teams alongside equitable patient-specific payment models. AI-enabled solutions are also evolving and learning systems. The researchers have anticipated that the solution described in their article will evolve with the increasing number of data points, including the impact of changing modifiable risk factors (e.g, weight, smoking status), providing accurate and actionable predictions in real-time. Advanced functionalities could be provided across the care continuum from pre-surgical decision-making and forecasting outcomes to post-surgical monitoring.

From the broader view, Krittanawong et al. (2020) published an article on the promises and pitfalls of artificial intelligence in healthcare. It highlights the changing facets of AI applications and calls for responsible application in these areas with special emphasis on ethical concerns, privacy risk associated with data use etc., to ensure safe roll-out into healthcare systems. This is so important to consider, especially when adopting AI technologies that have direct implications on patient care and decision-making.

Obermeyer et al. (2019) provide a more nuanced perspective on how generalizable AI solutions might be, in a broader sense to investigate racial bias in algorithms, and hence disparities that may emerge from healthcare outcomes. This becomes even more important when looking at the varied demographic and cultural dimensions of patient masses in care continuum. This also emphasizes the need to constantly mitigate bias in order to achieve equal and unbiased delivery of AI services between various demographic groups.

2.4 Identification of Research Gaps

The totality of a variety of studies on AI in healthcare highlight the transformative promise and current limitations surrounding this ever-evolving field. Although AI seems to have important effect on healthcare delivery, it makes itself more visible when some limitations raised up as the necessity of other future research.

While the Davenport and Kalakota (2019) review on AI in healthcare provides an overarching perspective, it fails to provide elaborations. Though the potential of AI in diagnostic ergonomics and treatment planning is recognized by this study, yet it neglects pointing out how can an effective reduction is possible in hospital readmission through direct utilization of AI. Future research should investigate how AI can help avoid frivolous returns and assess its effect on the digital care continuum in multispeciality hospitals. There is also a call for research on the realistic complexities of implementing AI in healthcare, including questions pertaining to infrastructure and operations (e.g., technology acceptance), training employees who will be impacted by AI, as well as interoperability. Although the ethics were discussed generally, more exploration of these to outline what is just or unjust with AI in post-discharge care and from patient-provider relationships would be beneficial. These specifics would allow for more targeted exploration of these elements to make the study relevant in clinical conditions outside this research.

Study by Panch et al. (2019) have shed light on the horizon of AI in healthcare albeit with missing links. The study leaves health systems with a choice — temper the enthusiasm around AI or invest heavily in infrastructure for data ownership and trust. The growth of cloud computing provides a golden opportunity to do just that, but only the issue of ownership and control around health data is settled. However, research on the method of integrating AI in digitized care continuum program for multispeciality hospitals remains understudied, which is deserving additional attention. They mention AI's potential to improve patient care and lower costs, though in a matter of little depth. Future research must explore practical solutions to deploy these AI algorithms in real-life clinical settings, including the remaining challenges and strategies towards its success implementation.

Fei Jiang et al. (2017), illustrated various AI applications in healthcare studying ML and NLP for disease diagnosis. However, the study did not have any specific focus on the aspect of digitized care continuum programs in a multispeciality hospital. The study hints at the value of ML and NLP components, but provide relatively little detail about their actual challenges or possible use in a healthcare context with high complexity. Additional studies are essential to evaluate how AI-derived strategies can be applied in real clinical practices across different kinds of clinics, such as a multi-speciality setup evolving experiential guidelines for health care operators and decision-makers. According to the study, road map from clinical data generation (Figure 15) through NLP data enrichment and ML data analysis to final working this decision-making flow chart. Clinical behavior is both the beginning and end of a roadmap. AI techniques have to be driven by clinical demands and finally used as tools for use in the clinic, they suggested.

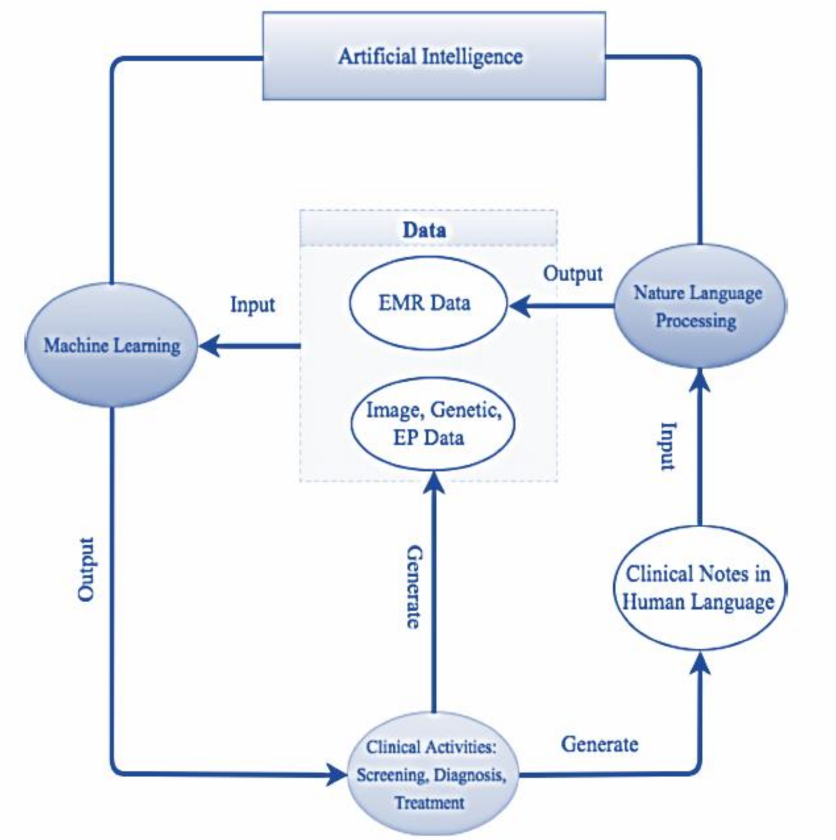


Figure 15:

Clinical data generation to decision making

Yousef Shaheen (2021) describes artificial intelligence as somewhat becoming part of the norm in healthcare, by aiding staff with treating patients and making improvements to clerical duties. However, it does not provide an in-depth investigation of the reduction in staff workload within a digitized care continuum among multispeciality services. While the promise of AI to drug discovery, clinical trials and patient care, is huge — there's a gap in how specific strategies for implementing staff workflows to an optimal level through technology is understood. More extensive research is needed to clarify the implications of AI for avoiding an excessive strain on staff workload so that seamless integration into regular patient management can be achieved as well as addressing some intricacies related with its application in a multispeciality hospital environment. A better understanding of AI capabilities in improving patient care and facilitating operational efficiency across an entire digital healthcare ecosystem can be achieved by addressing these gaps.

The study by Reddy et al (2019) provides a well rounded summary of different applications & potential in healthcare using AI. While the authors are positive on AI becoming more pervasive in health service delivery, with potential cost-savings and improvements in quality of care being possible, little was explored how this functions when utilised as part of a full continuum-of-care program. Additional research is required to investigate the real-world impact of AI on patient outcomes, operational efficiency and overall quality-of-care delivery in a multispeciality hospital setting. More work is needed to understand the realworld implications and hurdles in applying advanced AI applications, as well as its potential impact on improving patient care across different clinical fields. Studying these gaps will help in answering the question of how is AI enabling care delivery.

Bohr and Memarzadeh (2020) looked at the revolutionary role of AI in healthcare, discussing big data analysis combined with machine learning effects which recognized AI's role in improved healthcare workflow. Additional research is needed to better understand the real-world implications and outcomes of AI applications in image analysis, medical device automation (including self-regulation), patient monitoring within a full continuum-of-care. Uncovering these gaps will provide critical knowledge about how AI can be harnessed to enhance patient care and ensure efficient healthcare delivery particularly in a multi-speciality environment.

Guo & Li (2018) pointed out Medical AI Technology could improve the efficiency of physicians and quality medical services. This study focuses on the bigger picture outcomes such as providing a solution to physician shortage and increasing access to healthcare but doesn´t give any indication as how it may affect care continuum in a multi-speciality hospital setting. The study examined a program that utilized an ambulant multilevel medical AI service network within a comprehensive care continuum in comparison with regular follow-up. Scrutiny of these discrepancies will provide a clear perspective about actual changes that Medical AI brings to the table in terms of healthcare accessibility, performance and overall efficiency at multispecialty hospitals.

The study by Precise4Q consortium et al. (2020) by comparing the technological, legal, medical and patient perspectives explores the impact of explainable AI in Clinical Decision Support Systems (CDSS). While there is high importance of AI-based CDSS in clinical practice, the manner they operate within a more comprehensive care continuum remains unclear. Future studies would be needed to understand the practical implications and challenges related to implementation of AI CDSS in multispeciality units, so it can be seamlessly incorporated into clinical workflows for improving patient care across various specialties. This analysis will offer crucial understanding of the actual impact to inform whether explainable AI interventions improve clinical decision support within a digital care continuum program.

In another study, Manne and Kantheti (2021) explained if AI is helpful in medicine, hence stated about treatment planning to skin cancer detection for robotic surgery. Despite covering the various benefits of AI to healthcare like hospital staff timing, reduced patient monitoring and remote methods; this study neglects illustrating how integration has been practically beneficial in other clinical specialities for a care-continuum program. References detailing the power of AI to assist with process efficiencies, administrative automation and workflow enhancements may nudge earlier for a more extensive understanding surrounding how these utilities can be practically deployed in care continuum programs. More importantly, very few examples or a case-study was shared in the article to stress this advantage of improving service quality for different specialities. This deep-dive analysis to reveal the gaps and projected benefits such that stakeholders can then know where AI is much-or not-well-proven in terms its ability to improve patient outcomes.

In the study by Dente et al. (2017) published in the Journal of Trauma and Acute Care Surgery, spotlights studies on detecting the microbiological signature(s) or niches (biomarkers) essential to trauma patients that can predict future wound infections, thereby assisting healthcare workers surveil closely enough to intervene prospectively. More research is required to examine how the practical implications of applying these findings in an integrated care continuum. Furthermore, the results of this study specifically reference machine learning for postoperative complication prediction in patients with type 2 diabetes and early cardiovascular complications suggesting it as a possible use case where fast models could be directly actionable by clinicians to predict and personalize detection strategies related to infections. However, the study does not detail exactly how these models could be applied or produce an outcome in a comprehensive digitized care continuum program for various other specialities. However, their study allowed massive insights into gaps among the microbiological knowledge and ML techniques on patient outcomes infection control, showcasing areas that need further research to improve health care quality.

Schwalbe & Wahl (2020) in their research focused on the potential for artificial intelligence to solve certain global health issues and use cases in low, middle income countries. The researchers set out to investigate an array of health-related AI interventions, including diagnostic and risk stratification, disease prediction capabilities as well influencing policy through machine learning-based decision making. Another important research gap is the lack of exploration into ethical, regulatory and on-the-ground requirements necessary to deploy AI-driven interventions at scale in global health. Building on the potential of AI to introduce health benefits in LMICs, it remains that more research is necessary before guidelines can be populated for how best to develop test and implement these apparently beneficial technologies at scale for various specialities under different hospital settings and also private sector. These findings highlight the pressing imperative for global health leadership to set a patient-led research agenda in ethical and responsible AI in healthcare for digital care continuity.

Czerwonka et al. (2015) describes the support needs of survivors recovering from complex critical illness, focusing on this transition once patients leave the intensive care unit (ICU), proceed through rehabilitation and eventually return home. Although this study offers foundational perspective for evolving support needs throughout the recovery process, it does not isolate how digitized care continuum programs address these dynamic requirements especially among different clinical specialiteis in multi-speciality hospital settings. Research to identify effective methods for incorporating digital interventions and technology along the care continuum is urgently needed in order to meet dynamic changes in support needs of survivors, caregivers alike. Key factual findings from the study will help inform the creation of individual and/or community-specific digitized care programs to benefit patients, family caregivers during recovery post ICU discharge (and at home or in hospital), for long-term survivors.

Goldberg et al (2014) emphasise the continuity of care as people move between different settings. The study stresses the need for effective care transitions that protect patients from, among other things, being readmitted to hospital too soon after discharge and highlights a concerning dearth of public or professional awareness about services. Disjointed healthcare components, each with its own regulatory framework and stream of funding contribute to the inability to create a "continuum of care". Although the study underscores electronic health records as role players for effective communication and coordination, it fails to offer detailed information about how digitized care continuum programs translate into practice in a multispeciality hospital as his focus was on a single speciality. Future studies should investigate how digital solutions can be used to bridge gaps, improve communication and support better coordination between care transitions with a full appreciation of the practical challenges and maximize the effectiveness of programs focused on patient-centeredness across different phases within the continuum. Looking in to these voids will aid more integrated and patient centered healthcare systems.

Cawley and Grantham (2011) underscore that purposeful utilization of a quality change framework to unite programs and administrations for Heart Failure patients will have favorable results. Collaboration, communication and alignment of vision are key themes which run through the implementation success stories outlined in the study. This proves that to deliver better outcomes a more efficient sustainable coordinated approach is necessary. There is scope for more research to investigate how digital solutions can be utilized to support collaboration and communication across care settings for departments other than Cardiology to enable a seamless health system, in order to develop an integrated delivery model. While perhaps sobering, these gaps should prove educational as they illustrate some of the practical barriers and opportunities related to implementing digitized care continuum programs designed to improve patient outcomes defined locally by certain medical conditions such Heart Failure within specified health delivery system with unique challenges.

Toscan et al. (2012) examined the possibility of system changes facilitating an integrated approach to transitional care study. The authors propose the improved financial and human resources, changes in care roles as well as integrated delivery systems to support an integration of health services. A lot more research is needed to better understand where digital can help, in particular how it might critically enable and shape integrated care practices that were often lagging somewhat behind on the ground due to a series of practical challenges identified within this study — thus maximizing investment benefits from these high-cost chronic disease / long-term condition programs. Analyzing these breaches will yield important reference points for implementing digitized solutions to a full-systems perspective that is more holistic and system-centered in the context of transitional care within a multispecialty hospital.

Hannum Rose et al. (2007) identifies potential for individual work role/task modifications to extend integrated care / inclusive teams. The study recommends creating those structures male and female counterparts would have in professional areas, much like the physician leader works alongside with a non-physician administrator. Even though this insight is certainly useful, the study also fails to dive more deeply into investigating how digitized care continuum strategies can be orchestrated with these reformed roles and structures. What is needed now is to assess the ease, implementation and tools of digitized solutions are followed in practical application for improved communication efficacy and care efficiency. A study exploring these gaps is important to help understand how digital technologies can play a part in enhancing the impact of job roles and characteristics along with enhanced collaboration between different organizational members, thereby achieving an effective care continuum other than in primary care settings.

Research by McLeod et al. (2011) acknowledge the changing acuity of patient conditions and goals as patients transition across care settings. It illustrates the importance of developing strategies aimed at improving informational continuity and care coordination when transitioning into and out an ICU. Here, specifics on how digitized care continuum programs carry immense potential for streamlining standardized transitional care process in a multispeciality hospital was not evaluated. Future research is needed to better understand how digital solutions might support, from care-providers' perspectives, a high-quality transition and to identify key elements required for an efficient integrative care continuum across various settings. Future research to address these gaps can help the implementation of digital technologies in improving transitional care processes and bringing standardization ensuring cost-effectiveness and better patient experience across various healthcare settings.

Gagliardi et al. (2011) reviewed the conceptual models for teamwork, interprofessional collaboration, integrated care delivery and organization-level integration of different professionals or agencies; continuity of care; case management, etc. These models elucidate different collaborative theories comprising a group or team of two or more professionals who share goals and communicate, forming a continuum. The researchers found differences in the kinds of interaction as well as how much decision-making was engaged and spanned on tools/combinations. However this review does not discuss how a digital care continuum program could best exist within these constructs and particularly in clinical specialities other than Cancer Care. Additional studies are required to understand how and with what impact digital solutions exhibit these models of care—and the patient-level benefits of receiving this collaborative primary health-based initiative in a wider-ranging extension for better health outcomes across different healthcare settings. Beyond just understanding the voiding habits, further inspection of these findings could produce useful results in how well and at what extent the digital technology can be used on a larger scale to improve care keeping with that team-based framework.

Study by Rayner et al. (2020) underscores the promise of structured, linkable EMR data for studying patients in COPD across care settings. The study was able to assemble a cohort of patients with COPD and examine their encounters in primary care; emergency department visits, hospital admissions through linked databases. Although the study aids in enriching the state of knowledge on how structured EMR data can help better understand patient journeys, it only scratches the surface with respect to how digitized care continuum programs might improve these analyses for a single condition or speciality. These and other areas of inquiry deserve additional attention as digital tools are evaluated in concert with patient journey investigations, to develop a more holistic view of the impact care continuum programs can have across different healthcare settings. Study of these gaps will provide key approaches to optimize the judicious use of digital in an integrated and effective patient care continuum for multispecialty hospitals.

The work by Segal and Mortimer (2006) has studied many areas (i.e. medical, surgical, pharmaceuticals, media or allied health etc) across different stages of diseases taking into account the distribution of resources among various these areas within an economic framework directly. They focused on effective resource utilization and redeployment across the health care continuum for each disease, or health issue. More research is qualified to explore the capabilities of digital solutions in improving resource deployments, allocative efficiency and end-to-end operations management across multiple care modalities spanning continuum of care. Exploration of these gaps will give critical learnings in how digitized technologies can be applied to improved resource distribution.

Lüdecke (2014) explore on integrated care partnerships recognized that proper self-organization structures are necessary to implement patient centered care. The study does not, however, provide detailed insights into how digitized care continuum programs within multispecialty hospitals can help support self-care/mutual aid and empower patients having more autonomy in their healthcare journey giving way to patient-centeredness as the data was taken only from case managers and social workers. The research has not been able to address whether there is a potential role of digital tools in promoting collaboration, communication and information flow through various healthcare organizations. More research is required to examine the potential of digital technology for enhancing self-organization in care networks.

While van der Weijden et al. (2010) underline the vital role of patient participation in clinical decision making and imperfections that are associated with one-for-all guidelines—an issue which is not examined from a multispeciality hospital setting while utilizing digitized care continuum programs to solve this widespread concern. The research also lacks a thorough investigation of the ways digital tools and platforms could be used to distill and integrate patient-level preferences into the entire care continuum. One significant gap in knowledge is how technology can support a more patient-centric model, one which ensures that decisions made at the clinical service level reflect factors specific to individual patients. More research is needed to understand whether digitized care programs will be effective in promoting patient activation and clinical customization, particularly within a complex multispecialty system.

The study by Braun et al. (2012) go into detail about the many roles of cancer patient navigators across a spectrum of potential needs from throughout the Cancer Care Continuum. The paper describes the functions navigators perform to guarantee cancer services are understandable, available, accessible and affordable — but also that they meet organisational standards quality indicators. Patient navigators will also benefit from many technology-driven solutions, but implementing such tools effectively has its unique challenges in increasing the efficiency of navigating patients to services and providing culturally competent care while improving overall patient outcomes. Yet, this research neglects a deep dive into what digitized care continuum programs could be to better enable and leverage the work of patient navigators in a multispeciality hospital. Future research should investigate the operational implementation of a digitized care continuum program and its integration into other clinical specialities and patient navigation squads, as well as evaluate how best to tailor it to meet specific challenges while harnessing technology-driven innovation that could reinforce navigators in multi-hospital settings across different specialties.

Study by Van Houdt et al. (2013) focused on the development of a care pathway in primary and hospital care continuum along standardization level; inter-organizational mechanisms, it falls short in clearly explaining how digitized continuity of such path can essentially enhance these procedures especially for streamlining different specialities. The study does not investigate, for example, how digital tools may help or hinder smoother communication and co-ordination between primary care clinicians and those based in hospital work; nor real-time data sharing across different sites involved with patient care to support shared decision-making. A significant void remains in knowledge about the mechanisms by which advanced digital platforms strengthen care pathway coordination, i.e., tools to streamline goal setting definitions as well clarifying roles and resources. Future research is required to investigate how these programs can be integrated into the multi-level framework, offering more focused responses and using technology enabled solutions to strengthen a connected health system.

While Jayakumar and Bozic (2020) make a reference to the applicability of AI for learning and adapting to different data pools, they conduct no similar elaborate examination on how digitised care continuum programs actually work in various clinical specialities as their study was focused more on patients who underwent Total Hip Replacement. It exemplifies the broader potential benefits of AI in interpreting heterogeneous data, reflecting on health as both a physical and psychosocial phenomenon. This is demanding, but if the study could be structured to provide an exploration of difficulties and benefits from implementing in a comprehensive care continuum program aimed at all specialties supported by focused programs that would better serve the population. More work is needed to fill this gap by exploring the practical consequences and results of introducing AI in care continuum programs.

Although the study by Krittanawong et al. (2020) provides useful insights into overall more significant challenges and opportunities of AI in healthcare, it does not specifically focus on digitized care continuum programs for departments other than Cardiology. While it acknowledges the wider landscape of AI applications, and a clear focus on ethics, examination criteria for evaluating solutions in multi-speciality healthcare remain a gap. The research does cover what role AI can play in improving patient care coordination, connecting dots between specialties and optimizing efficiency. Research is needed to investigate specifically how digitized care continuum programs can work best in the multispecialty hospital context of generalist-to-specialist-large-group-practice-based multidisciplinary workflows for more coordinated or integrated care continuity.

These studies demonstrate the promise and pitfalls of AI in healthcare settings; however more complete research is necessary to fill-in gaps regarding challenges faced by its deployment, interdisciplinary collaboration amongst stakeholders, patient outlooks toward this new technology. Type of consideration always occurring within a real-world or resource-thin environment—ideally from multiple perspectives especially multi-speciality hospitals. These gaps when addressed will further help to capitalize on the opportunities and mitigate potential risks in this perpetually changing landscape of health tech.

The joint analysis of these studies brings to light the gaps in research that have been identified, which point towards future investigations on multi speciality hospital settings. It also points out further generalizability across populations & ethical frameworks for AI biases; nuanced understanding with respect to what role an engineered system stands most beneficial considering specific care transition points. Bridging these lacunae will build towards the responsible and successful application of AI in healthcare — ultimately improving outcomes for patients throughout the health system.

2.5 Summary

During the past several years, artificial intelligence (AI) has been increasingly highlighted as a type of technological boon for radically altering healthcare virtually across all aspects of care. Within healthcare, AI has enormous potential to deliver across the care continuum and to provide a wide range of advantages that can revolutionize things.

One of the most basic benefits any AI-powered care continuum solution offers is better patient outcomes. Data mining from a wealth of patient-specific data is done with the help AI algorithms and high-end analysis tools to provide health care solutions. Diagnostics turned on to be more precise; personalized and pre-emptive intervention for treatment plans. There could be a direct benefit in clinical practice, finding patterns that the entities missed to predict disease progress or recommend interventions for specific patients.

According to De Regge et al. (2017), their study represents the first extensive effort to assess the significance of hospitals for individuals living with chronic illnesses. Nevertheless, the study does have certain potential limitations. The most apparent one is the relatively modest sample size of articles scrutinizing the specific function of hospitals in managing chronic diseases and considering other clinical specialities. Conducting longitudinal studies presents a promising direction for future investigation. Additionally, there is a possibility that some articles were overlooked because they specifically addressed the role of hospitals in managing chronic diseases, rather than in chronic disease management in broader terms. The demographics involved different stakeholders compared to standard adult care. Nevertheless, studies that focus on the elderly are tremendously vital since the hospital's role in overseeing care and post-treatment for the elderly could be substantial. Consequently, further exploration in the field of elderly care with the support of care continuum is recommended.

According to Van Houdt et al. (2013), it seems important that to facilitate mechanism of care pathways establishment a good infrastructure for grasping the qualitative connection between them must be defined. It is imperative to incorporate care pathways into existing IT systems, in concordance with the needs and expectations of healthcare professionals. More research is needed on the influence of care pathways that cut across organizational boundaries and their effect on coordination quality especially in multi-speciality hospital settings.

Cichowitz et al., (2018) were able to highlight important discontinuities in care as patients transition to home following acute hospitalisation. This period seems linked to dropping out of care and with higher morbidity and mortality. Future research is needed to further elaborate on patients risk and vulnerability after hospitalization, retention in HIV amongst other chronic disease programs following an inpatient stay. Significant consideration must be given for the integration of services across care-continuum but also pilot patient-centered interventions that could address latest-to-best practice gaps among those being discharge from acute care hospital stays.

In addition, AI tools can handle menial duties and allow for uniformity in administrative functions possibly leading to operational effectiveness benefits including; reducing the overtime of operations by refining resources management thereby lowering wasteful healthcare spend. Hence, by better resource utilization, cost-effective treatment options, efficient facility usage, healthcare firms can create a huge costs reduction and open up the way for sustainable systems.

AI is not only used to improve patient results and reduce costs, but it can also increase the overall efficiency of care delivery across the continuum. AI-based algorithms can go through huge amount of medical data really fast, so health care providers have more information available to make a decision. With AI able to enter data, create documentation and schedule appointments automatically; healthcare personnel can devote more time towards direct patient care. This increased efficiency is not only beneficial for healthcare providers but also results in less time waiting, greater patient satisfaction and more efficient use of health resources.

There are many unique challenges and considerations healthcare organizations should address in preparing for a capable digitized care continuum. The performance and predictability of digitized models depend on having high quality data. The responsible use of such futuristic technologies in healthcare demands rigorous privacy and security controls, for good reason. The trust level and diffusion by healthcare professionals or patients, are linked to the performance of system algorithms. For the digitized models to be clinically applicable, they warrant ongoing research, monitoring and validation.

Another crucial element is the need to facilitate better incorporation of digitized technologies into existing healthcare infrastructures. This technology needs to enable, rather than replace healthcare professionals and seamlessly integrate in the workflow of care and opportunity cost. Integration of AI into the continuum of care has leveraged on factors such as alignment with EHRs and compatibility with healthcare IT infrastructure, regulatory standards among others.

In summary, the potential implementation of digitization across the care continuum can lead to enhancements in patient outcomes, cost-effectiveness, and operational efficiencies. Healthcare providers can leverage digitized algorithms and advanced analytics to gain personalized treatment insights while maximizing resource utilization. To harness the full power of AI for the care continuum, it is crucial to address challenges related to data quality, algorithm precision, and the seamless incorporation of biometric-driven healthcare solutions. Through intentional efforts and continual research, digitized systems have the capability to revolutionize healthcare delivery worldwide, ultimately improving health outcomes for both individuals and communities.

CHAPTER III:

METHODOLOGY

3.1 Overview of the Research Problem

Over time in the world of healthcare, it is becoming increasingly evident that innovative ways are needed to address challenges related to delivering care at a high level. In the healthcare domain, Artificial intelligence (AI), is emerging as one of the state-of-the-art technologies. The preceding section scrutinized the extant literature on AI, importance of care continuum and amalgamation. AI will help in re-architecting the way by which healthcare is delivered with more precise diagnosis, better treatments, strategy to substantial cost savings making Digitized or AI driven Care Continuum more futuristic. It is important to investigate the efficacy of Digitized Care Continuum in a multi-specialty hospital setting.

Multispecialty hospitals are known for the number of services they offer and hence need effective communication between healthcare service providers. However, it can be difficult to deliver great care consistently because of the considerable number of patients seen every day, along with very complicated treatments and limited resources. The digitized care continuum may help overcome these barriers by enabling accurate and early diagnosis, improving treatment planning, ultimately decreasing healthcare costs.

The goal of a care continuum program in a hospital setting is to reduce the disease burden, lower re-hospitalizations and improve patient satisfaction and retention. While the hospitals are dealing with a variety of disease conditions, the care continuum program is exposed only in a few departments. Hence, most of the previous studies were focused either in chronic conditions or in very few acute conditions. Comprehensive studies involving care continuum program covering all the clinical departments in a multi speciality hospital is extremely limited in number. In addition, most of these studies relied on human involvement in data collection, customization, sequencing, follow-up, and feedback collection. Mostly Microsoft Excel, other MS Office and CRM tools were used.

The disease conditions vary and so the time of onset of post discharge complications because every individual has a unique anatomy. This is highly individual based and would need personalized or organized follow up with standards according to the disease. A digitized system can take over so that no human error or oversight takes place. But it is still the disadvantage that no top study had determined how effective use of AI driven digitized care continuum program was performed in a multi-speciality hospital setting. Although artificial intelligence may improve care delivery up and down the continuum of care, much remains to be learned. For example, with what efficacy does AI enhance the quality of care and outcomes for patients? How can AI help hospitals improve Patient Satisfaction & Retention?

This study is a comprehensive analysis and the literature evaluation of research papers that focus on care continuum with suitability gaps through artificial intelligence adoption in healthcare. It updates the overall system, knowledge and understanding of care continuum as well of effects on different health indicators together with future research direction in this area. According to the review, research on AI in care continuum is still at an early stage and thus a further examination of overall impact on reduced readmissions as well as increasing satisfaction, patient experience and recurrent visits are warranted. In addition, it stresses the need to assess the AI-based care continuum in different scenarios, including multi-speciality hospitals.

The study researched the effect of AI on health care and examined literature to assess the effectiveness of the care continuum, noting challenges in establishing an effective program. It also identified weaknesses in studies conducted previously, particularly the lack of multispecialty hospital environments. To fill this void, the research mechanism carried by study is combining quantitative and qualitative techniques dealing with active patient/customer who recently availed treatment at the target site hospital. Consideration of the 6-month period as a study duration provided inclusion of an optimal sample size.

The study takes into consideration the various parameters of digitized care continuum have on reduction of readmissions, improvement in patient satisfaction, patient retention, etc. especially in a multi-specialty setting that enables the future researchers to dive more on the tools that can be deployed both by researchers, healthcare providers and HealthTech companies to make a reasonable and positive changes on the systems supporting the improvement of care at various levels.

The growth of artificial intelligence used within the health care sector is expansive. In this way, AI has come in handy to assist healthcare professionals for the process of data science and support remote care communication as well such that it also enlarges diagnosis treatment reliability along with the clinical trial management system advancements.

A hallmark of this research is the comprehensive investigation into patient-perceived advantages of digitized care continuum. The study hopes to unearth the significance of treatment adherence, reduced complications leading to early recovery by evaluating patient's insights. How well digitization applies to care continuum is valuable knowledge for any healthcare provider, patient and HealthTech company alike.

This study is focused on the Indian population of patients treated at a hospital. The key goal is to evaluate the efficacy of digitized care continuum post hospital discharge with decrease in readmissions or improvement in patient experience. This research is an attempt to discover the parameters which play significant role in enhancing digitized care continuum programs through these factors. This research is exploratory; hence it shall touch upon concepts and perceptions that are still nascent or not fully addressed particularly in a multi-speciality hospitals.

This chapter allows the research to conduct a full investigation into the subject matter helping it in identifying potential patterns, connections and important factors in line with Kalu and Bwalya (2017). This research aims to improve insight into the determinants of adoption and effects on out comes in a multiple specialty hospital setting with digitized Care Continuum Program through this initial exploration. The information collected in this exploratory study will provide novel insights regarding patient care coordination, and the types of influences that interact with impacts from the program. With this understanding, researchers can now conduct more thorough and expansive studies of the topic in subsequent research. With a good understanding of the basic mechanisms underlying why or how well a program works once that exploratory phase is completed, researchers can then move on to follow-up studies dedicated to focusing specifically on particular aspects of the program.

The results of this preliminary study will encourage future investigations. It will help to uncover the most important research questions and design future studies using a realist-based approach that can provide in-depth insights into how the digitized care continuum program works at a multi-speciality hospital with different clinical specialities. In the context of healthcare delivery, exploratory research can lay down a strong knowledge foundation upon which future studies may replicate and generalize insights as well as contribute to more holistic theories or models.

Several studies have explored different aspects of healthcare delivery; however, to the best of knowledge, no existing study has evaluated the effectiveness care continuum programs at a multispeciality hospital. To bridge this research gap, this study specifically investigates the efficacy of patient care journey programme for improvement in patient care coordination and outcomes in a multi-speciality hospital with different clinical specialities. After the exploration part, which results in an understanding of a phenomenon, detailed further deeper studies could be taken up.

3.2 Research Purpose and Questions

This study will aim to fill the gap by attempting to generalize the utility of an AI driven digitized system across major clinical departments in a tertiary care multispecialty hospital. The following research questions will guide the study to meet the objectives stated earlier:

1. To quantify the effectiveness of a Digitized Care Continuum system by measuring patient satisfaction and assessing the reduction in re-admissions over a 6-month period.
2. To evaluate the effectiveness of a Digitized Care Continuum system in a multi-speciality hospital by measuring staff satisfaction.

Hence this study is aiming to find solutions as the research exploring various resource usage of AI based digitized care continuum from a multi-specialty hospital for better patient outcomes. Study objectives are to evaluate the effectiveness of digitized care on improving quality and patient outcomes, characterize potential risks associated with using this technology approach in a real-world setting. This study will help to gain valuable information about advantages and disadvantages of digitized care continuum for its implementation in an optimal way.

The aim of the study is to:

i. Assess the effectiveness of a care continuum program in a multi-speciality hospital setting.
ii. Assess the effectiveness of an AI driven care continuum program over manual driven process.

The study objectives are given in the Table 3 below:

Table 3:

Objectives of the Study

Objective 1	:	To quantify the reduction in post discharge re-admissions, achieved by the implementation of a digitized care continuum program over a 6-month period.
Objective 2	:	To assess the patient satisfaction levels resulting from the implementation of an effective digitized care continuum program, using measurable satisfaction scores.
Objective 3	:	To measure the effectiveness of a digitized care continuum program in better clinical outcomes post discharge.
Objective 4	:	To measure the effectiveness of a digitized care continuum program in improving patient retention and loyalty.
Objective 5	:	Determine the importance of a digitized care continuum program in a multi-speciality hospital
Objective 6	:	To assess and quantify the enhancement in employee satisfaction levels resulting from the implementation of an effective digitized care continuum program.

3.3 Research Design

To find the answers to these research questions, mixed methods will be employed. Using the case study methodology of Saunders et al. (2019), the study will be based on semi-structured in-depth interviews to better understand the patient satisfaction variables, and it would help lay out foundation for further qualitative analysis. The focus of the research is to investigate patient preferences (qualitative — open ended semi-structured interviews).

On the other hand, a quantitative survey is administered that contains structured questions with fixed response options for capturing quantitative data of patients' experiences and satisfactions levels or outcomes etc. regarding digitized care continuum program. Statistical methods are used to sift through the data in order to detect patterns, trends, correlations or associations.

While such programs have become increasingly common, the relative impact of different components on outcomes such as healthcare utilization has yet to be elucidated - a gap that the preliminary literature review suggested was particularly important in multi-specialty hospital settings. A new and exploratory path was chosen to consider as many facets of the problem space as possible, having in mind above-mentioned limitations and research context. This second step examines the depth of topic and also some key aspects on factors affecting 'how' much is it affected by digitized care continuum program. The research is exploratory in nature and seeks to understand the parameters within program and how it has resulted in improved patient care.

A solely deductive approach might not be tangible enough, as healthcare service is complicated phenomenon and multi-speciality hospitals face very different situations. The initial literature review has identified a significant gap in understanding of the determinants and barriers that affect the adoption in relation to effective utilisation of digitized care continuum program.

Due to the exploratory and descriptive nature of this research, a mixed-methodology more suitable to discern the breadth and depth around innovation adoption practices is chosen.

This aligns with the need for increased granularity on program outcomes and patient experiences/perspectives.

3.3.1 Methodology

1. Literature Review. Review of related literature and studies on the effectiveness of care continuum programs in healthcare settings, with specific references to Multispeciality Hospitals. The review of literature — for which articles in academic journals, industry reports and other publications was reviewed to build more inclusive insights concerning the topic at hand. The database captured the healthcare setting, health condition type covered under each digitized care delivery program and implementation methodology, along with outcomes including challenges encountered and best practices for select areas of interest over time. Further, the review evaluated the gaps in the current literature that warrant future study.

2. Selection of Research Site. The construction of the research site was meticulous by following the guidelines in subsequent chapter 3.4. The preliminary study site was selected and sent to the Institutional Research Committee/Board (IRC) for further evaluation and approval. IRC invited the researcher for a meeting on 23 June 2022, to talk about research. This study met the guidelines and information requested by IRC. This was reviewed, and ultimately approved after proper formal clearance of this Institutional Research Committee. The plan was based on an AI-enabled digital care continuum named Heaps. The management of the hospital approved the draft to deploy as well.

3. Preparation of questionnaire. The questionnaire was developed after evaluating studies that measured effectiveness of such healthcare programs, and the research guide assigned by the university reviewed it. The online platform Google

Forms was used to capture the data for conversion to digital format, facilitating efficient analysis and reporting. The questionnaire had three sections (see Appendix A). The first section focused on demographics and determined the respondent's gender, age, education, geographic location, employment status; the second addressed the awareness and effectiveness of digital based care continuum program by asking the respondent to identify patient outcomes, user satisfaction, ease of use, perceived value, communication effectiveness, and overall program impact; the third used qualitative questions to assess the challenges the respondents faced while being part of the digital based care continuum program.

Questionnaire with different types of score criteria for open ended question and closed questions was prepared. A pilot test was performed among twenty participants from the target population to ensure both content and validity of questions. The questionnaire was updated based on feedback given in this process. The pilot study was performed in two batches of the pilot population. One of the groups received a link to fill out on Google Form survey tool in WhatsApp. One-on-one interviews with the next batch were also conducted, and the data was obtained. Indeed, 3 reminders only yielded 2 responses (20%) in the first batch. Only one respondent refused to take part in the survey for batch two; thus, 9 respondents (90%) from the second batch were obtained. The response rate jumped up massively in the second batch.

There were 22 questions in the initial survey form, but the respondents perceived repetitions while the survey was administered. Hence question numbers 12, 14, 17, 18 and 22 were excluded from the questionnaire.

Question No.12 - How would you rate the ease of access to your health information through the digitized care continuum program?

- *Very easy*
- *Easy*
- *Neither easy nor difficult*
- *Difficult*
- *Very difficult*

Question No.13 - How satisfied are you with the communication between you and your healthcare providers facilitated by the digitized care continuum program?

- *Very satisfied*
- *Satisfied*
- *Neutral*
- *Dissatisfied*
- *Very dissatisfied*

Seventy eight percent (7/9) of the respondents stated that Question No. 12 seemed duplicative to them as compared with Question No. 13. Moreover, the Question No.13 appeared to be precise and clear to understand for respondents So, Question No.12 was not included in the final questionnaire.

Question No.14 - In your opinion, how well does the digitized care continuum program facilitate care coordination between different healthcare providers involved in your care?

- *Very well*
- *Well*
- *Neutral*
- *Poorly*
- *Very poorly*

Question No.15 - Have you experienced improved follow-up care and coordination of services after the implementation of the digitized care continuum program?

- *Yes, significantly improved*
- *Yes, improved*
- *No significant change*
- *Declined*
- *Significantly declined*

Eight out of Nine respondents (89%) said that Question No.14 seemed familiar with respect to Question No.15. Also Question No.15 was considered as well clear and easy to read by the respondents. Therefore, Question No.14 was removed from the questionnaire.

Question No.16 - Have you noticed any changes in your health-related behaviors (e.g., medication adherence, lifestyle choices) since using the digitized care continuum program?

- *Yes, significantly improved*
- *Yes, improved*
- *No significant change*
- *Declined*
- *Significantly declined*

Question No.17 - In your opinion, does the digitized care continuum program empower you to make informed decisions about your health?

- *Very well*
- *Well*

- *Neutral*
- *Poorly*
- *Very poorly*

Out of 9 respondents, 8 of them (89%) expressed that Question No.17 appeared redundant when compared to Question No.16. In addition, the respondents found Question No.16 to be precise and easier to understand. Hence Question No.17 was excluded from the final questionnaire.

Question No.18 - Likelihood of Recommending the AI-Driven System at Aster Prime Hospital, Hyderabad:

- *Yes*
- *No*
- *Maybe*

Question No.19 - How likely are you to continue seeking healthcare services from this hospital due to the positive impact of the care continuum program?

- *Very likely*
- *Somewhat likely*
- *Neutral*
- *Somewhat unlikely*
- *Very unlikely*

Question No.17 appears to be repetitive, 8 of the total respondents out 9 (89%) agreed that it is redundant compared with Question No.16. Consequently, Question No.17 did not appear in the final questionnaire file with which subjects were presented.

- *Question No.20 - Share any Positive Experiences or Benefits with AI-Driven Care Continuum System at Aster Prime Hospital, Hyderabad:*

- *Question No.21 - Share any Challenges or Drawbacks Encountered while Using the AI-Driven System at Aster Prime Hospital, Hyderabad:*
- *Question No.22 - Share any Suggestions or Additional Comments about AI-Driven Care Continuum System at Aster Prime Hospital, Hyderabad:*

All of the 9 respondents mentioned in pilot survey that their insights are captured with Question No.21 and no extra inputs for Question No.24. Therefore, Question No.22 was removed from the final questionnaire with which research was conducted.

Based on the findings of the pilot study, it was concluded that administering the questionnaire through one-on-one interview showed significantly higher response rate from respondents (patients). Additionally, the final questionnaire was streamlined to 17 questions for the convenience of the respondents.

Another research data from employees was explored through direct questionnaire method using Google Form Survey link. All employees who were involved in the digital care continuum implementation were part of the study. As the population size was small, no pilot study was conducted. 22 questions were administered to these respondents population. The questionnaire had three sections (see Appendix B). The first focused on demographic information and determined a respondent's age, gender, location, education, experience; the second addressed the implementation experience and perception about digital based care continuum; the third addressed used qualitative questions to understand the improvement suggestions by the respondents while being part of the digital based care continuum program implementation team. Both the questionnaires were scrutinized and vetted by the research guide assigned by the university.

4. Data Collection. Individual phone interviews with patients (or if patient was unable to respond, then the family members of those patients) directly involved in the implementation and use of Digitized Care Continuum Program in a multispeciality hospital. Semi-structured interviews were performed including open-ended questions to explore participants' experiences, perceptions and challenges of the program. Discussion topics included perceived benefits of the program, barriers to use, workflow integration challenges, patient satisfaction and suggestions for improvement. This step was intended to get into the details and capture rich qualitative data from a contextual perspective, which can offer an explanation of implementation and utilization dynamics.

Semi-structured in-depth interviews performed during this research design are of a particular importance for multiple reasons. To start with, the interviews provided an individualized and situational examination of patient satisfaction throughout all levels of care. However, in contrast to adoption of quantitative methods which can be based on predefined metrics, specificities extracted from in-depth interviews are often expressed theoretically or directly articulated by the participants. This gives a flavour of the individual perspectives and further provides an insight that cannot be captured completely with quantitative means. From the pilot study, it was so clear that participants were very hesitant over an online data collection method.

The importance of semi-structured interviews is apparent in their capacity to explore more nuanced patient behaviours, perceptions and experiences along the care journey. Patients or their surrogates were asked open ended questions, which solicited more information regarding determinants that might increase satisfaction and also how the same could be done. This approach acknowledges that health experiences of care

are intimately personal and further illuminates the emotional-related dimensions often hidden in quantitative data. The pilot study revealed that response rate was much improved in interview compared to self-mode. Accordingly, the high proportion is due to verbal responses over online survey forms. A preference was noticed to address the qualitative questions through direct interaction, indicating that growing responses could be complemented with more of an interpersonal engagement.

Also, including attendants in the interviews if direct patient responses were not allowed was seen as a way of adding caregivers and ensured inclusivity. This is important in older patients and even when patient was not able to respond to the survey. This approach grounded healthcare experiences as connected and interwoven with those who have insider information about a patient care experience.

These interviews went above and beyond the scope of inquiries into patient satisfaction. The purpose of the study was to determine how a digitized care continuum program would affect employee engagement and organizational metrics. Qualitative findings from a parallel online survey of healthcare professionals provided further insights and context into how the technological intervention influenced everyday activity. It centered around factors like workload, reduced errors but other things were considered as well and that is how a broader view of various determinants was taken.

5. Data Analysis. Interview data were pooled with the questionnaire responses to develop a complete picture of what was revealed about factors affecting success in using Digitized Care Continuum. This includes statistical tools such as Power BI (which is used to define relationships between the variables, and determine critical factors or trends correlation with each other) that could help quantify qualitative data from questionnaires etc.

Visualization of admission, readmission, clinical outcomes and patient satisfaction data retention were performed using Power BI. Line charts, bar charts, scatter plots and histograms were used to breakdown the distribution or trends for such variables across different categories. As a result, this allowed for the program to get an end-to-end view through Power BI of the impact it had in decreasing readmissions and positively impacting clinical outcomes while also improving patient satisfaction rates and increasing retention data. Utilization of this tool helped in getting more intense data drilling using ad-hoc analyses, furthering identification of outcomes and trends related to digitized care continuum program successes.

Quantitative research focused on the hypothesis test to know about relationship for reduced Re-admission against number of admissions within the period and NPS Score denoted patient satisfaction also employee satisfaction for the digitized care continuum program. Applying a Hypothesis Test in this quantitative research, allowed to fully investigate the effectiveness of an AI-driven digitized care continuum program for reduction of admissions in systematic and comprehensive manner.

Reducing re-admissions is important in healthcare, as it helps the program to improve continuity of care and address problems that with high risk for going back to the hospital. Re-admission information was abstracted from hospital electronic secondary data. Likewise, improvements in patient health and well-being serve one of the hallmark metrics to evaluate clinical outcomes. The physician escalations for target population while implementing care continuum program with Heaps data was determined. This aligns well with the identification of any inherent risk factors that affect patient outcomes. Another important aspect of hospital quality, patient satisfaction is how good the patients feel about their care experience, which ties into the human part to health care delivery. Finally, an increase in patient retention demonstrates the program's ability to create a long-term relationship between patients and their healthcare institution. These two inputs were from the participant responses during interview.

Through cross comparing these outcome measures with the total admissions data processed during this time range, Hypothesis test allowed to see a numerical layer of how effective as patients are in terms of program relative of patients who did not participate in it. By taking this statistically based direction, the study was able to confirm whether or not this AI-enabled digitized care continuum program leads significantly towards these desired outcomes which further provided them insights of how beneficial it is in a profound manner.

A Hypothesis Test implementation in this regard proved to be a strong exercise which accurately quantified and explains the connection between rolling out an AI-powered care continuum program, with its effect on health indicators. This fact-based approach was critical to confirming the overall results of the study and offered several important learnings on how well the program worked in a complex healthcare delivery system.

3.4 Population and Sample

Population implies the entirety of individuals, events or items that are characterized by a set of common attributes and describe according to certain parameters prescribed by Mugenda et al. (1999). Their research defines the target population with reference to all individuals a researcher is interested in or intends to make generalizations about.

First, the place was selected that is considered convenient in both distance and easy contact. As the researcher is exposed to Hyderabad District of Telangana State, then a convenient sampling method for selection of study location was adapted by topographically choosing it as preferred area based on in-depth practical knowledge and accessibility constraints.

Concurrently, Hyderabad is among the vibrant healthcare hubs with both urban as well suburban settings which may further add to external validity of this study. The inclusion of urban and suburban/rural patients allows for a complete picture on the challenges and opportunities to deploy care continuum programs in varying healthcare settings.

The analysis further excluded public hospitals since the nature of concerns for data collection from this subset is different. The list of potential research sites was compiled by accessing information ("dme.telangana.gov.in," n.d.) available at the Director of Medical Education, Government of Telangana (statutory body to recognize any medical institution in Telangana State) Website for 763 registered healthcare institutions, out which 252 were found based in Hyderabad District. But this also included small hospitals, nursing homes, clinics and the like. To preserve the quality of data, only those who were accredited institutions and preferably quoting National Accreditation Board for Hospitals & Healthcare Providers were considered. NABH is considered as one of the highest quality and accreditation standards in India. The refinement of the list ("portal.nabh.co," n.d.) resulted in a total number of 60 healthcare institutions located within Hyderabad District.

Since the study focused on multispecialty hospitals, 11 niche specialty hospitals in Paediatrics, Oncology, Urology, and Birthing were excluded, yielding 49 hospitals under consideration. Another criterion enforced was to determine the hospitals that practice Care Continuum. Thus, 30 hospitals were excluded since only 19 remaining hospitals fell under the research interest. Further examination suggested that only two hospitals among the 19 were using a digitized care continuum program, both using the Heaps platform. While both hospitals were reached out, Aster Prime Hospital was the only institution that agreed to participate in the study, making it the chosen research site.

In conclusion, the choice of the study location, namely the multi-speciality hospital in Hyderabad, has been thoroughly researched and supported by several considerations. The multi-speciality hospital considered offers a wide and comprehensive range of healthcare services that have been fully accredited by the National Accreditation Board for Hospitals & Healthcare Providers. It, therefore, offers a rich field for the study of In-Patients within and across different medical specialties. The latter is particularly important as it provides rich and multiple perspectives of various health care practices, patient experiences and perspectives, and how care continuum programs are integrated in a complex clinical setting.

Secondly, the hospital's patient population is large with over 300 patients discharged every month. This demonstrates the large numbers of potential research participants, giving a healthy and representative sample for the study. The number of patients observed in this study is substantial which gives robustness to the research findings and makes them generalizable.

Apart from that this hospital is also associated with ethical perspective in terms of outreach. The research team has an integrated relationship with the hospital (approved, transparent and ethical) with institutional ethics approval to maintain patient privacy/confidentiality. The hospital also has a top-down organized Institutional Research Board to review all studies, such as this one. This partnership supports the conditions for ethical research practices, creating a smooth process to collect data and engage participants. Practically, the accessibility and cooperation of the hospital administration contribute to the logistical feasibility of the study. The willingness of the hospital to participate in the research affords the researcher the necessary support and resources for smooth data collection, minimizing potential disruptions to the study timeline.

The study location is one of the first to implement the digitized care continuum program to seek value addition to their patients. While AI is becoming more and more important in healthcare, not many hospitals have taken advantage of the latest progressions. This is a good example for other institutions who want to embrace this innovation proactively. The study location has implemented Heaps, an AI-based digitized care continuum for the care purpose of patients in hospital.

Therefore, the selection of said multi-speciality hospital in Hyderabad is a reasoned one considering the overall scope of the healthcare services the venue provides, the significant patient graph, the representative demographical structure of the population, the competent business collaboration, and the real-world aspect. The location is optimal in the context of the intensive analysis of the digitized care continuum program dynamics among In-Patients.

The research protocol was designed to be conducted on In-Patients in a multi-speciality hospital at Hyderabad and settlement of the sample size as 500 stands out appropriate option considering embracement of methodological rigor along with ethical considerations and practical feasibility amongst complex healthcare situations.

In this framework, it is crucial — from a methodological standpoint — to establish the minimum sample size necessary for adequate statistical power and study precision. The study location is a multi-speciality hospital that usually has 300 average monthly discharges (anticipated pool of eligible research subjects). The choice of 500 as the sample size was a balance between statistical power and practicality in terms of study period (six months from January 2023).

This methodological calibration is to safeguard not only statistical rigor in finding but also it captures a wide range of the variety amongst which factors exist within relationship with population. A larger sample size may surely improve statistical power, yet it has to be thoroughly balanced with the practical aspects of data collection within a specific time and resource framework. It is deliberately fixated as 500 to ensure methodological perfection with operational viability.

In terms of ethics, defining the required sample size accordingly embodies a strong commitment to respect for patient autonomy. This highlights the ethical necessity of informed consent — anticipating that some patients will object or not agree. Acknowledging patients as subjects, the fixed sample number actually represents that all-important commitment to ethically sound research practices focusing on voluntary participation and informed choice.

The realities of the research environment in healthcare mean that it is necessary to take a proactive approach on challenges associated with recruitment from practical reasons. The contingency plan allows the data collection to be continued for an additional period if a target of 500 subjects cannot be met due to lack of consent. This is an adaptive approach that protects the robustness and sustainability of the study, so as to properly address unexpected events tied with use patterns of the study.

Also, finding a sample of 500 again increases the external validity regarding the study. Consequently, one is able to generalize the findings with more confidence across a larger population of In-Patients in comparable multi-speciality hospital settings. The heterogeneity of population comes with a broader perspective and hence the potentially better results. This is subject to the large part correctly represented in all its aspects substantially improving quality, interpretability and generalization capabilities helpful for healthcare researchers working in the same fields of study.

