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Patient Experience and Satisfaction

Evolving Landscape of Healthcare

Edited by Hatice Esen Koç, Nazife Öztürk and Maija Huttunen-Lenz



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Meet the editors



Hatice Esen Koç has been employed in the healthcare sector for more than two decades. During that time, she has completed a master's degree in internal nursing, a doctorate in healthcare management, and an associate professorship in Healthcare Institutions Management. Her professional experience encompasses roles in pulmonology, nephrology, endocrinology, diabetes education, quality management, directorship, and expertise in public hospital organisations. A variety of original research articles have been published in SSCI, SCI, and national journals. She has participated as a researcher or manager on numerous projects and currently works in the R&D department at Antalya Training and Research Hospital.



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Preface

The healthcare landscape is undergoing a significant transformation, shifting from a volume-based paradigm to a value-based model where the quality of care and patient outcomes are paramount. Central to this evolution is the recognition that the patient is not merely a recipient of care, but an active partner in the healing process. *Patient Experience and Satisfaction – Evolving Landscape of Healthcare* explores this critical dimension, offering a comprehensive examination of how healthcare systems can adapt to meet the complex needs and expectations of modern society.

Patient experience is a multidimensional construct that encompasses the entire continuum of care, from the initial appointment to discharge and follow-up. It is distinct from, yet intrinsically linked to, patient satisfaction. While satisfaction often reflects a subjective evaluation of services, patient experience is grounded in the tangible interactions between patients and the healthcare ecosystem. Contemporary literature increasingly focuses on the positive patient experiences, which are strongly correlated with improved clinical outcomes, higher adherence to treatment plans, and a robust safety culture within healthcare institutions.

This edited volume serves as a vital resource for clinicians, hospital administrators, researchers, and policymakers. It bridges the gap between theoretical frameworks and practical application, providing evidence-based strategies to enhance the delivery of care. The chapters collected herein address various facets of the patient journey, analysing the impact of communication, organisational culture, and digital innovation on the overall quality of healthcare services.

By integrating diverse perspectives and interdisciplinary research, this book emphasises that enhancing patient experience is not merely a metric to be managed, but a fundamental ethical and professional obligation. It calls for a systemic commitment to empathy, transparency, and patient-centred design in every aspect of hospital management.

We want to express our sincere gratitude to all the contributing authors for their scholarly dedication and valuable insights. We also thank the reviewers for their constructive feedback, which has significantly enhanced the scientific rigour of this work. Finally, we acknowledge the support of the IntechOpen editorial team for their guidance throughout the publication process.

We hope this volume will inspire further research and dialogue, ultimately contributing to a healthcare environment where every patient feels heard, respected, and well cared for.

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Chapter 1

Introductory Chapter: Nursing Research, Practice and Education

Maija Huttunen-Lenz

1. Introduction: Nursing – Views from research and practice

1.1 Nursing in a constantly changing healthcare landscape

As population needs and disease patterns continue to change and evolve over time, nursing practice must also adapt and transform in order to effectively meet these shifting healthcare and population requirements [1, 2]. In many countries around the world, there has been a notable shift in disease patterns, moving away from primarily acute diseases towards a growing prevalence of chronic, non-communicable diseases. One prominent example is type 2 diabetes, which is now increasingly recognised and regarded as a significant public health emergency [3–6]. In regions such as Europe, demographic changes have also resulted in a substantial increase in the proportion of older adults within the population, thereby requiring healthcare systems to adapt and respond to these new demographic realities [7, 8].

Although these changing demographic and disease patterns are likely to present significant and complex challenges to healthcare systems worldwide, one of the most pressing issues is the ongoing shortage of nursing professionals. This shortage is widely seen as one of the factors that can hinder or slow down the necessary transformations within healthcare systems [9, 10]. In addition, rapid technological advancements in the treatment and care of individuals are expected to introduce a range of financial, security, policy, and ethical challenges, likely affecting the nursing practice [11]. As healthcare systems continue to evolve in response to these challenges and the changing needs of populations, there is a growing need for collaborative interprofessional working practices and the development of innovative policies. Such approaches are essential for identifying and implementing effective solutions [10, 11].

As one of the largest and most essential groups of healthcare professionals worldwide, nurses are not immune to the challenges associated with adapting to evolving population needs [7, 9]. Even though the global number of nurses is on the rise, significant inequalities persist in terms of the population's access to nursing care [7]. Despite these regional differences in access, nurses continue to provide care to individuals and communities across a wide variety of settings. Therefore, it is crucial that nurses possess a broad, evidence-based set of skills