Therefore, the significance of choosing a sample size of 500 for this In-Patients study in a multi-speciality hospital at Hyderabad arises from striking an intricate balance between methodological rigor, ethical considerations and pragmatic flexibility. This decision goes beyond an arbitrary numeric decree; it embodies a consideration for the complexities of health research work. The balancing act is to strive for statistical integrity and participant freedom while operating pragmatically in the study constraints related to the capture of sufficient sample size.

The digitized care continuum being applied in this study is “Heaps.ai” which is a flagship AI-driven digitized care continuum platform founded in 2020 by Dr. Suman Katragadda. This system provides a demonstration to assess the care span functionality of hospitals. Heaps has rapidly become a provider of innovative technology and services to the health tech industry in India and is now expanding its presence into North America, as well as entering new territories such Europe and Middle East and North Africa (MENA). Powered by state-of-the-art technologies, data analytics and artificial intelligence, Heaps offers an end-to-end health care management system that improves the care managed for patients, hospitals, corporates & insurers.

The Post Discharge Care Management module of this digitized care continuum program is an integral part in assessing the performance of the care continuum. By analysing the status/condition of reporting patient and matching it with a massive database derived from historical cases similar to this; the system intelligently guides on most appropriate care management in accordance onsite. It enables comprehensive, patient-specific discharge plans to be developed on a pre-planned and proactive basis for all patients. The platform deploys multiple Post-Discharge Omni-channel interventions to track patient recovery up to the end of the care episode.

The system offers various benefits in clinical health data sharing, operational efficiencies and financial returns for hospitals. From a clinical perspective, it claims to improve the overall clinical outcomes and reduce readmission rates. It zeroes in on rehospitalization issues, lifting up hospitals to a new level of specialization–setting out standards for certain specializations (centers-of-excellence) supported by measurable proof.

From an operational perspective, the system focuses on improving patient satisfaction and loyalty (decreasing the likelihood of leakage to competitors after patients are discharged). The tool is expected to report feedback and satisfaction scores in detail on a specialty & physician level, giving insights the hospitals are meant for improving.

The platform extracts data from discharge summary either from scanned image of discharge summary or directly from the hospital information system. The system then identifies the medical condition of the patient and appropriately categorizes these patients for different touch points as per protocols and algorithms defined in the system. As the post discharge complications vary between various medical conditions, the algorithms already present in the system give the output of the number of touch points and the specific questions to be posed during the interaction with the patient. The system focuses on regular follow-up with calls made to patients on 3^{rd}, 7^{th}, 18^{th}, 33^{rd}, 60^{th}, 90^{th}, 180^{th} day of discharge and hence the coverage provided by the program after discharge extended up to 180 days (6 months) of discharge. The convenience of just opening the interface and making calls to relevant patients listed for the day and asking the right set of questions based on their clinical conditions provide a great deal of convenience for the employees engaged in the implementation of the care continuum program. The screen shots of the system interface are provided as Appendix E.

Heaps, at its core is more of an expert-led AI driven digitized platform and less like the regular health tech solution. This not only help hospitals improve patient outcomes but also empower them with a powerful system that allows for better clinical, operational and financial performance through the integration of AI-powered digitized data analytics in post-discharge care management. Heaps is positioned as the preferred solution for evaluating and improving care continuum in multi-speciality hospitals, given that it leads with innovative healthcare solutions which have been developed worldwide.

Heaps was the only care continuum platform subjected to AI driven digitized process available inside researcher selected geography. Therefore, it was decided to include this platform in a limited way and accept the inherent trade-off of convenience sampling.

3.5 Study Period

The proposed study duration was initially set for a period of 6 months, from June 2022 to December 2022. This time limit was chosen to allow sufficient time for data collection, analysis, and reporting while ensuring efficiency and adherence to project timelines.

After approval was obtained from both the hospital's IRB and Heaps management, it is suggested by the research site that the study to be conducted from January 2023 to June 2023. This request followed the contract stipulation that any clinical research would need to be performed when the study period was under only those of mutual agreement between Heaps and the hospital. The importance of these contractual obligations lies not only in their impact on the hospital/Heaps relationship for reputational reasons but also their association with legal and statutory necessity.

The hospital was already halfway through a pilot study with Heaps when the research proposal submitted, which was set to start in May 2022 for a period of four months. This pilot study phase was covered by a non-disclosure, non-binding agreement for both parties in order to lay the groundwork of working together going forward. However, the hospital conveyed that such broad trial could wait until after a pilot study and as part of a commercial research agreement with Heaps. This strategic approach was designed to ensure the privacy and confidentiality of data because, in health research (particularly with external partners), this is an extremely important thing.

The hospital signed the definitive contract with Heaps in November 2022. This agreement clearly defined the data-sharing modality and proved enough transparency to meet all statutory and legal compliances. Therefore, the duration of study was rescheduled to January 2023 in consent with institution and contractual obligations. This amendment was made necessary to confirm with the time limits established in a contract between both groups. It also complied well with regulatory constraints and scientific integrity. Accordingly, this change increases transparency and accountability within parties as well. This disclosure was passed on to the Research Guide, and permission was given.

3.6 Participant Selection

All research, especially that involving human participants should explicitly deal with ethical issues. Participants have to be fully informed (informed consent — this is what institutional approval looks for) about the goals of the study, how it might affect them, possible negative and positive consequences of taking part in such a study or their right withdraw anytime. Consent for participation in the care continuum program was sought from all participants once they were admitted to hospital using Informed Consent Forms. The Informed Consent Form template is provided as Appendix D. These interviews took place in complete privacy so that participants could answer freely. All identified consenting participants consented to participate in interviews that were conducted as part of an evaluation of the effectiveness of an AI-driven care continuum program.

When selecting participants, utmost care was taken to provide a discreet and confidential environment addressing these requirements in order for the participants to be at ease during the interviews. All interviews were conducted with prior specific verbal permission from the participants, and extensive attempts were made to get permissions on a case-by-case basis before embarking upon each particular discussion.

This process was formalized by way of a written Informed Consent Form, which patients were asked to sign at the time of hospital admission. This lists out what participating in a care continuum program actually means and makes clear their willingness to do it with phone communications involved. This is the purest form of ethics, with participants only participating should they wish to and not due to outside pressure that in turn ensures those persons who would like to take part are active participants. This ethical structure maintains commitment towards carrying out research with highest level of respect for the health and rights of all subjects therein.

The number of participants in the study, therefore, was adequate to have a sufficient sample size that is representative and covers variance. Having more subjects makes the statistics as well as the findings generalizable to a wider population. The study aims to provide a more complete picture of the diverse experiences within that population by including a large number of patients. This served to increase the reliability of findings, and legitimacy in generalizing results wider than that observed at a local level.

3.6.1 Criteria for selection of sample

1. Inclusion Criteria.

- Patients treated from January 2023 to June 2023 at study site.
- Patients willing to be involved
- Eligible patients were approached for involvement if they were present at the time of data collection. They were contacted thrice. After three unsuccessful attempts, they will be removed from the sample population. This approach is to optimize participation while remaining respectful of patients' time and availability.
- Patients who can read, comprehend English or Telugu or Hindi.

2. Exclusion Criteria.

- The patients who declined participation in the study.
- The patients who could not be reached over phone after 3 attempts.
- The patients who did not initially consent to be part of the digital care continuum program.
- The patients who were discharged from the hospital against medical advice.
- Patients whose family declined participation due to the patient's serious illness.
- Patients who were less than 15 years old whose family did not consent to participate.
- Deceased Patients.

In the initial study period, 2355 total discharges resulted with only 1596 patients opting-in to participate in the digital care continuum program. Although a few patients had apparently verbally consented during hospital admission, these were not contactable by phone to progress the enrolment. Those who were not able to reach within 3 attempts were removed from the study. Of these, only 392 patients were ultimately available for research. Limitations encountered were the inability to contact some patients via phone after three attempts, refusal of some to participate in interviews, other instances where patients had unexpectedly become seriously ill or died before they could be contacted (or their families declined participation), and regrettably cases when a patient was deceased. These difficulties led to the extension of an extra three months for this study in order to reach 500 participants.

From the total of 1305 discharges occurred during the long period from 1st July 2023 to 30th September 2023, only 620 patients agreed on being included in the digital care continuum program. The target population of 500 was only achieved after reaching up to the data of a patient who had been discharged on 1st September 2023. At this time, another 108 patients had agreed to participate in the research. This group faced similar problems: patients who were difficult to contact by phone, others that refused participation when contacted, and some cases of extreme illness where the family did not give their consent or patient death.

During both the baseline and extended periods, reaching the desired number of participants proved challenging. After all the efforts – extending enrollment, having to extend the time in this process — it was only with great difficulty that the study succeeded at meeting what had been a pre-specified goal (Table 4) from day one. Challenges remained to actively involve patients, from communication problems with relatives and caregivers in life threatening circumstances. Despite these challenges, the study stayed true to its mission and successfully reached the necessary numbers of recruited participants after extending recruitment time.

Table 4:

Final sample population data for the study period

Ref. No.	**Data Points**	**Jan - June 2023**	**July - Sep 2023**	**Total**
A	Total number of discharges	2355	1305	**3660**
B	Left Against Medical Advice	71	45	**116**
C	Hospital Deaths	54	38	**92**
D	Not able to reach or did not consent to enrol*	634	602	**1236**
E	Final population available (E=A-B-C-D)**	1596	620	**2216**
F	Not able to Reach	762	281	**1043**
G	Family did not consent	437	229	**666**
H	Deceased	5	2	**7**
I	**Final population consented & taken part in the survey (I=E-F-G-H)**	392	108	**500**

**Not able to reach or did not consent to enrol in the digitized care continuum program at hospital level*

***Final population available for survey after applying initial exclusion criteria*

In conclusion, recruitment of participants was a process undertaken carefully and transparently towards ethical norms while ensuring informed consent. Similarly, the ways in which population size was considered were essential for ensuring both that this study is a sound one and also likely to illustrate about some broad things outside of just the immediate context. These would be furthering the goals of healthcare research on both counts.

3.7 Data Collection Procedures

To measure digital cascade outcomes, quantitative data will be gathered through electronic health records and patient assessments as part of routine clinical care while qualitative assessment on the experience with implementing this digitized continuum-of-care intervention from healthcare workers involved in program delivery. Primary and secondary methods are used to extract the data.

3.7.1 Primary data. The study utilized various techniques to gather primary information. A more personalized approach was used with patients, whereby semi-structured telephone interviews were conducted. Open-ended questions, and follow-up probes with ways to gain insight regarding their experiences. The use of a semi-structured format allowed for the systematic yet free-form engagement with topics that might come up during the interview process. This enabled to collect rich and detailed information on how patients experience these influences, what provides a deeper understanding of the patient view.

Simultaneously, for healthcare workers who participated in the digital care continuum implementation-object oriented ready method was adopted using Google Forms. They completed a simplified form of the questionnaire, which was sent to them via digital delivery point. This approach allowed for more orderly capture of data on administrative aspects, thereby indicating both policies and practices that were important in explaining overall satisfaction with healthcare delivery. Google Forms became an accessible tool for the stakeholders and convenient place to put up valuable feedback. Delivery of the form on SMS, WhatsApp facilitated ease and speed in participation which is helpful for busy healthcare workers.

The use of different approaches for patients and health care providers reflected the distinctive functions that they both occupy in a complex healthcare system. By way of the semi-structured interviews with patients, a narrative-rich qualitative component was added to otherwise quantitative data that helped in ascertaining patient satisfaction not only through numbers but also verbally. Conversely, the Google Form survey for healthcare workers met the needs by providing a more organized and quantifiable process of receiving targeted feedback necessary to facilitate operational changes. All of the methods used in combination added a new level of depth to the understanding about satisfaction levels and functioned as an overview, despite being observed through different lenses — that is patient versus healthcare provider perspectives.

3.7.2 Secondary data. Analysis for data is a secondary way of the approach to ensure in depth information about research problems. The second approach requires a detailed exploration and synthesis of multiple data sources including: written documents, government reports/websites; academic journal articles, Heaps platform retrieved from this instance but also additional relevant information which directly emanates the research site.

The document review was comprehensive, including reports, policy documents and organizational records which provided a rich understanding of the social context within which related research topics were embedded. Government Websites provide insights of data and policies with the required background information on healthcare establishments, patients & accreditations in the health sector.

Academic journal articles, facilitating the secondary data analysis, are an academic base that allows to look over existing theories or frameworks regarding subject matter and emphasizes also empirical studies. The literature review went beyond the confines of research problem, was broad in scope and depth to uncover relevant themes, and informed how primary data findings were understood.

Data extracted from the hospital data excluding such obtained through Heaps and patient databases helped to increase granularity of research. The platform had the data of all eligible patients who consented to be in Digitized Care Continuum program and any background events, escalations during assessment period which served as an important supplementary source of primary study data collected.

The hospital EMR was a direct source of data complemented by secondary analysis to include perspectives from the real world as well as operational considerations. This involved individual hospital policies, procedures and measures along with the added insight of looking at clinical performance indicators as well a broader perspective on healthcare from discharge data. The clinical aspects of various specialities were clearly understood from the hospital electronic medical records.

By integrating secondary data sources, the research sought to extend beyond what could be learned from primary methods alone and provide a more robust understanding of context around — as well as interpretation of — the problem being researched. Using this multipronged approach allowed for both theoretical and practical issues about the usage of AI to be explored, which should enrich any potential research therefore making it a more thorough study in general.

3.8 Data Analysis

This research takes a sensible view by using standard software programs (e.g., Microsoft Word and Excel) for basic data categorization. However, data was analysed using a computer-assisted qualitative data analysis tool, Power BI. The tools were implemented to enable the integrated comparison of quantitative and qualitative data that was collected during study. Power BI over programs like Microsoft Word and Excel offer great flexibility when it comes to the logical structuring, summarizing or graphically displaying numerical values making certain that the analysis is sound while also being easily understandable.

The Power BI helped qualitative data analysis to analyze the rich quality of empirical data gathered. This improved analysis of text or narrative data. The incorporation of an analytical tool as Power BI into the analysis of qualitative data contributed to raising both depth and efficiency within the field of work. Above all, the tool's capability for integrating data from across different sources (quantitative and qualitative) into one place was crucial — it offered a consolidated format to help bring disparate insights together.

To safeguard participant confidentiality, a thoughtful and secure coding system was implemented. Each participant is assigned a unique alphanumeric code coupled with a corresponding number. This coding strategy not only protected the anonymity of the participants but also streamlined the data analysis process. It allowed working with participant data in an aggregated and de-identified manner, ensuring that the findings can be presented and discussed without compromising the privacy and confidentiality of the individuals involved in the study.

The data captured in the CSV format was converted to Microsoft Excel Workbook format for further analysis. The raw data was validated for duplications, data errors and improper data. The final data was evaluated for demographics, clinical presentations, admission & discharge records, readmissions, complications, events and hospital escalations.

A data analysis strategy was chosen to combine the efficiency of Microsoft Word and Excel for quantitative data with sophistication of Power BI tools for rich understandings and deeper insights. The addition of a secure coding system underscored adherence to preserve participant confidentiality whilst conducting the analysis phase, thus allowing both careful exploration as well as ethical research.

3.9 Research Design Limitations

Even though the research design was painstakingly structured and executed, no study is without its struggles. Most of the patients at enrolment agreeing to enter digitized care continuum program were disqualified because they simply had no connectivity whereas others declined consent altogether. Accordingly, a large number of potential participants missed out on the opportunity to participate in evaluating program. Those who did participate had a hard time taking part in the study because they were so busy. As for limitations, a group of people were chosen not to take the study, limiting its scope and generalizability.

An important and complex challenge that emerged was the situation whereby third parties inundated the participants, creating a further level of complexity in the research environment. An incessant flow of calls fueled an environment of interruption and invasion, with very few patients showing a willingness to invest time in completing the survey. Not just disrupting the usual communication in a healthcare function these calls formed an added layer of hesitation amongst patients. This highlighted the difficulty of recruitment and engagement in a setting where opportunities for studies had been heavily impacted by external reasons, over which participants themselves had no control.

These findings suggest a need to manage and schedule participants as well as the importance of considering not only such factors at face value but also their wider implications. Through these complexities the research has been flexible to respond, adapting wherever possible in addressing barriers and increasing the robustness of its design thus credibility.

While the research site did require adjusting to a new study period, it had its challenges and extended the timelines, but it was essential that it was complied with the direction of the research site. This meant that data relating to procedural issues at the outset of roll out and initial patient feedback when they had been taking part in for only a short time frame, were omitted.

It was also found that communication barriers around language made it more difficult to approach and talk with participants one-on-one during the survey. Because the hospital was located in Hyderabad and, therefore most patients were conversant with mainly Telugu language, a local dialect not known to the researcher. Given the language-based barriers experienced in the data collection from participants and an obligation to uphold qualitative depth, a systematic alternative was proposed. Instead of using another survey method it was decided to stick with the original plan and use semi-structured interviews. A major alteration came in the way a language translator was used. The primary aim of this was to make the language accessible even for Telugu speaking patients, a vital need when it came to breaking the gap that languages created and ideally represented an inclusive culture.

This strategic choice ensured both the methodological robustness of audit and feedback was maintained, while simultaneously demonstrating that this research not only sought to survive challenges but attempted to do so without compromising the intent of the study. The study attempted to support more meaningful and authentic communication with the patients as possible by including interpreter assistance, thus obtaining an interpretation of patients experience in their own language within its cultural context. This adaptation serves as an example of the adaptability and agility that is built into the design to address real-world complexity, which in turn strengthens the rigor and utility of this research.

Though this change in protocol enables the data to continue being of a qualitative nature, it also gave rise to new issues about translation validity and neutrality. This was to try and reduce credibility threatening biases that could have arisen from the translation process by selecting a competent, culturally sensitive translator.

Also, the present study covered only a single multi-speciality hospital in Hyderabad geographically. Although informative about program effectiveness in one specific hospital setting, this venue-specific design limited inference to other hospitals. Even the big hospitals, due to their larger patient flow and associated higher complexity in managing such follow-ups (which also vary with each discharge), found it hard to get a sturdy process going. The dynamic nature of these processes and procedures during the study period limits generalizability to hospitals employing alternative strategies to augment post-discharge follow-up.

The researchers additionally had technical limitations, especially in evaluation of the AI-driven care continuum systems. This was evaluated in just one system, because of the difficulties associated with comparing programs between different hospitals. The fact that a research partner hospital with the same system could not or did not participate state-wide, further limited what findings would exist for this study to draw upon; in other words, only data available from one institution. Indeed, this limitation underlined the difficulty of generalizing study results to patterns for hospitals using other AI-driven care continuum tools.

Therefore, it is very important to acknowledge these limitations in interpreting the findings of this study. The research has tried to address these by careful adjustment and transparency in reporting. Although, the period of data collection had constraints but referred to as a rich source, so it is derived in that perspective fulfilling good insights within given scope and context. Generalizing the results to contexts beyond those examined herein should be done with caution; however, future research could build on the work by focusing more rigorously on these limitations and refining methods of study.

3.10 Conclusion

This chapter has been a careful journey through the complexities of designing and carrying out a study that seeks to investigate what can be transformative about AI-based technologies in healthcare. This chapter provided the bases for the study that was being undertaken, building on theoretical understandings and methodological choices which required to be adjusted to meet real world challenges.

AI in healthcare is expected to shift this paradigm of choice fundamentally across the care continuum as we move into a future governed by AI for decision making within healthcare. This change was encapsulated within the conceptual framework presented. The study is unique in its comprehensive scope at the front line of dealing with not merely the technical aspects surrounding this current era of application, but also around a mandate to anchor these advancements based on patient needs and experiences.

The first consideration in the protocol was that an excess of initiatory calls from outsiders had put off very many who would otherwise have taken part. The massive number of requests and the hesitancy from participants demonstrated that a different approach was required which not only honors the time of the participants but can also provide subtle insights otherwise lost in an ordinary survey-based format. Relatively few other unanticipated difficulties emerged that required additional adaptation, and the decision was made to proceed with interviews while adding in translational support for Telugu speakers. It reflects the adaptability and responsiveness abstractly needed when operating in a real-world environment.

Even though these limitations are recognized in the study design (i.e., limited geographical scope specific to one hospital and technical hurdles associated with testing only a single AI-driven digitized care continuum system), they help delineate where this research fits into context. These limitations are not passive acceptances of boundaries but open doors for other researchers to investigate and develop these areas, ensuring an ongoing progression in knowledge through the continually changing landscape of AI within healthcare.

The research methodology chapter provides an extensive guide to researching AI driven digitized care continuum in a real healthcare environment. Proposed theoretical framework, methodological choices and adaptive strategies are at the heart of careful planning in this matter. This methodology chapter sets the stage and captures the ethos of inquiry, flexibility, and commitment to deploying AI technologies sensibly but with a focus on advancing knowledge as well as enhancing healthcare outcomes while also informing future replicability.

CHAPTER IV:

RESULTS

4.1 Introduction

This chapter highlights the results of the study designed to assess the effectiveness of care continuum for hospitals in which this digitized program is being used. This chapter presents the characteristics of participants, experiences and perceptions related to participation in a digitized care continuum with specific attention on semi structured interview data collected from patients and healthcare providers.

Earlier research chapters covered research objectives, overall design of the work, sample size and methodology. This chapter seeks to reveal the relationships among some of these factors by thorough analysis on one part based on primary data obtained from the survey and another by referring other secondary sources. Higher follow up and resolve from the well tracked information contributes a solid grounding for analysis and interpretation.

The data will be analyzed from both qualitative and quantitative perspectives to answer the research questions, as well as help reach study objectives. Following this section will be discussions, and not only discussing the findings but also setting a broader context to them demonstrating their implications for future research and clinical practice. The results are taken, in order to be related with the research objectives and analyses will also be carried out in the subsequent chapters.

This chapter summarizes the care continuum programs launched in a series of depth analysis and insights. This will offer a more nuanced understanding of the digitized care continuum program in the context of healthcare delivery which is quite complex.

4.2 Research Question One

The results also seek to provide enhanced understanding of the research questions. The original research question addressed the following: how effective is Digitized Care Continuum in improving patient satisfaction and reducing readmissions. The results were obtained by these two particular parameters and discussed them in 2 parts, one for patient satisfaction the other to reduce readmissions.

500-patient sample was surveyed to understand the satisfaction score. The re-admission data was reviewed from January through June for 2022 and 2023 to compare the reduction in re-admissions over a six month time period. This program in the care continuum was fully implemented in 2023. Data from the period between January and June 2023 were partitioned to distinguish subjects who belonged in group that enrolled in the digitized care continuum program or do not. For all of these variables, results include the readmission data for each category and appended are detailed statistical analysis that was performed which will be discussed in detail in Chapter V.

4.2.1 Part One - Patient Satisfaction. Results of patient survey had three sections – demographics, the implementation experience and perception about digital based care continuum and qualitative questions to understand the improvement suggestions by the respondents while being part of the digital based care continuum program.

1. Analysis of demographic information. The sample patient population was dissected for demographic information to identify the distribution of sample in terms of age, gender, level of education, geographic location, employment status, etc. This data will be used to deep dive in to the various population groups and understand the significance of the program in each group.

1(a). Gender distribution of sample population. The study looked at gender distribution of the population (Table 5), finding that 53% (264 individuals) were men and only 47% (236 individuals) are women (Figure 16). This is a reflection of the usual gender distribution in the demographics of India as a country as per the 2023 census (projected) calculation report represented in the website - https://countrymeters.info/en/India. This is to create a balance between both genders in the sample at large, therefore increasing representativeness.

Table 5:

Gender Distribution

Gender	**Count**
Female	236
Male	264
Total	500

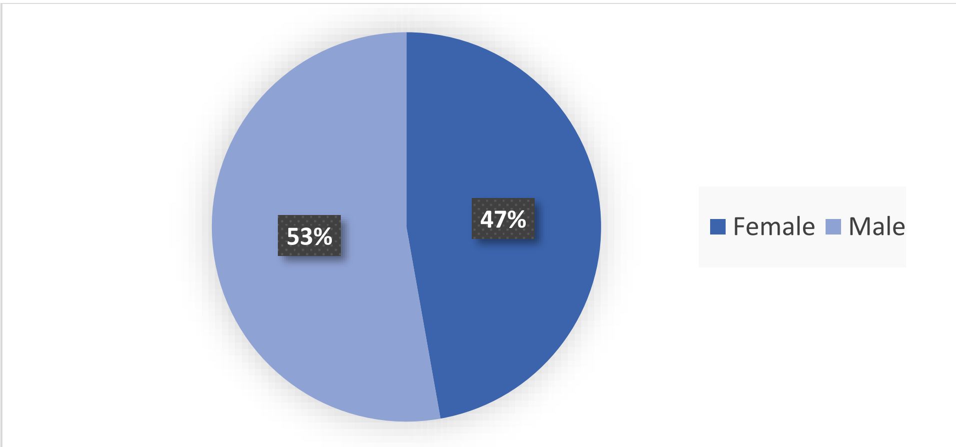


Figure 16:

Gender Analysis

1(b). Age distribution of population. The Age distribution of sample population was assessed (Table 6) and determined to be evenly distributed. The United Nations Population

Fund (UNFPA) has stated in its report of 2019 that 25% Indian population is between the age group of 0 to14 years,18% are with-in the range of 10 -19 years and about one-fourth almost 26% population lies within a bracket extending from10–24 years/age. The India profile projects the largest segment which accounts for approximately 68% under 15—64 years while only 7% occupy the category of 67 years and above. Average life expectancy was estimated at 71 for a male and 74 for a female in India.

The sample population as part of exclusion criteria did not include participants less than 18 years unless the family member was willing to participate in the study. Hence, the percentage of respondents in this category (6%) was seen to be lower.

Table 6:

Age Distribution

Age	**Count**
Less 18 Years	30
18-30 Years	89
31-40 Years	58
41-50 Years	86
51-60 Years	88
61-70 Years	91
71 Years and above	58
Total	**500**

Seven categories of age distribution were considered (Figure 17) in which less than 18 years of age were 30 Nos. (6%), 19-30 years were 89 Nos. (17.8%), 31-40 years were 58 Nos.

(11.6%), 41-50 years were 86 Nos. (17.2%) , 51-60 years were 88 Nos. (17.6%), 61-70 years were 91 Nos. (18.2%), and above 71 years were 58 Nos. (11.6%).

Health is relative, and what counts as healthy at one age will be different to another person who also may or may not have health conditions that individual does. Wellness is a complex state determined by numerous factors such as genetics, nutrition and lifestyle choices like exercising, access to healthcare services or the environment we live in. However, many people believe that middle age (in their 40's and 50's) is when certain health problems start to become more common. With advancing age, several chronic conditions such as heart disease, diabetes and arthritis are more likely to develop. Among these, 323 (64.6%) are over the age of 40 and therefore at risk for health problems that may require admission to hospital system in this population.

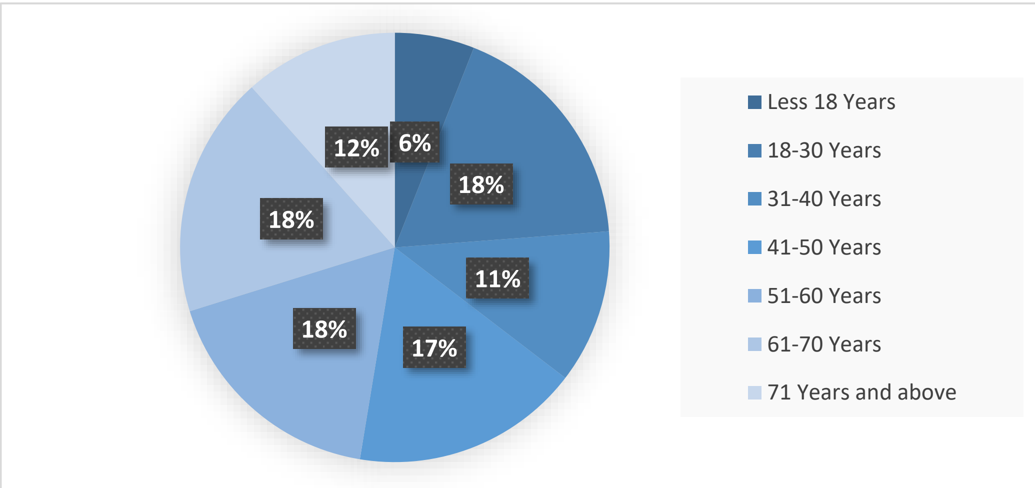


Figure 17:

Age distribution

The distribution of age across gender was also assessed (Table 7). There were 146 females and 177 males in the category of above 40 years and above contributing to 65% of population (Figure 18).

Table 7:

Age – Gender Distribution

Age	Count	Female	Percentage	Male	Percentage
Less 18 Years	30	17	3%	13	3%
18-30 Years	89	47	9%	42	8%
31-40 Years	58	26	5%	32	6%
41-50 Years	86	44	9%	42	8%
51-60 Years	88	47	9%	41	8%
61-70 Years	91	34	7%	57	11%
71 Years and above	58	21	4%	37	7%
Total	**500**	**236**	**47%**	**264**	**53%**

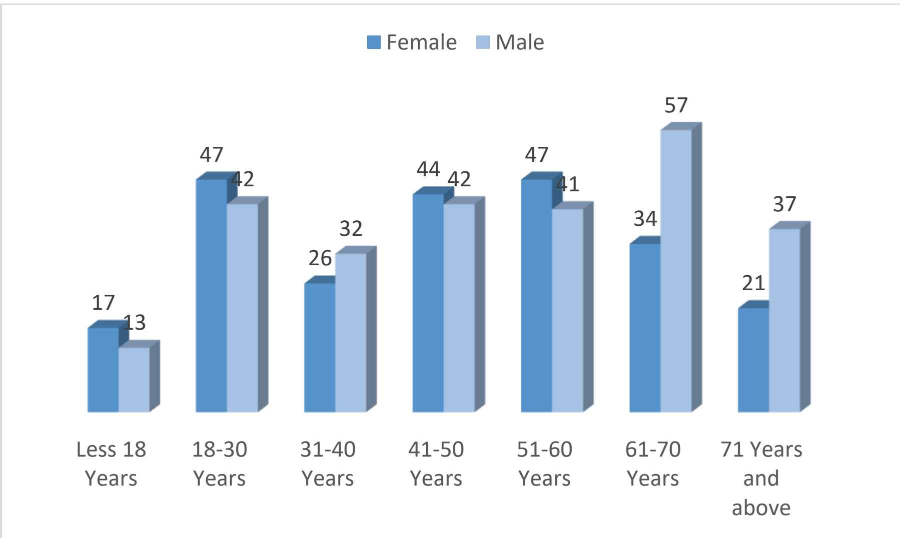


Figure 18:

Age-Gender distribution

1(c). Level of Education of respondents. The level of education is an important criterion to measure the understanding of healthcare metrices. Basic education always helps patients or families in improving awareness levels in the healthcare domain. The explanation of medical conditions along with diagnostic and treatment modalities are often complex for a lay man to understand. Hence, the level of education becomes an important parameter in assessing the judgement of the patients or families in measuring any healthcare initiative. The level of education of sample population was assessed (Table 8), and it was found that 71% of the respondents had some formal education.

Table 8:

Level of Education

Level of Education	**Count**
Prefer not to say	143
School Education	134
Bachelor's Degree	170
Master's Degree	49
Doctorate Or Professional Degree	4
Total	**500**

While 143 respondents (29%) of the population preferred not to say, 357 participants (71%) responded to the question (Figure 19). The population had 134 participants (27%) with school education, 170 participants (34%) with Bachelor's Degree, 49 participants with Master's Degree and 4 participants (1%) with Doctorate/Professional Degree. Overall, 223 participants (45%) of the population were graduates and above.

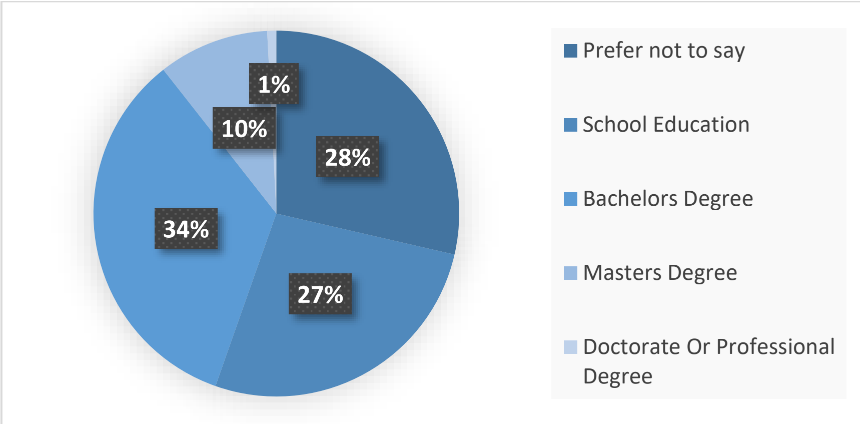


Figure 19:

Level of Education

It was observed (Table 9) that 30 patients had responded in the less than 18 years age category. 218 participants who were graduates and above fell under the 18 years and above age category.

Table 9:

Age-Education Mix

Age Range	**Prefer not to say**	**School Education**	**Bachelor's Degree**	**Master's Degree**	**Doctorate Or Professional Degree**	**Grand Total**
< 18 years	8	17	3	2		30
18-30 Years	10	9	54	15	1	89
31-40 Years	14	7	28	8	1	58
41-50 Years	29	24	25	8		86
51-60 Years	30	37	15	6		88

61-70 Years	32	22	28	7	2	91
> 71 Years	20	18	17	3		58
Total	**143**	**134**	**170**	**49**	**4**	**500**

1(d). Occupation of respondents. The occupation or employment status of the participants was assessed (Table 10), and it was found that 143 participants (29%) of them were employed at different levels. Out of these 143 participants, 90% were employed full-time and 10% were employed part-time. 133 participants (27%) responded as "Others". 12 Students contributed to 2% and 75 retired participants contributed to 15% of the survey population. Unemployed category constituted 27% of the population with 137 participants.

Those who responded as "others" contributed to 133 participants (Figure 20) and 27% of the survey population. On detailed analysis, it was found that this category constituted 83 participants who were Home Makers (62%), 21 participants were Self-Employed (16%), and 29 participants (22%) were those who preferred not to disclose their employment status.

Table 10:

Employment Status

Employment Status	**Count**	**Percentage**
Employed Full-Time	128	26%
Employed Part-Time	15	3%
Unemployed	137	27%

Student	12	2%
Retired	75	15%
Others	133	27%
Grand Total	**500**	**100%**

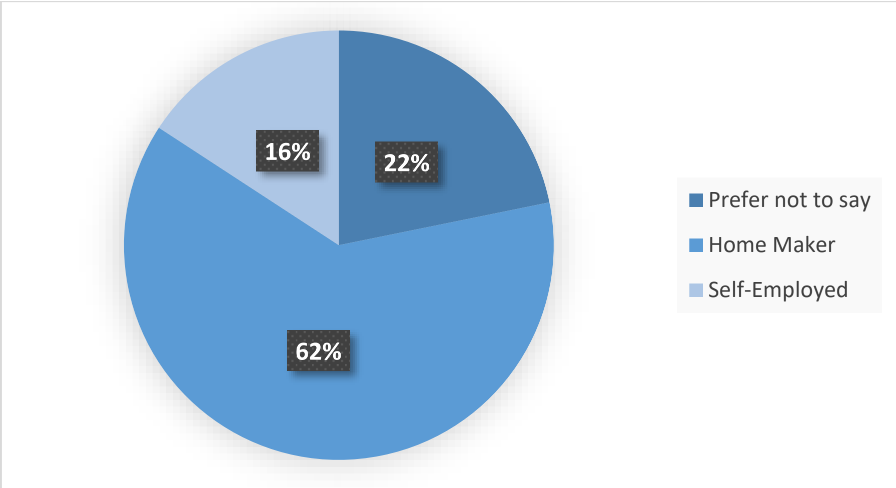


Figure 20:

Employment Status (Others Category)

1(e). Geographic Distribution of respondents. The geographic distribution of the population was evaluated (Table 11), and it was found that the population was more skewed towards Urban as the number of participants was 447 contributing to 89% of the survey population. For the ease of tabulating the data, participants who mentioned Hyderabad as their location were considered to be part of the city. Those from the districts of Telangana state were 36 in number, contributing to 7% of the survey population (Figure 21). There were 17 participants (3%) who utilized the services of the hospital from other states.

Table 11:

Geographic Distribution

Category	Classification	Count
City	Urban	447
District	Rural	36
Other States	Outstation	17
	Total	**500**

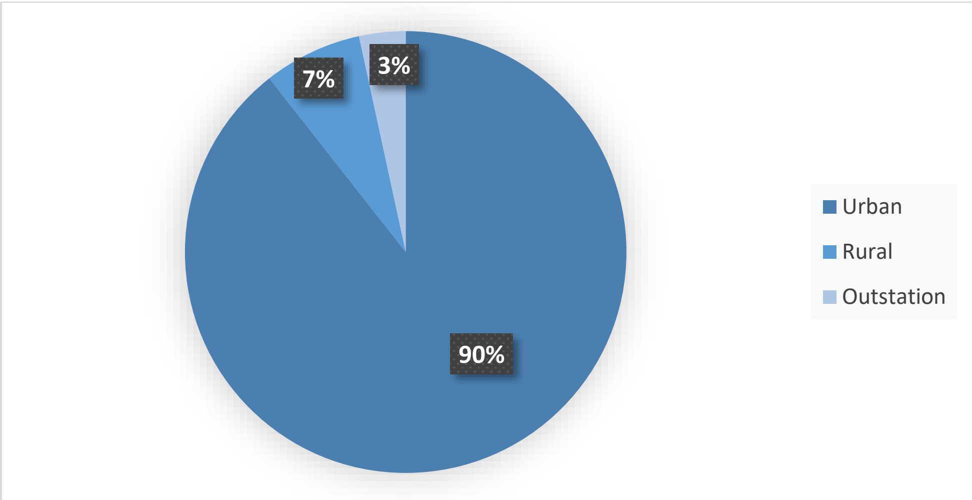


Figure 21:

Urban-Rural Distribution

2. Analysis of Clinical Information. The clinical information of the participants is vital to understand the distribution among various clinical departments. The date of discharge is significant to assess and dissect the number of readmissions in the next Six-month period. As the research site is a multi-speciality hospital, evaluating the number of patients being discharged from each clinical department is a significant parameter to assess whether the target population is a true representative of the discharge data.

2(a). Clinical department distribution. The clinical departments were systematically clubbed together to get anatomical system-based inferences. Hence, specialities like Nephrology and Urology were clubbed under Renal Sciences, Neurology and Neuro Surgery were clubbed together as Neuro Sciences, Cardiology and Cardiothoracic Surgery were classified under Cardiac Sciences, Surgical Gastroenterology was placed under General Surgery, Medical and Surgical Oncology were clubbed together as Oncology and Medical Gastroenterology, Critical Care Medicine, etc. were clubbed together under General Medicine. Clinical department distribution was assessed (Table 12), and it was found that the hospital had more focus on Cardiac Sciences as this speciality contributed to 30% of the survey population (Figure 22). This was followed by General Medicine (14%), General Surgery (11%) and Neurosciences (11%).

Table 12:

Clinical Department Distribution

Clinical Departments	**Count**
Cardiac Sciences	151
General Medicine	70
General Surgery	56
Neurosciences	55
Renal Sciences	41
Obstetrics and Gynaecology	36

Clinical Departments	**Count**
Otolaryngology	33
Orthopaedics	32
Paediatrics	13
Pulmonology	7
Plastic & Cosmetic Surgery	4
Oncology	2
Total	**500**

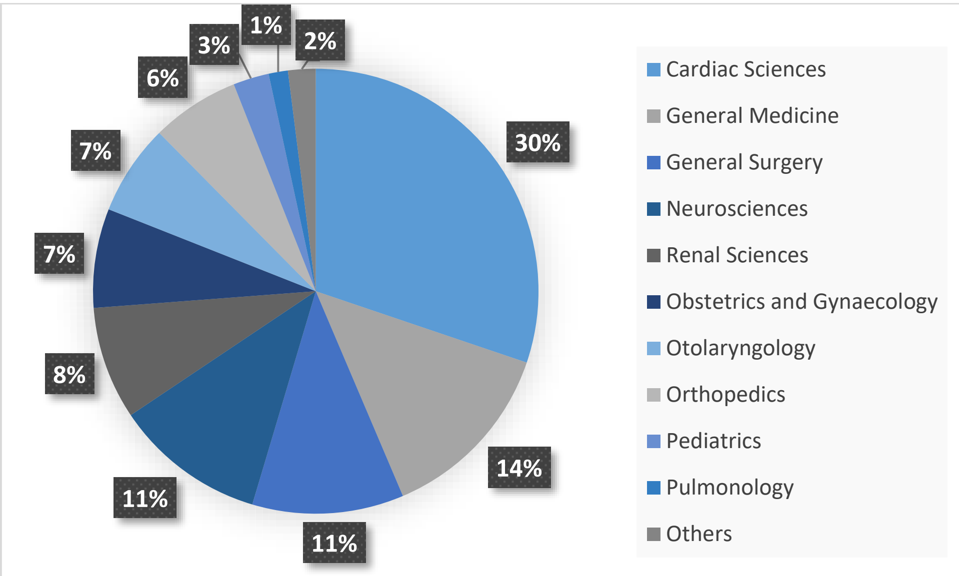


Figure 22:

Top Clinical Departments – Survey Population

Similar data was evaluated for the overall discharges from Jan-June 2023 (Table 13) and it was found that the top 5 departments remained the same in both the groups with the exception of General Surgery and Neuro Sciences swapping ranks. The same pattern was noticed among the top 10 departments and it was observed that the rankings are more of less the same with the only exception of Oncology department in the Survey population. As per survey population Oncology department was ranking 13, while in the total number of discharges it was featuring in the 9^{th} rank. Pulmonology was featuring in the top 10 departments which was pushed to 11^{th} position in the total number of discharges (Figure 23).

One specific observation here was that the number of discharges for Oncology patients were slightly on the higher side as the department was introduced towards the end of 2022 and most of the patients were either on Chemo or had higher comorbidities warranting more admissions. Hence, this was taken as an exception and the top 10 department data was finalized.

Table 13:

Top Clinical Departments – Jan to June 2023 discharges

Rank	**Department**	**Count**	**%**	**Rank as per survey population**
1	Cardiac Sciences	676	29%	1
2	General Medicine	299	12%	2
3	Neurosciences	286	12%	4
4	General Surgery	251	11%	3
5	Renal Sciences	210	9%	5
6	Orthopaedics	140	6%	8
7	Obstetrics & Gynecology	130	6%	6
8	Otolaryngology	128	5%	7
9	Oncology	78	3%	13

Rank	Department	Count	%	Rank as per survey population
10	Pediatrics	72	3%	9
11	Pulmonology	60	3%	10
12	Plastic And Cosmetic Surgery	25	1%	11
		2355		

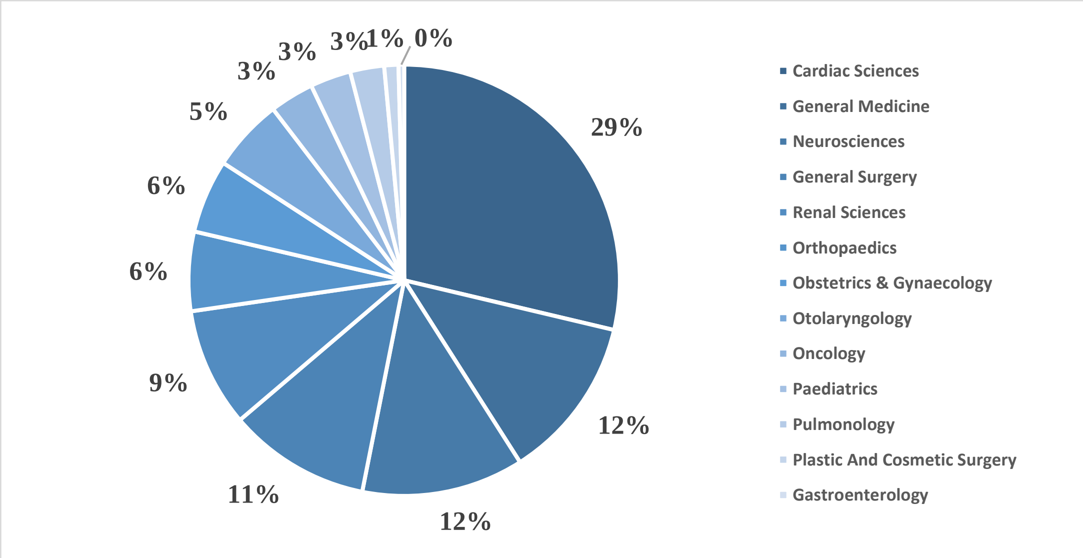


Figure 23:

Department Rankings

2(b). Hospital Discharge Distribution. One of the most important pieces of information for measuring effectiveness in any care continuum program is hospital discharge data. The secondary data included that of all discharges from Jan-June 2022, all discharge from Jan-June 2023 and the monitored digitized care continuum program (Table 14). This was then supplemented by an assessment of 6-month re-admissions in the secondary data. The interpretation of the statistical results will be explained in detail in the subsequent chapter (Chapter V).

While the survey population shows a slight deviation in few months, notably February and March 2023 it was found that for the year of 2022, there is not much variation in discharges distribution (Figure 24).

Table 14:

Hospital discharge distribution

	Survey Population 2023		**Overall Discharges 2023**		**Overall Discharges 2022**	
Month	**Count**	**%**	**Count**	**%**	**Count**	**%**
January	64	13%	411	17%	293	15%
February	65	13%	385	16%	308	16%
March	61	12%	428	18%	352	18%
April	80	16%	405	17%	313	16%
May	84	17%	372	16%	345	17%
June	56	11%	354	15%	373	19%
July	35	7%				
August	53	11%				
Septembe r	2	0%				
Total	**500**		**2355**		**1984**	

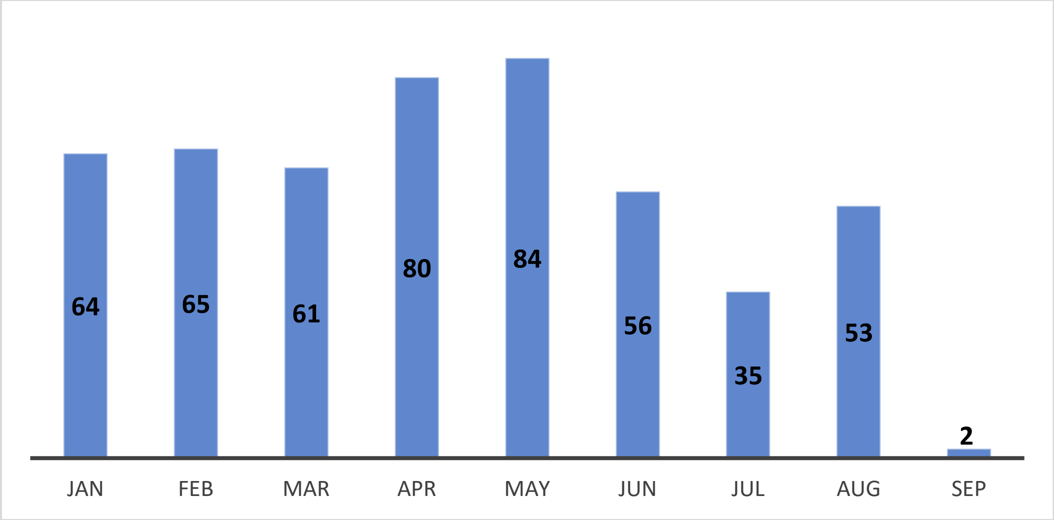


Figure 24:

Distribution of discharges

It was noted that the discharges were slightly higher for the months of April and May for the Survey population followed by February. Since the period extended till September 2023 for the sample population, the distribution of discharges slightly varied from the population distribution for the years 2022 and 2023.

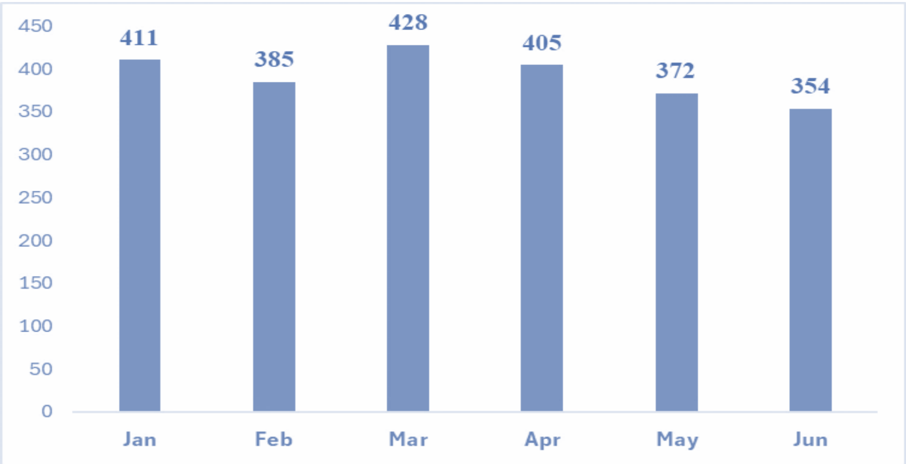


Figure 25:

Distribution of discharges for the period Jan-June 2023

Discharge distribution in analysis of Jan-Jun 2023 (Figure 25) reported high discharge rate other than survey population for month of January, March and April. Although the distribution was different for that period in 2022 (Figure 26) with June, March and May having highest discharge rates among six months starting from January of 2022.

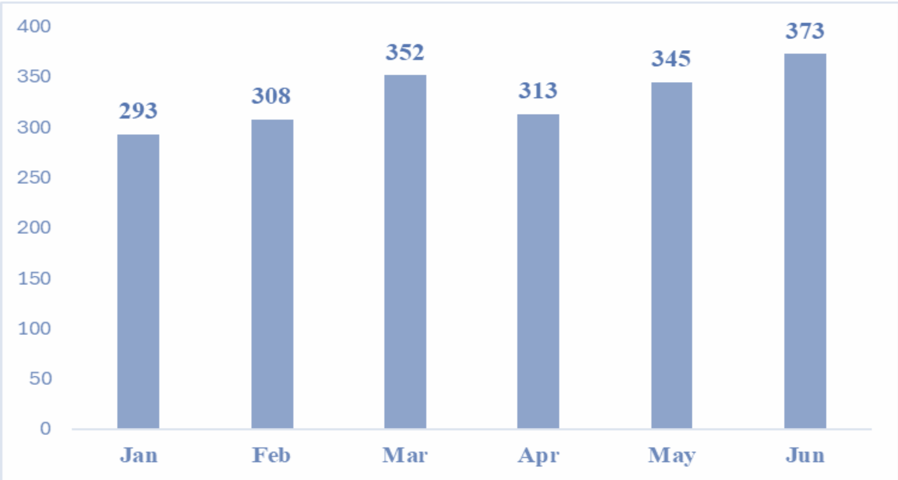


Figure 26:

Distribution of discharges for the period Jan-June 2022

2(c). Frequency of hospital visits. The frequency of hospital visits was assessed (Table 15) to understand whether the survey population is properly placed in terms of age groups. Another inference that could be achieved in terms of the health status of these patient groups was based on the frequency of visits. If the visits are more frequent, it can be considered to have more prevalence of chronic health conditions in general while if the frequency is less, the conditions will be acute in nature.

The overall findings show that 126 respondents (25%) visit the hospital regularly and 233 respondents (47%) visit only occasionally. Population from rare visits contributed to 141 respondents (28%). As the large group participants who visited the hospital occasionally was the highest, it can be interpreted that the hospital has a mix of both chronic and acute disease distribution.

Table 15:

Frequency of Hospital visits

Frequency	**Count**	**Percentage**
Regularly	126	25%
Occasionally	233	47%
Rarely	141	28%
Total	**500**	

On dissecting this data further as given in Table 16, it was noticed that the age group of patients visiting the hospital occasionally and regularly was highest in the 61-70 years followed by 18-30 years and 51-60 years. It was also observed that the age group of patients frequenting the hospital (Figure 27) contributed to 47% of the population that corresponds to the relevant age group (above 40 years) of people who are generally sick.

Table 16:

Frequency of Hospital visits in terms of Age

Age Range	**Rarely**	**Occasionally**	**Regularly**	**Total**
18 Years and below	7	13	10	30
18-30 Years	33	37	19	89
31-40 Years	13	29	16	58
41-50 Years	20	44	22	86

51-60 Years	25	43	20	88
61-70 Years	29	40	22	91
71 Years and above	14	27	17	58
Total	**141**	**233**	**126**	

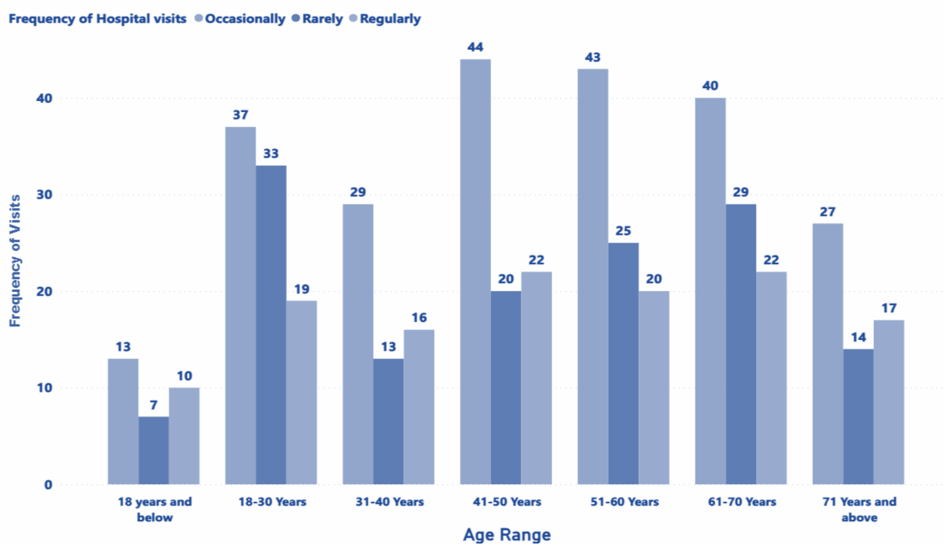


Figure 27:

Age wise distribution of frequent hospital visits

In terms of clinical departments (Figure 28), Cardiac Sciences contributed to 35% of the population who frequently visited the hospital followed by General Surgery with 18% and General Medicine with 12% followed by Neurosciences with 10%.

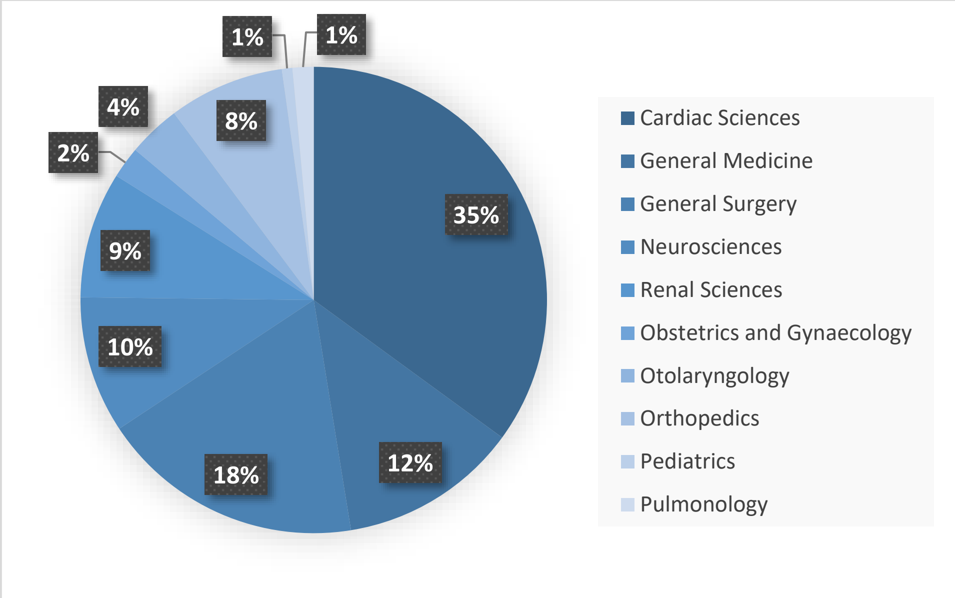


Figure 28:

Department wise frequency of hospital visits

3. Analysis of patient experiences. To analyze effectiveness of any healthcare program, the assessment of patient experience is a must. If the ultimate users have positive perceptions about the program, there will be an obvious increase in patient satisfaction and patient retention. User satisfaction is an important parameter to understand the perception and strength of loyalty to the organization. Various parameters related to patient experiences were measured in terms of awareness and satisfaction in connection with the usage of digitized care continuum. The findings are given below:

3(a). Recent hospital visit experience. Any patient perceptions would be interlinked with the recent experience. Hence, the recent experience of the respondents was measured (Table 17), and it was found that close to 98.6% of the patients had a great experience at the hospital. Only 2 respondents rated Fair (0.4%), and 5 respondents rated poor (1%). This shows that the hospital is focusing on the service excellence for its customers. The overall findings will be discussed in detail in the subsequent chapter.

Table 17:

Recent Hospital Experience

Recent Experience	**Count**	**Percentage**
Excellent	39	8%
Very good	157	31%
Good	297	59%
Fair	2	0%
Poor	5	1%
Total	**500**	

Detailed analysis (Table 18) shows that the positive recent experience was "Excellent" in the patient category who were visiting the hospital regularly. The "Very Good" and "Good" experiences were more in the group which was visiting the hospital Occasionally.

Table 18:

Frequency of visits and recent hospital experience

Frequency Of Healthcare Visits	**Excellent**	**Very good**	**Good**	**Fair**	**Poor**	**Total**
Rarely	4	42	94		1	141
Occasionally	12	81	138	2		233
Regularly	23	34	65		4	126
Total	39	157	297	2	5	500

The recent experience was evaluated among population based on their frequency of hospital visits. It was found that 71% respondents who “occasionally” and “regularly” visited the hospital had positive experiences (Good, Very Good and Excellent) during their recent visit. Another interesting fact was that 28% of the population who visited hospital “rarely” also had positive experience during their last visit.

3(b). Awareness about digitized Care Continuum. Success of any healthcare program largely depends on the awareness and acceptance of the end users. This will also have an influence on user satisfaction and future acceptance. The awareness about digitized care continuum was evaluated (Table 19) and the data showed that close to 40% of the population were “Very Aware” of the presence of the digitized care continuum in the hospital.

The majority of the population (60%) were “Somewhat Aware” and only 1% of the population responded that they were ‘Not aware” of the presence of the digitized care continuum program in the hospital.

Awareness levels among different age groups were analyzed (Figure 29) and only 3 respondents from 31-40 Years (1) and 41-50 (2) responded that they were “not aware” of the digitized care continuum program. Higher awareness levels were noticed in the 18-30 Years (43), 51-60 Years (35) and 61-70 Years (34). The highest response for “Somewhat aware” was seen in the 41-50 Years (60) category.

Table 19:

Awareness about presence of DCC

Awareness Level	**Count**	**Percentage**
Not Aware	3	1%

Somewhat Aware	298	60%
Very aware	199	40%
Total	**500**	

60% of the population (Figure 29) responded "Somewhat Aware" that denotes that they have some knowledge but not very deep understanding about the program or its benefits. Hence, the research site needs to focus on improving the awareness level of their patients about the presence of care continuum program. Awareness level is a key factor in understanding and adoption of any healthcare program and hence improvement in awareness is an important parameter that influences patient satisfaction. The steps to be taken by the research site to improve the awareness level of patients will be discussed in subsequent chapters.

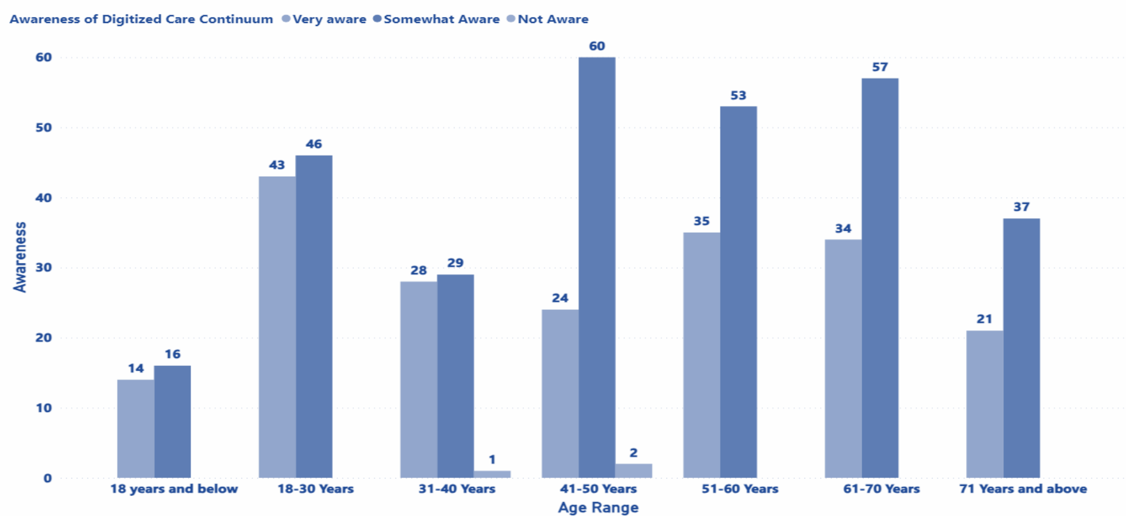


Figure 29:

DCC Awareness among different age groups

Similarly, correlation between frequency of visits and awareness levels (Figure 30) were evaluated. It was found that 25% respondents who regularly visited the hospital were "very aware" or "Somewhat aware" about the digitized care continuum program. The highest awareness level was seen in the occasionally visiting group contributing to 47% with subgroups responding as “Very aware” (17%) and “Somewhat aware” (29%).

Those who visited hospital rarely also had reasonable awareness about the program with “Very aware” contributing to 8% and “Somewhat Aware to 20% of the total survey population. The responses for “not aware” denotes that the patients who are placed in the program should be given more information with benefits associated with the program. Understanding a product better will lead to better usage and acceptance.

In complex healthcare scenarios, it is always confusing for the patients or families to understand the medical jargons and technicalities. The healthcare providers should take adequate measures to improve awareness level of any healthcare program for better acceptance and future usage. Various measures that can be utilized to improve awareness level will be discussed in the subsequent chapter.

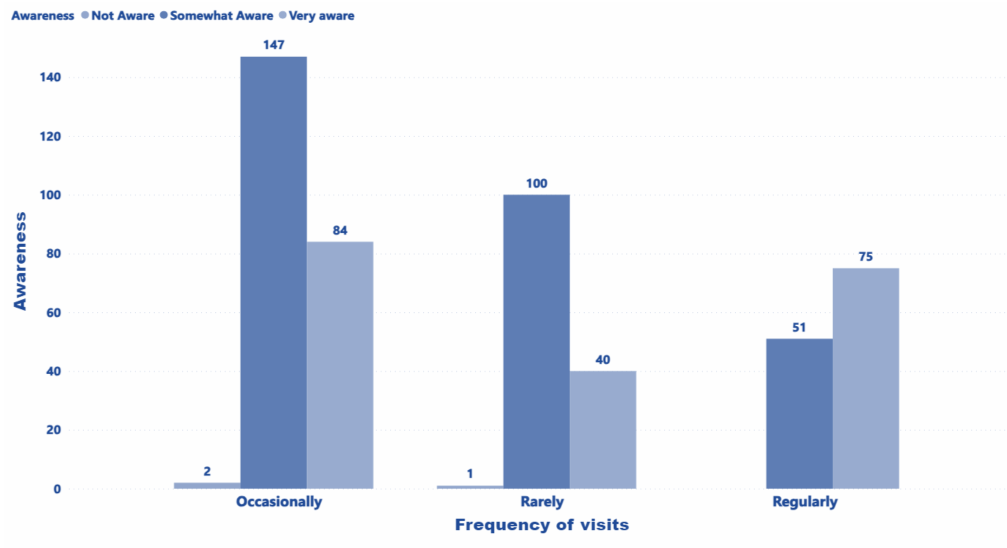


Figure 30:

Awareness level and frequency of visits

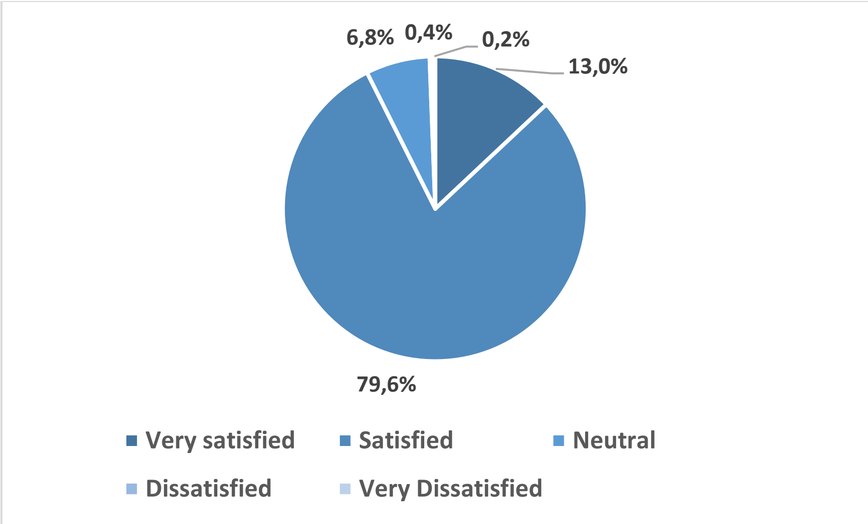


Figure 31:

Overall experience with DCC

3(c). Overall experience with Digitized Care Continuum. The most important parameter of overall experience of respondents with the program was evaluated and it was observed (Figure 31) that 13% of the population were "very satisfied" with the program and 79.6% of the population were "satisfied". Hence, the positive perception about the program was seen to be close to 90% among the total survey population. 6.8% of the population responded as "neutral" and those who responded as "dissatisfied" and "very dissatisfied" were 2 respondents (0.4%) and 1 respondent (0.2%) respectively.

To understand the patient overall acceptance and satisfaction, Net Promoter Score is an important parameter. To calculate the Net Promoter Score (NPS) from the data, the percentage of promoters, detractors, and neutrals were determined.

- Promoters: Those who are "very satisfied" and "satisfied" with the program.
- Detractors: Those who are "dissatisfied" or "very dissatisfied" with the program.
- Neutrals: Those who are "neutral" about the program.

Table 20:

Net Promoter Score of Digitized Care Continuum

	Promoters	**Detractors**	**Neutral**
Very Satisfied	13.0%		
Satisfied	79.6%		
Neutral			6.8%
Dissatisfied		0.4%	
Very Dissatisfied		0.2%	

- Promoters (P) = 13% + 79.6% = 92.6%
- Detractors (D) = 0.4% + 0.2% = 0.6%
- Neutrals (N) = 6.8%

NPS Score = Promoters (P) – Detractors (D) = 92.6 - 0.6 = 92

NPS is calculated by subtracting Detractors from Promoters. It was found that the NPS (Table 20) was above 90 denoting a positive Net Promoter Score for the program. It can be clearly understood that the users are happy with the program and are promoters for the success of the program. In terms of Customer Satisfaction Score (CSAT), the score was shown to be 92.6% where the percentage of "Satisfied" and "Very Satisfied" was calculated to measure the satisfaction level of patients.

Both the parameters NPS & CSAT show that the overall patient satisfaction levels about the digitized care continuum were seen to be positive which has to be correlated with feedback collated for other parameters.

The overall experience of the digitized care continuum was evaluated among different age groups (Figure 32), and it was found that close to 59.6% of the population who were satisfied or very satisfied with the program belonged to age group 40 years and above (298 Nos.). Age group less than 40 years contributed to 165 numbers and 33% of the total population. Neutral, dissatisfied and very dissatisfied categories were 5% and 2.4% among those above 40 years and below 40 years respectively.

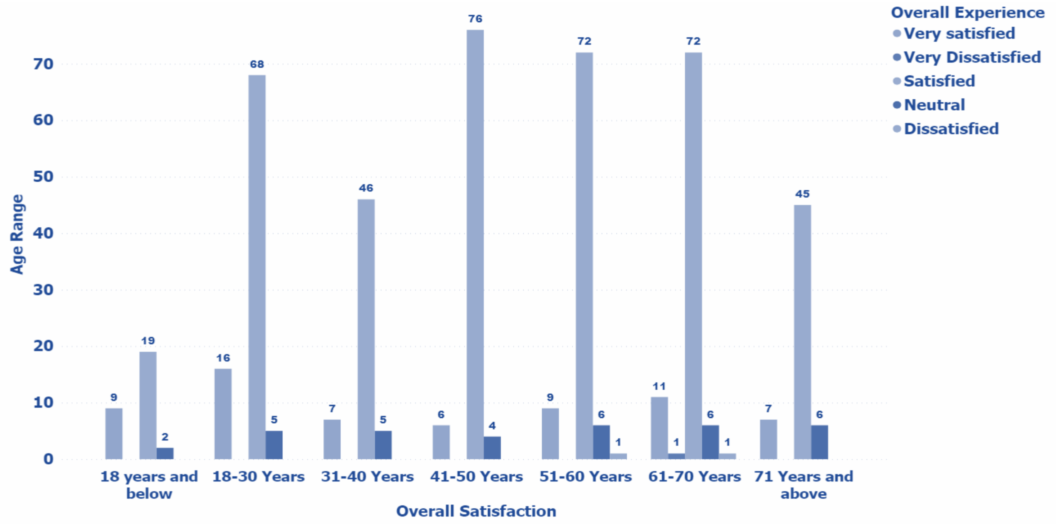


Figure 32:

Overall experience of DCC among age groups

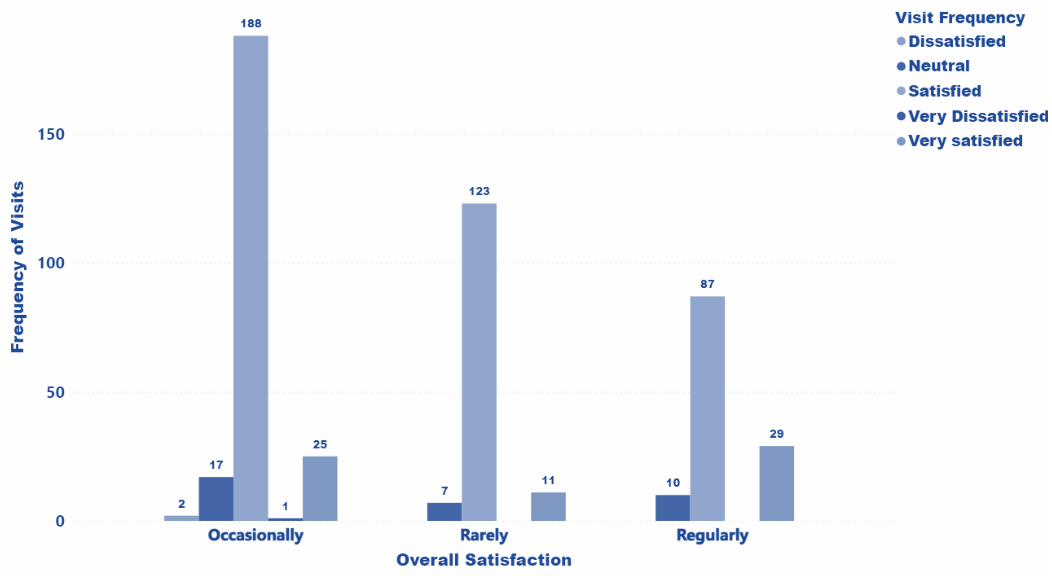


Figure 33:

Overall experience of DCC with frequency of visits

When the overall experience associated with the frequency of hospital visits was measured (Figure 33), it was observed that those who visited hospital regularly contributed to 23% of the satisfied and very satisfied category. Those who visited occasionally and rarely contributed to 43% and 23% of the satisfied and very satisfied category respectively. There were no dissatisfied or very dissatisfied patients among those who visited hospital regularly.

When the recent hospital experience was measured along with the overall experience of Digitized Care Continuum program (Figure 34), it was seen that patients who rated good, very good and excellent experience during their recent hospital visit contributed to 92% of "satisfied" and "very satisfied" category. Surprisingly, 2 patients who had "good" recent experience were either "dissatisfied" or "very dissatisfied" with the digitized care continuum program though no specific reasons were given by both. One patient who had "fair" experience during their recent visit to hospital rated the program as "dissatisfied" while another one rated the program as "satisfied". Among patients who rated recent visit experience as "poor", one remained "neutral" in his response towards digitized care continuum while four patients responded as "satisfied" with the program.

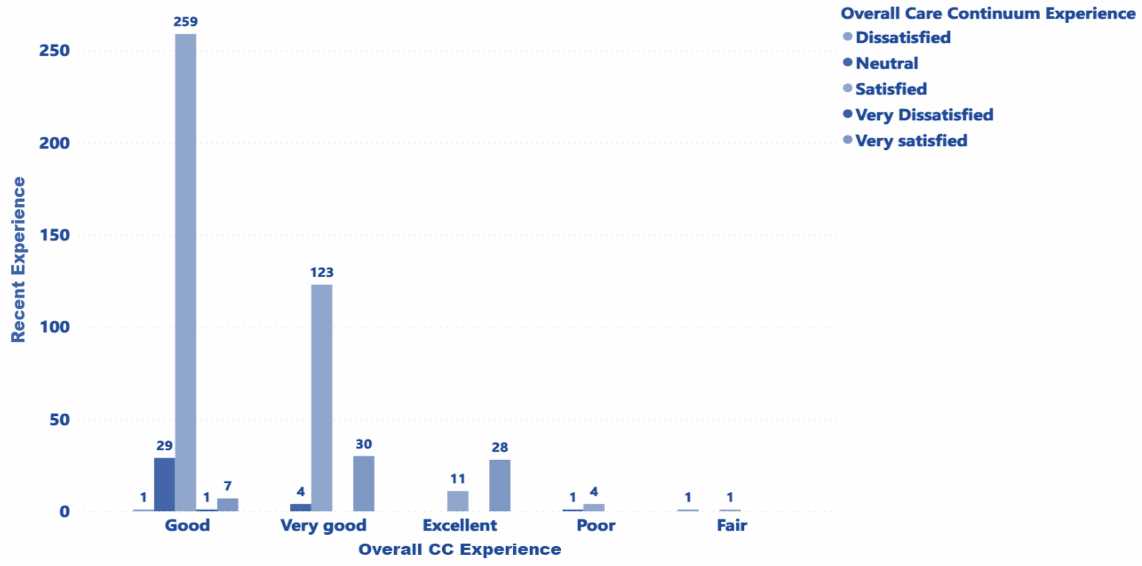


Figure 34:

Overall experience of DCC with recent visit experience

The overall experience of digitized care continuum was measured among patients who took services from various clinical departments (Figure 35). 89% (134 Nos) of Cardiac Sciences patients were seen to be "satisfied" or "very satisfied" with the digitized care continuum program while 11% rated the program as "neutral", "dissatisfied" and "very dissatisfied". Among the top 5 departments, patients availing services from General Medicine, General Surgery, Neurosciences and Renal Sciences responded 93%, 95%, 98% and 93% respectively to "satisfied" or "very satisfied".

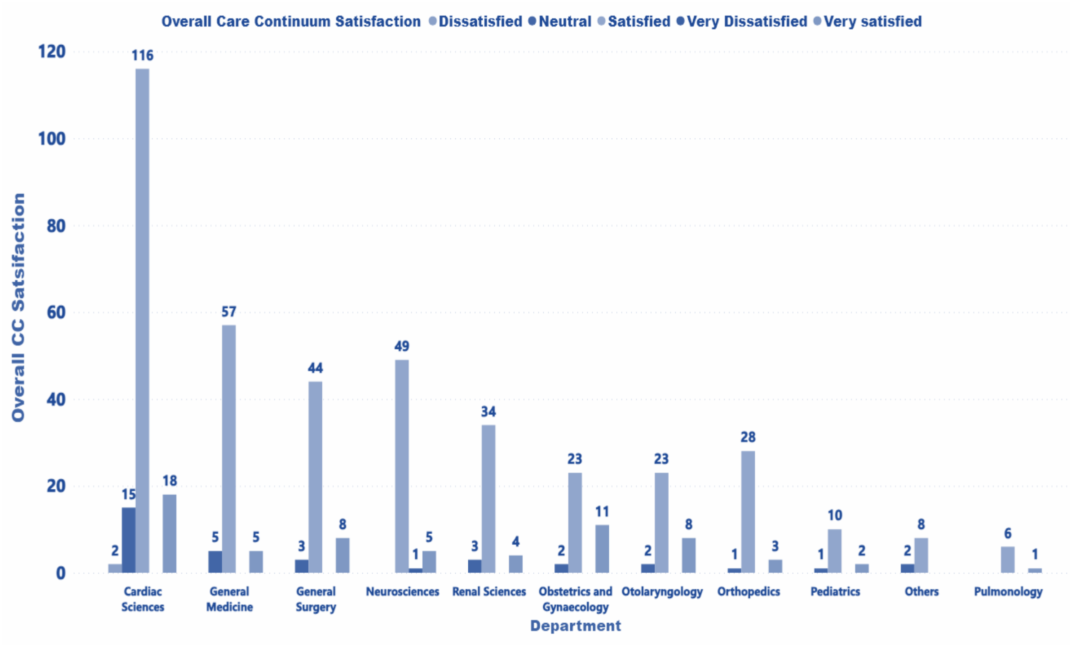


Figure 35:

Overall experience of DCC among clinical departments

3(d). Perception about Digitized Care Continuum help regain health. The perception of patients about digitized care continuum helping in regaining health was evaluated (Figure 36). It was seen that 30% of the population responded that they believe that the program "significantly" helps in regaining health while 2% responded that they were "not benefitted". However, 68% of the population responded "neutral" to this question clearly indicating that the overall benefit of the program in regaining health is either not properly communicated or the benefits not clearly understood by the population. The healthcare providers have to improve awareness about the program and how it helps regain health. Suggestions to improve awareness will be discussed in subsequent chapters.

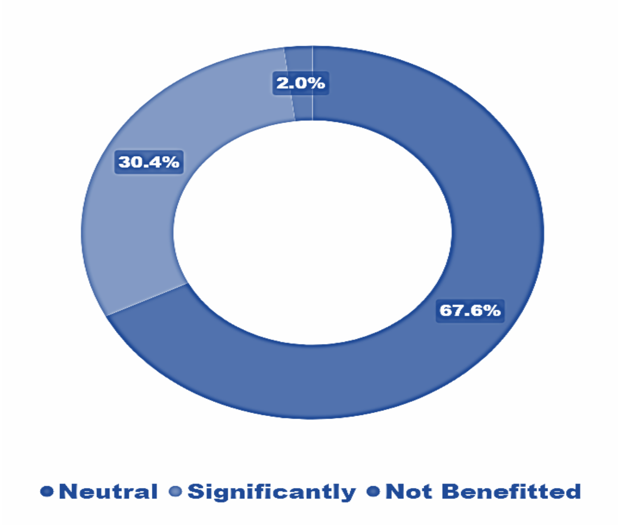


Figure 36:

Overall perception of DCC regaining health

The perception of patients about digitized care continuum helping in regaining health was evaluated (Figure 37) among different age groups. Age group of 18-30 years (35 patients) were among the category who responded positively that Digitized care continuum “significantly” helped regain health followed by 61-70 years (23 Patients), 51-60 years (22 Patients) and 41-50 years (22 Patients). Neutral responses were highest among 61-70 years (66 Patients), 51-60 years (64 Patients) and 41-50 years (61 Patients). The category of patients who responded that as “not benefitted” contributed to 2% of the overall population and 41-50 years (3 Patients), 51-60 years (2 Patients) and 61-70 Years (2 Patients) were among the top categories.

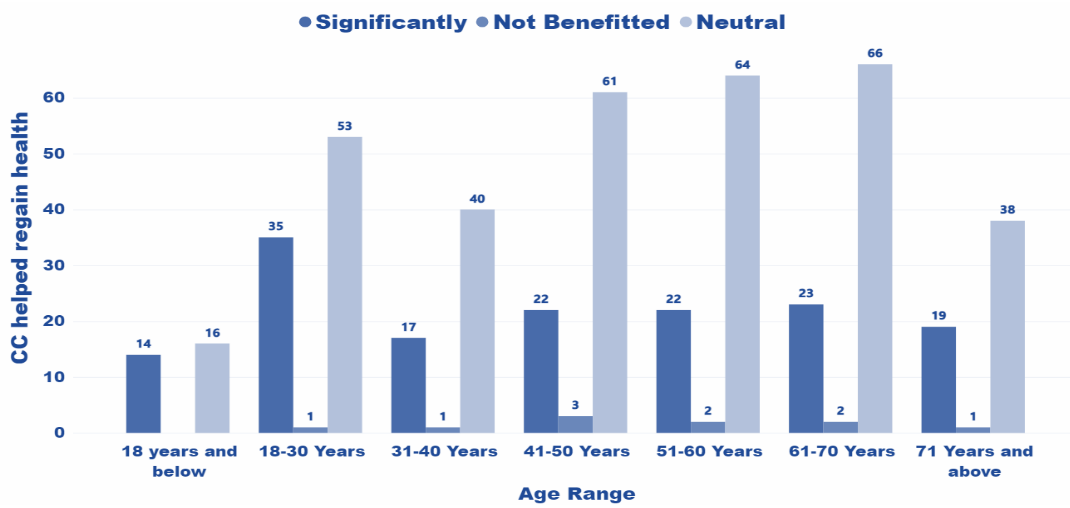


Figure 37:

Perception of DCC regaining health among age groups

The comparison was carried out among different clinical departments on the perception of patients about digitized care continuum helping in regaining health (Figure 38). 57% of patients who were treated under Pulmonology department responded that they felt the program significantly benefited in regaining health followed by 54% of patients under Pediatrics, 50% under Obstetrics & Gynecology. The "Neutral" responses were highest for General Medicine (76%), Orthopedics (75%) and 71% for three departments (Cardiac Sciences, General Surgery and Renal Sciences). The category who responded as "not benefitted" was under the "Others" category contributing to 10% and Orthopedics with 6%. The "Others" category under clinical department was pertaining to departments who had lesser number of patients like Oncology, Plastic Surgery, etc.

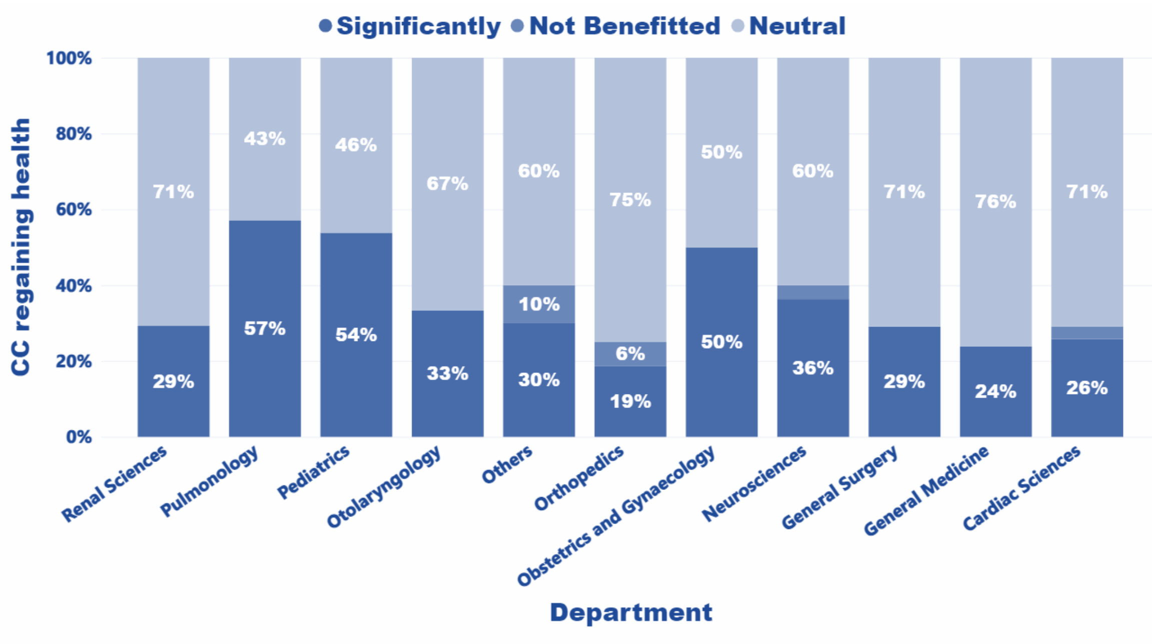


Figure 38:

Perception of DCC regaining health among clinical departments

The perception of patients about digitized care continuum helping in regaining health was evaluated over the overall experience (Figure 39). 30% of patients (148 patients) who were either "Satisfied" or "Very Satisfied" with the overall experience responded that the program "Significantly" benefitted in regaining health. 310 patients (62%) who responded as "Neutral" also belonged to the "Satisfied" or "Very Satisfied" category. Surprisingly Five patients who were overall "Satisfied" with the program felt that the program did not help them regain health.

The overall awareness on how the digitized care continuum helps regain health has to be properly communicated by the healthcare providers so that the patients clearly understand the value of the program. It seems that those who were satisfied with the program also did not have much awareness on how the program benefits in regaining health. More awareness by Clinical, Nurses and Hospital Operations team during admission phase will be a good step towards improving awareness among patient groups.

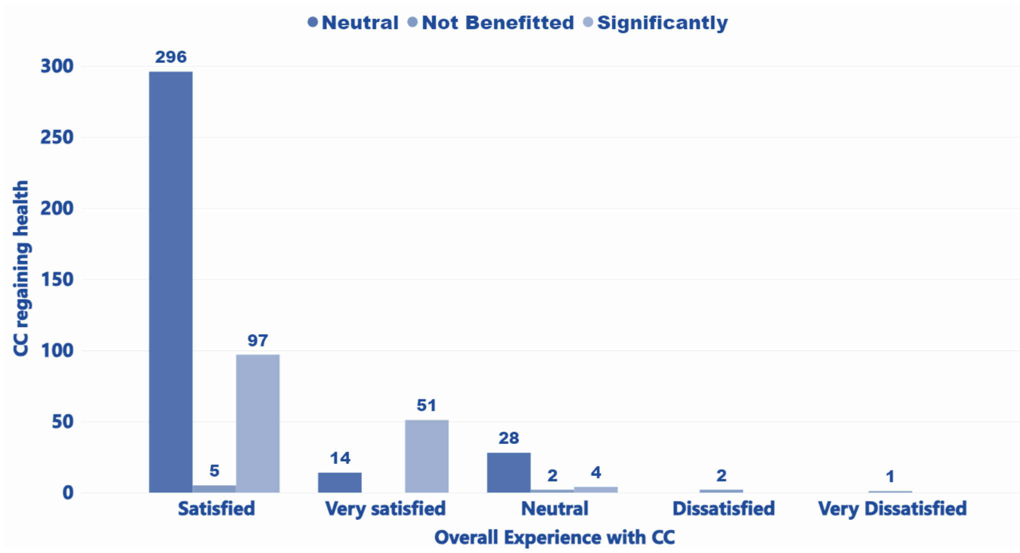


Figure 39:

DCC regaining health and overall experience

3(e). Patient satisfaction about Digitized Care Continuum improving communication between patients and healthcare provider. At the core of any digitized care continuum, one fundamental objective is to enhance communication between healthcare providers and patients. Patient satisfaction was examined (Figure 40) with respect to this element and 9% of the population were "very satisfied" with the program, while a further 79% reported being "satisfied." Therefore, close to 88% of people saw positive satisfaction about how this program had an effect on communication among all survey population. Only 11.4% of the population were neutral, with less than 1 percent in each category "dissatisfied" or "very dissatisfied". One possible inference is that patients communicate better with healthcare providers when digital care continuum was implemented.

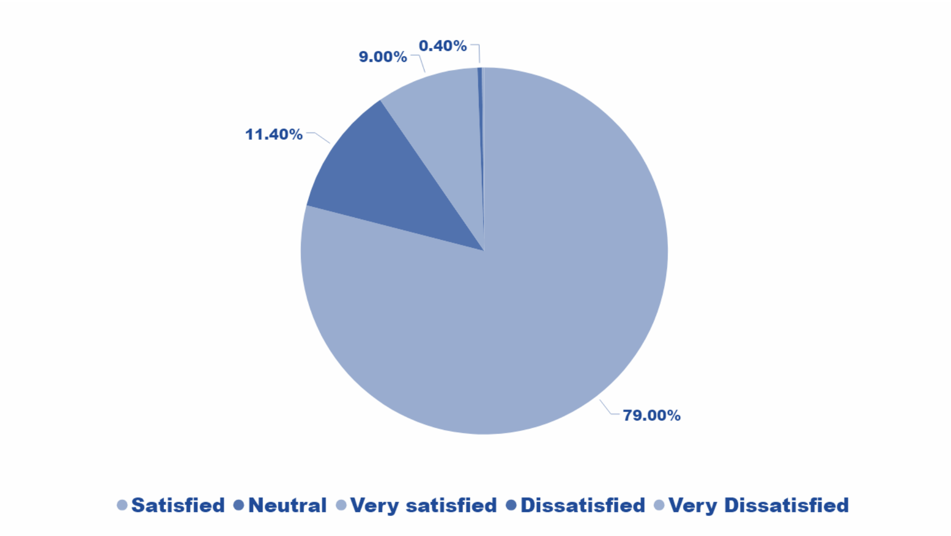


Figure 40:

Overall Patient Satisfaction and improved communication

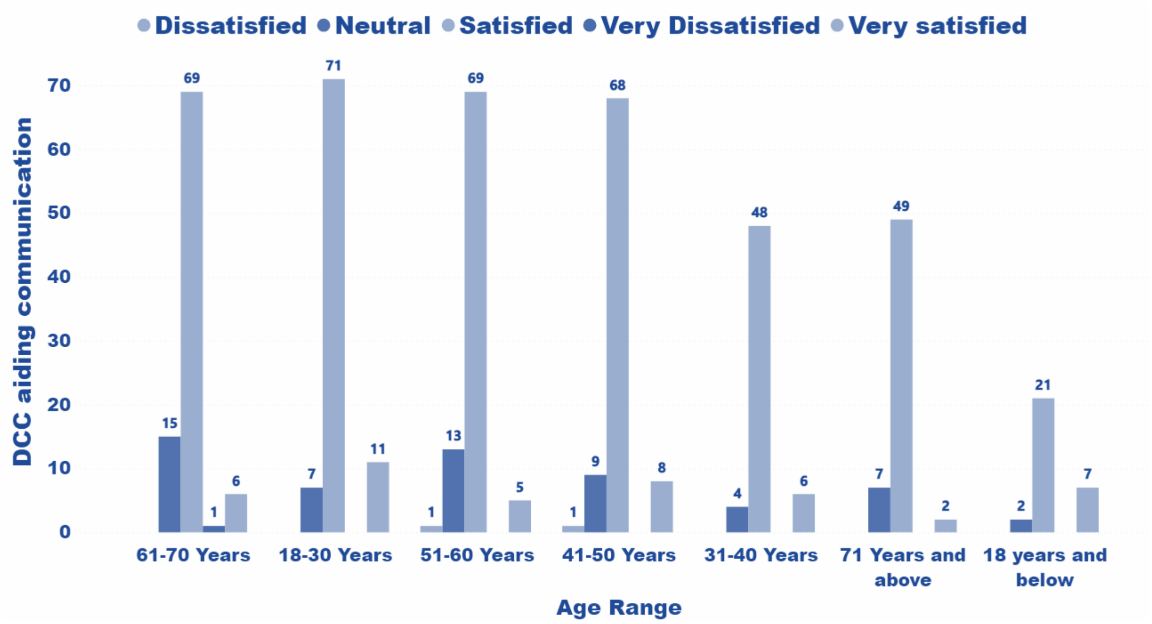


Figure 41:

Overall Patient Satisfaction and improved communication for age groups

Patient satisfaction in improving communication between patients and healthcare providers was evaluated (Figure 41) for different age groups, clinical departments, and overall experience. Under different age groups 18-30 years (71 patients) came under “Satisfied” category while highest positive responses with “Very Satisfied” came under 18-30 years (1a Patient). “Satisfied” contributed to 69 Patients each in 51-60 years and 61-70 years category and 68 patients under 41-50 years category.

Among Clinical Departments (Figure 42), 95% “Satisfied” & “Very Satisfied” patients were under Obstetrics & Gynecology who felt that digitized care continuum improves communication followed by 92% under Renal Sciences and 91% for Neurosciences. “Neutral” were more under “Others” category (30%) followed by 16% in Orthopedics and 15% in General Surgery. Some “dissatisfied” patients were seen under Neurosciences.

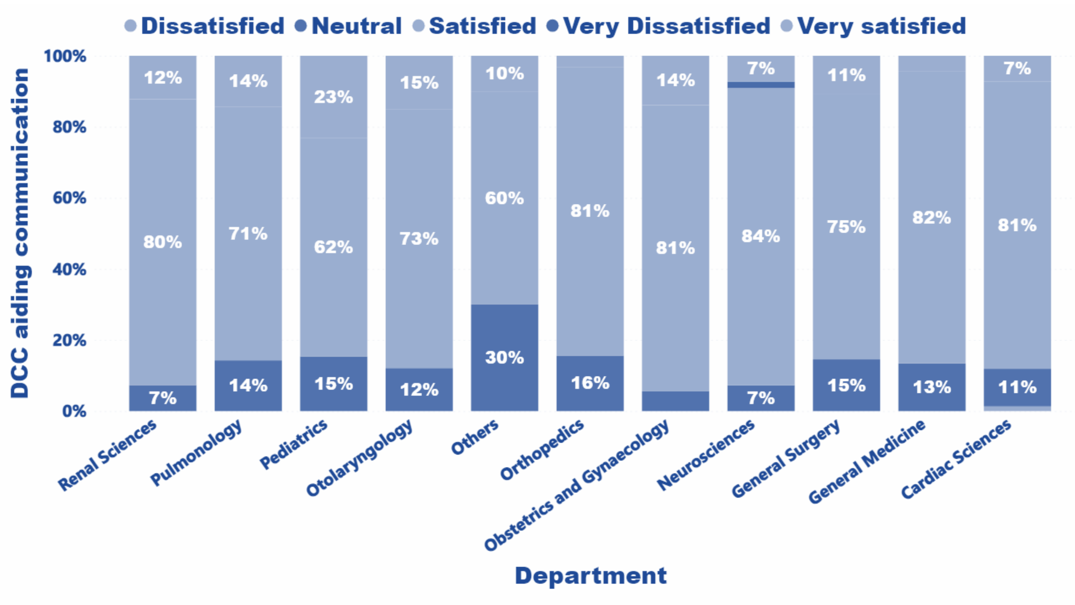


Figure 42:

Patient Satisfaction and improved communication among clinical depts

90% of the population (452 patients) who had overall experience with DCC as “Satisfied” and “Very Satisfied” had positive perception about improvement in communication as per Figure 43 while enrolled in the program. This denotes positive perceptions about the communication advantage of digitized care continuum.

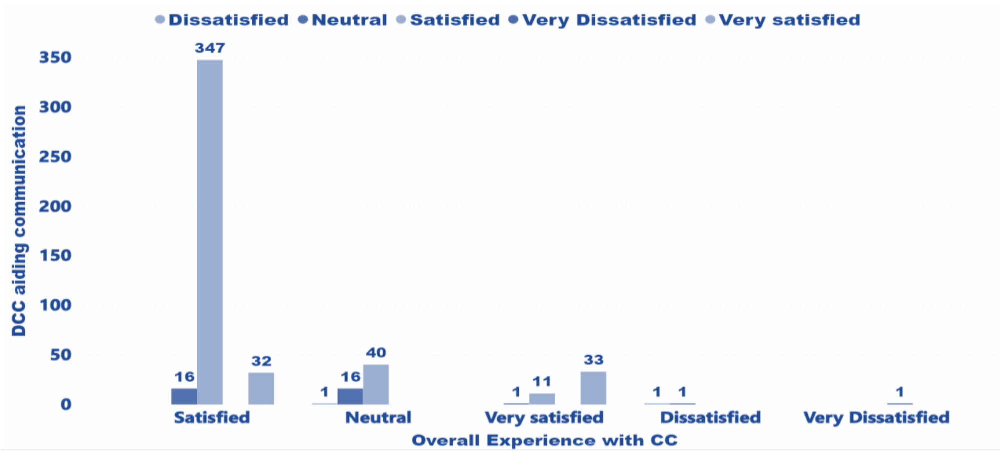


Figure 43:

Patient Satisfaction and improved communication with overall experience

3(f). Patient Experience about Digitized Care Continuum improving follow-up, care, and coordination (FCC). Patient experience about Digitized care continuum improving follow-up, care and coordination was evaluated. 62.8% of the population (314 patients) responded that the program "Significantly Improved" and "Improved" follow-up, care, and coordination. 37% of the population responded that the program did not exhibit "no significant change" or remained "neutral". 1% of the population responded that the program "Significantly Declined" and "Declined" the follow-up, care and coordination as given in Figure 44 below.

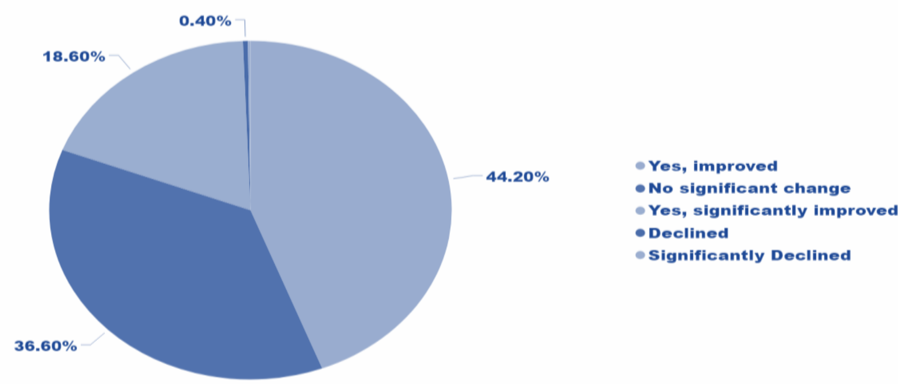


Figure 44:

Overall Patient Experience with improved FCC

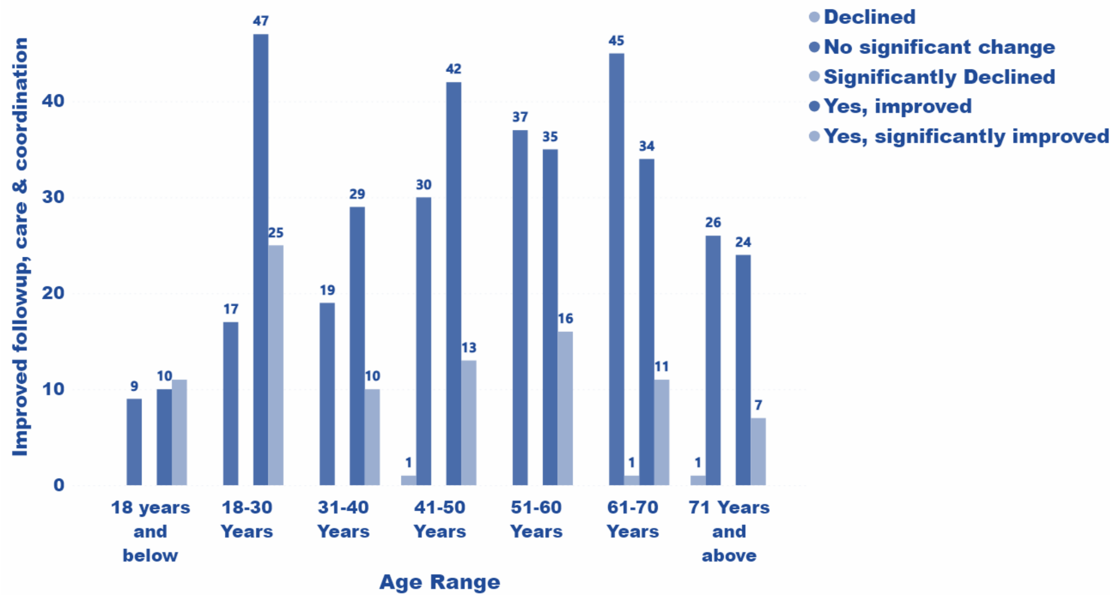


Figure 45:

Patient Experience, improved FCC among age groups

The same parameter was evaluated for various age groups (Figure 45), and it was found that the 18-30 years age group (72 patients) were among the population who felt that the program "Significantly Improved", and "Improved" follow-up, care, and coordination followed by 41-50 years (55 patients) and 51-60 years (51 patients). Those who did not perceive any specific change about the program were highest among the 61-70 years of age with 45 patients.

When the effectiveness of digitized care continuum on improving follow-up, care, and coordination was evaluated among various clinical departments (Figure 46), it was observed that Obstetrics and Gynecology had the maximum positive responses with 86% of the patients responding that the program significantly improved the parameters. This was followed by

Pediatrics with 77% and Pulmonology with 72%. Responses with “no significant change” were seen highest (50%) in Orthopedics department.

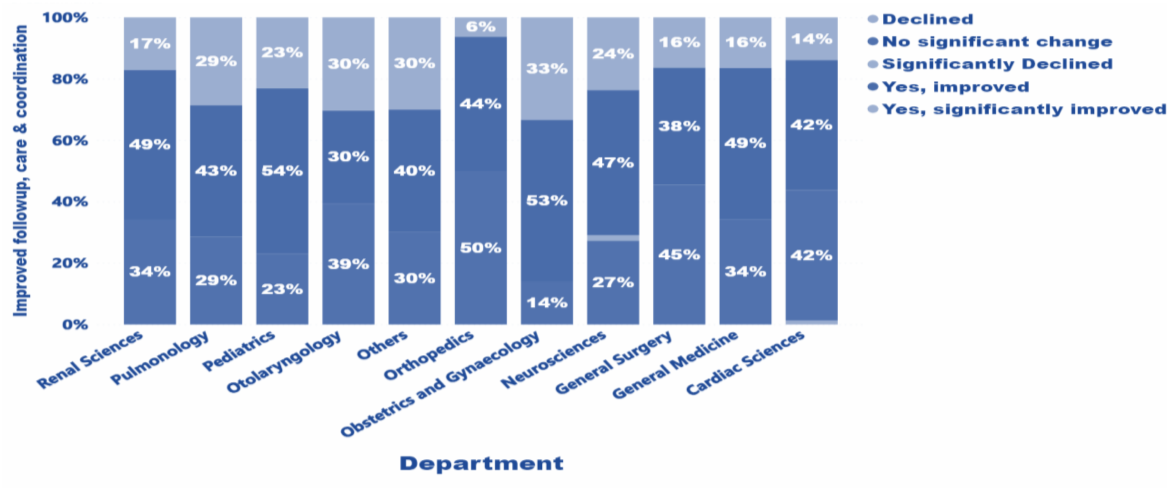


Figure 46:

Patient Experience and improved FCC among clinical departments

When the overall experience of the digitized care continuum was rated against the effectiveness on improving follow-up, care, and coordination was evaluated among various clinical departments (Figure 47), it was observed that 306 participants who were either “Satisfied” or “Very Satisfied” with the program felt that it “Improved” or “Significantly Improved” the parameters. 155 participants who were “Satisfied” or “Very Satisfied” responded that they observed “no significant change” in the follow-up, care, and coordination after the program was implemented.

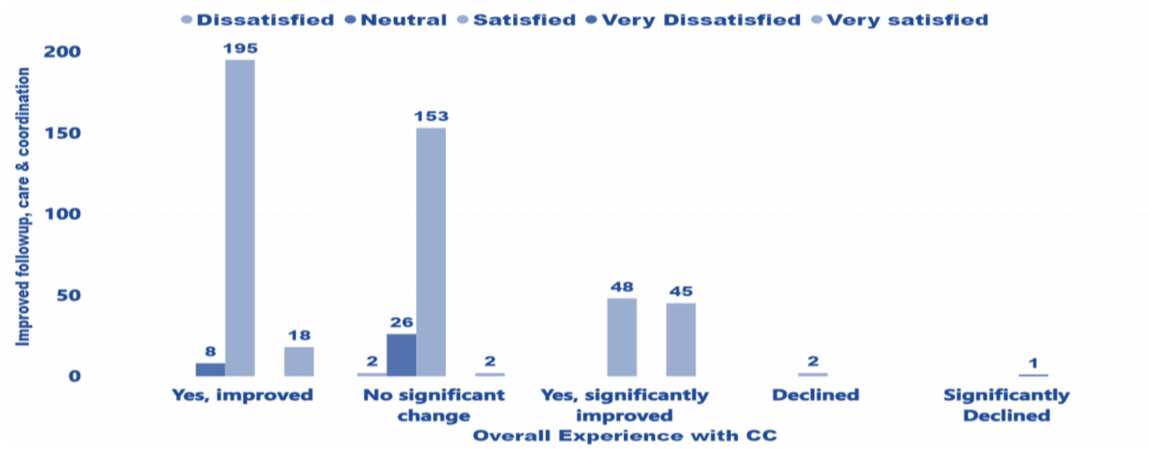


Figure 47:

Patient Experience and improved FCC among different experience levels

To evaluate the effectiveness of the follow-up, care and coordination, the number of physician escalations for the period from Jan-June 2023 was assessed. There were 68 physician escalations raised through the program while calls were made, and the timely intervention resulted in reduction of complications and possible readmissions. This clearly demonstrates that the timely intervention of such digitized programs can really help patients among all clinical departments and the benefits of such programs have to extended to all the clinical specialities. The department wise split of the escalations is given in Table 21 below:

Table 21:

Physician escalation among *clinical departments*

Department	**Physician Escalations**
Cardiology	26
General medicine	2
General surgery	8
Neuro sciences	5

Obstetrics and gynaecology	8
Orthopaedics	8
Otolaryngology	1
Renal sciences	10
Grand Total	**68**

3(g). Patient Experience about Digitized Care Continuum improving health related behaviour (HRB). Improvement in health-related behaviour is an important parameter to assess the effectiveness of any patient centric programs. As the patient behavior is directly proportional to the treatment adherence including medication, it can really help in better recovery. Hence, if there is a positive behavioral change associated with the program, it can be considered as one of the most vital post discharge successful events. When the overall impact of the digitized care continuum was assessed (Figure 48), it was found that 200 participants (40%) responded that the program "Improved" or "Significantly Improved" their health-related behaviour. 59.6% of the population responded that they did not find any significant change in their health-related behaviour associated with the program. Those who responded as "Declined" or "Significantly Declined" were negligible in number (0.4%).

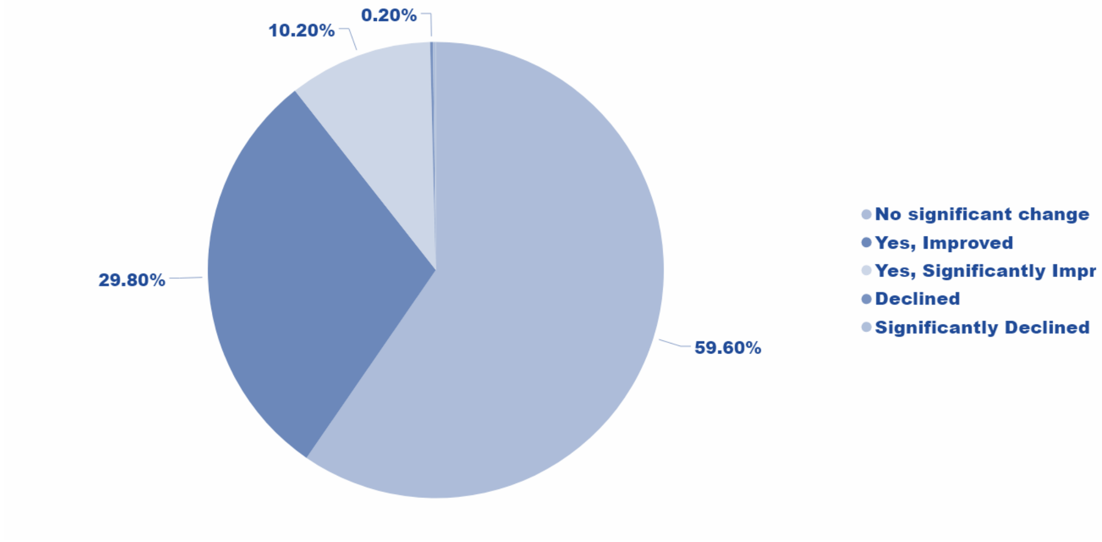


Figure 48:

Overall impact of DCC on health-related behaviour

The impact of health-related behaviour was evaluated for various age groups (Figure 49), and it was found that the 18-30 years age group (38 patients) were among the population who felt that the program "Significantly Improved" and "Improved" the health-related behaviour. This was followed by 41-50 years (36 patients) and 51-60 years and 61-70 years (33 patients each). Those who did not perceive any specific change were highest among the 61-70 years of age with 57 patients followed by 51-60 years with 55 patients.

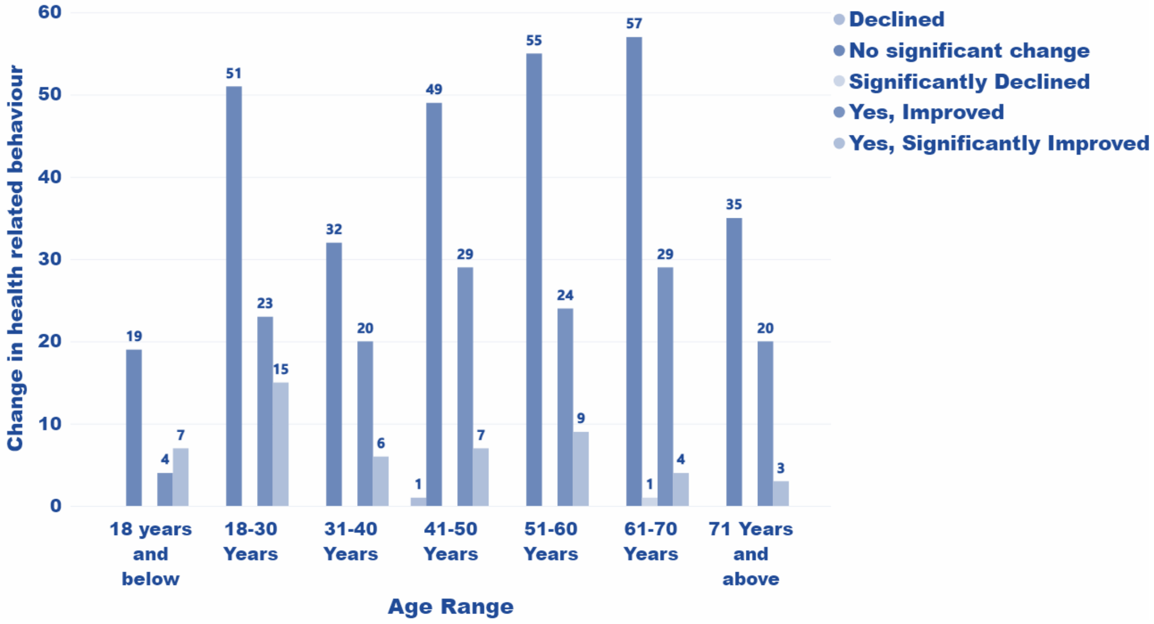


Figure 49:

DCC improving HRB among different age groups

When the effectiveness of digitized care continuum on improving health-related behaviour was evaluated among various clinical departments (Figure 50), it was observed that 57 participants who were treated under Cardiac Sciences responded that the program had "Improved" or "Significantly Improved" their health-related behaviour. This was followed by General Medicine (23 participants) and Obstetrics & Gynecology (23 participants).

Surprisingly 94 participants from Cardiac Sciences responded that they did not experience "any significant change" in their health-related behaviors. In terms of the population under the same department, Obstetrics and Gynecology had the maximum positive impressions with 64% of the patients responding that the program significantly improved the parameters. This was followed by Otolaryngology with 45% and Orthopedics with 44%. Responses with "no significant change" were seen highest (71%) in Pulmonology department.

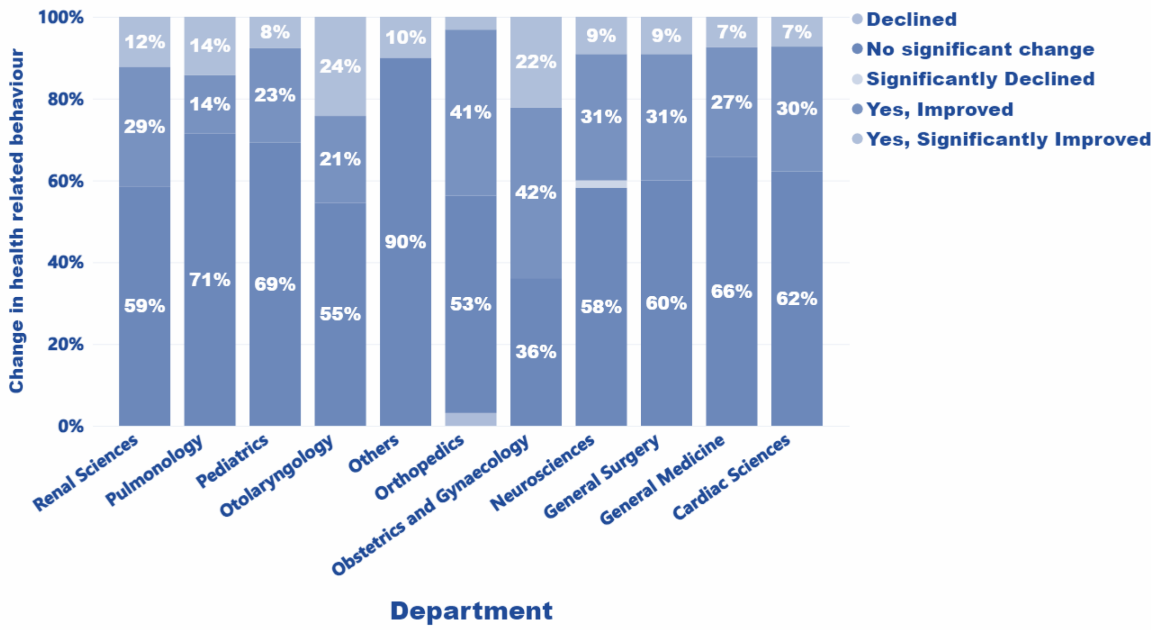


Figure 50:

DCC improving HRB among different clinical departments

The impact of health-related behaviour was evaluated against responses received for the overall experience of the Digitized Care Continuum (Figure 51). It was found that the 196 patients (39% of the population) who were "Very Satisfied" or "Satisfied" were among the population who felt that the program "Significantly Improved" and "Improved" the health-related behaviour. However, 266 patients (53% of the population) who were "Very Satisfied" or "Satisfied" responded as "no significant change" observed in health-related behaviour due to the program implementation.

31 patients (6% of the population) who were "neutral" in the overall experience of the digitized care continuum responded that they observed "no significant change". One patient who responded "Very dissatisfied" with the program responded that health-related behaviour "Significantly declined" while one patient who had overall experience as "dissatisfied" responded that the program "Improved" his health-related behaviour.

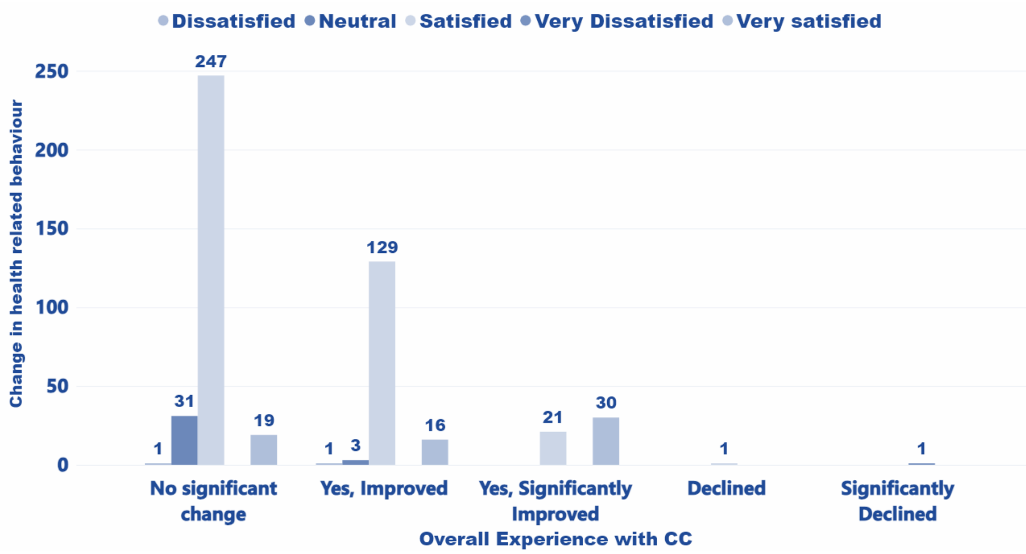


Figure 51:

DCC improving HRB among different overall DCC experience levels

3(h). Overall Patient Retention due to positive impact of Digitized Care Continuum. Patient retention is an important aspect of healthcare that establishes the fact that the patients are satisfied with the healthcare provider and will continue to avail services from them. Patient retention allows healthcare providers to focus more on the care as the patient visit to the hospital is very regular.

Patients who have undergone prior treatment possess specific expectations regarding their care experience. Their decision to return reflects the healthcare provider's fulfillment of these standards and the establishment of robust, positive relationships with these individuals. In addition, the investment required for this retention is notably lower compared to the expenses incurred in acquiring new patients.

The overall patient retention due to digitized care continuum was evaluated (Figure 52) and it was observed that 46% of the population (230 patients) responded as "Likely" or "Very Likely" to use the services of the healthcare provider in future based on the effectiveness of the program. 53% of the population (265 patients) remained "neutral" in their responses clearly indicating that they are undecided on whether to use the services in future.

Only 1% of the population responded that they are "Unlikely" or "Very Unlikely" to use the services of the healthcare provider based on the experience with the digitized care continuum. As the percentage of the population who comes under the retention group constitutes to 46% of the population, which is significant, it can be assumed that the digitized care continuum has established positive perceptions on the patients.

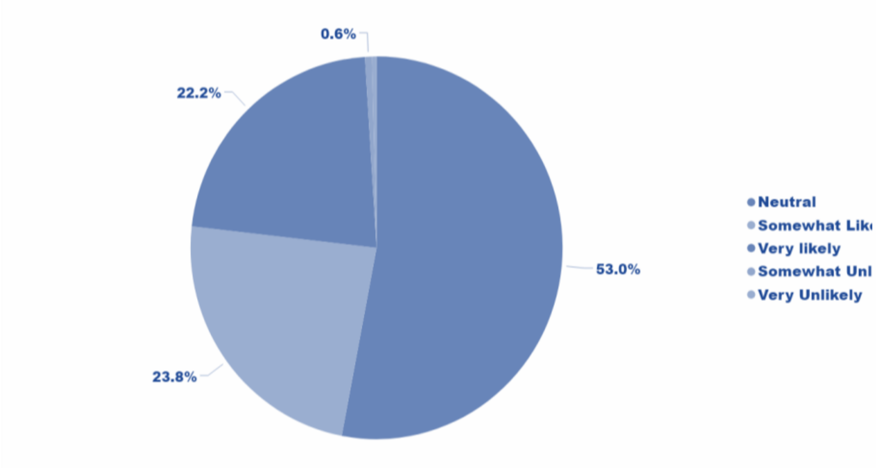


Figure 52:

Patient retention due to DCC

The patient retention due to the effectiveness of digitized care continuum was evaluated among different age groups (Figure 53). Patients under 18-30 years age group constituted 9% of the positive retention population (Very Likely and Likely to use services) followed by 7% each in 41-50 years, 51-60 years, and 61-70 years. The "Neutral" responses were the highest among 61-70 years (55 patients) followed by 53 patients each in 41-50 years and 51-60 years.

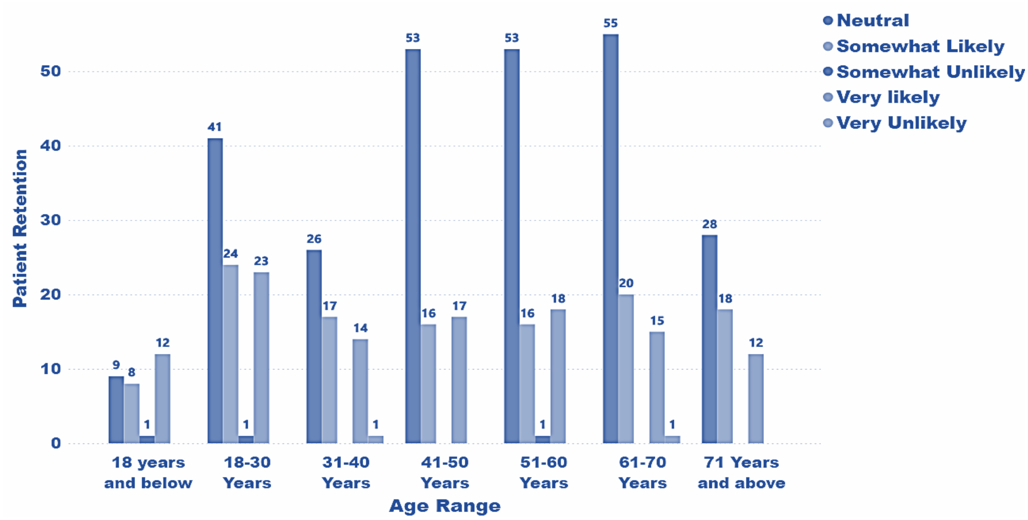


Figure 53:

Patient retention among different age groups

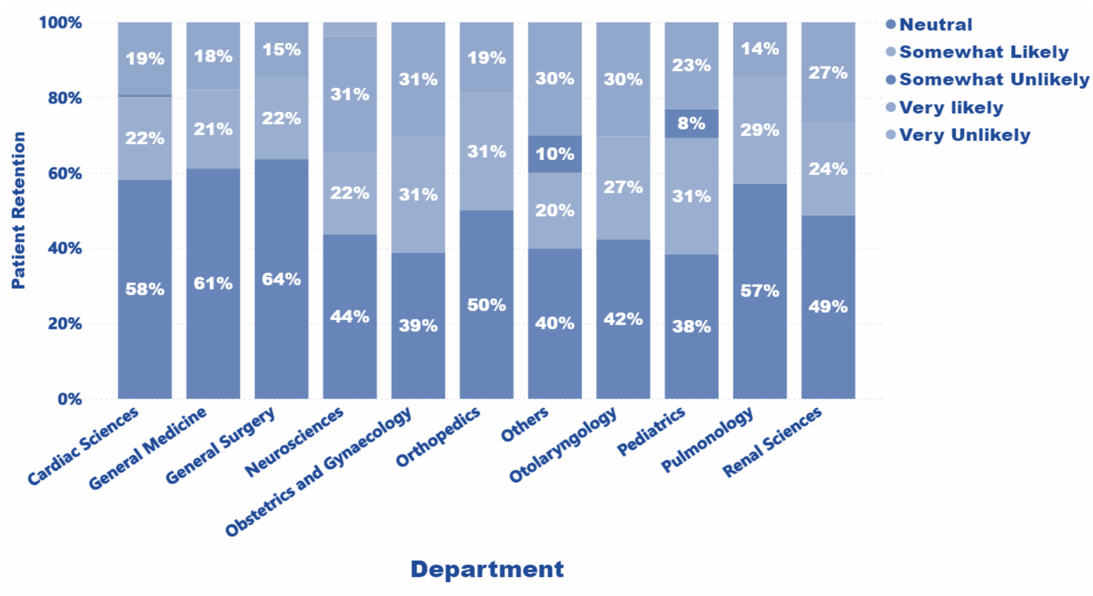


Figure 54:

Patient retention among different clinical departments

The responses related to various clinical departments were assessed (Figure 54). It was observed that Cardiac Sciences (12%) followed by Neurosciences (6%) and General Medicine (5%) had positive perception about returning to the healthcare provider for future services. The

"Neutral" responses were highest among Cardiac Sciences (18%), General Medicine (8%) and Neurosciences (5%).

When categorizing the responses within each clinical department, it was found that patients who availed services from Obstetrics & Gynecology responded with 61% positive perception. This was followed by Otolaryngology with 58% and Pediatrics with 54%. Those who responded "Neutral" was highest among General Surgery with 64%, General Medicine with 61% and Cardiac Sciences with 58%. The responses under "Very Unlikely" or "Unlikely" were not very significant.

The frequency of visits associated with patient retention was assessed (Figure 55). Patients who visited hospital regularly contributed to 14% towards positive perceptions of the "Very Likely" or "Likely" category. 23% contributed towards positive perceptions of the "Very Likely" or "Likely" category in the "Occasional" hospital visit category. In each of the categories, 56% of the regular visitors are likely to return to the healthcare provider due to the positive impact of the digitized care continuum program. 48% of occasional visitors and 33% of rare visitors are likely to return.

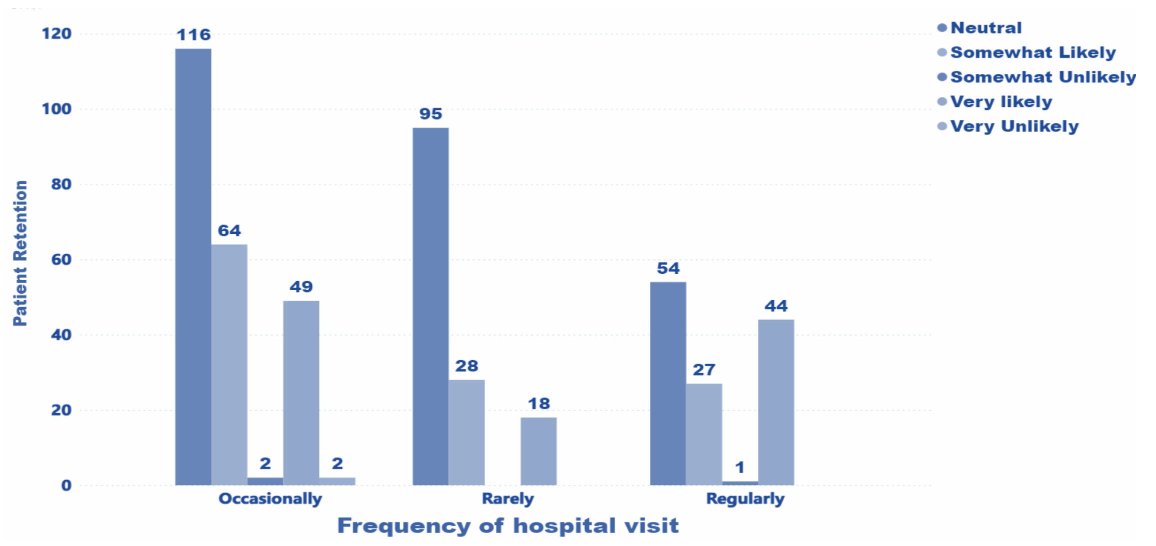


Figure 55:

Patient retention and frequency of hospital visits

The patient retention due to the overall experience of the digitized care continuum was evaluated (Figure 56). Among the "Satisfied" and "Very Satisfied" group, 219 patients (44% of the population) responded that they will seek services from the healthcare provider in future. Among the "Satisfied" and "Very Satisfied" group, 241 patients (48% of the population) remained "Neutral" in their response whether they will return to the same healthcare provider. Surprisingly, one patient who was "dissatisfied" with the program plans to return to the hospital for future care. Similarly, three patients who were "Satisfied" with the program do not intend to return to the healthcare provider for future care.

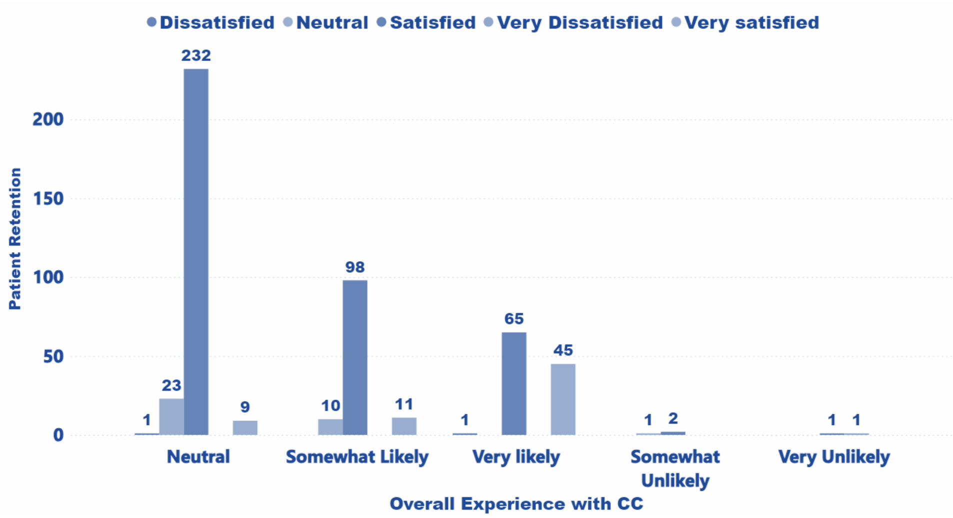


Figure 56:

Patient retention among overall experience levels

The awareness level of Digitized Care Continuum and patient retention was estimated (Figure 57) and it was observed that 148 patients who were "Very Aware" of the program plans to return to the healthcare provider followed by 81 patients in the "Somewhat aware" category.

However, the "Neutral" response was the highest among the "Somewhat aware" category denoting low awareness level among the population about the benefits of the program.

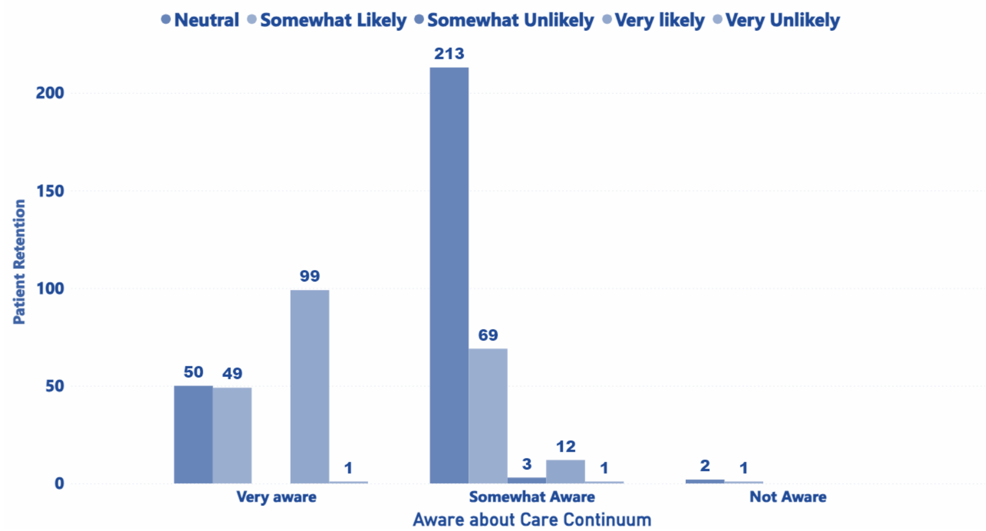


Figure 57:

Patient retention due to DCC with different awareness levels

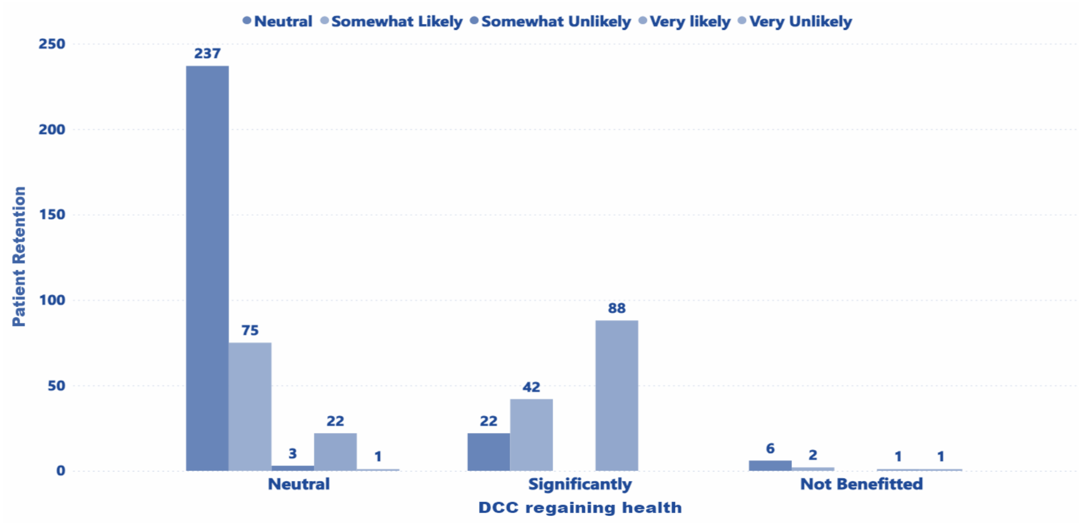


Figure 58:

Patient retention among regaining health perceptions

The patient retention due to the perceived improvement in health was measured (Figure 58). 130 patients who perceived that the program helped them "Significantly" improve their health plans to return to the healthcare provider for future care while 97 patients remained "Neutral" in their response under the same category. 237 patients who remained "Neutral" in their response to retention were those who responded "Neutral" in perception of improvement in overall health. This signifies that the awareness about the program on the overall health benefits is still not very clear to the target population.

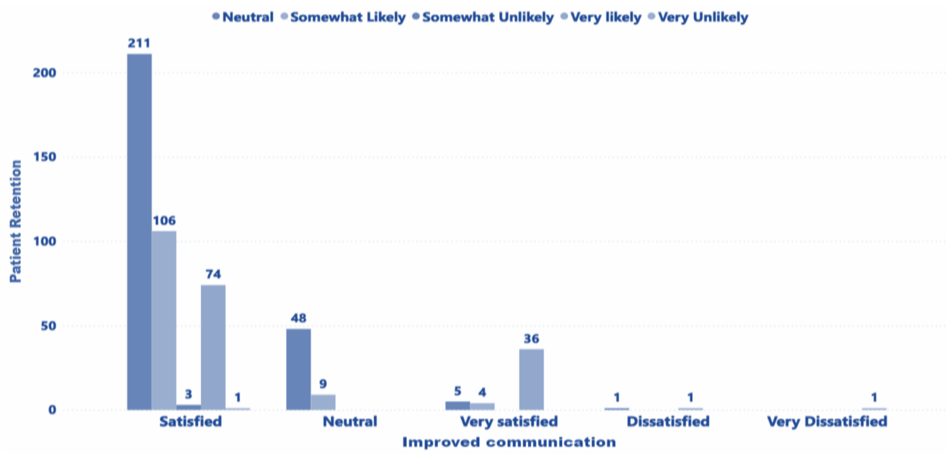


Figure 59:

Patient retention and improved communication

Out of the "Satisfied" category of patients who responded that digitized care continuum improved communication between them and the healthcare provider, 211 patients remained "Neutral" in their response whether they will return to the same healthcare provider. This was observed when the patient retention was compared against the improvement in communication due to the program (Figure 59). 220 patients who were either "Satisfied or "Very Satisfied" with improved communication intend to return to the same healthcare provider.

The patient retention due to the effectiveness of digitized care continuum was evaluated (Figure 60) among population who perceived improvement in follow-up, care and coordination. 184 patients (37% of the population) who felt that the program "Improved" or "Significantly Improved" responded that they are "Somewhat Likely" and "Likely" to visit the healthcare provider for care. 128 patients who felt that the program “Improved” or “Significantly Improved” the follow-up, care and coordination remained “Neutral” in their response on visiting the healthcare provider for future care. 137 patients who felt that there was no significant change in the follow-up, care and coordination also remained “Neutral” in their response on visiting the healthcare provider for future care.

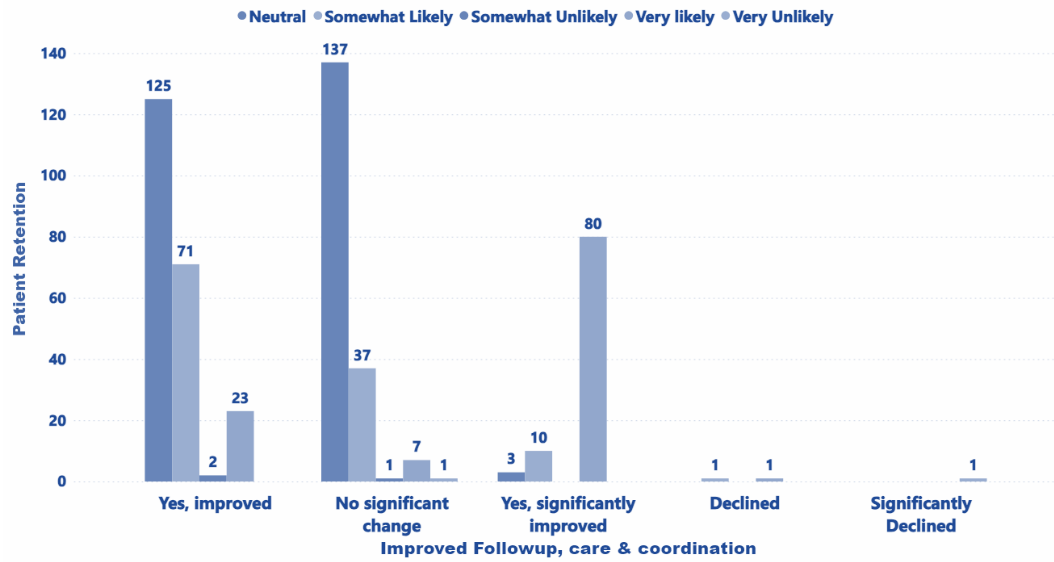


Figure 60:

Patient retention due to improved follow-up care and coordination

The patient retention due to the effectiveness of digitized care continuum was evaluated (Figure 61) among population who perceived improvement in health-related behaviour. 23% of the population who felt that the program “Improved” or “Significantly Improved” responded that they are “Somewhat Likely” and “Likely” to visit the healthcare provider for future care. 23% of the population who responded that the program “Improved” or “Significantly Improved” the health-related behaviour remained “Neutral” in their response on visiting the healthcare provider for future care. 180 patients (36% of the population) who felt that there was no significant change in the health-related behaviour also remained “Neutral” in their response on visiting the healthcare provider for future care.

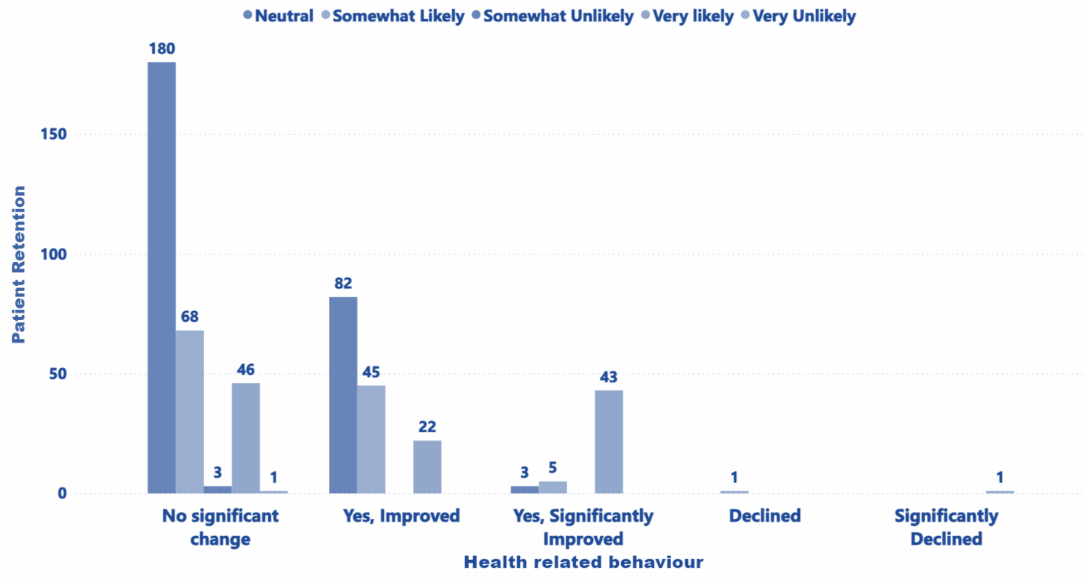


Figure 61:

Patient retention and improved HRB

4. Analysis of qualitative responses. Other than the quantitative parameters, three questions were posed to extract qualitative responses from the participants. One was a close ended question with pre-filled options with "others" category for open ended responses and the other two questions were completely open-ended to understand the positive experiences and challenges.

4(i). Perception of Specific Benefits. To understand the perception of specific benefits of the digitized care continuum, options given were 1) Better Communication Between Healthcare Providers and Patients, 2) Increased efficiency, 3) Enhanced Personalization of Care, 4) Improved Accuracy in Diagnosis and Treatment and 5) Others. The findings are given below:

67% of the population (Figure 62) rated better communication between healthcare providers and patients as one of the most important benefits of the digitized care continuum program. 18% of the population rated "Others" and gave open suggestions which will be discussed in Figure 63. 7% of the population rated "Increased efficiency", 6% rated "Enhanced Personalization of Care" and 1% rated "Improved accuracy in Diagnosis and Treatment" as the benefits of the program.

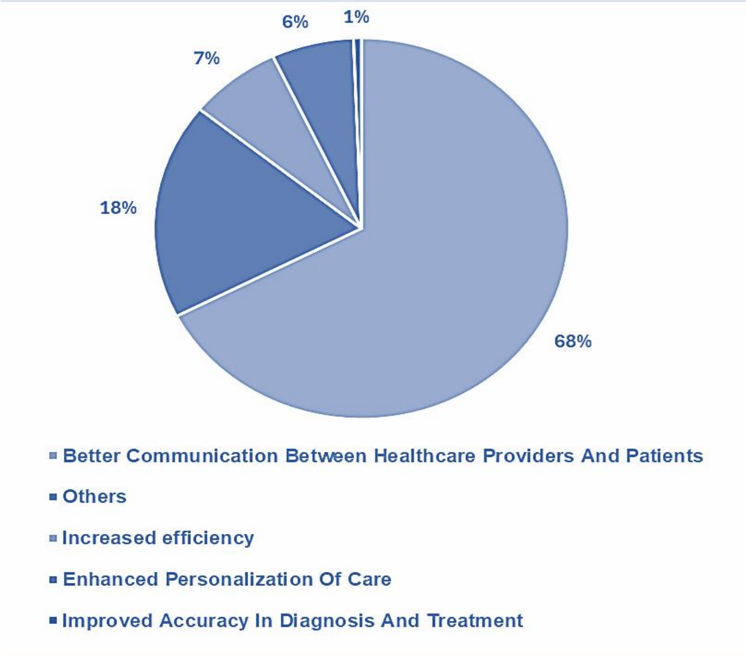


Figure 62:

Qualitative responses on perception of specific benefits of DCC

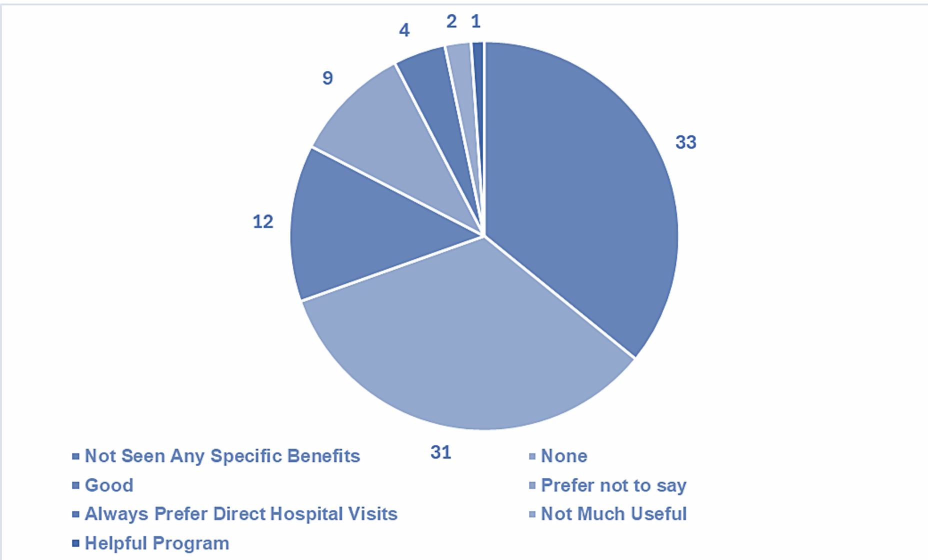


Figure 63:

Qualitative responses on specific benefits under "others" category

92 participants (18%) gave "others" as their response (Figure 63) which was further evaluated. 33 participants mentioned that they "did not see any specific benefits" and 31 participants responded as "None". While 12 participants mentioned the program as "good", 9 participants "preferred not to say". 4 participants opined that they "prefer direct hospital visits and there were 2 responses under "not much useful" and one response under "helpful program".

Following this, analysis looked at the perceived positive experiences and benefits with an indication of individual occurrence rates (Figure 64), which was followed by a thematic approach to identify common narratives. It was important to review all responses and gain an understanding of the context. Initial observations were made which recognized positive responses, benefits that were featured and comments that seemed somewhat more neutral/general as well as recurring themes in responses. Then, during the early stages of coding all parts of text were methodically marked with codes in connection to main ideas or responses.

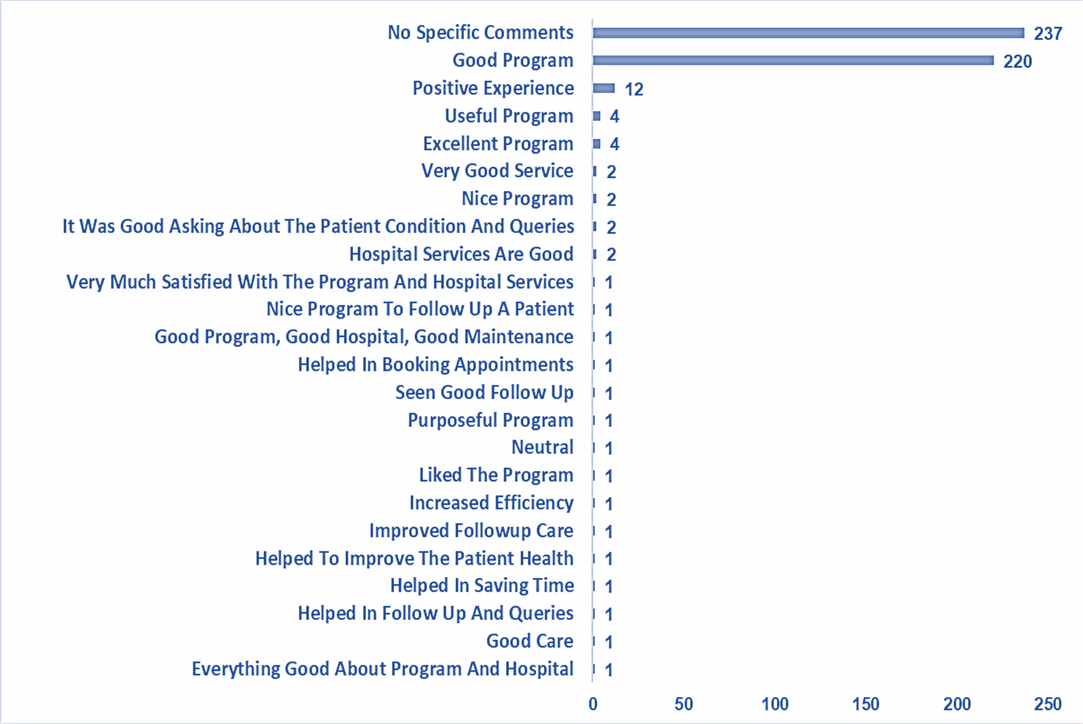


Figure 64:

Perception of Positive Experiences or benefits of DCC

These codes were sorted into high-level groups like positive feedback, concrete benefits, neutral statements, and redundant statements to aid in later interpretation. These close codes were then grouped (Table 22) in such a way that potential themes which captured repeated concepts or ideas within the data could be identified. An inductive analysis approach was taken which for each potential theme, interpreted and defined themes through a detailed review of coded segments to ensure coherence with the research question stage during the development phase. Naming the themes descriptively was particularly important to ensure brevity and avoid interpretation of their content with respect to whatever underlying concept it captured through the thematic analysis process. The themes were then analyzed in detail to bring out the interpretation of the experiences shared by the participants in the qualitative data capturing.

Table 22:

Thematic Analysis for Positive Experiences or benefits of DCC

Code	Theme	Count
Benefits	Positive Feedback on the Digitized Care Continuum	8
General	General	3
Neutral	Repetitive or high frequency Comments	1
Positive	Positive Feedback on the Digitized Care Continuum	251
No Specific Comments	Repetitive or high frequency Comments	237
Grand Total		**500**

By analyzing each theme and decoding what they imply, the significance of the efficiency of the digital care continuum in a multi-specialty hospital can be evaluated.

4(i)(a). Theme 1 - Positive comments about the Program and Hospital Services. The importance of the efficiency in digital care continuum process that made about each theme and decoding their implications were done. This theme shows that a majority (259 participants) of respondents were satisfied with the program. It would therefore be accurate to claim that this program generally responds well in terms of the patients' health care delivery improvement demand.

What is more, this type of feedback suggests a further and well-earned acknowledgement for spreading the wings in terms innovative approaches but with strong patient-focused care within an institution. This theme represents that respondents' interactions with digitalized care continuums involve especially to the tangible benefits of using such services. This includes better communication between different healthcare stakeholders; streamlining processes so they become more efficient and various types of care becoming readily available. It is also another indication that follow-up treatments have significantly upgraded thus boosting overall efficiency in patient outcome management at large.

4(i)(b). Theme 2 - General Feedback. A few answers (3 participants) described common hospital services, although the majority were positive or identified specific service-related benefits. These were general comments, and the interpretation can be as follows: a) these people have not really formed strong opinions or experiences around digitizing the care continuum, b) were indifferent towards it. On the other hand, they were favorably disposed to hospital services.

4(i)(c). Theme 3 - Repetitive or High-Frequency Comments. Many respondents did not provide any direct feedback on the program or hospital services who checked box (238 Nos) with a "No Specific Comments". These statements are not particularly illuminating but instead reflect a deficit that needs to be explored in order to understand differences across participants. It may be that those answered this way, either have no opinions or experiences to say about the program and hospital services, or they just simply did not care. The most important factor to consider is that however neutral or un-opinionated these people may have felt, there should be an attempt to see this kind of feedback in the background with all custom response data and try to understand why these participants might not had any comment at all.

Overall, theme analysis of qualitative response revealed satisfaction with the digitized care continuum program among participants and perceived as an effective means to enhanced healthcare delivery in multi-specialty hospital setting. Particular items subtended an overall finding of the program's efficacy in improving efficiency, communication and patient outcomes. Nonetheless, generic comments of neutral attitude still need more in-depth probing as to the reasons and also whatever improvements that have been mentioned by respondents.

4(ii) Perception of Challenges. Participants provided their perceptions of the challenges and limitations with digitizing care continuum (Figure 65). A thematic analysis was done to uncover dominant patterns. A detailed examination was performed on the responses, wherein initial remarks were taken note of and identified as either complaints with particular limitations mentioned; or neutral/ general comments and recurring phrases that emerged. Codes were then systematically applied to text segments based generally on salient content first identified to separate different responses for thematic analysis.

The codes were then grouped in various categories, such as negative feedback, specific disadvantages, neutral comments and repetitive issues to ensure a simple overview regarding the subsequent analysis effort. It allowed to group related codes together and to detect candidate themes. Each potential theme was examined in detail and defined, paying attention to the coded segments that supported them. Patterns were named with descriptive names that encapsulated the content they represented, providing insight into what underneath themes had in common.

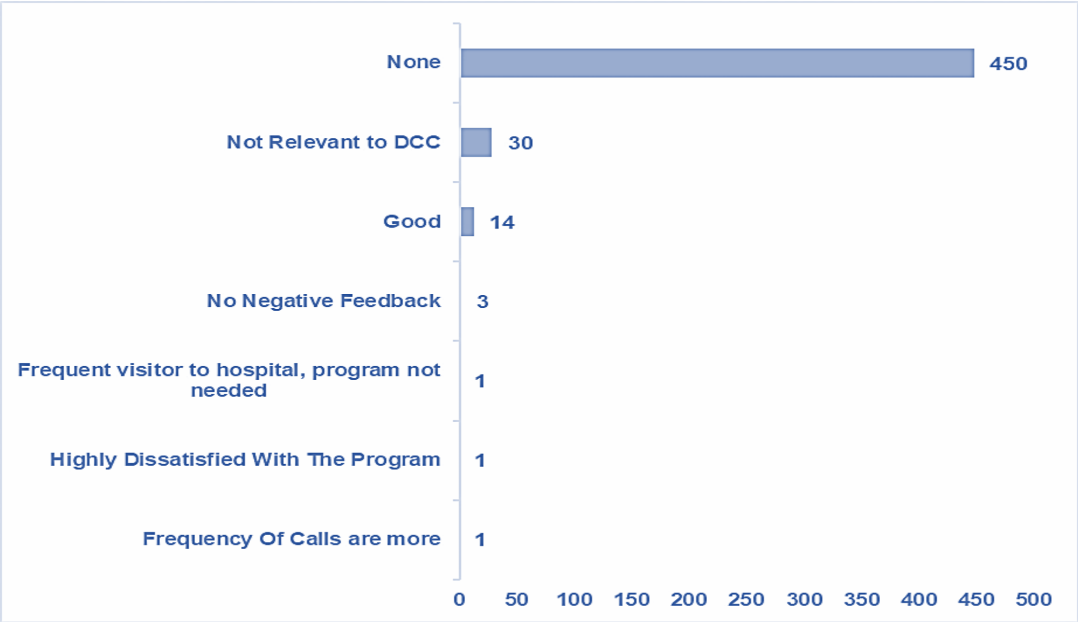


Figure 65:

Perception of Challenges or drawbacks of DCC

The representation of codes for Thematic Analysis related to challenges and negative experiences with count of each category are provided in the Table 23 given below:

Table 23:

Thematic Analysis for Negative Experiences or drawbacks

Code	**Theme**	**Count**
Drawbacks	Negative Feedback on the Digitized Care Continuum	3
General	General	30
Neutral	Repetitive or high frequency Comments	450
Positive	Positive Feedback on the Digitized Care Continuum	14

No Specific Comments	Repetitive or high frequency Comments	3
Grand Total		**500**

4(ii)(a). Theme 1 - Negative feedback on the digitized care continuum. This category includes feedback and concerns about the digitized care continuum project. Only 3 respondents from the population actually highlighted some disadvantages of such a program. Few of the specific complaints were about "Frequency of calls is more" and most blunt one was like, "Highly dissatisfied with program", or even someone went ahead saying this as well that they are a 'frequent visitor to hospital' so this service is not required. This shows that the plan is well personalized to meet the needs of patients, and it has very little negative perception.

4(ii)(b). Theme 2 - Positive feedback on the digitized care continuum. This theme presents the positive perception of the participants towards the digitized care continuum project. Among the population, 14 respondents specifically praised the program. This indicates that the plan is effectively tailored to suit patients' needs and enhances healthcare delivery within a multi-specialty hospital.

4(ii)(c). Theme 3 - General feedback. A few responses (30 participants) provided comments on other processes that are not relevant to digitized care continuum. The detailed split of the same is provided separately as Figure 66. Though these responses do not directly link to the digitized care continuum, it helps the healthcare provider to understand the other pain points inside their facility.

4(ii)(d). Theme 4 - Repetition or frequency. The majority of responses reported repetition (especially from 453 respondents) in the feedback - "no specific comment". This was a frequently repeating term suggesting many respondents chose not to provide more detailed comments on the Digital Continuum of Care or hospital services — this heavily could reflect an absence in opinion, experience sharing and the program. However, it is always relevant to take them into account globally with all the responses. Future research is needed to uncover the reasons why respondents felt neutral or did not provide information for many of these items. Addressing these neutral or indifferences will help improve continuity and overall patient satisfaction.

The utilization of thematic analysis of qualitative feedback concludes that the perspective on a digitized care continuum is largely not negative, yet discrepancies need further research to determine why some responses are neutral or objective and plan for improvement in problem areas pointed out by the respondents.

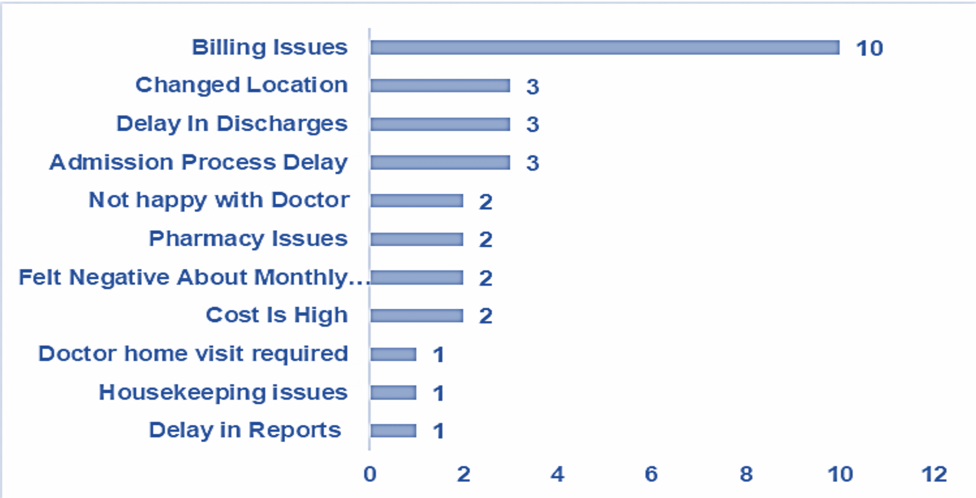


Figure 66:

Perception of Challenges or drawbacks *under not relevant category*

Thirty participants came under the "not relevant to Digitized Care Continuum" Category and their response (Figure 66) was further evaluated. 10 participants mentioned that they had "billing issues" and 3 participants responded as "changed location" meaning that they have moved to a different location and hence not using the hospital services. While three participants mentioned "delay in discharges", other three participants commented about "admission process delay". The other responses were "not happy with doctor", "pharmacy issues”, “felt negative about monthly visits”, “cost is high”, ‘doctor home visit required”, “housekeeping issues” and “delay in reports”.

5. Comprehension of Results for Part One - Patient Satisfaction. While analyzing results for Part One of the Research Question One which was “to quantify the effectiveness of a Digitized Care Continuum system by measuring patient satisfaction”, the following objectives were met.

5(i). To assess the patient satisfaction levels resulting from the implementation of an effective digitized care continuum program (Objective 2), using measurable satisfaction scores. The satisfaction score (NPS) of the digitized care continuum was measured and it was found that the NPS of 92 signified “high positive satisfaction levels” from the implementation of digitized care continuum. The analysis of the overall experience of the Digitized Care Continuum shows that most patients have a positive perception about the program. 65 patients were highly satisfied and 398 were satisfied, which collectively accounted for 92.6% of the total population. The high-level acceptance denotes that nearly all patients found digitized care continuum useful to some extent. 6.8% of the patients (34 Nos) responded as "neutral" denoting that a small group of patients did not have either positive or negative impressions about the program. Furthermore, positive satisfaction was spread across all the clinical departments clearly indicating that the program should be implemented across all clinical specialities for the benefit of patients.

Only 0.6% of patients had expressed negative sentiments about the program. With the above responses, it can be concluded that the digitized care continuum has more positive experience as high levels of satisfaction is an indicator. However, neutral responses indicate there is still room for improvement in actively engaging these patients to enhance their experience. Some efforts should be made to understand and address the reasons behind the neutral impressions. Strategies to better engage patients and improve their interactions with Digitized Care Continuum could turn these neutral experiences into positive ones. Furthermore, it will be important to maintain a high level of satisfaction and address any specific concerns from the dissatisfied subset of patients. Overall, the overwhelmingly positive data indicates that Digitized Care Continuum is more effective and has chances of even improvement.

5(ii). To measure the effectiveness of a digitized care continuum program (Objective 3) in better clinical outcomes post discharge. Better Clinical Outcomes are directly proportional to regaining health and this parameter was measured. The survey revealed that 67.6% of patients feel uncertain about whether the Digitized Care Continuum helps them regain their health or improve clinical outcomes, suggesting that while Digitized Care Continuum may not seriously harm them, it may not have a significant impact also on their health perceptions. However, 30.4% of patients were satisfied with Digitized Care Continuum to regain health, which means that almost one-third of patients benefitted from Digitized Care Continuum. The lowest percentage of 2.0% among patients who were dissatisfied means that few patients have misconceptions about the health-related impact of Digitized Care Continuum. This aspect of the program was also seen to be beneficial across all clinical departments with timely physician escalations supporting the patients in reducing complications, better outcomes and reduced readmissions.

The neutral responses suggest that there are a few patients who did not experience either positive or negative impressions about the program. This is an opportunity for better patient engagement and to improve communication regarding benefits of the program. However, considering the satisfaction levels it can be inferred that the digitized care continuum was proven to be helpful for majority of patients. As there are substantial neutral responses, chances of them becoming positive increase with broader roll outs of Digitized Care Continuum programming with more exhaustive patient education and better care coordination. In general, the quality perspective of Digitized Care Continuum is promising as demonstrated by the increase in patients who believe they are more satisfied compared to others. Hence, there was an overall "positive perception of better clinical outcomes". More neutral feedback indicates room for improvement in both effectiveness and patient perception.

5(iii). To measure the effectiveness (Objective 4) of a digitized care continuum program in improving patient retention and loyalty. With the Digitized Care Continuum, patient retention had a more favorable analysis: 111 patients were extremely likely and 119 somewhat true to the group, accounting for a total of approximately one-half (46.4%) of overall cohort would reuse the hospital services after participating originally due to positive experiences from using the digitized care continuum. The remaining 265 cases (53%) were neutral. This substantial subset signals that, while these patients did not flatly object to the concept of Digitized Care Continuum, they also are by no stretch inclined already towards repeat use of the hospital services — an opportunity area. There is a possibility that there are other hospital services that the patients are rating high in comparison to the recently launched digitized care continuum program.

Only 2 patients were very unlikely and 3 were somewhat unlikely to continue with the same healthcare provider owing to the perception of lower benefits of the Digitized Care Continuum, together making up just 1% of the total. This indicates that very few patients have a negative perception regarding continued use of the Digitized Care Continuum.

With the above results, it can be concluded that while the Digitized Care Continuum has a solid base of patient retention with 46% showing a positive inclination, there is a substantial opportunity to convert the neutral 53% into more likely retainers through targeted strategies.

Since patient retention and loyalty is a very important matrix, correlation coefficient was measured with overall experience (Table 24). This analysis revealed a strong positive correlation, with a correlation coefficient of 0.72180. This high correlation indicates that patients' overall satisfaction with their experience using the Digitized Care Continuum is closely linked to their likelihood of continuing to use the services of the same healthcare provider.

The correlation coefficient of 0.72180 shows that as patients satisfaction with the Digitized Care Continuum increases, so does their retention with crucially significant p-value. This strengthens the commitment to retaining and optimizing the experience of one's patients in promoting utilization within the Digital Care Continuum. The numbers reflect how enhanced patient retention is with better overall patient experience leveraging Digitized Care Continuum, so clearly the results are not surprising. Steps to improve user satisfaction, ranging from better interface design through enhanced support and communication all the way down to improving how well the Digitized Care Continuum allows patients to be served immediately impact retention rates.

The retention factor among various clinical departments had clearly shown that participants were either “Very Likely” or “Likely” to return to the hospital for future services. This clearly shows that the program was able to make an impact on every clinical speciality irrespective of whether the condition is chronic or acute. The necessity of such a program in a multispeciality hospital is completely justified in terms of benefits to patients as well as improved retention to hospitals. The responses under “Very Unlikely” or “Unlikely” were not very significant.

Table 24:

Correlation Coefficient for Patient retention

Overall Experience with DCC	**No. of participants (A)**	**Weightage (B)**	**X = (A*B)**	**Correlation Coefficient (r)**
Very satisfied	65	2	130	**0.72180**
Satisfied	398	1	398	
Neutral	34	0	0	
Dissatisfied	2	-1	-2	
Very Dissatisfied	1	-2	-2	
Patient Retention	**No. of participants (C)**	**Weightage (D)**	**Y = (C*D)**	
Very Likely	111	2	222	
Likely	119	1	119	
Neutral	265	0	0	
Unlikely	3	-1	-3	
Very Unlikely	2	-2	-4	
$(r) = n\Sigma XY-(\Sigma X^{*}\Sigma Y) / \sqrt{(n\Sigma X^2-(\Sigma X)^2)^{*}(n\Sigma Y^2-(\Sigma Y)^2)}$				

5(iv). Determine the importance (Objective 5) of a digitized care continuum program in a multi-speciality hospital. Establishing the relevance of a Digitized Care Continuum program in a multi-specialty hospital requires analysis of satisfaction scores through various parameters, and their effects on overall patient experience/outcomes. The correlation coefficient between every parameter and overall experience was computed to assess the significance of each parameter.

Table 25:

Correlation Coefficient for all parameters

Parameter	**Correlation Coefficient (Importance)**
DCC helping Improved Communication	0.99579
DCC improving Health-related Behaviour	0.95964
DCC helping Regain Health	0.94880
DCC aiding Follow-up, Care and Coordination	0.92697
DCC leading to Patient Retention	0.72180

Measurement across various parameters to gauge the necessity of a Digitized Care Continuum (DCC) program in a multi-specialty hospital. This rationale explained their effect on the larger patient experience and outcome. Characteristics of the Program, while further insight was unavailable as to what aspects worked better than others, it is evident that some potential combination had higher satisfaction among patients experiencing these attributes as in Table 25.

The parameter "DCC helping Better Communication" showed the best correlation coefficient of r = 0.99579, therefore, it was an important scale. This ensures that patients have a full understanding of what their condition is, how it will be treated and any necessary follow-up care. Better communication leads to more trust and a feeling of engagement, which ultimately can greatly improve patient satisfaction. Patients with a good understanding of their condition (knowledge) and treatment can manage complex self-care instructions, comply better with prescribed protocols for symptom management, to name just few examples or best practices in improving health outcomes.

The second most influential parameter, with a correlation coefficient of 0.95964 was "DCC improving Health-related Behaviour", indicating the greatest potential effect from DCC program on health behaviors in patients. Thus, programs which promote adherence to prescribed treatments or healthy lifestyle changes among patients and this continuous support can result in significant quality care improvements. As such, the strong association supported findings that suggested people tend to feel far less vulnerable and frustrated within their individual health organization if they are more engaged in positive behavior regarding their own personal long-term health outcomes. This highlights that DCC programs need to include elements of serving as a support tool and catalyst for patients making health-related decisions.

The other parameters were also well correlated with the overall patient experience, "DCC helping Regain Health" (0.94880) and "DCC aiding Follow-up, Care and Coordination" (0.92697). Such specifications highlight the necessity of broad and regular health and wellness of individuals through successful treatment as well rehabilitation are indispensable elements in DCC program. Likewise, cooperative follow-up care prevents overuse of medical services and allows patients to obtain appropriate attention for systemic treatments (e.g in case of chronic conditions or risk factors), hazardous situation thereby leading stable health condition. Overlapping these three parameters with patient experience suggests that a “connected” and “seamless,” or, in a word, continuous model of care is fundamental to the design of the DCC program.

Although not as high as other parameters, "DCC leading to Patient Retention" showed its correlation with the DCC program is prevalent and evident (correlation coefficient of 0.72180). When a healthcare system retains high amounts of patients, this most likely means that they are not only providing quality care experiences but also meeting patient needs more effectively than competitors who might be chipping away their overall volume due to poor performance and low satisfaction rates. This measure stressed the need for a DCC program to develop enduring patient relations, and those that persist with patients may ultimately result in lasting health gains and better bottom-line results. So, the correlation coefficients highlight very well and back-up the digitized care continuum into a multi speciality hospital.

6. Conclusion. Evaluation of Satisfaction scores and correlation coefficients answers Part I of the Research Question One "Digitized Care Continuum improves patient satisfaction and retention". These results suggest that in terms of the patient experience, changes to improved communication and health behaviors are among the most influential components of a DCC intervention. In addition, the strong correlations of parameters related to regaining health and also care coordination suggest the necessity for a comprehensive and iterative approach towards patient- centered care. Although patient retention is crucial, the main goal should be to optimize messages and health behavior support in order for DCC program benefits to go unrealized. With more focus and improvements in these areas, multi-specialty hospitals can greatly enhance patient outcomes, as well as the overall satisfaction levels of patients to eventually provide a better treatment experience that is oriented towards providing them with high-quality medical care.

4.2.2 Part Two - Analysis of Re-admissions. Part 2 of the Research Question One was to quantify the effectiveness of the digitized care continuum by assessing the re-admissions over a 6-month period. To quantify and measure this parameter, the hospital readmission data from the hospital was assessed for the year 2022 and 2023 before and after the implementation of Digitized Care Continuum and various observations were made. Hypotheses was proposed as follows:

1. Comparison of Overall Readmission Rates between 2022 and 2023. The total number of discharges for both the years was collected from the hospital database and proper evaluation of data was carried out. The following Hypotheses were proposed to compare the readmission rates between 2022 and 2023.

- *Null Hypothesis (H0):* There is no difference in the overall readmission rates between 2022 and 2023.
- *Alternative Hypothesis (H1):* There is a difference in the overall readmission rates between 2022 and 2023.

The total number of discharges (Table 26) for the year 2022 was 4572 and the number of readmissions was 947 contributing to 20.7% readmissions to overall discharges. Similarly, the total number of discharges for the year 2023 was 4858 and the number of readmissions was 691 contributing to 14.0% readmissions to overall discharges. This included planned readmissions for Chemotherapy, Dialysis, Suture Removal, payer-mix changes, etc. All these readmissions were considered to ensure an effective year-to-year comparison.

Table 26:

Overall discharges vs readmissions for 2022 and 2023

	2022		**2023**	
Overall Discharges	4572		4858	
Overall Readmissions	947	20.7%	691	14.0%

The chi-square statistics were computed (Table 27) on the data for One degree of freedom (df). The chi-square statistic was 69.1003 and the p-value <0.00001 (data obtained from socscistatistics website). Results were statistically significant at p <. 05, the null hypothesis was rejected.

The Chi-Square test result for comparison of readmission rates between 2022 and 2023 is statistically so significant based on the evidence in term of low p-value. This leads to a strong conclusion that the difference in readmission between 2022 and 2023 is statistically significant.

Table 27:

Chi-Square Test for readmissions of 2022 and 2023

Particulars	**Observed Frequencies**			**Expected Frequencies**			x^2
	2022	**2023**	**Total**	**2022**	**2023**	**Total**	**69.10003**
No Readmissions	3625	4167	7792	3777.839	4014.160	7792	
Readmissions	947	691	1638	794.160	843.839	1638	
Total	4572	4858	9430	4572	4858	9430	

The statistically significant value suggests that the implementation of the **Digitized Care Continuum in 2023 has had a substantial positive impact on reducing readmissions.** The data demonstrated that the program made a substantial impact, reinforcing how successful the Digitized Care Continuum is in enhancing patient results. However, it is to be noted that the Digitized Care Continuum was already undergoing pilot in the research site from May 2022 and was fully implemented in November 2022 which could have some additional beneficial effect in reducing readmissions towards the end of the year 2022.

2. Comparison of Overall Readmission Rates for January to June between 2022 and 2023. As the study period was limited to 6 months, the period from January to June was considered for both the years. The data pertaining to discharges and readmissions were assessed for Jan-June 2022 and Jan-June 2023. The digitized care continuum was running under pilot from May 2022 and was fully established only from November 2022. There were initial technical hiccups in implementation of the pilot from May 2022 and effectively the pilot commenced only by July 2022. Hence, the period from January to June 2022 was without much influence of Digitized Care Continuum program and the necessary comparison before and after implementation could be assessed. Hypotheses was proposed as follows:

- *Null Hypothesis (H0):* There is no difference in the overall readmission rates for January to June between 2022 and 2023.
- *Alternative Hypothesis (H1):* There is a difference in the overall readmission rates for January to June between 2022 and 2023.

Table 28:

Overall discharges vs readmissions for Jan-June of 2022 and 2023

Period (Jan-June)	**2022**	**2023**
Overall Discharges **(A)**	2107	2355
Overall Readmissions **(B)**	261	249
Re-Admission Percentage **(C)**	12.4 %	10.6 %

It was noticed that overall discharges (Table 28) for the period of Jan-June 2022 were 2107 and for Jan-June 2023 it was 2355. However, these readmissions included co-morbid patients requiring frequent hospitalization for chemotherapy, dialysis, etc. Since digitized Care

Continuum program will not have much impact on these readmissions, there was a need to exclude such cases from the comparisons.

It was also noticed that some patients were readmitted within 1 day of discharge and on detailed introspection, it was found that these cases had payor related (exhaustion of insurance limits, special schemes, etc.) challenges and readmissions were required to continue the treatment by changing the payor category. There was a need to exclude such cases from the purview of the study.

Given that these 6 months in both the years were highly impacted due to the presence or absence of the digitized care continuum, these exceptional cases were excluded from comparison for both the years. After applying the above conditions, the overall readmissions were seen to be 261 and 249 for 2022 and 2023 respectively. In terms of percentage, the readmission to discharges for the period of Jan-June 2022 was 12.4% and for Jan-June 2023 was 10.6%.

This yielded (Table 29) a chi-square statistic of 3.61483 with One degree of freedom (df), and p-value of <0.00001. The results were significant at $p < 0.05$ level, which means the null hypothesis was rejected.

Table 29:

Chi-Square Test for readmissions of Jan-June 2022 and 2023

Particulars	**Observed Frequencies (Jan-June)**			**Expected Frequencies (Jan-June)**			**X^2**
	2022	**2023**	**Total**	**2022**	**2023**	**Total**	**3.61483**

No Readmissions	1846	2106	3952	1866.173	2085.826	3952	
Readmissions	261	249	510	240.826	269.173	510	
Total	2107	2355	4462	2107	2355	4462	

Chi-Square test p-value comparing readmission rates between January–June 2022 and January to June 2023 revealed an extremely low p value which implies that there was a documented divergence in readmissions during these two periods. This shows a significant difference in readmission rates for these two periods of Jan-Jun 2022 and Jan-June 2023. **The implementation of the program appears to have dramatically reduced readmissions in the first part of 2023** and the implementation has been a success. This data further underscores the significant transformation that this initiative had on it and provides a testimonial to how patients could be benefitting from the Digitized Care Continuum.

3. Effectiveness of Digital Care Continuum in Reducing Readmission Rates. The data of patients who were enrolled in the Digitized Care Continuum for the period January to June 2023 was evaluated (Table 30) and the following observations were made. The number of patients who willingly enrolled or volunteered for the program were 1596 from 2355 discharges. The readmissions within 6 months under this category were 155 while readmissions in the group who did not get enrolled (759 patients) under the digitized care continuum was 94. The following Hypothesis was proposed:

- *Null Hypothesis (H0):* There is no difference in readmission rates between patients enrolled under the digital care continuum and those who are not.
- *Alternative Hypothesis (H1):* Readmission rates are lower for patients enrolled under the digital care continuum compared to those who are not.

Table 30:

Overall readmissions for population enrolled vs unenrolled under DCC

Period (Jan-June)	**2023**	**Enrolled under DCC**	**Not Enrolled under DCC**
No. of discharges	2355	1596	759
Readmissions	249	155	94
Percentage	10.6%	9.7%	12.4%

The Chi Square Statistic for the data was calculated (Table 31) with degree of freedom (*df*) as One. The chi-square statistic was found to be 3.886739 where the p-value was < 0.00001. The results were significant at p < .05 and hence the null hypothesis was rejected.

The test whether population who were enrolled in digitized care continuum from January-June 2023 had difference readmission rates with p-value less than .0001, suggests that it is unlikely by chance. Given this, it can now state that for the months of January through June 2023 there was a particular substantive difference between readmission rates when compared to what patients would have been if they were not enrolled at all in Digitized Care Continuum.

Table 31:

Chi-Square Test for readmissions for population enrolled vs unenrolled

Particulars	**Observed Frequencies**			**Expected Frequencies**			X^2
	2023 With DCC	**2023 Without DCC**	**Total**	**2022 With DCC**	**2023 Without DCC**	**Total**	**3.886739**
No Readmissions	1441	665	2106	1427.251	678.749	2106	
Readmissions	155	94	249	168.749	80.25096	249	

Total	1596	759	2355	1596	759	2355	

There is a statistically significant difference in readmission rates for patients enrolled in the Digitized Care Continuum according to the analysis. **The evidence points to the fact that the program was associated with dramatically reduced readmission rates.** Additionally, the readmission divide among both groups is further proof of the program's success.

4. To quantify the reduction in post discharge re-admissions (Objective 1), achieved by the implementation of a digitized care continuum program over a 6-month period. The number of discharges and readmissions for different periods before and after the implementation of the digitized care continuum was assessed. It was found that digitized care continuum was effective in reducing the number of readmissions (Table 32) in all the categories. More efficiency from the program can be derived by improving awareness and educating the patients about the benefits of the program. In terms of percentage reduction in the readmissions, the digitized care continuum provided significant positive results for the whole year and the focused 6 months in particular. The 6-month division of population under digitized care continuum and without enrollment also showed significant benefits in terms of reduced admissions.

Table 32:

Comparison of discharges vs readmissions with or without DCC

Period	**Period**	**Overall Discharges**	**Overall Readmissions**	**%**
Non-DCC	2022	4572	947	20.70%
DCC	2023	4858	691	14.20%

Non-DCC	Jan-June 2022	2107	261	12.40%
DCC	Jan-June 2023	2355	249	10.60%
Non-DCC	Jan-June 2023 – Not Enrolled	759	94	12.38%
DCC	Jan-June 2023 - Enrolled	1596	155	9.70%

Comparison with the Chi-Square Coefficient and percent reduction in each category justifies **how well Digitized Care Continuum system ensures a decline on re-admissions within 6 months of time.** The results provide an indication of how it might be able to reduce readmission rates and impact them significantly in a positive way. It also received high ratings for the structured follow-up and patient engagement strategies of the program, which are believed to have led to better patient outcomes. The program has dramatically lowered readmission rates for its participants and is clearly a best practice in patient care as well as post-discharge management.

4.3 Research Question Two

Research question two was designed to examine the effect of a Digitized Care Continuum system on staff satisfaction in a multi-speciality hospital. This was distributed as a survey to employees — including all members of the implementation team in order to gauge how well a digitized care continuum worked, and how this specific program was perceived. The survey drew responses from 93 employees working on different aspects of the digitized care continuum program. The results of the survey aim to assess staff satisfaction related to using digitized care continuum as well as reduction in effort. The findings of the Employee Survey are illustrated below:

1. Analysis of demographic information of Employees. Demographic information on sample employee population was included in order to breakdown the distribution of age, gender, level of education and experience, department job title, etc. This would be used to deep dive in a detailed manner into various population groups and assess how important the program was within each group.

1(a). Gender distribution of sample population. The gender mix of the population was measured (Figure 67), and it was found that a mix of 23% men (21 Nos) and 77% women (72 Nos) responded to the survey. This sample population matches the typical healthcare worker Population mix of 70% women and 30% women as per the study "Gender equity in the health workforce: Analysis of 104 countries" conducted by Boniol et al., n.d. This ensures that each gender is adequately represented in the sample making it more representative of the entire population.

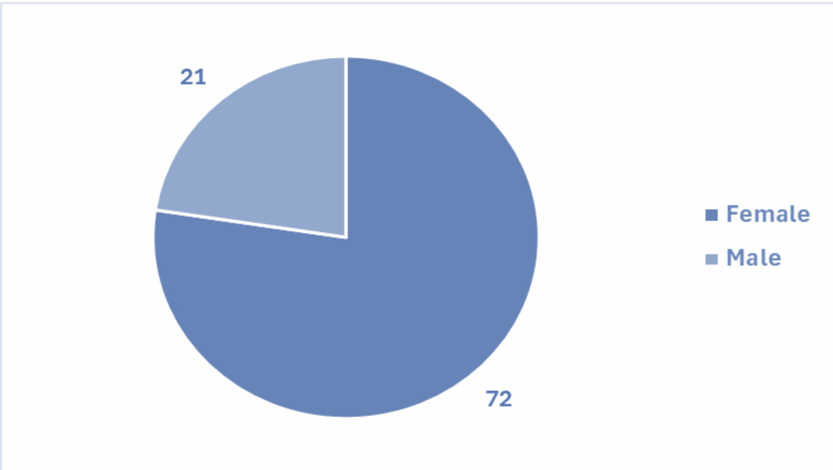


Figure 67:

Gender Analysis of Sample Population

1(b). Age distribution of population. The age distribution of sample population was assessed (Figure 68), and it was found that there were 30 employees who were in age bracket of 18-24 years contributing to 32% of the population. 57% of the sample population was in the 25-34 years category with 53 participants. 35-44 years contributed to 10% of the population and 45-54 years contributed to 1% of the population.

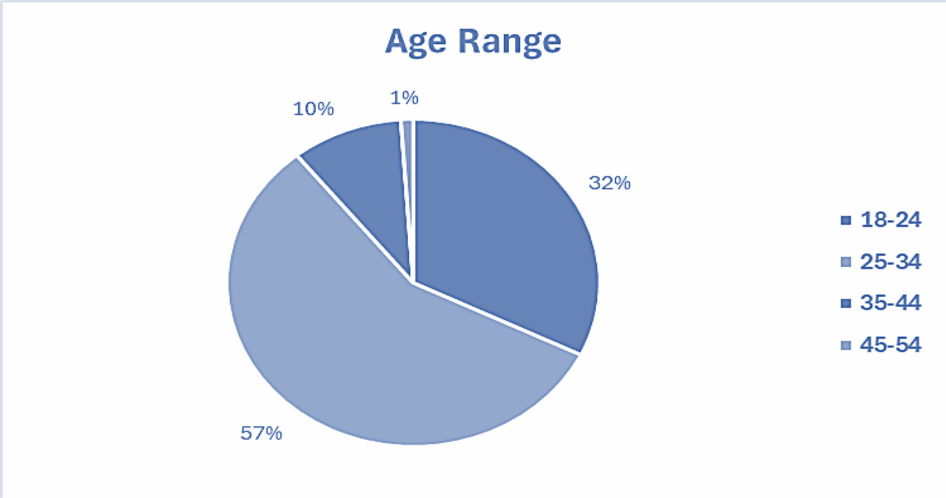


Figure 68:

Age distribution of Sample Population

The distribution of age across gender was also assessed (Figure 69). There were 63 females and 20 males in the category of less than 30 and 9 females and 1 male in 40 years and above category.

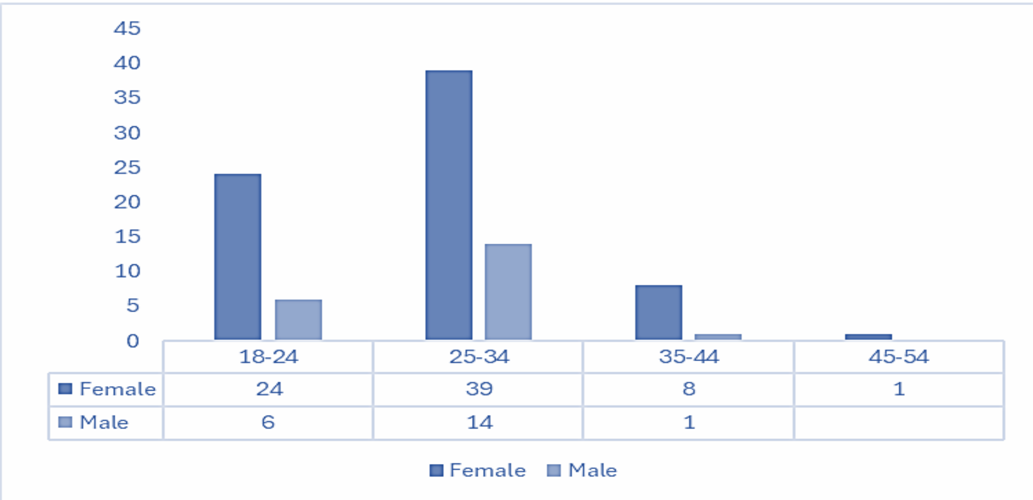


Figure 69:

Age-Gender distribution

1(c). Level of Education of respondents. The level of education is an important criterion to measure the level of understanding and knowledge in the healthcare domain. Education of employees places them under appropriate departments in a hospital. Hence, the level of education becomes an important parameter in assessing the judgement of the employees in measuring any healthcare initiative. The level of education of sample population was assessed (Figure 70), and it was found that 96% of the respondents had qualification of Bachelor's Degree and above while 4% declined to respond. Out of this, 76% of the population had Undergraduate degree (71 respondents), 5% had Post Graduate Degree (5 respondents) and 14% had professional degree (13 respondents).

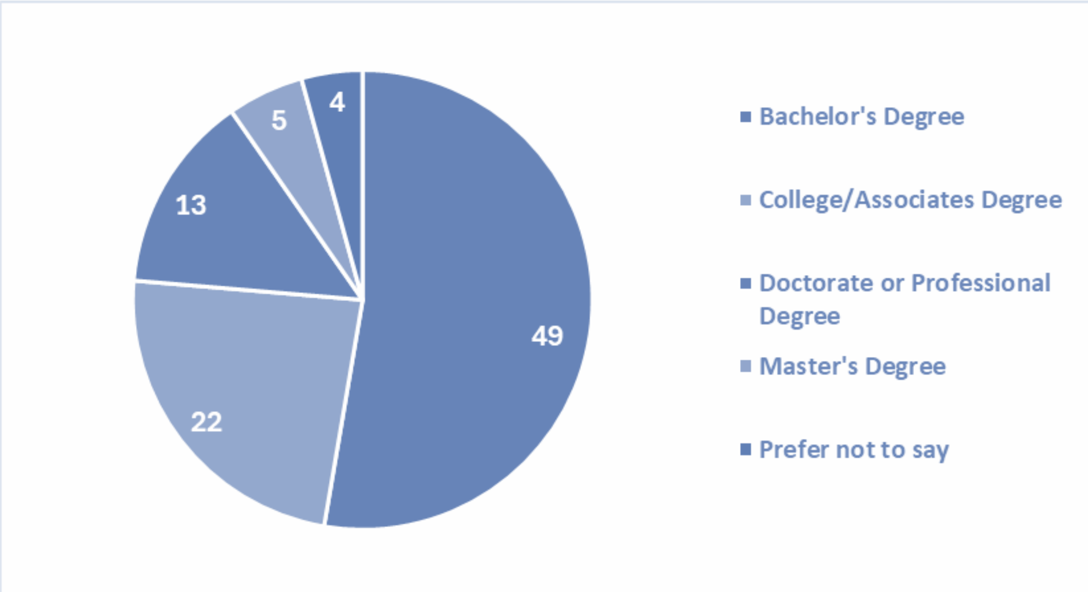


Figure 70:

Level of Education

1(d). Job Title of respondents. The Job titles of the respondents were assessed (Table 33) to understand the details of department where they function and their seniority level. All the employees who were directly involved in the implementation of digitized care continuum program from customer relations team were included. However, some employees who were indirectly involved in the follow-up and closure of escalations were also included. The medical officer who was single point of contact for physician escalations was part of the study. Nursing team including the deputy chief nursing officer who was the single point of contact for nursing escalations were also included. They were part of the in-patient care as well as follow-up support in terms of home visits. Emergency team members and Cathlab team members who were engaged in closing some patient escalations were part of the study. The implementation team of customer relations (12 participants) were involved in the overall process of follow-up and coordination of the digitized care continuum program. These participants were the ones who were directly using the system from discharge to culmination of digitized care continuum time period for each patient.

Table 33:

Job Title of participants

Job Title	**Count**
Cath Lab Technician	3
Cathlab In charge	1
Cathlab Nurse	2
Customer Relations Executive	11
Senior Customer Relations Executive	1
Nursing In charge	5
Staff Nurse	64
Deputy Chief Nursing Officer	1
Nursing Team Leader	2

Job Title	Count
Senior Emergency Technician	1
Emergency In Charge	1
Senior Medical Officer	1
Total	**93**

1(e). Department of respondents. The department level distribution was assessed (Figure 71), and it was found that 72 members from Nursing department were part of the study. Twelve members from the Customer relations department who were the core team members of the implementation and One Medical Officer (Clinical Operations department) who was the single point of contact for physical escalations were included. Other members were from Cathlab and Emergency Department.

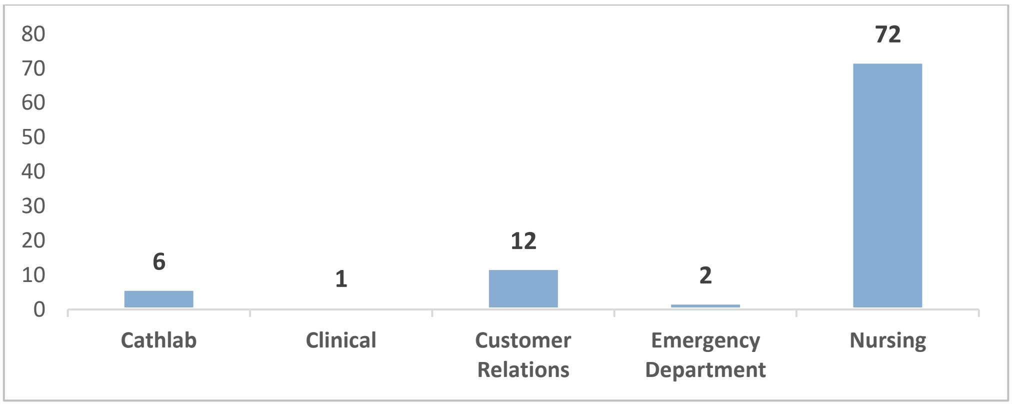


Figure 71:

Departments of participants

1(f). Experience level of respondents. The experience level of respondents was measured (Figure 72), and it was found that 26% of the respondents had more than 5 years of hospital experience. 23% of the respondents had 3-5 years of experience and 30% had 1-3 years of experience. The percentage of respondents who had less than 1 year of experience was 22%.

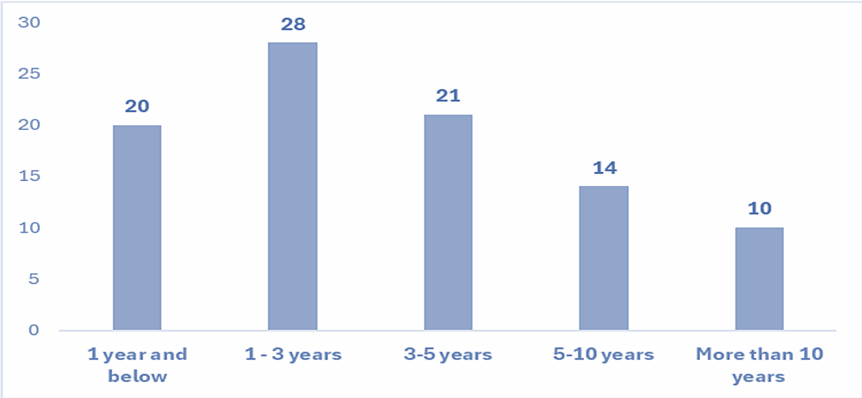


Figure 72:

Work experience of participants

2. Analysis of working with digitized care continuum. After the demographic evaluation, a thorough analysis of working with digitized care continuum was evaluated among the sample population. Various parameters like time period that they have been engaged with the digitized care continuum program, their overall satisfaction levels, perception of factors that led to the success of the program, etc. were evaluated. Specific challenges that they faced during implementation and suggestions for improvement were also collected. Their overall satisfaction in terms of reduced workload in comparison to the manual system was also measured. Their perception on the efficiency of the system in terms of reducing errors was evaluated too.

2(a). Experience working with digitized care continuum. The experience (time period) of the respondents in using the digitized care continuum was evaluated (Figure 73) and it was found that 75% of the respondents had 1-3 years of experience working with the system. 25% of the respondents had 1-3 years of experience with the system.

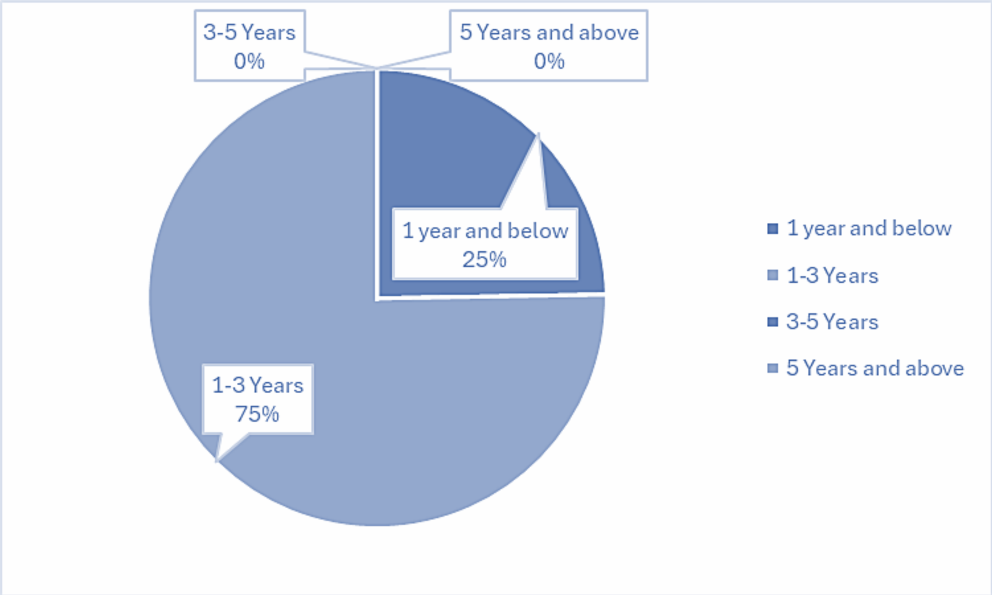


Figure 73:

Experience of participants with DCC

2(b). Overall Satisfaction working with digitized care continuum. Most employees also either agreed or strongly disagreed (Figure 74) with whether they were satisfied overall working with the digitized care continuum program. Virtually every employee — 98% — said they were "Satisfied" or "Very Satisfied." 2% of the workers avoided giving a reply. The NPS (Net Promoter Score) was evaluated which was positive in terms of benefits of the program.

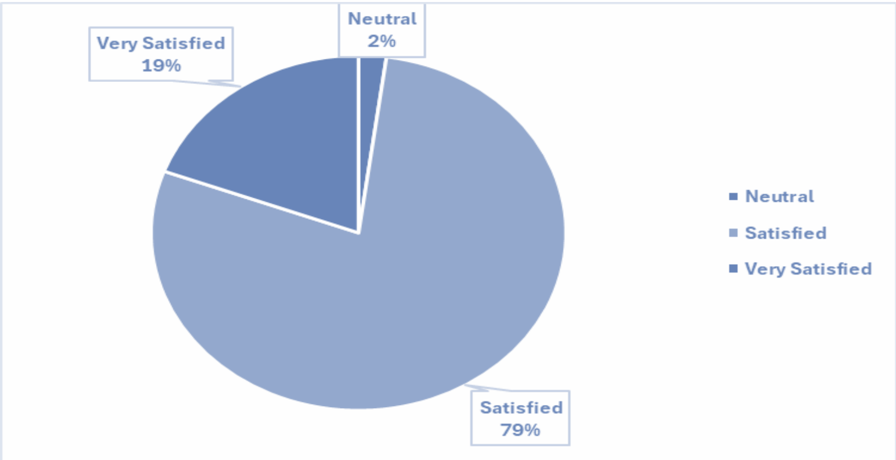


Figure 74:

Overall Satisfaction of participants

The data was drilled down to the employees (12 respondents) who were directly part of the implementation team, and it was found (Figure 75) that 11 participants were either "Satisfied" or "Very Satisfied" with the program and only 1 participant remained neutral in the response. It was very evident that the core team who are part of the implementation are seen to be completely aligned with the presence of the digitized care continuum in their location. These are the core employees who work with the system to maintain data, track, call, follow-up, provide escalations to ensure that the system is able to provide the expected delivery in post discharge care continuum.

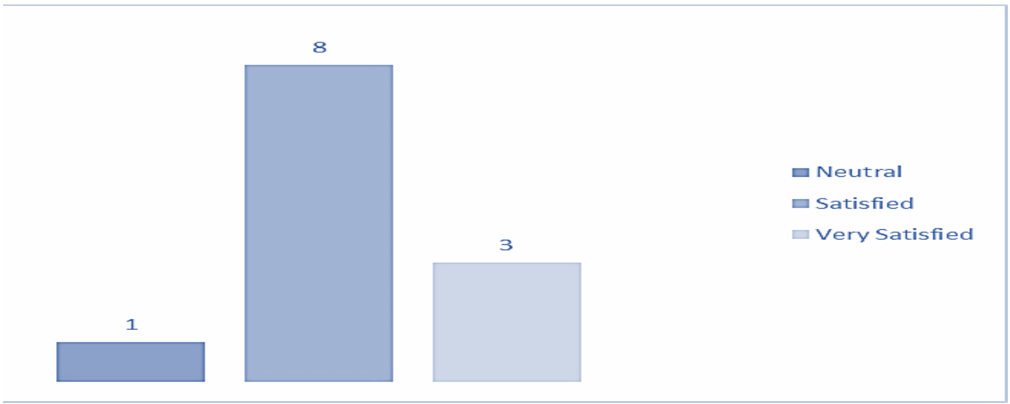


Figure 75:

Overall Satisfaction of the core team

Table 34:

Net Promoter Score of Digitized Care Continuum

	Promoters	**Detractors**	**Neutral**
Very Satisfied	19%		
Satisfied	78%		

Neutral	2%
Dissatisfied	0%
Very Dissatisfied	0%

- Promoters (P) = 19% + 78% = 97%
- Detractors (D) = 0% + 0% = 0%
- Neutrals (N) = 2%

NPS Score = Promoters (P) – Detractors (D) = 97 - 0 = 97

It was found that the NPS (Table 34) was above 90 denoting a positive NPS Score for the program. It can be clearly understood that the employees are happy with the program and are promoters for the success of the program.

2(c). Perception of improved communication with digitized care continuum. The perception of improved communication with digitized care continuum among employees showed positive results among 94% of the respondents. 94% responded (Figure 76) that the program "Improved" or "Significantly Improved" the communication. 5% of the population remained "Neutral" in their response and 1 participant responded that the program did not improve communication.

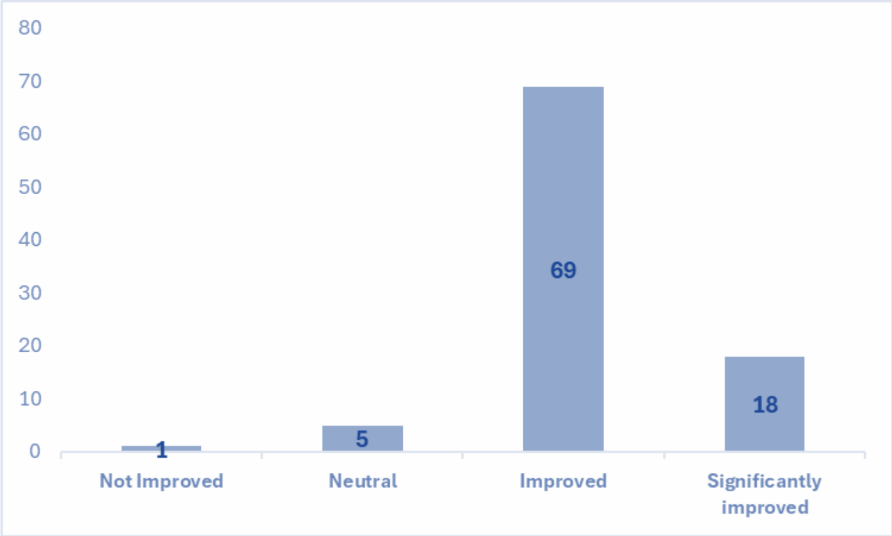


Figure 76:

Improved communication with DCC

Nine participants from the core team (12 respondents) who were directly part of the implementation team responded (Figure 77) that the program either "Improved" or "Significantly Improved" Communication while 3 participants remained neutral. This clearly shows that the employee perception towards digitized care continuum improving communication between healthcare providers and patients is positive.

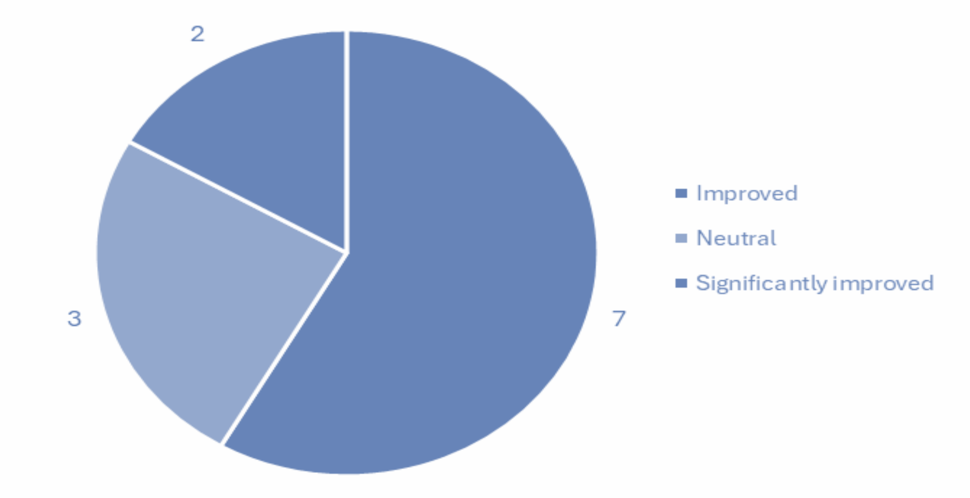


Figure 77:

Perception of improved communication of the core team

2(d). Perception of enhanced patient coordination with digitized care continuum. Enhanced patient coordination is an important measure to understand the success of any patient-oriented programs and digitized care continuum is expected to bring positive outcomes towards this parameter. When this was measured (Figure 78), 90% responded that the program was either "Effective" or "Highly Effective" in enhancing patient coordination. 10% of the population remained "Neutral" in their response and no one responded that the program did not improve patient coordination.

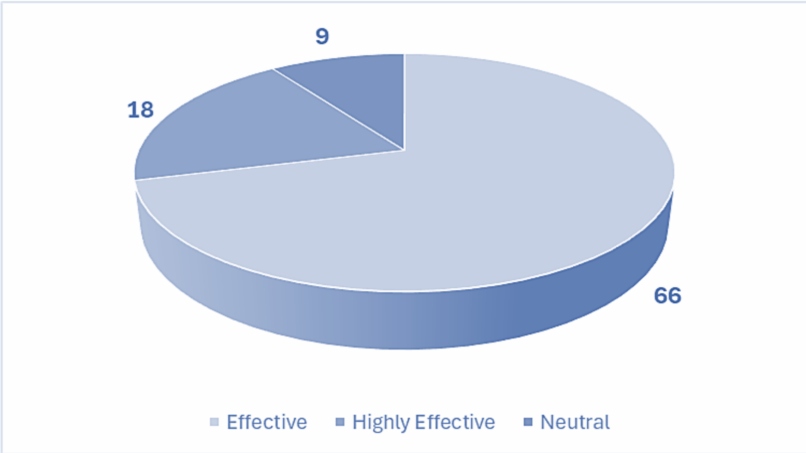


Figure 78:

Enhanced Patient Coordination with DCC

Eight participants from the core team (12 respondents) who were directly part of the implementation team responded (Figure 79) that the program was either "Effective" or "Highly Effective" in enhancing patient coordination while 4 participants remained neutral. Both the categories clearly show that the employee perception towards digitized care continuum enhancing patient coordination is positive.

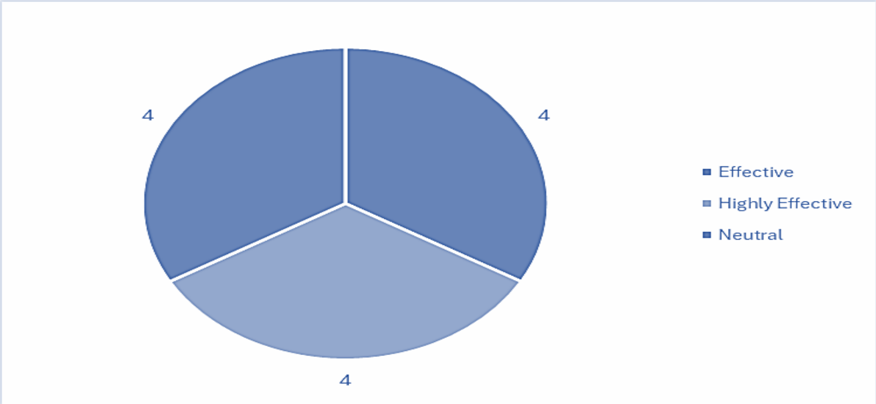


Figure 79:

Perception enhanced patient coordination of Core Team

2(e). Perception about training provided for digitized care continuum. Training is an essential component for improving employee awareness and acceptance. Successful trainings can contribute to the overall success of the program as the improved employee awareness will contribute in effective implementation of the program. This parameter was evaluated, and the findings are given below:

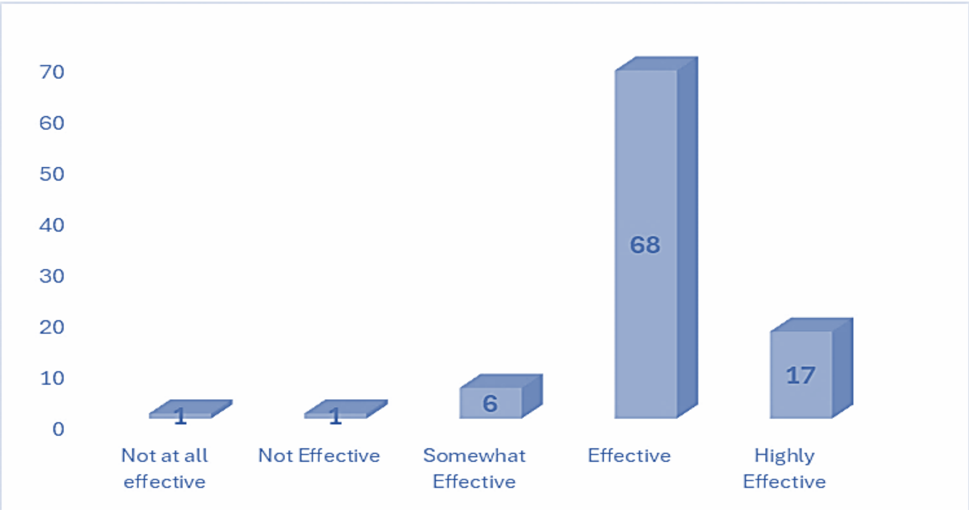


Figure 80:

Training Perception among employees

91% of the participants felt (Figure 80) that the training program was either “Effective” or “Highly Effective” contributing to the positive perception about the training. 6 participants responded that the training was only “Somewhat effective”. Two participants responded that they did not find the training effective.

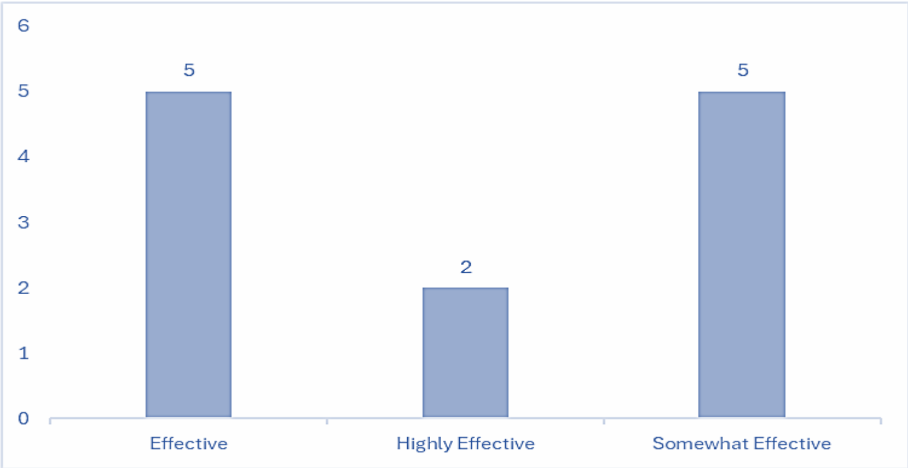


Figure 81:

Training Perception among Core Team

Seven participants from the core team (12 respondents) who were directly part of the implementation team responded (Figure 81) that the training for the program was either “Effective” or “Highly Effective” while 4 participants responded that they felt the training to be “Somewhat Effective”. Both the categories clearly show that the employee perception towards training for digitized care continuum is positive.

2(f). Perception of technical difficulties while using digitized care continuum. The perception of employees about technical difficulties while using digitized care continuum was evaluated (Figure 82) and 73% of the participants (68 participants) responded that there were not major challenges while 23% (25 participants) responded that they faced some technical difficulties.

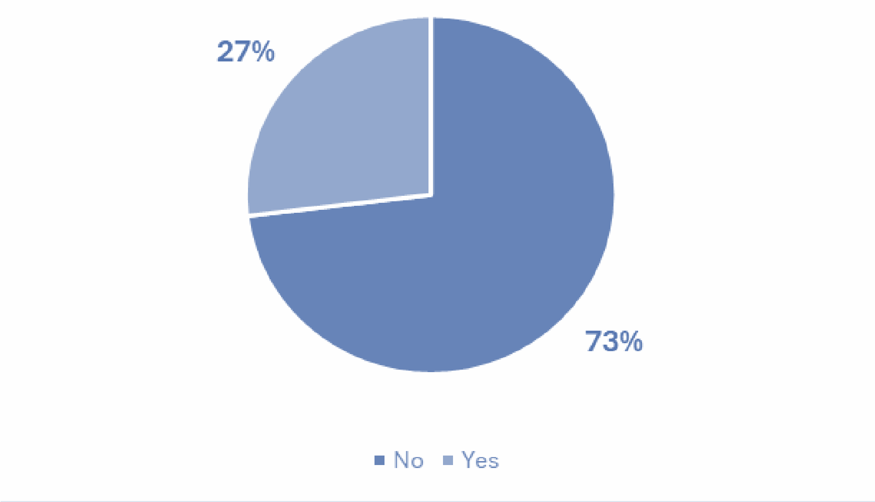


Figure 82:

Technical difficulties with DCC

Nine participants from the core team (12 respondents) who were directly part of the implementation team responded (Figure 83) that they did not face any technical difficulties while 3 responded that they faced some challenges.

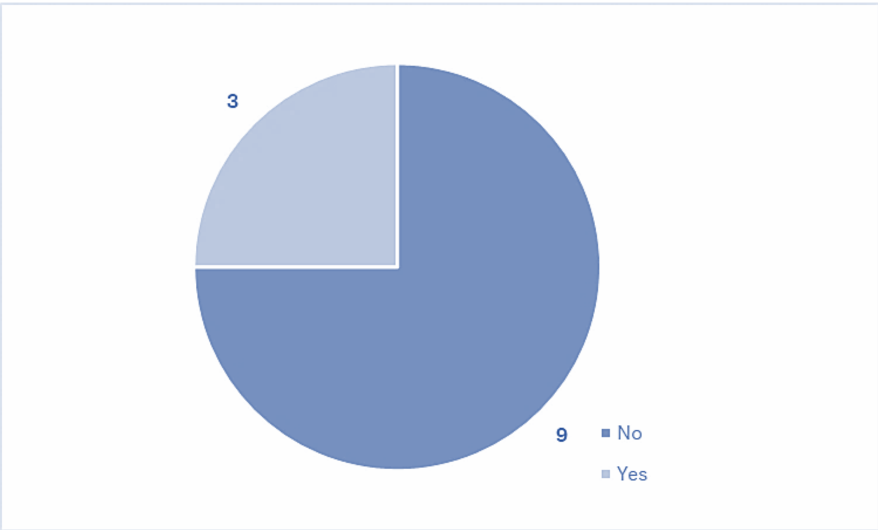


Figure 83:

Technical difficulties with DCC among Core Team

2(g). Specific technical difficulties while using digitized care continuum. More introspection was carried out on the type of technical difficulties faced by employees, and it was noted (Figure 84) that some employees felt that the maintenance of records was not proper while some others felt that the program lacked evidence-based standards and ethical considerations. While few others responded that the program coordination will be slightly difficult for new joiners, some others cited internet issues. However, majority of the participants responded that there were no challenges.

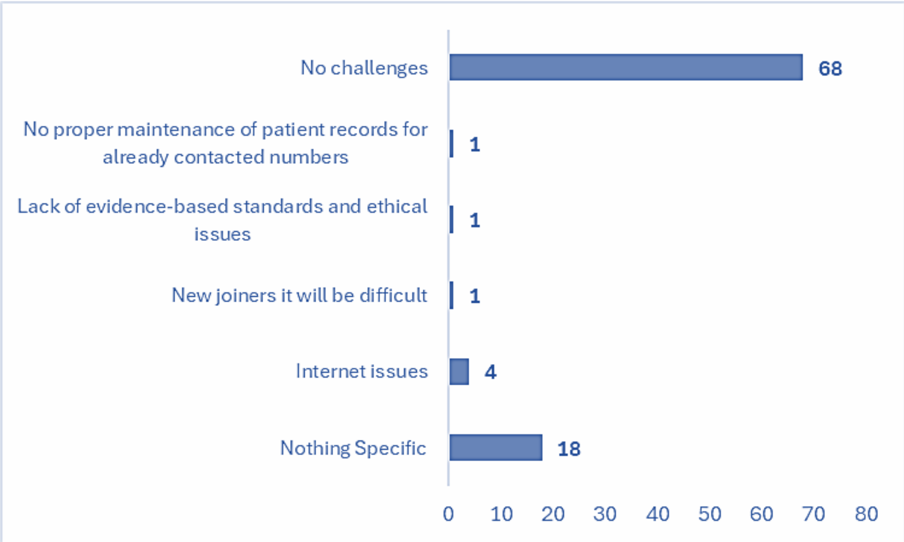


Figure 84:

Details of technical difficulties with DCC for employees

2(h)(i). Reduced workload through digitized care continuum. The study was supposed **to identify whether the implementation of the digitized care continuum reduces workload (Objective 6)** in comparison to the manual system. This important parameter was measured, and it was observed (Figure 85) that 90% of the participants felt that the digitized care continuum system reduced workload. 10% of the participants did not perceive any significant change in reduction of workload after the implementation of the digitized care continuum.

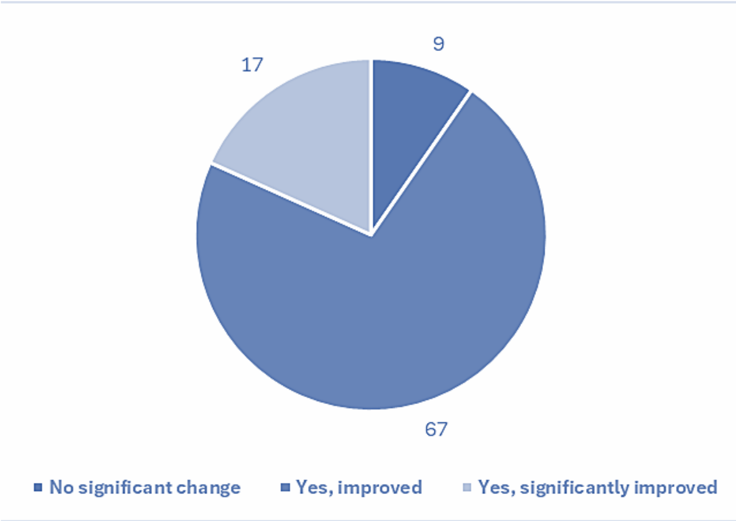


Figure 85:

Reduction of workload with DCC

When the data was drilled to the core team, 10 participants from the core team (12 respondents) who were directly part of the implementation team responded (Figure 86) that the digitized care continuum either “Improved” or “Significantly Improved” the reduction in workload. This constituted 80% of the population which **significantly undermines the fact that digitized care continuum is effective in reducing workload in comparison to a manual system**. 20% of the population (2 participants) remained neutral in their response.

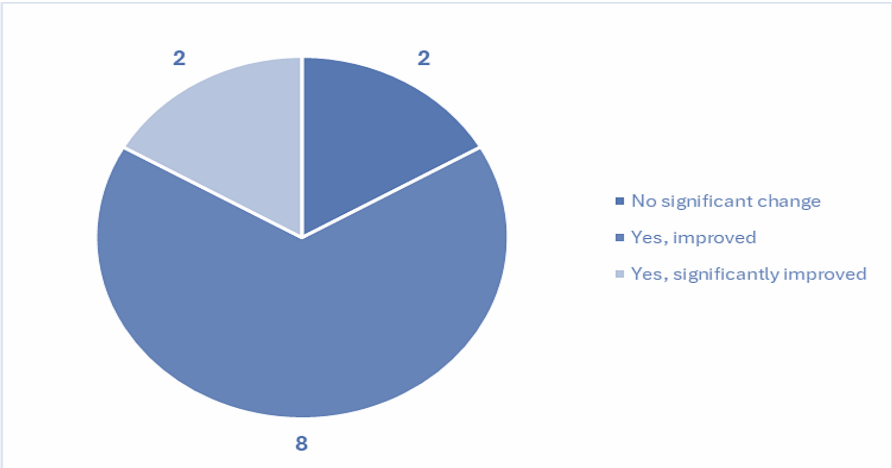


Figure 86:

Reduction of Workload with DCC among Core team

2(h)(ii). Reasons for dissenting with reduced workload through digitized care continuum. More introspection was carried out to understand the reasons for dissenting with the perception (Figure 87) of digitized care continuum reducing workload.

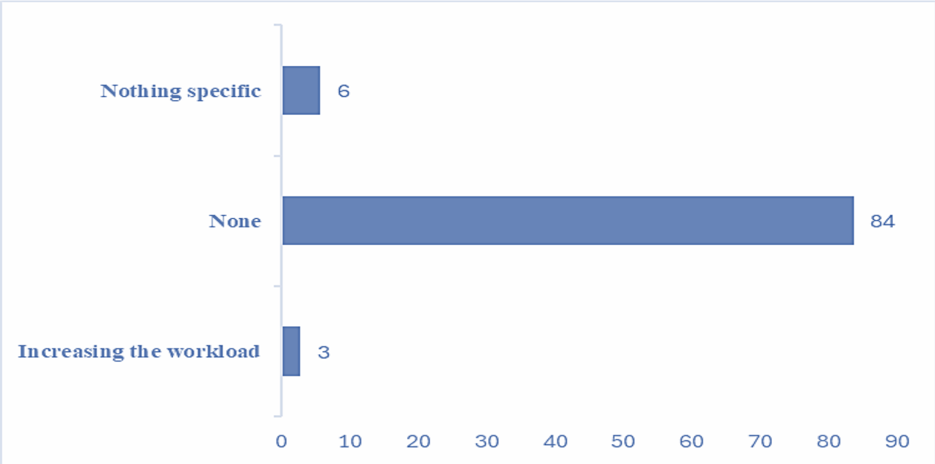


Figure 87:

Reasons for dissent with perception of reduction of workload

It was noted that majority of the dissenting employees did not give any specific reasons for dissenting other than 3 participants who responded that the program increased workload without citing any specific reasons.

2(i). Perception of digitized care continuum reducing manual errors. One of the major expected outcomes of the implementation of a digitized care continuum program is reduction of manual errors. When this parameter was measured, it was observed (Figure 88) that 80% of the participants responded that the digitized care continuum system reduced manual errors. 14% of the participants remained neutral, 3% perceived that there was no reduction and 3% felt that there was an increase in manual errors.

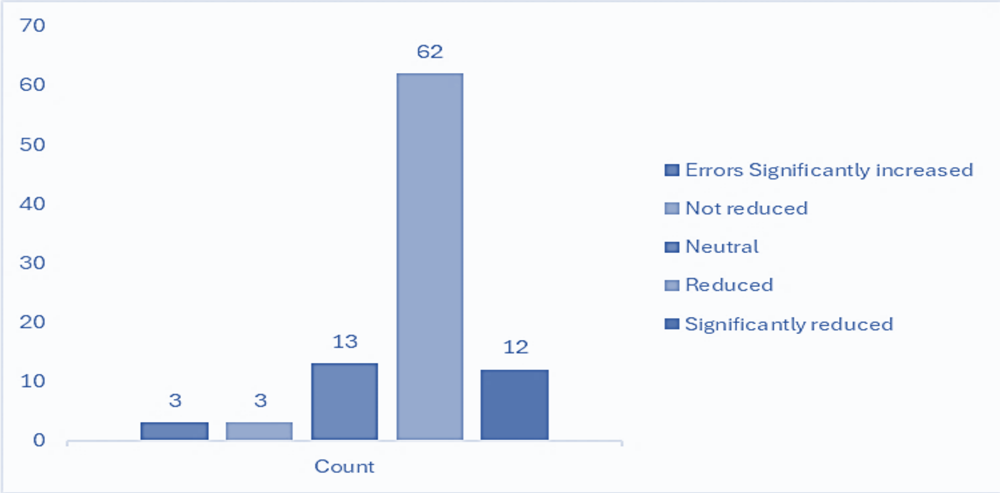


Figure 88:

Reduction of manual errors with DCC

Eight participants from the core team (12 respondents) who were directly part of the implementation team responded (Figure 89) that the digitized care continuum either "Reduced" or "Significantly reduced" manual errors constituting to 67% of the population. 33% of the population (4 participants) remained neutral in their response.

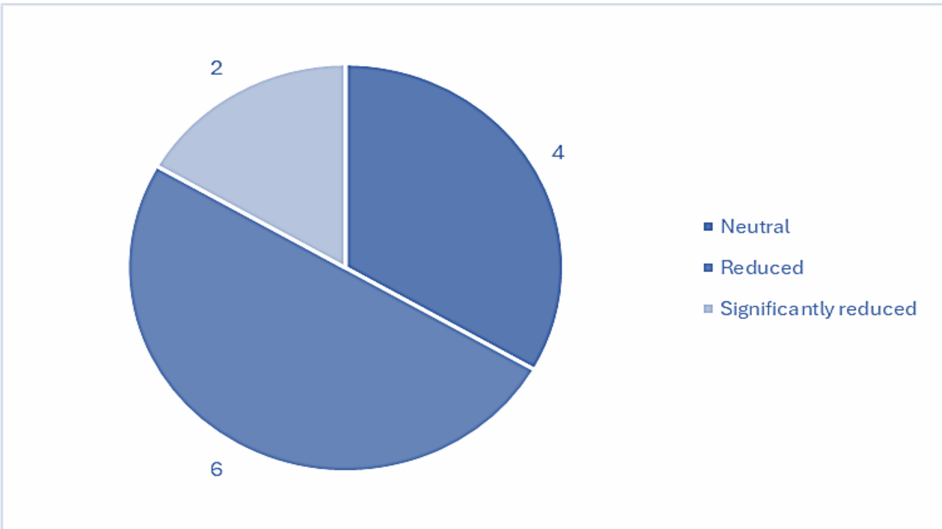


Figure 89:

Reduction of manual errors with DCC among core team

2(j)(i). Opinion on whether digitized care continuum should continue to operate in the hospital. The opinion of employees in continuing the digitized care continuum in the hospital was taken and it was observed (Figure 90) that 96% of the population responded that they would like the program to continue at the hospital. Only 4 participants responded that they do not wish the program to continue at the hospital.

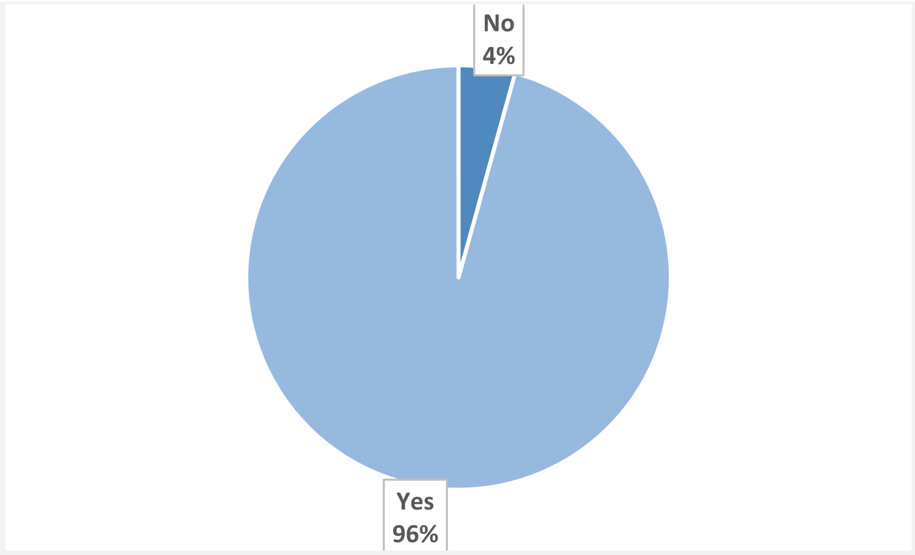


Figure 90:

Continuation of DCC

The same opinion was measured only among the core team, and it was found that 11 out of 12 participants felt that the program should continue to operate at the hospital. Only 1 participant responded that there is no need for the program to operate at the hospital. The positive perception among employees clearly shows that the digitized care continuum leads to employee satisfaction and strong connection with the program.

2(j)(ii). Dissenting opinion on whether digitized care continuum should continue to operate in the hospital. The dissenting opinion was dissected (Table 35), and it was found that the 4 participants who had suggested that the program need not continue in the hospital gave the following remarks.

Table 35:

Remarks from dissenting employees

Encourage the employees to take part in this program (1)
Whenever a complaint is raised, we need think of solving it and not to be repeated instead of just closing the complaints. (1)
Patients are getting very irritated by these calls. (2)

One observation was that 2 employees responded that the patients are getting irritated by continuous calls which clearly denotes that the awareness among patients and employees about the benefits of the program has to be enhanced.

3. Analysis of qualitative responses. Other than the quantitative parameters, three questions were posed to extract qualitative responses from the participants. All were open-ended to understand the positive experiences and challenges. One was to take suggestions for any additional features that the employees perceive could be added to the program. Second one was to take suggestions to improve utilization of the program and the third and last one was to take general suggestions or inputs on the program. The findings are given below:

3(a). Suggestions for any additional features for digitized care continuum. Suggestions were sought from employees on any additional features that could enhance the program, and the responses were collated (Table 36). While majority of the responses (72 Nos) did not specify any additional features, 16 responses were not relevant to the program. Introduction of demographic representation of patient recovery in the system was suggested by one of the participants. Improvement of feedback mechanism and introduction of personalized medicine were also recommended.

Table 36:

Additional features for DCC

Remarks	**Nos**
Demographic representation of patient recovery statistics	3
Personalized medicine	1
Feedback mechanism can be improved	1
Nothing Specific	72
Not relevant	16

3(b). Any suggestions for improving utilization of digitized care continuum. Suggestions for improving utilization of the digitized care continuum were sought from employees and the responses were collated (Table 37). Few responded that Correlation of patient statistics in terms of demographics and recovery is essential to be improve utilization. Easy to use interface and integration with existing systems (HIS) was another feedback given by participants.

As per few other participants, allowing customized configurations and ensuring data privacy would ensure better utilization. Improving awareness levels and providing more training to employees will lead to better utilization as per employees. Few responded that once the challenges faced by callers are settled, utilization could be improved.

One participant provided detailed feedback on data privacy which is captured here: "*Data privacy needs to be maintained. And no multiple contact persons should be there.*

Should be a closed loop communication. Only one contact person and should address and solve the issues without Multiple calls".

Table 37:

Suggestions for improving utilization of DCC

Allow tailored configurations.
Better Awareness
Corelation of day-to-day patient statistics
Correlation of demographic representation of patient data statistics
Correlation of patient recovery statistics
Data privacy
Ensure an easy-to-use interface.
Few challenges are met by the caller, team is already working on it.
Integrate with existing systems
More training
Nothing Specific

3(c). Any additional suggestions or comments for digitized care continuum. Additional suggestions or comments for digitized care continuum was collected from employees and it was observed (Table 38) that employees felt that the program reduced stress, reduced workload, improved self-growth, reduced medication errors, improved communication, improved time management and offered great experience for patients and employees. One participant responded that multiple calls to patients are leading to patient dissatisfaction. Few responded with “Nothing Specific” comments. Few other participants responded that they found the program to be very useful and beneficial.

Table 38:

Additional suggestions for DCC

As this is a health care field, I think we should not call the patient again and again and make them irritate because in calls some of the patient they are telling that if any requirement they will call no need to call
Improved communication
Digital system helps in my Nursing work
From what I experienced using digitised care continuum will be useful for the staff to concentrate more on patient care if it is improved even more and provide exact results manual errors will be decreased.
Good Services
Improve our self-growth
It helps me to reduce our work stress. Thank you
It's supports to every service user
It's a great experience to involved in this program
Nothing specific
Overall, it is beneficial
Patient experience and why digital health strategies should focus on providing a continuum of care experience to the patient
Prevention of medications errors
Respond swiftly
Time saving process

Very satisfied with digital care continuum
Very useful for growth
We need to concentrate more on improving the care provided.

a.

4.4 Summary of Findings

The study intended to answer 2 research questions by clearly stating 6 objectives. Data for the same was collected from 2 surveys – one from the patient population and another from the employees. The objective was to measure the effectiveness of digitized care continuum in improving patient satisfaction and in reducing workload fof employees. Similarly, primary data was collected from the healthcare provider to measure the effectiveness of digitized care continuum in reducing readmissions.

Correlation coefficients was calculated for different parameters in terms of patient satisfaction and retention and it was found that the digitized care continuum displayed significant positive impression on the patients. Net Promoter Score (NPS) for the population was calculated and it was observed that the program had significant positive NPS denoting improved patient satisfaction.

The perception of employees were evaluated using Net Promoter Score and it was observed that the digitized care continuum offered high positive levels of employee satisfaction with large number of promoters. 90% of the employees felt that the program reduced workload in comparison with a manual system and reduced manual errors too.

The readmission data of 6 months for different period was evaluated and hypothesis was formulated. Chi-Squre test was performed and it was observed that in all the situations, the digitized care continuum exhibited significant positive impact on reducing readmissions.

Eventhough the benefits of digitized care continuum was clearly evident from the survey and the subsequent data analysis, the low awareness among patients posed the biggest concern or challenge in improving the effectiveness of the program. Few limitations for the study and scope for further research will be discussed in the subsequent chapters.

CHAPTER V:

DISCUSSION

5.1 Introduction

The aim of the study was to determine real-world effectiveness for a Digitized Care Continuum deployed in multispecialty hospital. One significant challenge for healthcare providers is managing the post discharge complications and readmissions. The occurrence of readmissions could be prevented by proactively involving through an extensive care continuum program. This will help the healthcare provider not to compromise on patient satisfaction and retention. But this kind of healthcare data analysis and resultant algorithms can be complex — leading to fatigue levels for personnel who are a part of the care continuum program. These dimensions of digitized care continuum program were measured in this study using some quantitative and qualitative analyses.

Literature reviews helped in finding research gaps and also provided ideas for bridging the same. Many studies have evaluated the effectiveness of care continuum programs in certain clinical specialities. However, there is still a significant need to have more focused studies on the overall effectiveness of a digitized care continuum program on reducing readmissions and improving patient and staff satisfaction in a multi speciality hospital setting. This study shows that the use of digitized care continuum may enable healthcare providers to proactively engage with discharged patients who are at risk of developing post discharge complications and specifically readmissions. This will allow the healthcare systems to achieve overall cost reductions and improved outcomes with minimal human errors and efforts.

In considering the digitized care continuum, this study focused on a multispecialty hospital in Hyderabad. The study aimed to achieve six objectives:

Objective 1. To quantify the reduction in post discharge re-admissions, achieved by the implementation of a digitized care continuum program over a 6-month period.

Objective 2. To assess the patient satisfaction levels resulting from the implementation of an effective digitized care continuum program, using measurable satisfaction scores.

Objective 3. To measure the effectiveness of a digitized care continuum program in better clinical outcomes post discharge.

Objective 4. To measure the effectiveness of a digitized care continuum program in improving patient retention and loyalty.

Objective 5. Determine the importance of a digitized care continuum program in a multi-speciality hospital

Objective 6. To assess and quantify the enhancement in employee satisfaction levels resulting from the implementation of an effective digitized care continuum program.

These objectives guided the research questions and were examined in detail empirically. Objectives 1 to 5 were part of the first research question, while objective 6 formed the basis of the second research question. The study thus investigated the overall effectiveness of a digitized care continuum on patient satisfaction, its impact on readmissions, and employee satisfaction in a multispecialty hospital in Hyderabad, India.

Although this study was primarily quantitative, several qualitative insights emerged during the design phase. Both primary and secondary data were analyzed, along with survey data from the patient and staff populations. Hypothesis testing was conducted using the Chi-

Square test for assess the effectiveness of the digitized care continuum in reducing readmissions.

5.2 Discussion of Research Question One

The Research Question One focused on 2 aspects - To quantify the effectiveness of a Digitized Care Continuum system by:

i. Assessing the reduction in re-admissions over a 6-month period.

ii. Measuring patient satisfaction

The first part of the research question one was analyzed by collecting discharge details (Secondary data) from the hospital and data captured from the Digitized Care Continuum system. Multiple admissions due to co-morbid conditions were avoided from the data and frequent admissions for dialysis and chemotherapy were also excluded. Different time periods of readmission data associated with various patient groups were analyzed to understand the effectiveness of the system in reducing admissions. This analysis also aligns with Objective 1 of the study.

5.2.1 Part 1 of Research Question One - Effectiveness in Reducing Readmissions (Objective 1). The study's findings on readmission rates provide a compelling case for the effectiveness of the digitized care continuum. The total number fo discharges and readmissions for a significant period of time was assessed. The digitized care continuum focused on regular follow-up with calls made to patients on 3^{rd}, 7^{th}, 18^{th}, 33^{rd}, 60^{th}, 90^{th}, 180^{th} day of discharge and hence the coverage provided by the program after discharge extended up to 180 days (6 months) of discharge. Hence, it was decided to assess the effectiveness of digitized care continuum for a period of 6 months. However, the universal criteria of readmissions within 30 days of discharge was also assessed as a part of the study.

1. Overall Readmission Rates Comparison between 2022 and 2023. In 2022, the total discharges were 4572 and there were 947 readmissions resulting in a figure of ~20.7% overall discharge which got readmitted. In the same manner, there were 4858 discharges with 691 readmissions for year ending in 2023 and readmissions contributed to be as much as 14.2% of overall discharge. This included all admissions and no cases were excluded for readmissions as there were overlap of care continuum during this period. The results of the Chi-Square test revealed a highly significant decrease in readmission rates across 2022 and 2023, with a very small p value. This indicates that the care continuum as it appears to be digitized in 2023 had a markedly beneficial effect. The results were significant at $p <. 05$ and therefore the null hypothesis was rejected in this case.

The number of readmission in each clinical departments was analyzed (Table 39) and it was found that for the year 2022, Cardiac Sciences (327) had the maximum number of readmissions followed by Renal Sciences (174) and Neuro Sciences (114). When the data was dissected further it was observed that readmissions under the same department was higher for Cardiac Sciences (265) followed by Renal Sciences (153) and Neuro Sciences (97). The readmissions under different departments were higher for Cardiac Sciences (62) followed by General Medicine (47) and Renal Sciences (21).

Table 39:

Readmissions for the year 2022

Departments	**Total Readmissions**	**Same Department**	**Different Department**
Cardiac Sciences	327	265	62
General Medicine	104	57	47
General Surgery	15	9	6

Neuro Sciences	114	97	17
Obstetrics & Gynaecology	22	20	2
Oncology	76	57	19
Orthopaedics	61	47	14
Otolaryngology	17	17	0
Paediatrics	4	4	0
Plastic And Cosmetic Surgery	14	14	0
Pulmonology	19	17	2
Renal Sciences	174	153	21
Grand Total	**947**	**757**	**190**

Likewise, a similar analysis was undertaken by clinical department (Table 40). Cardiac Sciences had top number of readmissions this year with 166 cases, followed by Renal Sciences at 134 and Neuro Sciences with 89 readmissions. A further breakdown table regarding the admission within the same department, it was noted that Cardiac Sciences was leading in readmissions with 140 cases, followed by Renal Sciences at 101 and Neuro Sciences with 66 cases. General Medicine and Renal Sciences had the maximum readmissions across different other departments with 33 cases followed by Cardiac Sciences (26) and Neuro Sciences (23).

Table 40:

Readmissions for the year 2023

Departments	**Total Readmissions**	**Same Department**	**Different Department**
Cardiac Sciences	166	140	26
General Medicine	71	38	33
General Surgery	39	30	9

Neuro Sciences	89	66	23
Obstetrics & Gynaecology	32	19	13
Oncology	81	64	17
Orthopaedics	34	30	4
Otolaryngology	15	13	2
Paediatrics	3	3	0
Plastic And Cosmetic Surgery	4	4	0
Pulmonology	23	10	13
Renal Sciences	134	101	33
Grand Total	**691**	**518**	**173**

The above data clearly shows that the benefits of the digitized care continuum entends to mostly all the clinical specialities and the future usage should be extended to all of them.This substantial readmission rate difference suggests that the digitized care continuum had an important and potential role in better outcomes for patients. A lower readmission rate suggests better follow-up care and fewer issues in patient management – all of which can be supported by a digitized continuum. If the total readmissions over all of 2022 and 2023 is evaluated, a downstream effect is seen showing that a digital care continuum was effective in reducing those rates. The only overlap with the digitized care continuum was a small proof of concept carried out in Q4 of calendar year 2022. It was the same or otherwise, if readmissions could be affected in Q4 2022 resulted to a better impact of digitized care continuum for 2023 compared to that for 2022.

2. Overall Readmission Comparison for January to June between 2022 and 2023.

The comparison of readmission rates for the first half of 2022 and 2023 was also highly statistical, which proved the positive outcomes of the program. It should be noted that overall discharges for the period of Jan-June 2022 were 2107 and for Jan-June 2023 was 2355. After excluding patients with frequent admissions, the overall readmissions were 261 and 249 for 2022 and 2023 respectively.

As a percentage, the readmission to discharges for the period of Jan-June 2022 was 12.4% and for Jan-June 2023 was 10.6%. The Chi Square Statistics was calculated with degree of freedom (df) as One. The Chi-square statistics was 6.92113 and the p-value was 0.00001. The results were significant with $p < .05$ and as a result, the study will reject the null hypothesis.

Analysis of number of readmissions in each Clinical departments (Table 41) for the period Jan-June 2022 showed that Cardiac Sciences (78) had the maximum number of readmissions. Next was Renal Sciences with count (53) and Oncology (49). An exploration of the data revealed that readmissions within the same department were represented more by Cardiac Sciences (58) followed by Renal Sciences (44), and Oncology (33). Cardiac Sciences (20) showed the highest readmissions across different departments followed by Oncology (16), and General Medicine with 12 readmissions.

Table 41:

Readmissions for the period Jan-June 2022

Departments	**Total Readmissions**	**Same Department**	**Different Department**
Cardiac Sciences	78	58	20
General Medicine	25	13	12
General Surgery	1	1	0
Neuro Sciences	19	15	4

Obstetrics & Gynaecology	6	6	0
Oncology	49	33	16
Orthopaedics	18	14	4
Otolaryngology	5	5	0
Paediatrics	1	1	0
Plastic And Cosmetic Surgery	1	1	0
Pulmonology	5	5	0
Renal Sciences	53	44	9
Grand Total	**261**	**196**	**65**

Like wise, the readmission in each clinical departments was analyzed (Table 42) and revealed that during 2023, Cardiac Sciences (63) had the highest number of readmissions followed by Renal Sciences (53) and Oncology (41). However, after the data was analyzed separately, readmissions within same department were observed higher in Cardiac Sciences (51) followed by Renal Sciences (48), Oncology (30). Cardiac Sciences with 12 readmissions under different departments topped the list followed by General Medicine and Oncology having Eleven each.

Table 42:

Readmissions for the period Jan-June 2023

Departments	**Total Readmissions**	**Same Department**	**Different Department**
Cardiac Sciences	63	51	12
General Medicine	22	11	11

General Surgery	12	10	2
Neuro Sciences	15	10	5
Obstetrics & Gynaecology	12	8	4
Oncology	41	30	11
Orthopaedics	15	13	2
Otolaryngology	5	4	1
Paediatrics	2	2	0
Plastic And Cosmetic Surgery	2	2	0
Pulmonology	7	1	6
Renal Sciences	53	48	5
Grand Total	**249**	**190**	**59**

Percentage of readmissions under various clinical specialities (Table 43) when compared showed that there was significant difference in the number of readmissions post implementation of digitized care continuum. The most prominent decrease was in Oncology, Cardiac Sciences and Neuro Sciences. However, a few clinical departments like Plastic and Cosmetic Surgery, General Surgery and Pulmonology had a slight increase in readmission percentages.

Table 43:

Comparison of reduction in readmissions under various clinical specialities

Departments	**2022**			**2023**			**Diff**
	Disc	**ReAd**	**%**	**Disc**	**ReAd**	**%**	

Cardiac Sciences	668	78	12%	681	63	9%	-2.4%
General Medicine	330	25	8%	300	22	7%	-0.2%
General Surgery	81	1	1%	245	12	5%	3.7%
Neurosciences	287	19	7%	284	15	5%	-1.3%
Obstetrics & Gynaecology	75	6	8%	132	12	9%	1.1%
Oncology	75	49	65%	79	41	52%	-13.4%
Orthopaedics	148	18	12%	137	15	11%	-1.2%
Otolaryngology	109	5	5%	129	5	4%	-0.7%
Paediatrics	31	1	3%	72	2	3%	-0.4%
Plastic And Cosmetic Surgery	25	1	4%	24	2	8%	4.3%
Pulmonology	69	5	7%	62	7	11%	4.0%
Renal Sciences	209	53	25%	210	53	25%	-0.1%
Grand Total	**2107**	**261**	**12%**	**2355**	**249**	**11%**	**-1.8%**

**Disc=Discharges , Re Ad=Readmissions, Diff=Difference*

Another analysis was done to measure the role played by digitized care continuum in reducing the readmissions within 30 days of discharge. This showed that 82 readmissions occurred within 30 days of discharge from the hospital during Jan-June 2022 where the total number of discharges were 2107 amounting to 4% readmissions. The same data was evaluated for the period of Jan-June 2023 and the effectiveness of the program was seen not be very significant. This amounted to 97 readmissions for the overall discharges of 2355 contributing to 4%. This could be due to the fact that the awareness and implementation challenges of digitized care continuum was not properly addressed even by June 2023 and this aspect of the program needs deeper evaluation. Another reason was the change or increase in admissions under the clinical speciality mix in 2023 especially under Oncology and Renal Sciences. This warranted more planned readmissions in some specialities. Another technicality was that the entire population from Jan-June 2023 was considered for the evaluation irrespective of whether they were enrolled in digitized care continuum or not. When the population who were not enrolled under the digitized care continuum was removed, the numbers came down to 80 readmissions with 3% percentage. This shows that the digitized care continuum has a positive effect on readmissions within 30 days of discharge too.

The continued decrease of readmissions in various departments and over time demonstrates the success with a digitized care continuum. Such consistency implies not only that the advantages provided by the digitized system are spread among multiple departments and encounter different types of patients; they likely ripple across all, or very nearly all the patient population. The also provides meaningful statistics on how effective the program actually is by proven vast difference of readmission rates. Readmissions have significant implications for patient health, lower healthcare costs and increase patient satisfaction. Hence, minimizing readmission percentage can improve the patients journey. The drop in readmissions for different departments underlines the success and ongoing vital need of re-enabling efforts towards implementation of digital care continuum in multi-hospital settings.

3. Effectiveness of Digital Care Continuum in Reducing Readmission Rates. When comparing readmission rates between patients enrolled in the digitized care continuum and those not enrolled, the results were again statistically significant, indicating the program's effectiveness.

The number of patients who willingly enrolled or volunteered for the program were 1596 from 2355 discharges. The readmissions within 6 months under this category were 155 while readmissions in the group who did not get enrolled (759 patients) under the digitized care continuum was 94.

The Chi Square Statistic for the data was calculated with degree of freedom (*df*) as One. The chi-square statistic was found to be 3.886739 where the p-value was < 0.00001. The results were significant at $p < .05$ and hence the null hypothesis was rejected.

Patients who were a part of the digitized care continuum received interventions faster and, thus, more effective at any time in development which helped reduce readmission rates. The personalized care plans along with timely follow-ups powered by the digitalized system resulted in rapid recuperation of patients and less readmission.

The fact that the enrollees had fewer readmissions is an indication that there are reasons to hope for broad applicability of digital solutions along a care continuum, even in very different patient groups with different conditions. This wide reach seems to suggest that the program has potential in positively impacting healthcare results across the board.

The data illustrate the effectiveness of the program in tackling factors that typically lead to readmissions, such as poor follow-up and medication non-compliance as well as lack of patient education. This helps greatly in reducing readmissions, as patients can be given the tools and support required to effectively care for themselves after being discharged from a healthcare setting.

There was a specific intervention by the digitized care continuum which had a life-saving value. A patient with a diagnosis of critical calcified aortic stenosis underwent surgical valve replacement on October 26, 2022 and then was enrolled in the program for digitized care continuum. The patient was performing well according to regular follow-ups in the system. On day 45, during a call initiated through the digital care continuum, the patient's care giver mentioned that she noticed drooping on one side of patient's mouth.

The hospital CRM executive who was handling the call escalated the issue directly to a physician who immediately informed the caregiver to take the patient for a CT scan at hospital requesting specifically that it should be done urgently as there was a possibility of stroke. The patient was rushed to the hospital, where a stroke was diagnosed. After the patient was admitted to the Critical Care Unit, his condition stabilized and was discharged in a good general status of health (Figure 91).

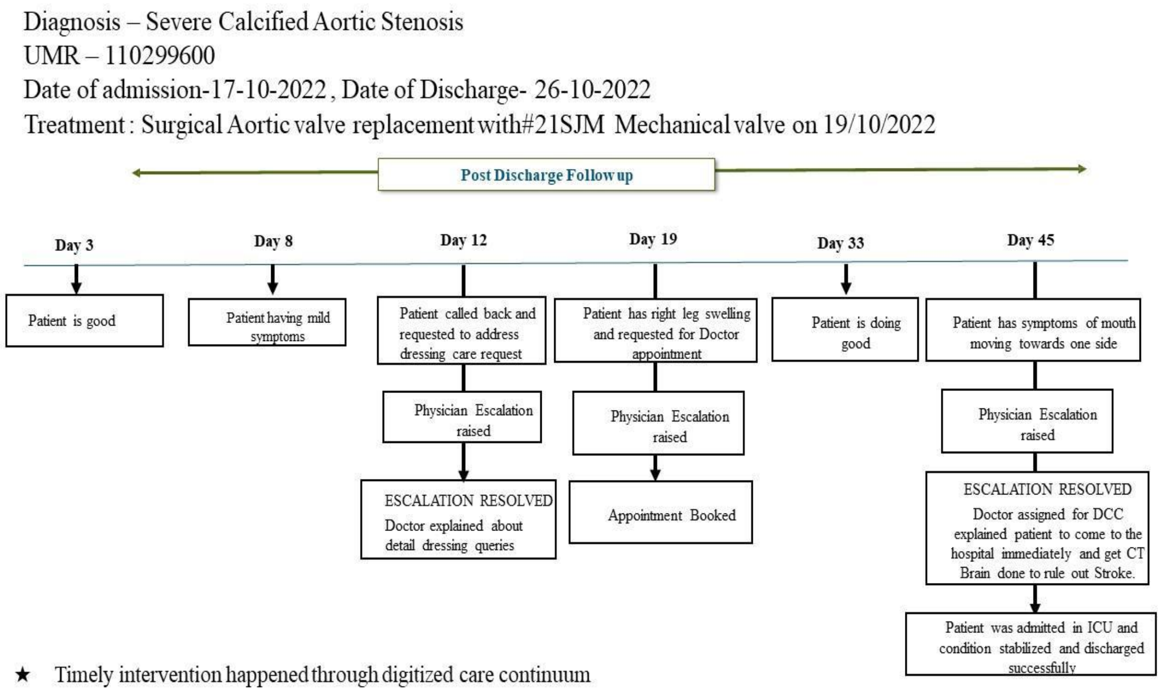


Figure 91:

Instance of Digitized Care Continuum saving life

The intervention during the follow-up through digitized care continuum enabled timely physican escalation and immediate transfer to hospital saving a precious life. Thus the system has proven its ability to support patients across clinical specialities in identifying post discharge complications, enabling physican escalations and improved coordination and communication.

This particular case exemplifies the importance of patient linkage and follow up using digitized care continuum system to ensure good post-discharge condition among patients; which if **practiced consistently can potentially save lives across various clinical specialities.** This also undermines the fact that the digitized care continuum should be practiced in all the clinical specialities to offer benefits of the system in both acute and and chronic conditions.

5.2.2 Part 2 of Research Question One - Effectiveness in Improving Patient Satisfaction (Objective 2). One of the aims of this study was to measure the effectiveness of digitized care continuum system in improving patient satisfaction.

1. Assessing Patient Satisfaction Levels. The Net Promoter Score (NPS) was utilized to measure patient satisfaction. NPS of 92 showed "high positive satisfaction levels" among patients after the digitized care continuum was introduced. The high NPS score signifies several key points:

1(a). Improved Patient Experience. The digitized care continuum optimized processes to assist in communication, lower post-discharge complications and readmissions thus making healthcare delivery more effective. This in turn led to a high patient satisfaction rate and made services more accessible, faster which is a huge difference from the queues and frustrations of traditional healthcare.

1(b). Comprehensive Care. The care was enhanced through integration of the digitized care continuum. Patient satisfaction was boosted by the ability to communicate with their physicians following discharge as well receiving guidance during recovery. It enabled them to interact with their care providers in the convenience of their home without having to travel and wait for hours. It complemented other digital resources such as Digital Health records and tele-consultation to ensure seamless access to patient information; further reducing the burden on healthcare providers in providing personalized care by enabling easy availability of consistent data.

1(c). Personalized Interactions. The digitized care continuum enabled personalized care that might be one reason satisfaction levels are so high. Better patient satisfaction is often delivered by personalized care plans and improved follow-up mechanisms. Healthcare provider gained insights with the help of different algorithms, data analytics in different aspects, got much more information about individual post treatment complications, patient needs and adjusted their outcomes, interactions and next steps accordingly.

1(d). Continuous Improvement. While the initial NPS was great, maintaining high satisfaction necessitates continued work to evolve and optimize the digitized care pathway. Listening to the patients and changing with the tides can help pave out some of those new rough areas that may come about. It is thus crucial to incorporate a comprehensive monitoring and response system for patient feedback into the digitization of care continuum, preserving its core values as an effective tool that displaces the traditional mode of practice, chasing patients.

2. Measuring the Effectiveness in Clinical Outcomes Post-Discharge. The study also sought to evaluate the effect of a digitized care continuum by examining clinical outcomes after discharge (Objective 3). This resulted in more favorable clinical outcomes from the patients' perspective. There was a significant amount of neutral feedback, which illustrates that the program is not yet meeting its full potential. Key insights from this finding include:

2(a). Positive Outcomes. Over all, most patients reported significantly improved clinical outcomes and suggested that the digitized care continuum supported more efficacious follow-up and timely intervention. Patients could access their health information and talk to a healthcare provider with ease that made treatment adherence better. The coordination with the health care provider for reduced complications which also led to improved outcome brought high satisfaction by digitized Care Continuum.

2(b). Neutral Feedback. The fact that some neutral feedback exists alludes to the reality that while many patients who were offered this service benefitted, a large number did not feel like it made enough of an impact. These reasons could be various ranging from the novelty of system and shifting strategies to adopting it, not fulfilling all needs what an individual patient may require or need more fine tuning on digital tools which were leveraged. The neutral feedback should not be dismissed, though dissatisfaction with an aspect of care can shed light on changes that need to be made in order for digitized journey areas to improve. They point out the fact that neutral feedback indicates need for higher awareness amongst patients about care continuum. Unconsciously it wanders to less or no adherence of the program because there is close hand distance relationship between low level awareness and perception toward their benefits of a particular approach. This eventually can affect the success rate outcome for the program.

3. Strategies for Improvement. To convert neutral feedback into positive, targeted strategies could include:

3(a). Enhanced User Training. Effectiveness can be enhanced by training both patients and healthcare providers how to use the digital tools. The training must be not only on digital tools but also tech integration into both patient and provider daily workflow. This is more engaging and it potentially easier to adapt, which will help reduce resistance towards the changes.

3(b). Feedback Integration. The use of patient feedback effectively integrated into the continuum can escalate satisfaction and positively influence the outcomes. Putting systems in place to gather, measure and act upon patient input could also see integration improve as the digitized care continuum adapts based on what patients believe they need.

3(c). Personalized Follow-up Plans. Creating tailored follow-up plans with better data analytics can meet individual patient needs in a more targeted way. Wearing data into meaningful insights helps in identifying patients who are at a greater risk for non-compliance or even complications, making health care providers avail of all the interventions they can to provide support. This also gives an additional fulfillment among patients that their presentations are recognized properly by the health providers leading to increased outcomes and patient satisfaction. This customization is further assisted by the digitized care continuum, which helps to map out particular algorithms of each condition.

4. Improving Patient Retention and Loyalty. Once the digitized care continuum is effective, patient retention and loyalty (Objective 4) becomes higher. Results showed 46% of patients had a positive inclination towards retention while 53% were neutral.

4(a). Solid Base for Retention. 46% positive sentiment also shows that a fair majority are happy enough to return, which is promising for patient retention. Patient retention is essential to the ongoing success of any healthcare provider, as it lowers the cost of new patient acquisition and helps maintain a healthy revenue flow. The digitized care continuum allowed seamless communication, enabled better patient outcomes and less readmissions which in turn engendered loyalty among patients to stay on with the same healthcare facility for their future needs.

4(b). Opportunity for Growth. That is a huge opportunity given that 53% of the neutral feedback belongs to this group. Tactics to turn these neutral patients into loyal ones may include personalized communication, loyalty programs or other ways that can secure the continuity of good and quality care over time. In identifying what makes them neutral, healthcare providers can address these deterrents and convert these patients into adopters. This neutral feedback suggests that patients have a low level of awareness and increasing the same could drive more adherent enrolment in the program, subsequently driving better outcomes with potential for improved retention as well.

4(c). Targeted Communication. Regular communication will also help build stronger relationships with patients, thus increasing not only loyalty but the likelihood of referrals. This approach not only allows patients to stay engaged with the healthcare provider but also reminds them of their continued value, which automatically reduces chances of attrition over long term.

4(d). Consistent Quality Care. Patient relationships are built on trust. This comes in the form of prompt follow-ups, precise individualized treatment plans and most importantly a patient centered approach to care. Patients that are listened to and properly cared, stay loyal patients. Getting their care done in time and getting followed up until they get into full recovery can go a long way in creating that confidence among the patients loyal towards stick with the same healthcare provider. Most hospitals do not have interaction with the patients post discharge resulting in complications, readmissions & low compliance. If the healthcare provider does well on any of these 3 factors, then it can contribute to improved patient and family loyalty through their subsequent care preferences. Invariably, all the clinical specialities have shown similar results showcasing the importance of such systems in multi-speciality settings.

5. Importance of a Digitized Care Continuum in a Multi-speciality Hospital. The study indicates the correlation coefficients back-up and highly support Digitized Care Continuum (Objective 5) for a multispeciality hospital setting. Based on the data, it appears that instituting such a system can make local improvements in patient care and hospital operations. It showed that the digitized care continuum did not only lower readmissions but also enhance patient- provider coordination, decrease post discharge complications and better overall health facilitating an amplified level of patient satisfaction and retention.

5(a). Enhanced Coordination. This is where coordination between various departments in a multi-speciality hospital comes into play. The digital-enabled care continuum helps to better integrate communication flow and collaboration that foster more coordinated and effective care. After discharge, the details of a patient are updated and shared across departments so every provider involved in caring for that same patient can have access to the latest data. This is useful for timeous implementation of preventive measures in any complications or adherence.

5(b). Integrated Care. Integrated patient data from across all departments like clinicians, home care and pharmacy would offer a comprehensive view of the health status of any patient, helping to improve key clinical indicators as well as enabling better decision-making. The integrated care will make sure that there is a treatment plan to address all aspects of the patient health needs, preventing the siloed approach resulting in fragmented patient services with measures as well to improve adherence to their prescription-led healthcare and enhancing better outcomes.

5(c). Operational Efficiency. The correlation data indicates that digitization of such operations can lead to efficient operational support, reduction in redundancy and improving overall quality care. The overall administration can be improved by streamlining and simplifying administrative processes for the patient to allow better treatment adherence rates and therefore facilitate a faster recovery of the patient. This would ultimately decrease redundancies and make the overall system more efficient, resulting in lowered costs and ensuring that everyone has access to better health opportunities.

Results show why **multi-speciality hospitals should introduce state-of-the-art digitized hospital-wide care continuum systems to benefit in terms of patient well-being, experience and operational performance.** But a continuous check and correct mechanism is required to troubleshoot, address the gaps that are identified for the system to perform better.

5.3 Discussion of Research Question Two

The study also aimed to test if the addition of digitized care continuum reduced workload compared to a manual system (Objective 6). The findings revealed a 90% perception of lower workload for the participating employees, demonstrating one of many benefits that digital healthcare systems provide.

1. Workflow Efficiency. With this digitized care continuum system, it led to improved efficiency for many administrative and clinical processes by automating documentation as well as patient tracking and communication efforts. Allowing the software to transform high-touch from manual and automated, clinicians and healthcare workers would be able to focus on direct patient care delivery while operations became more efficient — plus burnout was eliminated. Digitalized care continuum moves post discharge complications from convoluted algorithms and manual MS-Excel mode. Calls were scheduled, questions to be asked from patients post discharge call were auto populated and data capturing made easier.

2. Improved Coordination. Digitized Care Continuum improved coordination among healthcare providers, which resulted in reduced workload. By ensuring that all relevant information is readily accessible, and communication is seamless, the system reduced the time spent on coordinating care and resolving issues. Whenever an issue was reported, it was escalated to the concerned healthcare providers through the system itself that enabled tracking and closure of such issues. The Turn Around Time (TAT) for each process is tracked and hence there is an overall control of the entire closure of any post discharge complications reported by the patient or families.

3. Addressing the 10%. The lack of corresponding reduction in workload for 10% of the respondents may point to some employees who have specific concerns or additional challenges that should be addressed. These apprehensions can be allayed by offering additional training, perfecting the ways in which systems function and providing sufficient support; all of which work to combat these issues in leading to a superior digitalized care system. Increased understanding of the digitalized care system will pave the way for greater uptake and acceptance among healthcare professionals.

Both the research questions clearly answer that the use of digitzed care continuum should not be restricted to only few clinical specialities. **Instead, the healthcare providers should completely embrace the power of such digitized systems to reduce readmissions, improve outcomes, improve patient satisfaction and to lower employee workload in all the multi-speciality hospital settings.** This will not only benefit patients who have both acute and chronic conditions but also support the care givers or family the necessary support in getting the treatment beyond the purview of the hospital.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

The objective of this study was to evaluate the impact on patient satisfaction, clinical outcomes, patient retention and staff workload for a digitized care continuum system implemented in a multi-speciality hospital. The study gave a detailed idea about how the digitized technologies could be incorporated to improve the delivery of healthcare services which were beneficial for both patients and health care providers across all the clinical specialities.

Patient satisfaction analysis showed an NPS of 92, which yielded high levels of patient experience for individuals that navigated the digitized care continuum. This score demonstrates that with digitized care continuum patients are at the helm of attention. The high NPS is a clear early signal that this program continues to innovate in providing patients with an excellent user-centric care experience through simple patient flow workflows. The program also received overall positive satisfaction ratings, largely supported by the ability to meet patient needs, provide more timely intervention and support. On the other hand, patients were significantly more satisfied with the digital form, thanks to ease of use and interaction. This allowed patients to stay connected with their health care team and receive real-time information on how they were doing, which kept them engaged in the process of managing their own symptoms.

Another key part of the study was clinical outcomes after being discharged from hospital. Overall, the study results indicated that digitizing the care continuum had a substantial positive impact on clinical outcomes. Significantly more patients were pleased with their post-discharge care as the program has been able to provide regular monitoring, tracking and dedicated care plans which have resulted in positive health outcomes as well reduced the recovery times. Nonetheless, the high percentage of neutral reviews suggests that improvements still need to be made. The neutral responses provide an opportunity to continually improve and refine the program such that it can meet patient expectations around care delivery. In addition, the incorporation of higher-level analytics and predictive technology can aid in improving patient care as well as predicting possible health problems before they worsen.

The study also tracked patient retention and loyalty. Its findings indicated that 46 percent of patients had a favourable disposition to staying with the hospital, which is an encouraging finding for patient loyalty. This in turn suggests that a care continuum based on digitized patient engagement has built trust and demonstrated satisfaction to almost half of the customer base. In contrast, 53% of patients reported a neutral likelihood to not change hospitals. One inference is that the patients are not considering the presence of Digitized Care Continuum as the only factor to be attached to the healthcare provider and there can be some other services that they are rating better at this stage. This leaves a large portion of neutral responses that the hospital can get involved in to develop and implement specific initiatives with the goal of converting these neutrals into promoters. This will help in ensuring that the hospital is better capable of retaining these patients by addressing their respective concerns and needs, thus creating a stronger patient base. Initiatives such as increasing awareness, personalised follow-up calls or health education programs and loyalty programmes can target these neutrals to at least have them move towards the loyal end of the scale. Also, looking into the reasons for giving neutral feedback in detail or with face-to-face interviews may offer tips on how to improve.

The related high correlation coefficients in an integrated, digitized care continuum set-up further validated their importance and had significant strengthening impact on the relevance and scope of this program for facilitating better healthcare delivery. The study observed significant decrease in readmission rates which was one of the important correlates for improved clinical as well as economical outcomes being validated on statistical analysis.

Differences between 2022 and 2023 readmission rates differed significantly. These results indicated the impact of digitized care continuum roll out in 2023 on readmissions and emphasized its importance to patient outcomes while relieving healthcare facilities load. Those explanations include but are not limited to better patient education and improved follow-up care, as well as greater adherence with post-discharge arrangements. Healthcare providers were able to flag potential issues using the digitized system earlier than they would have under normal manual processing, which meant those problems could be addressed before a hospital readmission was warranted.

In addition, a comparison of readmission rates between patients enrolled in the digitized care continuum from January to June 2023 showed a significant difference. This indicates that the program's targeted interventions and personalized care plans are effective in reducing the likelihood of readmissions, further proving its effectiveness. These success factors were in part attributable to the ability of care plans for individualized patient needs and algorithms, as well as ongoing support and monitoring. This demonstrates a vision of what the digitized care continuum can be to scale up across healthcare institutions in need of technology-enabled innovation that improves outcomes and reduces costs.

In varied clinical specialty groups, the program resulted in substantial readmission reduction that surpassed reported results from past studies that focused only on certain specialities. Although the benefits of a care continuum in chronic conditions have been shown by previous research, this study shows its relevance to multispecialty setting. The findings consistently show the value creation of a digital care continuum in readmissions, patient experience scoring, collaboration and retention for several major specialties. The computerized algorithm reliably tracked patient health over a wide range of medical conditions and intervened promptly.

The research also explored the effect of the digital care continuum on staff workload. Results showed that 90% of respondents perceived a decrease in the amount of work they were doing, and this was solidly traced back to how well it functioned on all areas administrative as well clinical. Less work might be as a result of automation of menial tasks, better coordination between healthcare providers and digitized system that improved communication. On the downside, there were 10% of participants that did not see noticeable improvement which means there could be certain aspects or participants need further focus and assistance. Areas for improvement could involve additional training and resources to staff, as well in improving the system based on their new work pace. Any decrease in workload would be large, as it will free up staff time and energy to make them feel better mentally which should lead to more quality patient care and over all hospital performance.

The findings underscore the importance of a digitized care continuum for elevating patient satisfaction, driving better clinical results with lower staff burdens and enabling high levels of engagement to retain patients over time. The adoption of digital technologies in healthcare delivery has been the most significant development since the inception of this program, leading to a wide array of benefits on both sides including patients and providers. The results indicate additional enhancements and greater personalization combined with healthcare equity can extend the digital care continuum to realize high-quality, distinct delivery mechanisms across various areas of clinical specialties. With the progress and enhancement to the digitized care continuum, an exciting future for healthcare— patient-centered, efficient and above all effective is not far behind.

6.2 Implications

According to the study, these findings have important implications for utilizing a digitized care continuum such as this in improving healthcare service delivery. Perhaps one of the most impactful is understanding how technology contributes to improved patient safety and care. Creating a digitized care continuum to track discharge metrices and can deliver consistent insights that drive recovery outcomes among different clinical specialities. It helps to verify that the technology supports patient safety, and tangentially results in a higher level of care in both chronic and acute medical conditions.

Study reinforces timely care of patients enabled by a digitized care continuum. EHR integration with digitized care continuum can greatly reduce the number of readmissions for patients, with high impacts on patient experience, better efficiency — reducing lag time and increasing throughput in patient care leads to greater satisfaction as well. This was seen uniformly in all the major clinical specialties.

The effect of digitalized systems on patient-centeredness is vital. A digitized care continuum leads to a more individualistic model of care by optimizing tracking and ease in patient management post-discharge. This increased capacity in turn enables better patient centered care, positively influences the perception of service quality and increases patient satisfaction. The system with the customized algorithm provides customized interface for various clinical specialities thereby providing disease or condition-based care.

The use of digitized care continuum for care delivery also increases efficiencies. Digitizing care continuum has an overall impact on administrative and clinical workflows, making workload refreshing and operational inefficiencies faster. This increase in productivity creates better quality of care and an environment that allows for a more sustainable, effective healthcare.

It also showed the potential of digital facilitated equitable uses that many may ignore. Digitized communication, care management and scheduling can help healthcare organizations ensure that no one is missed as long as they have access to the appropriate platform. This equity-focused method improves patient satisfaction and quality of care, as well accessibility to high quality health Care. It was noticed that during the implementation phase, the program could save a precious life by timely intervention and proper physical escalation. This instance was observed in a patient treated under Cardiac Sciences but eventually developed stroke which comes under Neuro Sciences. **This clearly demonstrates that the system is of vital importance in multispeciality hospitals involving various clinical specialities.**

Hence, the digitized care continuum yields substantial improvements in patient safety, timeliness, effectiveness of treatment and equitable access in health care. By sharpening policies in these areas, healthcare organizations can improve service quality and patient satisfaction while getting to better care reach.

6.2.1 Improved Healthcare Operations. Implementing digitized care continuum systems change the way that healthcare functions, and provides a straight-across-the board path to making many of these processes simple. Such systems allow for the effective handling of patient data, automates administrative work and streamlines communication between different areas. Integrating it can increase operational efficiency, helping healthcare organizations match resources with service delivery espcially in hospitals that deal with multiple clinical specialities.

6.2.2 Enhanced Patient Experiences. These digitized care continuum systems are able to offer a more patient-centered and nimble model of healthcare. Using the data derived from systems like electronic health records (EHRs), remote monitoring tools, and automated communication platforms helps healthcare providers in tailoring their interactions & treatments to each patient. This level of personalization not only improves the entire patient experience but also drives overall higher satisfaction with an increase in returning patients.

6.2.3 Early Detection and Timely Interventions. By using the digitialized care continuum it is possible to identify health problems at an early stages – thanks to real-time data analysis and monitoring capabilities. With the help of digitally sophisticated data analysis on – Data patterns, subtle changes are picked early & rapidly leading to timely intervention and mitigation preventing compounding complications. By taking this approach, patients have better outcomes and issues are less likely to arise that would require an emergency department visit or re-admission. This was clearly documented in a case study illustrated in Figure 91 where a patient under Cardiac Sciences under the program developed complications of stroke which was picked up early during the system enabled call. This patient was saved due to the timely follow-up call and intervention which clearly support the use case of such a system in multi-speciality settings.

6.2.4 Increased Efficiency and Resource Optimization. Care continuum systems that are digitally-enabled reduce the workload and eliminate routine tasks, data management, etc. which makes it more efficiently easier for providers. Providers require less time and resources in managing complex excel sheets, manual data entry & processing. This automation enables faster and more accurate analysis of patient information, which in turn leads to better resource allocation as well reduced workload and operational costs.

6.2.5 Enhanced Remote Monitoring and Care. Remote patient monitoring of patients with chronic conditions facilitated by embedding digital tools in digitized care continuum can provide additional benefits. These tools, including voice-based systems and other digital technologies can help with ongoing remote health monitoring to allow healthcare providers to check on patient well-being and intervene when needed. Such coordinated systems can raise timely alerts to enable swift action by the care givers and healthcare providers. This feature will allow elimination of multiple in-person visits, making healthcare more available and comfortable for users.

6.2.6 Data-Driven Insights for Improved Decision-Making. The digitized care continuum creates a mountain of data that can be mined to provide insights on patient health trends and outcomes. Any data pattern studied by healthcare organizations will guide them to find correlations and predictors about a condition or clinical speciality. It demonstrated that the benefits of a digital care continuum span specialities and wider inference should be drawn from this data to explore which processes are amenable for modification across these domains, in order resultantly improve patient outcomes & satisfaction. This means that the healthcare strategies are more accurate and effective based on evidence used for decision making.

6.2.7 Cost Savings and Resource Efficiency. Digitized care continuum systems can save healthcare organizations hundreds of millions. The reduction in readmissions alone can provide financial benefit as it reduces the load on hospital beds and resources. Less manual work & interaction with the data cuts down on resource allocation. This will have additional burden on hospitals dealing with multiple specialities as the number beds are limited and the turn over can really benefit patients who are in the waiting list. In the healthcare industry, there is vast financial opportunity for health providers to improve operational efficiencies and decrease administrative expenses.

6.2.8 Improved Patient Engagement and Satisfaction. Customized care and real-time interventions with help from digital systems are what can lead to a good outcome for all the patients. Patients enjoy enhanced and individualized treatment, inducing better coordination in healthcare communication and delivery. When care is delivered more quickly, the outcomes are overall good quality and real-time patient-centric. More patient engagement and satisfaction can help hospitals earn more good will and improve their retention rates.

6.3 Limitations of the Study

In order to maintain the transparency, credibility and correct depiction of research findings it is imperative to consider some limitations encountered in this study. This will prevent future researchers from overgeneralizing or misusing the findings. In addition, by identifying the limits of existing research helps to inform future studies and promote improvements so as follow-up investigations can be focused on where there is most paucity in evidence against available literature. It also enables the evaluation of the validity and generalizability of its results, so that correct decision-making is fostered. Although informative, the study on digitized care continuum is not without limitations described as follows:

6.3.1 Geographic Limitation: The study was confined to Hyderabad (Tier 1 City) only and the findings cannot be generalized for other places in Tier 2 or 3 areas. Urban-centric Tier 1 geography may over-represent this geographic patient experience, biasing the realization of broader impacts on a digitized care continuum. There are likely some limitations in the generalizability of this study given that it does not take into account different opportunities across Tier 2 or 3 geographies. For example, people living in such areas may have issues with healthcare accessibility, awareness levels and fewer healthcare resources. As a result, the conclusions from one center-focused study may not generalize well to other geographic settings as healthcare in this environment is structurally different.

6.3.2 Feedback Source: Because the feedback was obtained from children through their parents, it may not be an accurate reflection of patients' own experiences and perceptions. In the same way, family members completed it when patients were greatly unwell or incredibly old. This proxy feedback potentially results in biased information on how beneficial and perceived the digitized care continuum is for the patients. For one thing, patients who are able to communicate directly would provide far better and more in-depth insights. An example is if parents narrate their young child's experiences in healthcare, they may consider and value different parts of the patient perspective than would children interviewed when old enough to articulate theirs. The use of proxy feedback is biased and may influence misinterpretation of patient satisfaction and engagement with digital health tools.

6.3.3 Departmental Bias: The study was conducted in a multi-speciality hospital, but the influence of certain specialized departments over results needed careful attention because clinical case mix varies according to specialty in hospitals. This departmental bias could also limit the data to indicate whether or not this digitized care continuum is successful across all clinical departments within the hospital. Therefore, it is conceivable that departments with higher patient volume or stronger resources will have different outcomes over those without these advantages. For example, Cardiac sciences is likely to both work with higher-end digital tools and have more patient interaction than a smaller or less resource-intensive arm such as General surgery. This may cause disparity between different departments in regard to evaluating the efficiency of the digitized care continuum, some who have more developed resources and higher patient engagement rates.

6.3.4 Population Skew: Even if the study did not represent any specific spatial geography, the sample population skewed more towards urbanization in comparison. This population of Urban residents (90%) overlooked the rural-specific issues and journey, which this population experienced. Such urban bias may prevent from learning how to use the digitized care continuum for rural healthcare. Some of these healthcare needs and barriers to technology could differ between rural patients, an area that is not well represented by this study. Urban patients may, for example, have more access to internet infrastructure and digital literacy which might translate into a growing impact of top-down digital health initiatives. A lack of access or familiarity to these tools among rural patients, for example, might suggest that the digitized care continuum is less effective than it truly is.

6.3.5 Language and Translation Issues: The potential for bias is at a different level when there is a need for Telugu translator to communicate with the patients who speaks Telugu which was the local language at the study location. It seems plausible that the quality of translation and the number of Telugu-speaking patients included in this study could validate the feedback of incorrect data or partial data will change the final results due to misunderstanding of controls, interaction etc. Moreover, the survey may miss subtle cues in patient responses and feedback that perhaps are lost or misinterpreted mainly during translation, leading to false impressions of satisfaction and engagement based on scores.

6.3.6 Connectivity Issues: Respondent recruitment was compatible only in mobile phone connectivity and those responded within 3 attempts. This may have implications for the population, as some of factors in this limitation are related to time during calling or unreachable due mobile network barriers. The patients who choose to participate may be the type of patient with a known and possible advantage, meaning they are not all necessarily low risk. Thus, the findings may be a result of patients who are more tech-savvy or have better access to mobile connectivity might overrepresented while others with less reliable cellular service or different schedules.

6.3.7 Random Sampling: The technique used — random sampling of the first 500 people who answered within three calls could result in a relatively small and non-representative sub-sample of the whole population. A major limitation with such work is the potential for a relatively homogenous group of patients to participate, and these findings may not reflect all experiences and needs. A combination of methods could give a better cross-sectional overview across patients. For instance, random sampling may miss significant groups of patients (those with chronic conditions or low socioeconomic backgrounds) and also therefore fall short in explaining how delivering this continuum of digitally enabled care affects various demographic populations.

6.3.8 Single Setting and Sample Size: Please note that the study was limited to a single hospital in Hyderabad with only 500 sample size and almost 300 discharges per month, which could hamper the robustness of intervene-ability of this evidence. The outcomes may be different in other healthcare centers or regions. Hospitals vary in digital infrastructure, patient populations and healthcare systems which may influence the results. The implementation of digital tools for a single hospital and how the patients interact with them could be considerably better than that observed in other geographic regions, more likely to reflect applicability of the findings.

6.3.9 Specific Patient Population: Study participants were those hospitalized patients who had been subsequently readmitted after two days—but not more than six months—driving to the rationale for exclusion of frequently admitted patients along with changes in payor status (moving from or losing insurance benefits), etc., as well as other medical conditions, which did lead into patients managing multiple chronic problems. This does not reflect the experiences of these categories of excluded patients. This focus may inadvertently ignore the fact that patient engagement often occurs across care settings, especially for patients with chronic illnesses or other complex healthcare needs. Patients with chronic conditions might, for example, have different digital health requirements and experiences than those who are acutely ill which would suggest a lack of overall study quality.

6.3.10 Scope of the Study: As the study was conducted in one private hospital located at Hyderabad, Telangana so it is hard to generalize these findings for other hospitals (public) and health care facilities. Additionally, the sample size was small with only 500 subjects overall which could have limited the impact of this study. Implementing a digital care continuum could pose other types of challenges and opportunities at public hospitals or that are part of different case mix facilities (charitable, boutique–size; rural etc.). By way of illustration, the higher patient volumes seen in public hospitals (compared to private settings) will be intricately tied to different funding structures and demographics all of which, may affect just how effective digital health initiatives can be expected to influence their uptake.

6.3.11 Cross-Sectional Study: There may be a bias in the behavior of patients through cross-sectional implementation in a single specific time limit so that it feels different among longer periods. This limits their ability to learn how broadly the findings can be identified and generalized if patients experience over time under different situations. Longitudinal studies are necessary to deeply investigate how patient engagement and satisfaction influences usage of digital health tools. Examples of these include patient experiences and attitudes toward digital tools that might change over the course of time as patients become accustomed to a different type of technology or as technologies advance itself, which are not well-suited for cross-sectional research.

6.3.12 Dropout rates: Some sick patients and deaths in the cohort would have affected overall accuracy of data collected; a few participants could not be recruited due to severe illness. The dropout may be associated with significant experience in seriously ill persons, changing research findings towards healthier or sicker cases. For example, very sick patients who may not be able to contribute much might have entirely different perspectives from the healthier patient well enough themselves to participate. In addition, all groups could remain with an incomplete picture on challenges or advantages of a digitized care continuum.

The limitations discussed above underscore the continuing and essential need for additional, appropriately designed research to fill in these gaps so a full picture can be formed of how digitization affects patient engagement/satisfaction throughout the scope of care. These constraints can be further studied for upgrading the digitized care continuum to improvise patient satisfaction & reduce readmissions.

6.4 Recommendations for Future Research

Improving speed and efficacy in all sectors, from healthcare to technology, basic sciences is needed to improve future research. It solves current problems in digital healthcare solutions such as integration challenges, data interoperability and most of all user adaptation.

Future research is even more imperative for the digitized care continuum. New ways to facilitate care coordination, improvement of the accuracy and effectiveness of digital tools, as well as experiment with solutions for emerging issues in patient management can be identified through future research. In addition to accelerating technological and software capabilities, future research in this area will lead into more unified professional collaborations across the entire healthcare continuum yielding overall superior patient care as well as operational efficiencies. In order to encourage the development and delivery of digitized healthcare services and optimize patient management, more research across several key domains is needed in terms of using digital health solutions as part of the continuum of care. These areas include:

6.4.1 Expanded Implementation Across Healthcare Settings. Future work should explore the digitized care continuum in different clinical settings, including hospitals, clinics and specialized care facilities. Moreover, comparative studies across settings (e.g. private vs public hospitals; large vs small facilities) will allow to clarify the level of impact they have on different types of digital care solutions. This was a single center study, but potentially different hospitals may have varying degrees of digital infrastructure and patient demographics that would lead to varied healthcare practices. The comparative analysis will enable to learn about the system behavior under different operational scenarios and patient demographics.

6.4.2 Application Across Diverse Geographic and Cultural Context. Improving specificity of results would help to illuminate the features one can find from historical migration patterns that could be used on a broader scale by other researchers and practitioners, in areas beyond dense urban environments. These include healthcare issues that are unique to rural settings, like poor access to facilities and digital infrastructure. This knowledge will inform program owners as to how digital care solutions should be addressed in these contexts, increasing the likelihood of effective deployment for each setting.

Further studies with wider sample size in urban and rural settings along with diverse demographic patient population are warranted. It will provide insights on the effects of digital care solutions across a range of patient populations and identify areas where access, digital literacy or healthcare needs are currently not being met. The research should be conducted in multiple regions across India to learn more about the local healthcare context and how best digitized care continuum could serve this varied population.

The study examines general principles of universal health care and thus further research in an international context would be needed to confirm this. A closer examination of the success in different countries and cities would be a way to understand the geographical, cultural or other factors that give patients good healthcare outcomes. This research should be cross-cultural in order to take regional differences into account and provide adaptations for the system to work worldwide, being responsive and feasible across different social as well national contexts.

6.4.3 Evaluation and Comparison of Different Models. Research is needed to examine how the digitized care continuum model compares with other models that are based on different theoretical frameworks and testing procedures, in order to test its validity as a potential enhancement. Given the use of Heaps as a system in this study, it provides motivation for comparison and validation to determine whether there exists another possible solution that can reproduce these results deployed on a different platform. Introducing such a comparative method could allow to call attention on elements that the present process lacks and suggest areas where it can be expanded. This data creates a compelling case but only if validated against digitized care continuum programs operated in different healthcare systems. This should be completed in diverse patient populations which include differences of age, gender and cultural background for validation and generalizability to real life.

6.4.4 Longitudinal Studies on Patient Perspectives. Longitudinal studies are needed to show how perceptions around the utility function change over time in patients' minds. This will allow researchers to evaluate the long-term efficacy of digitized care continuum and its impact on patient experiences, disease progression, treatment responses; investigate changes in patient outcomes over time; observe how well the system can be used for monitoring chronic conditions and tailoring management strategies overtime by analyzing patients at different stages during their journey through healthcare. Applying this methodology to an integrated setting will help illustrate shifts in patient behaviors and attitudes, shedding light on the lasting effects of digital care services.

6.4.5 Incorporating Diverse Stakeholder Views. While this research targeted patients and few employees involved in the rollout of program initiative, it is important to recognize that other stakeholders such as healthcare professionals (e.g., Specialist Doctors), patient families or caregivers, and community plays a crucial role in quality care—they must all be equally engaged when enacting change. Subsequent studies should examine these additional viewpoints to better represent the digitized care continuum and its effects on all stakeholders.

6.4.6 Investigation of Health Factors and Mixed Research Methods. Research in the future needs to address a variety of health information like physical condition, having difficulty even with daily activities, co-morbidities and stigmatization which could have effects on all steps along care continuum especially regarding the explorative techniques through digitized approach. To improve the digitized care continuum, there is a need to understand how these factors impact health outcomes. This would give a complete snapshot of these components and their lasting consequences by employing the mixed-methods approach (including quantitative and qualitative data). The goal of using this framework is for a greater understanding and knowledge on how the digitized care continuum can address different areas in health, including patient outcomes.

6.4.7 Optimization of Digital Care Continuum Algorithms. Future research should extend the newly proposed algorithms for treatment outcomes based on patient conversations. It must mean experimenting with the latest in machine learning and artificial intelligence methods to better predict, identify and ensure reproducibility of care continuums in digital form. Faster and better algorithms can expose finer, implicit details in patient data pertinent to complications or outcomes which result in narrower escalations/prioritizations of care with personalized treatment plans. Future studies need to understand technological advancements to mitigate challenges of digitized care, including development of algorithms flexible enough for diverse patient requirements and situations.

6.4.8 Synergy with Healthcare Technologies. The digitized care continuum is part of a broader infrastructure or "internet of health things" that can be layered on top of other key informatics like Wearables and Electronic Health Records (EHRs) to improve the quality care for the patients. The interoperability and compatibility of digital care continuum with other technologies — this is a way to investigate seamless data exchange among systems providing ideal steps for better patient-centered integrated healthcare solutions.

6.4.9 Ethical Issues and Privacy Concerns. In digitized care continuum - Ethics and patient privacy must be ensured. It may seem impossible, but due to recent developments in various technologies related to healthcare becoming entirely digital it is important to acknowledge this aspect. It must take into account the patients perception, attitude and preferences regarding data collection, creation of solid privacy framework for securing ethicality of handling sensitive information. Knowledge of these perspectives will not only provide stronger privacy frameworks, but also guarantee ethical processing of sensitive patient related information while implementing digitized systems.

6.4.10 Comparative Studies. Further research in comparative studies can help the potentiality and constraints of digitized care continuum as opposed to other monitoring strategies. This evaluation will enable healthcare providers to make more informed decisions about cost-effectiveness of digital care continuum compared with traditional methods of manual processing. Further work involving the comparison of various forms of digitized care continuum systems could provide a better understanding on what may or may not be beneficial from these system types.

6.4.11 Practical Challenges in Real-World Implementation. Investigations should be designed to address how the digitized care continuum is realized in practice, with a focus on integration and organization readiness as well as healthcare provider perspectives. Evaluating effects on patient outcomes, care coordination and resource use post-discharge is also important to understand the added value of this technology not only for systematic delivery but as well across a more comprehensive care continuum.

6.4.12 Employee Experience and Human-Machine Interaction. It is important to focus on enhancing the employee experience and human-machine interaction in a full-fledged digitized care continuum to ensure adoption. While future work should explore the design of these different user input technologies, training needs, and how they can be implemented in clinical workflows to improve staff satisfaction and effectiveness.

6.4.13 Evaluation of Cost-Effectiveness. Cost-effectiveness analyses should be conducted to evaluate the economic implications of digitized care continuum. Future research should evaluate possible cost savings and appropriate resource utilization while determining return of investment (ROI) to help health care organizations with decisions about how the system can be brought into practice, adopted widely and maintained successfully over time. This ought to be measuring the financial and operational advantages harvested by healthcare organizations in addition by individuals following digitized care continuum implementation.

6.4.14 Non-Medical Applications. Additional research could further investigate the utilization of digitized care continuum for non-medical industries, including patient education, self-management and support services. By exploring these determinants can help in pulling innovative threads and extending the domain of digitized care continuum beyond clinical settings. It will demonstrate what benefits different healthcare metrics can have.

6.4.15 Direct Patient Feedback. Future studies should be better informed by patient experience that is captured from patients and not solely through proxy responders (e.g., family) to provide a more complete picture of the breadth of human experiences in these interventions. Including direct patient input will make it easier to view how serious they are about such digital tools and ensure that their feedback is a true representation of their experience and perceptions.

It will be worth exploring other ways to collect feedback, which are less affected from biases related with mobile phone surveys or proxy response. By employing multiple feedback methods, the quality and contextual richness to patient experience data from such digital care tools acquired can be improved.

6.4.16 Departmental Impact. It is important to determine how effective digital care is across various clinical areas in the hospital. The distribution of clinical departments at the study site was not uniform but more concentrated on a few specific clinical specialities. The program's efficacy may not be generalizable to all clinical service lines. Resource and patient volume differences can impact how departments utilize the digital tools of today as well as their perceived value. Similarly, the readmissions within 30 days of discharge need further deeper evaluation as the results from this study were not very significant. Future research should investigate these departmental differences to give a better picture of the effectiveness on a digital care continuum.

6.4.17 Language and Translation. Investigating data from patients not fluent in English required identifying language barriers and providing proper translation but was necessary to obtain responses. Further work is needed to improve translation, capture the subtleties of patient feedback accurately making these data less subject to human interpretation.

6.14.18 Connectivity Issues. Future research should investigate whether the connectivity problems affect the recruitment and participation of patients. Recruiting in such a way that patients with unreliable connectivity are not excluded will also give more complete picture of how these tools are used at various levels of technological access.

6.4.19 Sampling Methods. Adopting sampling methods other than simple random sampling would improve the generalizability of study samples. Additional research, in which diverse subgroups (e.g., those with chronic conditions and those readmitted shortly after discharge for continued treatments) will be needed to more accurately gauge the impact of digitized care continuum within different patient demographics.

6.4.20 Scalability and Generalizability. Generalizability may be improved if future studies expand research to multiple healthcare settings and increase sample sizes. This will support digitized care continuum in terms of scalability and effectiveness for different types of hospitals or regions.

6.4.21 Dropout Analysis. Future research should focus on data accuracy and representation with dropout rates. Considering the impact of dropout on findings will help to ensure that exposure experiences are broadly represented, including those in critical condition.

Adopting these study suggestions will improve the depth and applicability of research on the digitized care continuum. Aligning these recommendations with the study's original objectives, researchers can help to fill in gaps, refine methods and explore new applications thus making digital healthcare solutions more interpretable and applicable.

6.5 Future Directions

The learnings from this study should be utilized to apply the benefits of digitized care continuum to multi speciality hospitals. This will not only provide health in general but also offers plethora of benefits to patients getting treated under various clinical specialities. The study has clearly demonstrated that the benefits are across all the clinical specialities and not restricted to few of them. The findings of the study can be comprehended to derive future directions.

6.5.1 Integration and Interoperability. One of the most inherent advantages in a digitalized care continuum is positively linking together an array of health processes and systems. Improving interoperability between diverse digital platforms is imperative to enabling the smooth exchange and delivery of patient data. Future direction for Integration and Interoperability can include:

1. Seamless Data Exchange. Seamless data exchange between the various digital platforms is an important factor for providing coordinated and effective patient care. This necessitates the integration of EHR systems with digitized care continuum, telemedicine platforms, remote monitoring tools and other health IT solutions to consolidate a patient record that is universally accessed among all relevant healthcare providers.

By integrating an EHR with data from wearable health devices and telehealth platforms, if a patient is hypertensive or diabetic then their blood pressure or glucose levels can be automatically monitored. This seamless data integrated into a digitized care continuum provides healthcare providers with deep insights about timely intervention. Seamless data exchange can also help to take administrative inefficiencies and errors out of the system by serving as an automatic spread for moving information between systems, removing duplicate tests (excessive cost) and reducing readmissions. Healthcare organizations can use Application Programming Interfaces (APIs) and other integration technologies to design a cohesive digital environment in which data is easily accessible. Rather, it facilitates higher operational efficiency by positioning clinicians to have complete and accurate information about the patients they care for.

2. Collaborative Care. Interoperability allows for collaboration, in that all members of a healthcare team operate off the same information. This unified access leads to improved communication and coordination among all the providers through the digitized care continuum. For example, a common case where multiple specialists might provide input to create a shared care plan post discharge could include the primary care physician and cardiologist consulting with each other or even an interprofessional team including any number of nurses. This supports not only efficient treatment protocol initiation but plans that are personalized to the patients. Correct and timely escalations to the proper specialists can literally be life changing for that patient.

Digitized tools need to be flexible, and place appropriate support based on the needs of different contexts including other clinical settings. There may also be needs that depart between departments or centers and the one-size-fits-all model does not apply. Flexible configurations allow healthcare organizations to tune their digital tools as per the required intervention making that functionality much more facility-centric and suiting user preferences.

Healthcare care tools that are digitized, on the other hand, require standards for interoperability because these tools must be able to effectively communicate with all other systems both within an institution and outside of it. With established standards for information exchange such as HL7 and DICOM, along with a myriad of other conventions like FHIR; data flow can be ported over to new services in healthcare which are meant to expand the scope exactly where it is needed.

Focusing on meeting requirements for interoperability can help ensure that data silos are overcome and drive cooperation among the different departments of a healthcare organization, improving how digital tools function. Through such methods, healthcare providers can keep up with technological trends by creating a culture of constant improvement and iteration that ensures the digitized care continuum remains an effective patient-care tool for preventative measures to better outcomes.

6.5.2 Personalization and Patient Engagement. Personalizing Patient Care is the future of the Digitized Care Continuum. Well-analyzed data and artificial intelligence (AI) applied directly to care delivery will enable more personalized treatment plans for individual patients, deliver better outcomes, increase patient satisfaction while simultaneously consuming the digitized care continuum. Patient engagement tools, like mobile apps and telehealth services boost patient involvement in their care continuum. The future prospects for personalization and patient engagement can comprise of:

1. Data-Driven Personalization. The intersection between Data analytics and AI has the power to revolutionize how to cater out care by delving deeper into what kind of health each patient really requires or is looking for. For example, patterns regarding performance and health history could help the healthcare providers to identify personalized treatment plans. Similarly, data analytics provide additional perspective on what transpires once a patient is discharged with digitized care continuum and by using predictive analytics. This may lead to early identification of high-risk patients for individual conditions which can have earlier interventions & preventative care. This could make care continuum more efficient by allowing modules to be adjusted when necessary in order to ensure that patient needs can still be tracked. Using vast amounts of data, and by observing patterns otherwise may not quickly notice with the naked eye, AI algorithms develop a more precise version. It will be the personalized element that projects throughout the digitized care continuum and ensures, a customization of post discharge health advisory & prescription as per own healthcare status or needs. This ensures more stable implementation of treatment plan & patient satisfaction.

2. Engaging Patients. Ensuring patients digitally engage throughout their care journey is a cornerstone of the digitized continuation of care. Crucial tools in today's digital landscape are mobile apps, patient portals and telehealth services. These resources allow the patients to gain access to their health data, care information and communication channel with the healthcare providers. These apps enable patients to stop only thinking they are being treated and actually take part in their own care by reminding them of medication schedules, symptoms monitoring & alerting the patient when a doctor's consultation is needed quite unlike what might be experienced today in traditional settings. Ensuring patients digitally engage throughout their care journey is a feature of the digitized care continuum. Few crucial tools in today's digital landscape are mobile apps, patient portals and telehealth services. These resources allow the patients to gain access to their health data, information and communication channel with their healthcare providers. These apps enable patients to stop only thinking they are being treated and actually take part in their own care. This helps remind them of medication schedules, symptoms monitoring & alerts.

Patients using digitized portals can review their test results, request prescription refills and contact the care team directly. This creates a more open and interactive healthcare ecosystem. Patients with mobility limitations or residing in remote locations will be able to receive care through Tele-health services on the Digitized Care Continuum. The digitized care continuum enables patients to take control of their health and comply with treatment regimens, directly engaging with the solutions enabled by this form of digital transformation. In doing so, not only are patients made happier, but it also improves outcomes in clinical practice because of improved shared decision making when approaching healthcare together.

6.5.3 Continuous Improvement and Adaptation. The Digitized Care Continuum, as is the case with any patient focused programs must have continuous improvement at its core. If user feedback and new developments in healthcare are used to guide such programs, then it can remain efficient and updated. Similarly, the utilization of agile methodologies in development can accelerate continuous improvement and rapid change to tackle new hurdles. Possible recommendations for continuous improvement and adaption could be:

1. Pilot Studies. Organizations must consider conducting pilot studies in different clinical environments to determine the effectiveness and impact of digitized care tools before full-scale implementation. Pilot studies allow healthcare organizations to examine the tools in real-world settings, identify any issues, and evaluate their impact on clinical outcomes and workflows. By using pilot studies to gather data and insights, organizations can make informed decisions regarding the implementation, ensuring that the tools are effective and provide tangible benefits for patients and clinicians in a complex healthcare environment.

2. User Feedback. Continuing to enhance the digitized care continuum requires user-driven feedback. Feedback from healthcare providers, patients and administrative personnel can help uncover areas in which the program is succeeding or where improvements are necessary. Specifically, for administrators to address program interoperability and usability or workflow integration; patients might talk about their experiences as a patient in the care management programs.

Focusing on and improving the program through user-sourced feedback will lead to many positive changes in the retention results, which is why such data must be captured first hand via surveys — with occasional follow-up short-run focus groups or deep interviews used for cross verification purposes so that improvements (with quantitative findings as backing) can be made. Structured feedback sessions with end-users, such as clinicians, nurses and administrative staff are paramount to gain insights on their experience of the digitized care continuum tools. These should be organized in a manner such that the overall good and bad of a work are neatly captured. Healthcare providers are able to ensure that the tools comply with clinical need and user-friendly features by enabling open conversations. This iterative feedback process is also highly useful for fast identifying and resolving any problems, boosting user satisfaction resulting in better adoption of the digitized care continuum.

3. Agile Methodologies. This requires a digitized care continuum that pivots around maintaining continuous innovation and responsiveness to change using agile methodologies, increasingly shaping the future. In conclusion, in the digitized care continuum agile practices, stage for release and iterative development cycles are very important to maintaining a responsive—and relevant–digital practice. For healthcare entities, agile methods will allow to rapidly embrace the new norms in health care regulations and meet patient needs while cycling through technical advancements in automation. For example, if the patient preference is having a more personalized combination of remote monitoring devices and care continuum programs this requires faster feature development deployment using agile methodologies.

Digitized care continuum evolves dynamically which ensures up-to-date digital realities. This correlates with the most current best practices in contemporary healthcare trends. Modified user interfaces, frequent updates and enhancements will help simplify the digital service patterns for high usability. Such iterative refinement will lead to higher user satisfaction, better treatment plan adherence and more valuable patient-provider encounters. Additionally, the development of cutting-edge aspects across an entirely digitized care continuum assures agile methodologies. Even In-patient care can be quickly modernized by, for example, adopting AI or machine learning advancements to improve diagnostic tools, predictive analytics and personalized care plans.

4. Best Practice Guidelines. Organizations should also create and disseminate rollout best practices from the first wave to help ensure digitized care tools are well-used. This can serve as a roadmap for other departments or facilities and provide guidance on the steps necessary to successfully implement programs, overcome common roadblocks faced in other health systems, and strategies for success. While healthcare organizations can certainly spread the word virtually on what works well, they must also work to get the insights and learning's from early adopters into every user, making all digital tools more effective across a healthcare organization.

5. Cross-Disciplinary Collaboration. Enterprise organizations must collaborate with clinicians, data scientists and IT professionals to ensure that digital care tools are both clinically relevant and technically robust. Cross-functional teams provide a diversity of knowledge necessary to create innovative and effective solutions. Workshops, meetings and common projects can facilitate communication of production. The reward of this collaborative strategy is improved quality and impact in digital care systems.

6. Partnerships with Academic Institutions. It will ensure that healthcare bodies are aligned with academic institutions which in turn provides updated research and digital health technology innovations. Academic partners can help to develop and evaluate pioneering solutions, providing important learnings and evidence for the field. Another advantage can be cooperation and interaction with universities or research institutions in conducting common projects, financing portions of R&D (development), as well access to a new type of expertise. These collaborative functionalities are major contributors in healthcare firms maintaining their precedent at the crest of digital care, by constantly enhancing such systems.

6.5.4 Training and Support. Continual training and support for the staff — as well as patient education and online virtual services are key to successfully implementing the digitized care continuum. By deploying holistic training programs and on-going tech support, users are encouraged to use the system most effectively while facing potential hands off in future. Future Directions of Training & Support could include:

1. Comprehensive Training. It is essential to develop and roll out comprehensive training programs to empower all users in accessing the digitized care continuum. Not only does that cover technical skills, but also talk of system navigation and workflow integration. It is important to understand on how a training program for healthcare providers might address using digital tools as an aid to clinical decision making; patient data processing/distribution and utility in this context. One challenge could be how some view digital tools as “black boxes. This can be addressed by making sure the team that is implementing has a thorough knowledge of how AI algorithms work, and all healthcare professionals are properly trained. This is built to give trust on technology that promises easier adoption.

The first and foremost point of concern is standardization of care coordination workflows and resource structures across the organization before plunging into implementation of digital tools. This standardization promotes consistency in the delivery of the program. Training of administrative staff, which covers system management and data entry (and possibly even troubleshooting) may be necessary. Patients too should be educated more about this program while they are in a hospital to make them accept the new digitized care continuum. In turn, users from all sides will find it easier to learn the system through hands-on training, online tutorials and continual education resources that help them get better acquainted with using the system more effectively.

2. Technical Support. Reliable technical support is necessary to troubleshooting issues and making sure the digitized care continuum runs more smoothly. As far as the current system is concerned, there have not been instances of absence of technical support. However, it will be essential for users to have a help desk that offers technical support for multiple channels of communication such as phone, email and online chat. The support teams should have the skills to solve technical problems, offer guidance on systems and ensure that all necessary issues are resolved in due course. A responsive support team can troubleshoot any issues with the system itself and data integration. Ongoing technical feedback and support further helps the system from crashing as well, building up its effectiveness in working properly for users to fix any problems that they face.

3. Change Management. Broad change management strategies are essential to manage the transition and gain stakeholder acceptance of digitized care systems. Whether it involves outlining the advantages and expectations of digital capabilities, developing training to enable stakeholders with new skill sets or ongoing support in this journey together. Conducting workshops and feedback sessions to assist resistance in change are the barriers for staff before they feel confident using modern technology. Change management efforts prepare the organization for acts of innovation and continuous improvement through building an effective culture.

One of the most effective approaches to driving adoption is identifying and enabling champion participants. Champion users are usually early adopters of new technologies and can help create use cases for other peers. Therefore, encouraging and training such staff members with the necessary knowledge results in them advocating for digital tools. These champions can act like peer counsellors and help their colleagues use the new system in a timely manner by answering queries or even addressing doubts (if any), making it easier for all sitting at different ends of an organisation to adopt smoother and quicker.

6.5.5 Addressing Disparities. Although the digitized care continuum has been shown to offer numerous advantages, the potential inequities in access and utilization should be always kept in mind. It will also be important that the system is usable by all patients, irrespective of their level of technological ability or socioeconomic circumstances. This could mean building more user-friendly interfaces and providing extra help with training. To address these disparities, the recommendations are:

1. User-Friendly Interfaces. To make the digitized care continuum available to patients, employees and all other stakeholders — including those who may have limited technological savvy — User Interface is the key. Incorporating some accessibility features like

Voice Commands and Screen readers to help employees with few disabilities can be an added feature. The above point applies to the creation of more user-centric system designs which are accessible by a higher portion overall stakeholders — patients as well as varied employees and other company users. This would mean more involved roles for healthcare professionals in the design and development phases of their digital care tools. This is to make the system intuitive and easy to integrate into a clinical workflow. Workshops, testing and pilot programs with users allows to dig deeper into their wants and needs. In turn, prioritizing the wants and pain points of end-users can help healthcare organizations build digital tools that are more useful, improve clinical decision-making time-to-impact as well as overall patient care.

2. Support for Vulnerable Populations. Delivering focused support to vulnerable population is essential for a robust digitized care continuum system. This will also mean doing more for population groups like seniors, people with disabilities and people with no or limited technology access. Aging adults might need a little more personal tech support and some additional, in-person training while those with disabilities most likely would have needs for adaptive technology as well resources. Reducing the digital health divide, improving accessibility to devices, providing required internet connectivity and being flexible, individualized systems can reduce both barriers within education program design. Meeting these needs is essential for the digitized care continuum to offer an engaging, efficient and effective experience across wide spectrum of patients.

6.5.6 Measuring Long-term Outcomes. While this study does present some important insights, the long-term benefits of digitized care continuum will be better efficaciously quantified when outcomes are gauged on sustained basis. This study covers two consecutive years of the same six-month time period. However, longitudinal study can describe persistent gains of patient satisfaction, clinical outcomes and staff workload over years. Future directions in the measurement of long-term outcomes would be:

1. ***Longitudinal Studies.*** Longitudinal research is necessary to better understand the lasting impact of a digitized care continuum on patients and systems. These studies provide long-term objective metrices. Otherwise, important details on patient satisfaction or clinical outcomes or staff workload over extended timelines may be left unexplored. For instance, a longitudinal study could assess whether changes in patient engagement and clinical outcomes apparent at short-term follow-up stand the test of time over longer intervals. It also guides future enhancements with the long-term trends in mind and evaluates how lasting system benefits may be. Longitudinal studies are designed to give a full picture of the system's effect over long periods, enabling decisions based on evidence and an ongoing evaluation of care.

2. ***Continuous Monitoring.*** Creating processes that measure the performance of the digitized care continuum is critical to ensure that it continues to deliver. This data can be monitored and evaluated on a regular basis in the form of key performance indicators (KPIs), identification from patient feedback, as well tracing clinical outcomes to test if it is suitable enough or needs refinement. Continual monitoring will allow for the identification of any trends in usage, whether favorable or unfavorable with respect to system utilization and its impact on patient outcomes as well as user satisfaction.

Real-time data analysis and performance metrices enable immediate course corrections as the system continues its full-throttle operation to make optimal impact on both ends of patient care in real time. An integrated care digitized care continuum enables continuous monitoring which helps to ensure that the digitized interventions are developed in tandem with changing needs, and they continue to be effective. The iterative updates should encompass algorithm refinements, new clinical guidelines, and user-uploaded issues encountered during use. Healthcare organizations must have the ability to apply a reliable and consistent update path for their digital tools in support of the care continuum if they are developed using an agile development approach, so that clinicians can be best supported with decision-making during patient care.

6.5.7 Expanding Scope and Scalability. For the digitized care continuum to fully realize its potential, it must continue expanding its mandate into more services and ensure scalability. This means adding new features by enabling more services and designing the system for growing patient populations, as well economic drivers like expanded technological capabilities. Increasing scope and scalability in future should have the following:

1. Broadening Coverage. Broadening the spectrum of healthcare services in this continuum that can be digitized would extend its potential benefit as well. This includes services for mental health care and support or chronic disease management, prevention. In addition, the integration of tele-mental wellness services in the platform will allow more well-rounded health care for patients that can treat both physical and mental conditions creating a healthier lifestyle. Expanding the ecosystem of solutions allows providers to deliver holistic care, better aligned across a context and establishes an environment that delivers improved health outcomes from all spectrums of patient engagement.

2. Scalability. It is crucial to ensure that the digitized care continuum system can scale up step by step as per the increasing requirements of patients and also in healthcare sector. It involves tuning the design of a system so that, in an effective manner, it can deal with more data to cater for growing users and new trends on technology. This should be used as the support system to manage a larger number of patients with more data and should be easily adaptable for new healthcare providers (and administrative staff) without compromising speed. Moreover, the system must be dynamic and upgraded continuously including new digital instruments emerging over time. The system can be easily integrated through modular and flexible architectures. Scalability planning makes sure that the system continues to function effectively and securely as health requirements and technologies advance. With the ability to scale digital tools for different populations, health care providers can effectively improve these aspects of their practices.

6.5.8 Ethical AI Practices, data privacy and security. Organizations need to regulate that digitized care systems are ethically mapped out. This includes fairness, accountability and transparency. Ensuring the reliability of AI including systems like digitized care continuum for all Healthcare organizations need to be vigilant and avoid creating new disparities through their use. Inventors should consider ethical implications when designing these systems, and make sure users understand how the system makes decisions. Furthermore, establishing transparent accountability frameworks also helps to ensure that any downstream problems or failings can be quickly corrected so as not to undermine the trust and utility of such digital solutions.

Processes for securing data sufficiently to provide patient trust of it being held securely and would not fall into wrong hands are integral. The anonymous nature of Blockchain is important for health institutions, because preserving patient data requires compliance with regulations such as HIPAA and GPDR. To do this, encryption and secure access controls to prevent unauthorized users from outside over the healthcare operations or in other cases of data leakage should be ensured. Through training employees in data safety procedures and ensuring digital tools are privacy-forward, there should be a focus to work towards addressing these threats and create a safe ecosystem that includes the needs of patients.

6.6 Conclusion

Digital technologies have advanced quickly, and their impact is felt throughout various sectors around the world — more so in healthcare. Digitized Care Continuum program is a major innovation to bring high quality patient care through digital technology. This study evaluated the impact of these programs on patient outcomes, care coordination and overall satisfaction in a digitized multispecialty hospital setting. The results support a complete understanding of the possibility to implement it but also in what sectors progress could be furthered.

The Digitized Care Continuum program displayed significant improvement in various crucial patient outcomes. The primary observation made is that the rates of hospital readmissions are decreased. A lower readmission rate is one of the critical criteria for effective care management. The program had a focus on long-term surveillance and after care follow up which helps in the early detection of any potential problems that could occur. This prevented patients from coming back to the bedside, which helps hospitals to become more efficient and less expensive. Without diminishing the quality of care, the system has sped up recovery by simplifying workflows and improving patient management.

The digitized care continuum was successful for all clinical departments, which validated its utility in multispecialty hospitals. This program decreased readmissions dramatically and improved patient satisfaction, as well loyalty in several clinical departments. While prior studies have only found benefits in select chronic conditions, this study showed similar improvements across nearly all clinical departments. An important reminder to the life saved by the system is solid proof that when care and timely follow-up combine, it can save lives. This one example highlights the high value of these digitized programs and suggests that if they were more widely adopted, there would likely be marked improvements in patient care endpoints as well as overall health outcomes. **Moreover, consistent success across a wide range of departments is further proof that the program works, and it holds promise to be applicable in transforming patient care within multispecialty hospital settings.**

The patient satisfaction scores have also shown a significant rise. Embedded digital tools in a program along the care continuum improved engagement with the health-care system. Patients now experience a much smoother and guided journey from making an appointment, better communication with health practitioners to being kept up-to-date and provided educational material too. Such improved satisfaction is integral for creating faith and a sense of belonging especially to the healthcare provider.

Good patient care depends on the seamless functioning of healthcare teams. The novel Digitized Care Continuum Program greatly improves this by enhancing communication, escalation and information sharing between different healthcare teams. Disorganized communication in conventional care facilities results to deficiency managing patients, duplication of tests and delayed treatment. The program solves this problem by offering a single ground where all qualified workers can consult the desired information from their patients as many times as required. Through this integration, every care team learns about patient situations and underline treatment plans on a proactive manner with coordination of follow-up needs.

One of the major benefits is that it has improved patient-provider communication. Incidentally, this accelerated the adoption of other digital health tools (like EHR patient portals and telemedicine platforms) that have enabled not just routine operational changes but also a pivot to more frequent and convenient interactions between patients at home with their care teams. Accessibility in turn allows patients to receive responses from their physicians quickly, manages chronic diseases better and provides a more individualized approach. By providing patients more transparency in what was being done with their data, it became easier for them to give feedback and report issues, leading to care that could respond better.

It also focused on patient education and self-management, an important part of the Digitized Care Continuum initiative. It offered patients a variety of educational resources including those related to their conditions, treatment options and self-care skills. This control fosters a positive environment for people to get involved in their own care, which is essential when it comes to handling chronic diseases and achieving better long-term health results.

The program enhanced patient retention while keeping patients aware and involved, allowing them to stick to their treatment plans and make informed choices regarding health. The above strategy intuitively leads to better health outcomes and less frequent hospital readmissions.

The findings of the study indicate that Digital Care Continuum has significant promise for enhancing patient care across a multispecialty hospital. As a result of the program, readmission rates have gone down while patient retention and satisfaction have been on an upward trajectory. It has also helped with healthcare provider coordination and communication, patient education and self-management. Reinforcement of best practice guidelines for the regular preventive treatment to patients while obtaining valuable insights about using digital tools in health care was another benefit**.**

But it is critically important to have proper insight into patient feedback and can resolve the pain points to move patients from a neutral retention position towards better retention. As innovations in healthcare demonstrate this potential, consideration must be given to how patients are kept apprised of the benefits associated with Digitized Care Continuum. When healthcare providers communicate the value as well as what to expect from a program, it might increase engagement levels leading to more satisfaction among patients. Further, any areas where the program could be failing to meet requirements can then also be identified and fixed in order that they may have a more positive effect on patients.

Finally, more studies are needed to understand the longer-term effects of the program and cost savings on healthcare. Further research is suggested to longer term implementation, cost-effectiveness assessment and additional sophisticated applications. Through improved solutions for interoperability, transparency and adoption of new use cases, healthcare providers can benefit from the Digitized Care Continuum program to drive better patient outcomes and transform health delivery.

In summary, the study advocates that the digitized care continuum strategies of today will revolutionize tomorrow's healthcare landscape especially among multi-speciality hospitals. Furthermore, as the healthcare industry evolves adopting & improving digital solutions like digitized care continuum will be the key to meeting contemporary patient-care needs and making sustainable changes in health over time.

APPENDIX A:

QUESTIONNAIRE – ONE-ON-ONE INTERVIEW - PATIENT GROUP

1. Patient Unique ID:
2. Gender:
    - Male
    - Female
    - Prefer not to say
3. Age Range:
    - 18-24
    - 25-34
    - 35-44
    - 45-54
    - 55-64
    - 65 or above
4. Education Level:
    - School Education
    - College/Associates Degree
    - Bachelor's Degree
    - Master's Degree
    - Doctorate or Professional Degree
5. Employment Status:
    - Employed full-time
    - Employed part-time
    - Unemployed

- Student
- Retired
- Other (please specify): ________________

6. Frequency of Healthcare Visits:
    - Rarely
    - Occasionally
    - Regularly
7. How was your recent experience during admission at Aster Prime Hospital?
    - Very Good
    - Good
    - Neutral
    - Bad
    - Very Bad
8. How aware are you of the presence and functioning of the AI-driven care continuum system at this hospital?
    - Very aware
    - Somewhat aware
    - Not aware
9. How would you rate your overall experience with the digitized care continuum program in Aster Prime hospital?
    - Very satisfied
    - Satisfied
    - Neutral
    - Dissatisfied

- Very dissatisfied

10. To what extent do you believe the digitized care continuum program has helped you regain health?

- Significantly Satisfied
- Satisfied
- Neutral
- Dissatisfied
- Significantly Dissatisfied

11. How satisfied are you with the communication between you and your healthcare providers facilitated by the digitized care continuum program?

- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

12. Have you experienced improved follow-up care and coordination of services after the implementation of the digitized care continuum program?

- Yes, significantly improved
- Yes, improved
- No significant change
- Declined
- Significantly declined

13. Have you noticed any changes in your health-related behaviors (e.g., medication adherence, lifestyle choices) since using the digitized care continuum program?

- Yes, significantly improved
- Yes, improved
- No significant change
- Declined
- Significantly declined

14. How likely are you to continue seeking healthcare services from this hospital due to the positive impact of the care continuum program?
    - Very likely
    - Somewhat likely
    - Neutral
    - Somewhat unlikely
    - Very unlikely
15. In your experience, what specific benefits have you observed with the AI-driven care continuum system compared to a manual system?
    - Increased efficiency
    - Enhanced personalization of care
    - Improved accuracy in diagnosis and treatment
    - Better communication between healthcare providers and patients
    - Other (please specify): _________________
16. Share any Positive Experiences or Benefits with AI-Driven Care Continuum System at Aster Prime Hospital, Hyderabad:
17. Share any Challenges or Drawbacks Encountered while Using the AI-Driven System at Aster Prime Hospital, Hyderabad:

APPENDIX B:

QUESTIONNAIRE – oNLINE SURVEY – HEALTHCARE PROFESSIONALS

2. Employee Unique ID:
3. Employee Name:
4. Gender:
   - Male
   - Female
   - Prefer not to say
5. Age Range:
   - 18-24
   - 25-34
   - 35-44
   - 45-54
   - 55-64
   - 65 or above
6. Education Level:
   - College/Associates Degree
   - Bachelor's Degree
   - Master's Degree
   - Doctorate or Professional Degree
   - Prefer not to say
7. What is your job title in the hospital?
8. Which department or specialty do you primarily work in?
   - CRM

- Clinical
- Operations
- Nursing
- Administration
- Any other

9. How many years of experience do you have in healthcare?
   - Less than 1 year
   - 1-3 years
   - 3-5 years
   - 5-10 years
   - More than 10 years
10. How long have you been involved in the implementation of the digitized care continuum program?
    - Less than 1 year
    - 1-3 years
    - 3-5 years
    - 5-10 years
    - More than 10 years
11. How would you rate your overall experience with the digitized care continuum program in Aster Prime hospital?
    - Very satisfied
    - Satisfied
    - Neutral
    - Dissatisfied

- Very dissatisfied

12. In your opinion, to what extent has the digitized care continuum improved communication between different healthcare providers?

- Significantly Improved
- Satisfied
- Neutral
- Not improved
- Significantly Declined

13. How effective do you think the digitized care continuum has been in enhancing patient care coordination?

- Highly Effective
- Effective
- Neutral
- Not effective
- Not at all effective

14. How would you rate the training provided for the use of the digitized care continuum system?

- Highly Effective
- Effective
- Somewhat effective
- Not effective
- Not at all effective

15. Have you encountered any technical difficulties or challenges while using the digitized care continuum system?

- Yes
- No

16. If yes, please specify the challenges:
17. Do you think the digitized care continuum reduces workload?
    - Yes, significantly improved
    - Yes, improved
    - No significant change
    - Declined
    - Significantly declined
18. If dissenting, please specify the challenges:
19. In your opinion, to what extent has the digitized care continuum reduced manual errors?
    - Significantly Reduced
    - Reduced
    - Neutral
    - Not Reduced
    - Errors Significantly Increased
20. Do you think the digitized care continuum program should continue to run at your hospital?
    - Yes
    - No
21. If no, please specify the reasons:
22. What additional features or functionalities would you like to see incorporated into the digitized care continuum system?
23. Do you have any suggestions for improving the implementation or utilization of the digitized care continuum program?

APPENDIX C:

APPROVAL FROM INSTITUTIONAL REVIEW BOARD

Aster
PRIME HOSPITAL
We'll Treat You Well

INSTITUTIONAL REVIEW BOARD (IRB)

Date: 23/June /2022

From

Dr. C. Uma Sreedevi,

Chairperson,

Institutional Review Board,

Aster Prime Hospital ,

Hyderabad – 500038, Telangana.

To

The Investigators

Dr. Atul Pati Tripathi, Mr. Devanand Kolothodi

Reference: Protocol: Effectiveness of digitized care continuum program in a Multispecialty hospital

Dear Mr. Devanand KT

The institutional Review Board (IRB) of Aster Prime Hospital has reviewed the scientific and ethical aspects of your initial and revised proposal and discussed your below mentioned documents :-

1. Study Protocol
2. Methodology
3. Study Plan
4. Expected Outcome

The IRB Meeting was held on the 23rd day of June,2022 at 14:00 hours and the documents mentioned above were reviewed during this meeting . The following IRB members were present at the meeting.

Corporate Office: Sri Sainatha Multi Speciality Hospital Pvt. Ltd
Regd. Office: Plot No.: 2 & 4, Opp. Passport Seva Kendra, Ameerpet, Hyderabad - 500 038, Telangana, India.
For Appointments: 040 4959 4959
Email: appointments.prime@asterhospital.com
T : +91 40 4456 9999
F : +91 40 2345 5152
E : info@asterprime.com
www.asterprime.com
Aster@Home +91 9177700100 | Aster eConsult

APPENDIX C:

(Contd.)

Aster
PRIME HOSPITAL
We'll Treat You Well

S. No	Name	Current Designation	Attended YES/NO	Study Approval
1	Dr. C. Uma Sreedevi	Chairperson	Yes	Yes
	Dr. Fatima Tahniyath	Convener	Yes	Yes
2	Dr. Chandrasekhar Rao	Member	Yes	Yes
3	Dr. Rama Devi	Member	Yes	Yes
4	Dr. Pravin Patil	Member	Yes	Yes
5	Dr .Usha Rani	Member	Yes	Yes
6	Dr. T. Rohith Singh	Member	Yes	Yes

The Institutional Review Board hereby approves the protocol for research to be conducted in its present form.

Please note that you should follow the requirements given below for this study.

- Do not implement any deviation from, or change to, the protocol approved by the IRB, without prior written approval of the IRB, Aster Prime Hospital, and Hyderabad.
- Please submit and get approval for all the study related templates before start using for the study.

Please promptly report to IRB, Aster Prime Hospital, the following:

- The progress of the study.
- Any changes in the protocol and patient information/informed consent documents prior to their implementation.
- Final report of the study shall be submitted to the Institutional Review Board in all cases, even when the study is abandoned for any reason(s).
- Please submit the status report of the study to IRB, Aster Prime Hospital at every 6 months interval. Also, provide us with a copy of the final study completion report.

Should you require any further clarification, please do feel free to contact me.

Yours sincerely,

Umasreedevi

Dr. C. Uma Sreedevi
Chairperson
Institutional Review Board ,
Aster Prime Hospital,
Ameerpet, Hyderabad.

Corporate Office: Sri Sainatha Multi Speciality Hospital Pvt. Ltd
Regd. Office: Plot No.: 2 & 4, Opp. Passport Seva Kendra, Ameerpet, Hyderabad - 500 038, Telangana, India
For Appointments: 040 4959 4959
Email: appointments.prime@asterhospital.com
T : +91 40 4456 9999
F : +91 40 2345 5152
E : info@asterprime.com
www.asterprime.com
Aster@Home +91 9177700100 | Aster eConsult

APPENDIX D:

CONSENT LETTER FROM HEAPS

HEAPS™

TO WHOMSOEVER IT MAY CONCERN

This is to confirm that Mr. Devanand K T is collaborating with Heaps Health Solutions India Private Limited ("HEAPS") for the purpose of conducting research on the topic "**Effectiveness of AI driven care continuum program in a multi-speciality hospital**".

HEAPS is an expert led AI-driven health tech platform that helps in optimising care management. HEAPS uses cutting-edge technologies, data analytics and artificial intelligence to create highly efficient and effective care management systems for insurers, hospitals, corporates and patients. Currently, HEAPS operates in the US, India, UAE and Singapore.

We are delighted to be working with Mr. Devanand K T and wish him the very best in his pursuit of a Doctorate in Business Administration from the Swiss School of Business Management.

Dr. Suman Katragadda
Founder & CEO, HEAPS
June 1, 2022

Heaps Health Solutions India Private Limited
CIN: U85300TG2020PTC143351
8-2-603/1/25, Plot no. 25, Krishnapuram Road, Rd No. 10, Banjara Hills, Hyderabad TG 500034 IN

APPENDIX E:

INFORMED CONSENT

Aster PRIME HOSPITAL

Plot no : 2&4
Behind Mythrivanam
Opp Passport Seva Kendra
Ameerpet- Hyderabad -500038

REGISTRATION FORM

If not registered earlier, please fill the form in CAPITAL LETTERS

Date: Time:

Name: Mr./Mrs./Master/Miss

Date of Birth: Age: Yrs

Sex: Male Female

Father / Mother / Spouse Name: Marital Status: Single/Married

Residential Address:

E-mail:

District: State: Country:

Pincode: Phone: Mobile:

Occupation:

Doctor to be consulted:

Name and Address of the Referring Doctor / Hospital / Clinic:

Camp / Walk-in / Family & Friends / Social Media / Newspaper

In Case of Emergency, Person to be informed: Relationship:

Local Contact Address & Phone No.:

Insurance / Corporate Patients only

Insurance / TPA / Company / Corporate Company Name:

Foreign Nationals only: Attach a copy of the passport.

APH (a) NCL/PRF/02-90

APPENDIX E:

(Contd.)

Notification Consent

At Aster Prime, we constantly strive to understand your needs and serve you better. That is why we endeavour to keep you informed of your appointment/transactions/care continuum with us by offering you the ability to receive mobile text message reminders, WhatsApp messages or voice calls. We also strive to keep you informed of the all the services including any new services and offers provided at Aster Prime by sending you text messages, WhatsApp messages or through voice calls. As a part of the new care continuum program under Heaps, we also tend to inform you that our care coordinator will be calling you for post discharge surveillance to track your recovery post discharge, progress and health outcomes on structured intervals. The coordinator shall provide telephonic support by coordinating with respective physician/primary consultant or other ancillary departments if required. The program also intends to capture any untoward symptoms and reports them to the hospital authorities for early resolution.

Please tick the box below

☐	I CONSENT to Aster Prime Hospital for contacting me by Mobile SMS/WhatsApp/Any other text message or through voice call for the purpose of transactions, appointments and care continuum program. I will ensure, to keep Aster Prime Hospital, always informed of my updated mobile number, or if the number is no longer in my possession.
☐	I hereby CONSENT to receive commercial or promotional messages (Unsolicited Commercial Communication) by Mobile SMS/WhatsApp/Any other text message or through voice call for the purpose of staying informed regarding the services rendered by Aster Prime including any new services, discounts and promotional offers. I will ensure, to keep Aster Prime Hospital, always informed of my updated mobile number, or if the number is no longer in my possession.

We will NOT send out any texts unless you have explicitly consented."

Terms & Conditions:

1. *Aster Prime Hospital shall endeavour to deliver the Appointment/ transaction alert/ care continuum via SMS/WhatsApp/Any other text message/Voice call to the best of its abilities to the registered mobile number.*

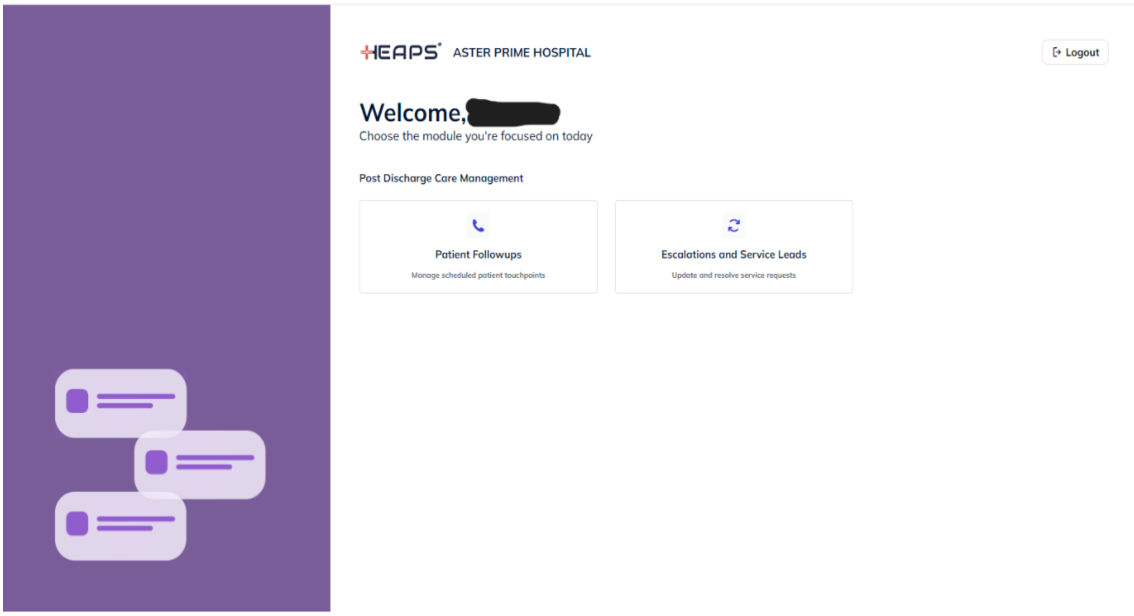
2. *The Customer acknowledges that delivery of SMS/WhatsApp/Any other text message/Voice Call dependents on the infrastructure, connectivity and services provided by the Telephone/ Internet Service Providers and the Intermediaries engaged by the Hospital. The Hospital shall not be responsible for non-receipt or delay of the SMS/WhatsApp/Any other text message, error, loss, or distortion in transmission of Information to the Customer for reasons beyond its control. The Hospital holds no responsibility for any losses incurred due to such reasons.*

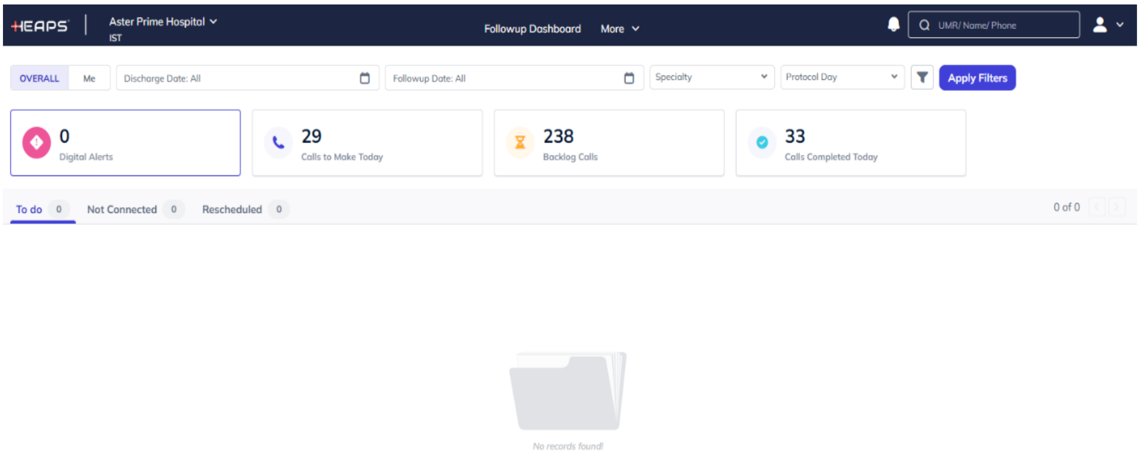
Signature of the Patient/Attendant:	Relationship:

APH (a) NCL/PRF/02-90

APPENDIX F:

HEAPS INTERFACE SCREEN SHOTS

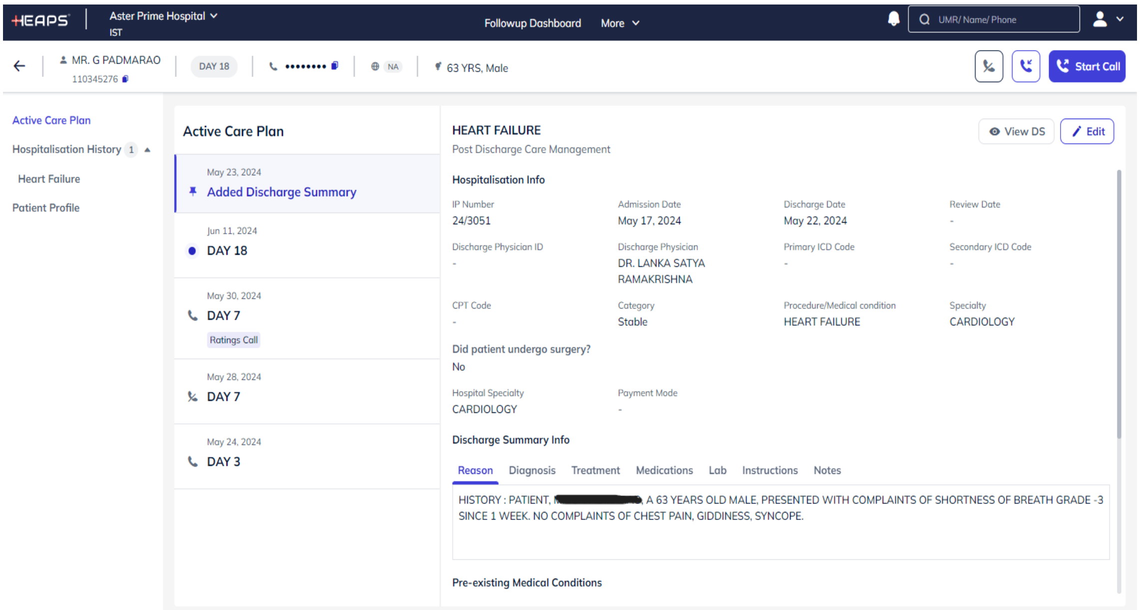


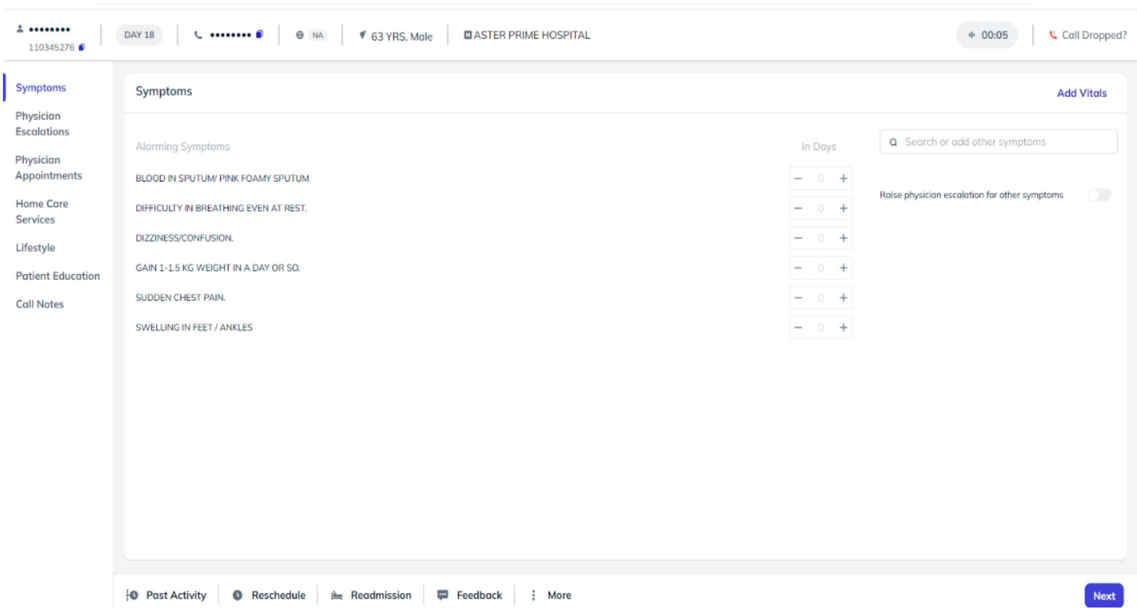


APPENDIX F:

(Contd.)

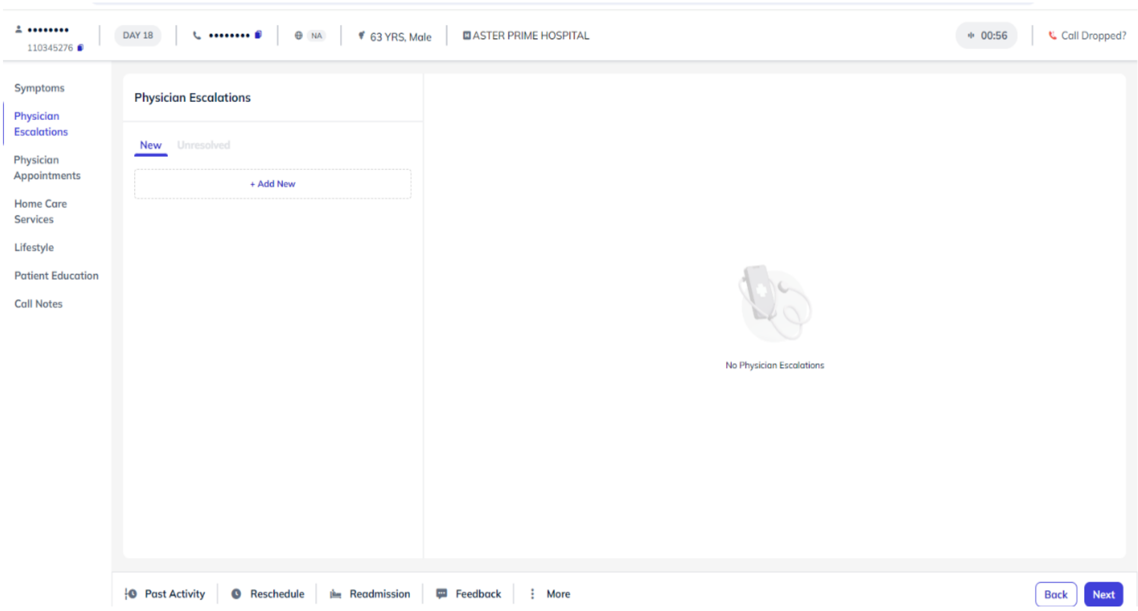
Cardiac Sciences – Case of Heart Failure

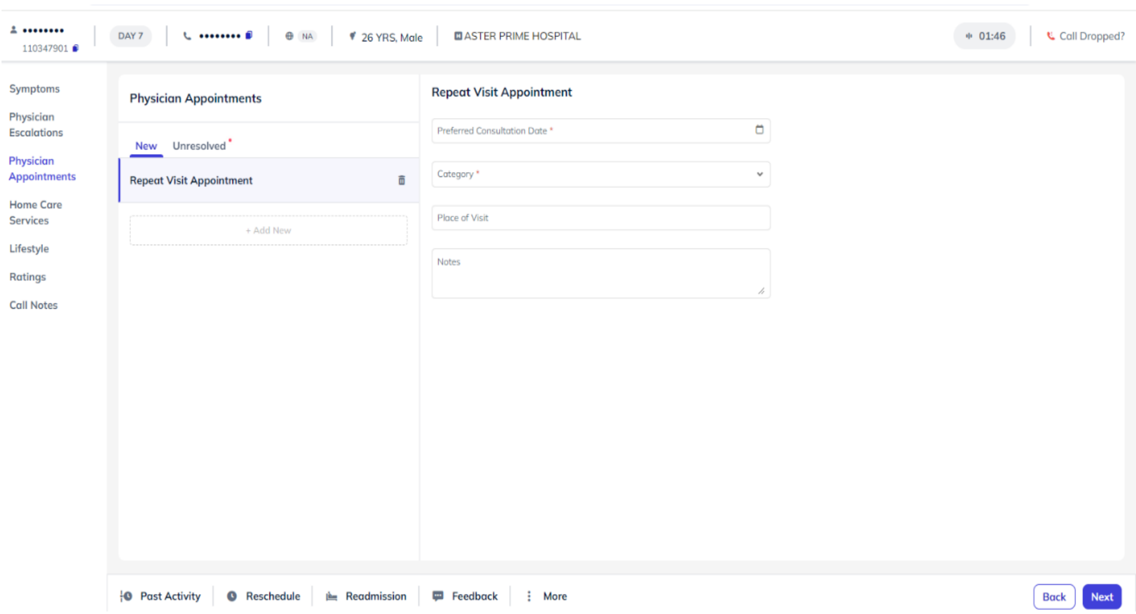




APPENDIX F:

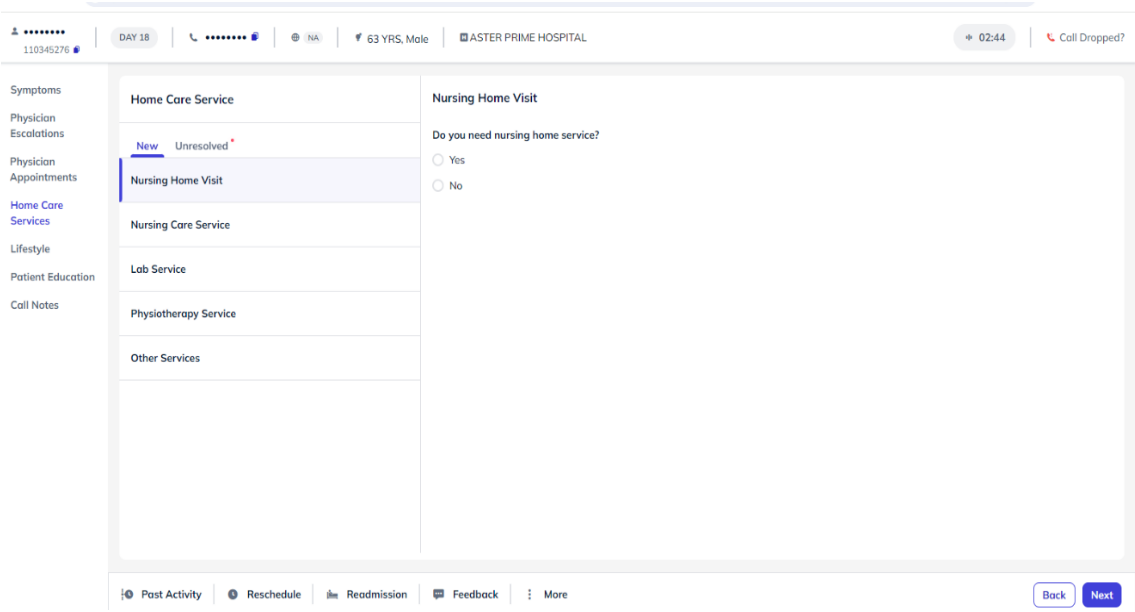
(Contd.)

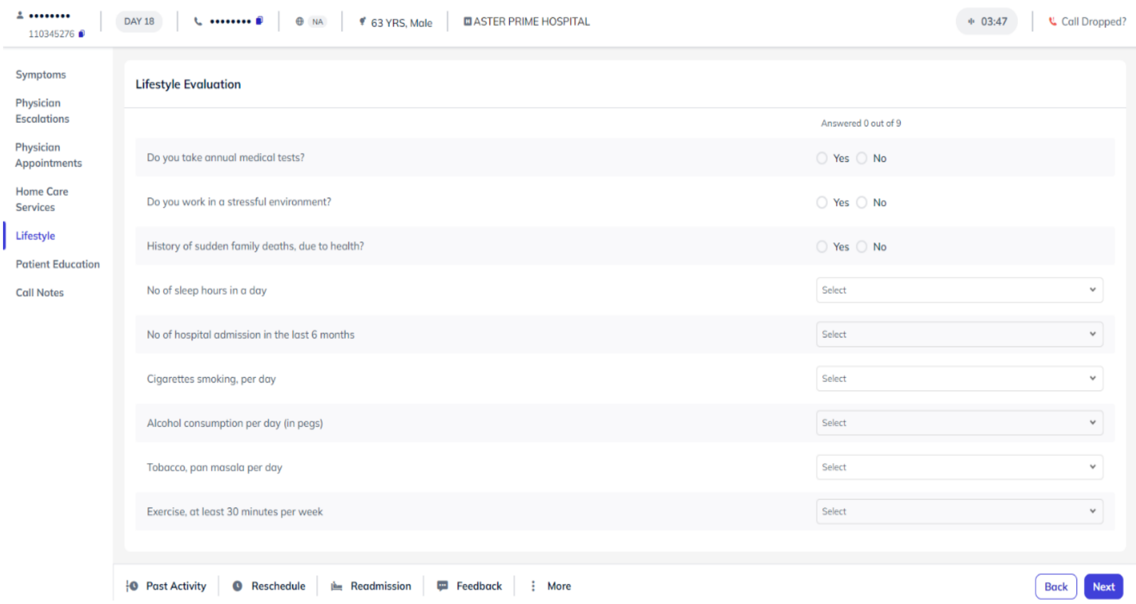




APPENDIX F:

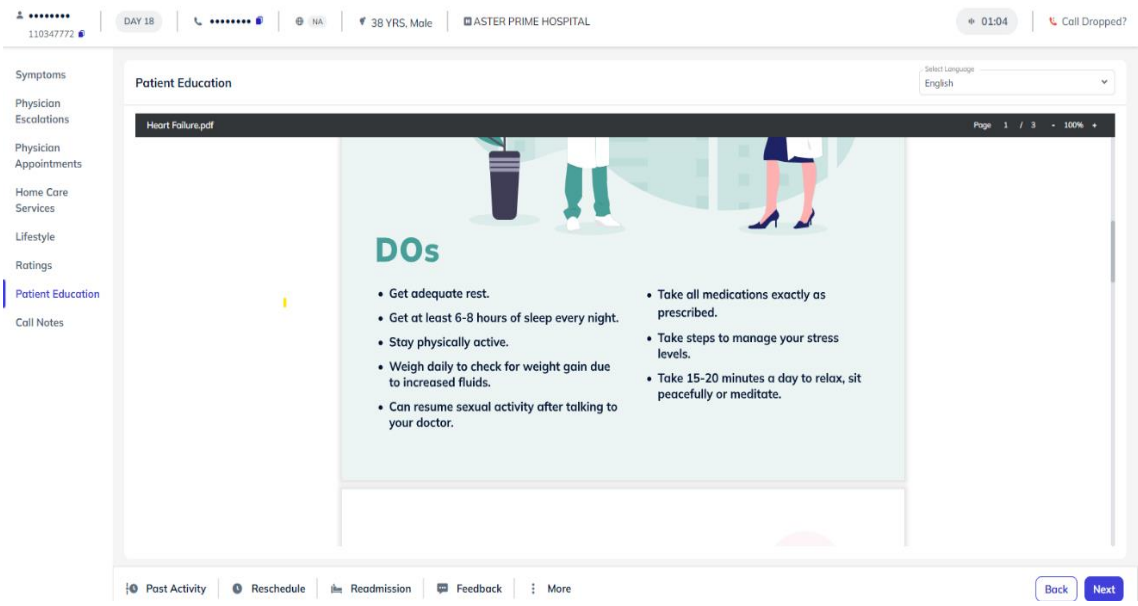
(Contd.)

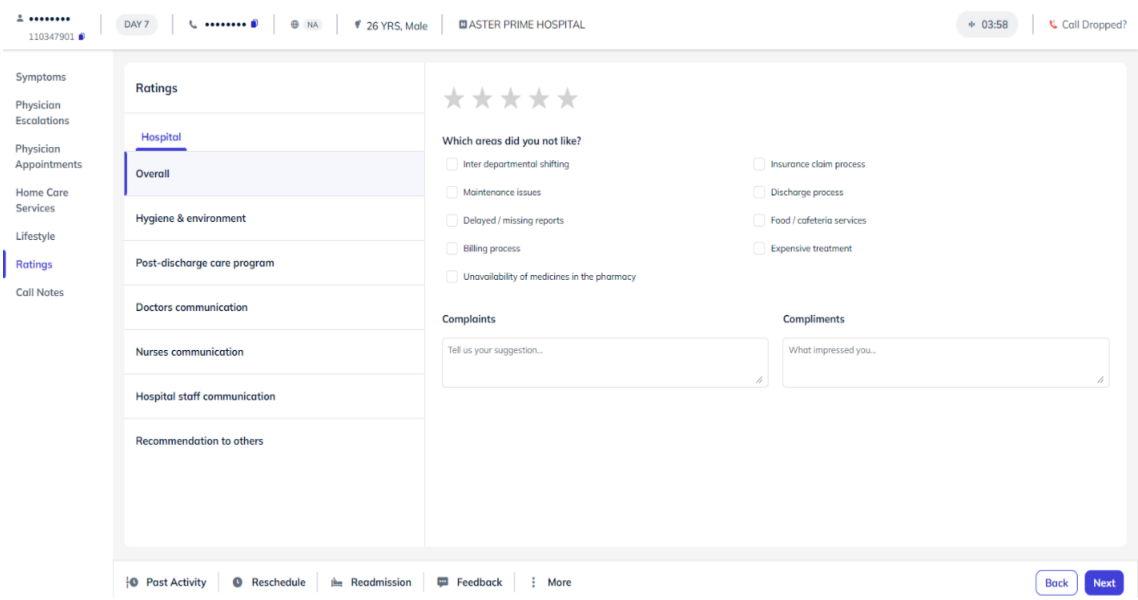




APPENDIX F:

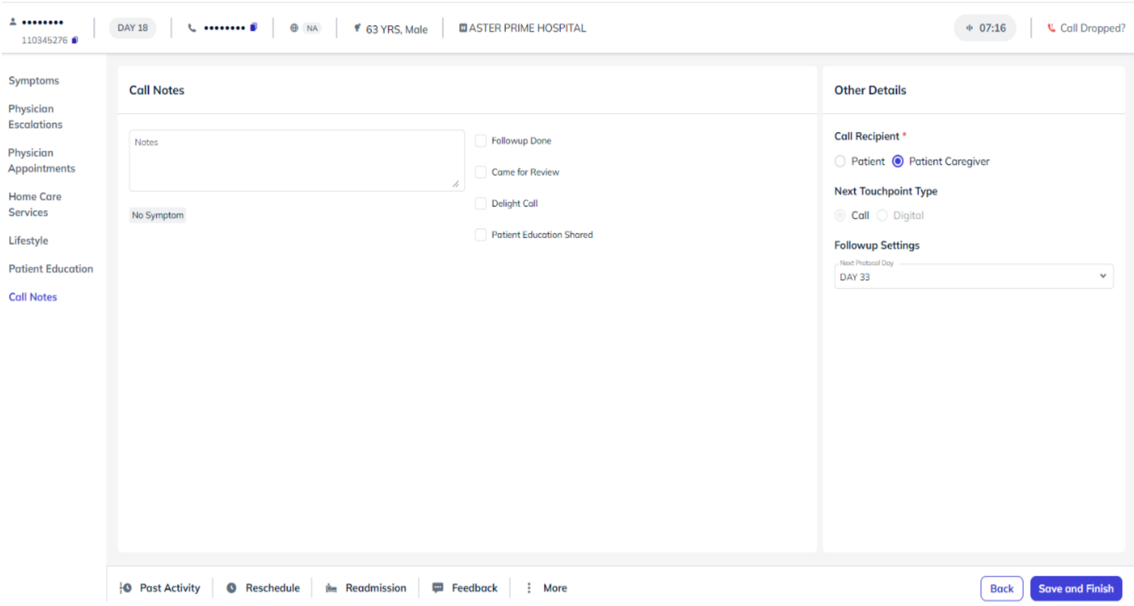
(Contd.)





APPENDIX F:

(Contd.)



REFERENCES

Amisha, Malik, P., Pathania, M., Rathaur, V., 2019. Overview of artificial intelligence in medicine. J Family Med Prim Care 8, 2328. https://doi.org/10.4103/jfmpc.jfmpc_440_19

Baker, D.W., Parker, R.M., Williams, M.V., Clark, W.S., 1998. Health literacy and the risk of hospital admission. J Gen Intern Med 13, 791–798. https://doi.org/10.1046/j.1525-1497.1998.00242.x

Bohr, A., Memarzadeh, K., 2020. The rise of artificial intelligence in healthcare applications, in: Artificial Intelligence in Healthcare. Elsevier, pp. 25–60. https://doi.org/10.1016/B978-0-12-818438-7.00002-2

Braun, K.L., Kagawa-Singer, M., Holden, A.E.C., Burhansstipanov, L., Tran, J.H., Seals, B.F., Corbie-Smith, G., Tsark, J.U., Harjo, L., Foo, M.A., Ramirez, A.G., 2012. Cancer Patient Navigator Tasks across the Cancer Care Continuum. Journal of Health Care for the Poor and Underserved 23, 398–413. https://doi.org/10.1353/hpu.2012.0029

Brooke, B.S., 2019. Transitioning Care at Discharge, in: Rosenthal, R.A., Zenilman, M.E., Katlic, M.R. (Eds.), Principles and Practice of Geriatric Surgery. Springer International Publishing, Cham, pp. 1–22. https://doi.org/10.1007/978-3-319-20317-1_29-1

Cawley, J., Grantham, C.C., 2011. Building a System of Care: Integration across the Heart Failure Care Continuum. TPJ 15, 37–42. https://doi.org/10.7812/TPP/11-016

Chan, K.-S., Wan, E.Y.-F., Chin, W.-Y., Cheng, W.H.-G., Ho, M.K., Yu, E.Y.-T., Lam, C.L.-K., 2021. Effects of continuity of care on health outcomes among patients with diabetes mellitus and/or hypertension: a systematic review. BMC Fam Pract 22, 145. https://doi.org/10.1186/s12875-021-01493-x

Christakis, D.A., 2003. Continuity of care: process or outcome? Ann Fam Med 1, 131–133. https://doi.org/10.1370/afm.86

Cichowitz, C., Pellegrino, R., Motlhaoleng, K., Martinson, N.A., Variava, E., Hoffmann, C.J., 2018. Hospitalization and post-discharge care in South Africa: A critical event in the continuum of care. PLoS ONE 13, e0208429. https://doi.org/10.1371/journal.pone.0208429

Czerwonka, A.I., Herridge, M.S., Chan, L., Chu, L.M., Matte, A., Cameron, J.I., 2015. Changing support needs of survivors of complex critical illness and their family caregivers across the care continuum: A qualitative pilot study of Towards RECOVER. Journal of Critical Care 30, 242–249. https://doi.org/10.1016/j.jcrc.2014.10.017

Dadosky, A., Overbeck, H., Barbetta, L., Bertke, K., Corl, M., Daly, K., Hiles, N., Rector, N., Chung, E., Menon, S., 2018. Telemanagement of Heart Failure Patients Across the Post-Acute Care Continuum. Telemedicine and e-Health 24, 360–366. https://doi.org/10.1089/tmj.2017.0058

Davenport, T., Kalakota, R., 2019. The potential for artificial intelligence in healthcare. Future Healthc J 6, 94–98. https://doi.org/10.7861/futurehosp.6-2-94

De Regge, M., De Pourcq, K., Meijboom, B., Trybou, J., Mortier, E., Eeckloo, K., 2017. The role of hospitals in bridging the care continuum: a systematic review of coordination of care and follow-up for adults with chronic conditions. BMC Health Serv Res 17, 550. https://doi.org/10.1186/s12913-017-2500-0

Dente, C.J., Bradley, M., Schobel, S., Gaucher, B., Buchman, T., Kirk, A.D., Elster, E., 2017. Towards precision medicine: Accurate predictive modeling of infectious complications in combat casualties. Journal of Trauma and Acute Care Surgery 83.

Dietrich, A. J., & Marton, K. I. (1982). Does continuous care from a physician make a difference. J Fam Pract, 15(5), 929-937., n.d.

Dilsizian, S.E., Siegel, E.L., 2014. Artificial intelligence in medicine and cardiac imaging: harnessing big data and advanced computing to provide personalized medical diagnosis and treatment. Curr Cardiol Rep 16, 441. https://doi.org/10.1007/s11886-013-0441-8

Fei Jiang, Yong Jiang, Hui Zhi, Yi Dong, Hao Li, Sufeng Ma, Yilong Wang, Qiang Dong, Haipeng Shen, Yongjun Wang, 2017. Artificial intelligence in healthcare: past, present and future. Stroke and Vascular Neurology 2, 230. https://doi.org/10.1136/svn-2017-000101

Forster, A.J., Murff, H.J., Peterson, J.F., Gandhi, T.K., Bates, D.W., 2003. The incidence and severity of adverse events affecting patients after discharge from the hospital. Ann Intern Med 138, 161–167. https://doi.org/10.7326/0003-4819-138-3-200302040-00007

Gagliardi, A.R., Dobrow, M.J., Wright, F.C., 2011. How can we improve cancer care? A review of interprofessional collaboration models and their use in clinical management. Surgical Oncology 20, 146–154. https://doi.org/10.1016/j.suronc.2011.06.004

Goldberg TH. The long-term and post-acute care continuum. W V Med J. 2014 Nov-Dec;110(6):24-30. PMID: 25651661; PMCID: PMC4476054.

Government of Telangana — dme.telangana.gov.in, n.d. List of Recognized Hospitals in Hyderabad. https://dme.telangana.gov.in/content1.php?U=8

Guo, J., Li, B., 2018. The Application of Medical Artificial Intelligence Technology in Rural Areas of Developing Countries. Health Equity 2, 174–181. https://doi.org/10.1089/heq.2018.0037

Haggerty, J.L., Reid, R.J., Freeman, G.K., Starfield, B.H., Adair, C.E., McKendry, R., 2003. Continuity of care: a multidisciplinary review. BMJ 327, 1219–1221. https://doi.org/10.1136/bmj.327.7425.1219

Hannum Rose, J., Bowman, K.F., O'Toole, E.E., Abbott, K., Love, T.E., Thomas, C., Dawson, N.V., 2007. Caregiver Objective Burden and Assessments of Patient-Centered, Family-Focused Care for Frail Elderly Veterans. The Gerontologist 47, 21–33. https://doi.org/10.1093/geront/47.1.21

Hansen, L.O., Young, R.S., Hinami, K., Leung, A., Williams, M.V., 2011. Interventions to Reduce 30-Day Rehospitalization: A Systematic Review. Ann Intern Med 155, 520–528. https://doi.org/10.7326/0003-4819-155-8-201110180-00008

https://www2.deloitte.com/content/dam/insights/us/articles/6872_AI-in-healthcare/6872_AI-in-healthcare.pdf, n.d.

https://www.heaps.ai/index_in.html

https://www.taliun.com/how-digital-health-should-focus-on-continuum-of-care-experience-for-patients, n.d.

Hu, J., Wang, Y., Li, X., 2020. Continuity of Care in Chronic Diseases: A Concept Analysis by Literature Review. J Korean Acad Nurs 50, 513. https://doi.org/10.4040/jkan.20079

Hu, Z., Melton, G.B., Moeller, N.D., Arsoniadis, E.G., Wang, Y., Kwaan, M.R., Jensen, E.H., Simon, G.J., 2016. Accelerating Chart Review Using Automated Methods on Electronic Health Record Data for Postoperative Complications. AMIA Annu Symp Proc 2016, 1822–1831.

Jayakumar, P., Bozic, K.J., 2020. Advanced decision-making using patient-reported outcome measures in total joint replacement. Journal Orthopaedic Research 38, 1414–1422. https://doi.org/10.1002/jor.24614

Jeangsawang, N., Malathum, P., Panpakdee, O., Brooten, D., Nityasuddhi, D., 2012. Comparison of outcomes of discharge planning and post-discharge follow-up care, provided by advanced practice, expert-by-experience, and novice nurses, to hospitalized elders with chronic healthcare conditions. Int J Res Nurs 16, 343–360.

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Yilong, Dong, Q., Shen, H., Wang, Yongjun, 2017. Artificial intelligence in healthcare: past, present and future. BMJ 2, svn-2017. https://doi.org/10.1136/svn-2017-000101

Kalu, F., Bwalya, J., 2017. What Makes Qualitative Research Good Research? An Exploratory Analysis of Critical Elements. International Journal of Social Science Research 5. https://doi.org/10.5296/ijssr.v5i2.10711

Krittanawong, C., Virk, H.U.H., Bangalore, S., Wang, Z., Johnson, K.W., Pinotti, R., Zhang, H., Kaplin, S., Narasimhan, B., Kitai, T., Baber, U., Halperin, J.L., Tang, W.H.W., 2020. Machine learning prediction in cardiovascular diseases: a meta-analysis. Sci Rep 10, 16057. https://doi.org/10.1038/s41598-020-72685-1

Lüdecke, D., 2014. Patient centredness in integrated care: results of a qualitative study based on a systems theoretical framework. Int J Integr Care 14. https://doi.org/10.5334/ijic.1361

Manne, R., Kantheti, S.C., 2021. Application of Artificial Intelligence in Healthcare: Chances and Challenges. CJAST 78–89. https://doi.org/10.9734/cjast/2021/v40i631320

McBryde-Foster, M., Allen, T., 2005. The continuum of care: a concept development study. J Adv Nurs 50, 624–632. https://doi.org/10.1111/j.1365-2648.2005.03447.x

McDonald, K., Ledwidge, M., Cahill, J., Kelly, J., Quigley, P., Maurer, B., Begley, F., Ryder, M., Travers, B., Timmons, L., Burke, T., 2001. Elimination of early rehospitalization in a randomized, controlled trial of multidisciplinary care in a high-risk, elderly heart failure population: the potential contributions of specialist care, clinical stability and optimal angiotensin-converting enzyme inhibitor dose at discharge. Eur J Heart Fail 3, 209–215. https://doi.org/10.1016/s1388-9842(00)00134-3

McLeod, J., McMurray, J., Walker, J.D., Heckman, G.A., Stolee, P., 2011. Care transitions for older patients with musculoskeletal disorders: continuity from the providers' perspective. Int J Integr Care 11. https://doi.org/10.5334/ijic.555

Mechanic, D., 2005. In my chosen doctor I trust. BMJ (Clinical research ed.) 329, 1418–9. https://doi.org/10.1136/bmj.329.7480.1418

Mugenda, O.M., Mugenda, A.G., Studies, A.C. for T., 1999. Research Methods: Quantitative and Qualitative Approaches. African Centre for Technology Studies.

NABH — portal.nabh.co, n.d. Accredited Institutions in India. https://portal.nabh.co/frmViewAccreditedHosp.aspx#gsc.tab=0

Naithani, S., Gulliford, M., Morgan, M., 2006. Patients' perceptions and experiences of "continuity of care" in diabetes. Health Expect 9, 118–129. https://doi.org/10.1111/j.1369-7625.2006.00379.x

Obermeyer, Z., Powers, B., Vogeli, C., Mullainathan, S., 2019. Dissecting racial bias in an algorithm used to manage the health of populations. Science 366, 447–453. https://doi.org/10.1126/science.aax2342

Panch, T., Mattie, H., Celi, L.A., 2019. The "inconvenient truth" about AI in healthcare. npj Digital Medicine 2, 77. https://doi.org/10.1038/s41746-019-0155-4

Rayner, J., Khan, T., Chan, C., Wu, C., 2020. Illustrating the patient journey through the care continuum: Leveraging structured primary care electronic medical record (EMR) data in Ontario, Canada using chronic obstructive pulmonary disease as a case study. International Journal of Medical Informatics 140, 104159. https://doi.org/10.1016/j.ijmedinf.2020.104159

Reddy, S., Fox, J., Purohit, M.P., 2019. Artificial intelligence-enabled healthcare delivery. J R Soc Med 112, 22–28. https://doi.org/10.1177/0141076818815510

Saultz, J.W., Albedaiwi, W., 2004. Interpersonal continuity of care and patient satisfaction: a critical review. Ann Fam Med 2, 445–451. https://doi.org/10.1370/afm.91

Saunders, M., Lewis, P., Thornhill, A., Bristow, A., 2019. "Research Methods for Business Students" Chapter 4: Understanding research philosophy and approaches to theory development. pp. 128–171.

Schwalbe, N., Wahl, B., 2020. Artificial intelligence and the future of global health. The Lancet 395, 1579–1586. https://doi.org/10.1016/S0140-6736(20)30226-9

Segal, L., Mortimer, D., 2006. A population-based model for priority setting across the care continuum and across modalities. Cost Eff Resour Alloc 4, 6. https://doi.org/10.1186/1478-7547-4-6

Somashekhar, S., Kumarc, R., Rauthan, A., Arun, K., Patil, P., Ramya, Y., 2017. Abstract S6-07: Double blinded validation study to assess performance of IBM artificial intelligence platform, Watson for oncology in comparison with Manipal multidisciplinary tumour board – First study of 638 breast cancer cases. Cancer Research 77, S6-07. https://doi.org/10.1158/1538-7445.SABCS16-S6-07

Sunita Nadhamuni, Oommen John, Mallari Kulkarni, Eshan Nanda, Sethuraman Venkatraman, Devesh Varma, Satchit Balsari, Nachiket Gudi, Shantidev Samantaray, Haritha Reddy, Vikas Sheel, 2021. Driving digital transformation of comprehensive primary health services at scale in India: an enterprise architecture framework. BMJ Global Health 6, e005242. https://doi.org/10.1136/bmjgh-2021-005242

Tang, N., Fujimoto, J., Karliner, L., 2014. Evaluation of a Primary Care-Based Post-Discharge Phone Call Program: Keeping the Primary Care Practice at the Center of Post-hospitalization Care Transition. Journal of General Internal Medicine 29, 1513–1518. https://doi.org/10.1007/s11606-014-2942-6

the Precise4Q consortium, Amann, J., Blasimme, A., Vayena, E., Frey, D., Madai, V.I., 2020. Explainability for artificial intelligence in healthcare: a multidisciplinary perspective. BMC Med Inform Decis Mak 20, 310. https://doi.org/10.1186/s12911-020-01332-6

Toscan, J., Mairs, K., Hinton, S., Stolee, P., 2012. Integrated transitional care: patient, informal caregiver and health care provider perspectives on care transitions for older persons with hip fracture. Int J Integr Care 12. https://doi.org/10.5334/ijic.797

van der Weijden, T., Légaré, F., Boivin, A., Burgers, J.S., van Veenendaal, H., Stiggelbout, A.M., Faber, M., Elwyn, G., 2010. How to integrate individual patient values and preferences in clinical practice guidelines? A research protocol. Implementation Sci 5, 10. https://doi.org/10.1186/1748-5908-5-10

Van Houdt, S., Heyrman, J., Vanhaecht, K., Sermeus, W., De Lepeleire, J., 2013. Care pathways across the primary-hospital care continuum: using the multi-level framework in explaining care coordination. BMC Health Serv Res 13, 296. https://doi.org/10.1186/1472-6963-13-296

Vedel, I., Monette, M., Beland, F., Monette, J., Bergman, H., 2011. Ten years of integrated care: backwards and forwards. The case of the province of Québec, Canada. Int J Integr Care 11. https://doi.org/10.5334/ijic.574

Volpp, K.G., Mohta, N.S., 2016. Patient engagement survey: improved engagement leads to better outcomes, but better tools are needed. NEJM Catalyst 2.

Yousef Shaheen, M., 2021. Applications of Artificial Intelligence (AI) in healthcare: A review. https://doi.org/10.14293/S2199-1006.1.SOR-.PPVRY8K.v1

Zang, Y., Zhang, F., Di, C., Zhu, D., 2015. Advances of flexible pressure sensors toward artificial intelligence and health care applications. Mater. Horiz. 2, 140–156. https://doi.org/10.1039/C4MH00147H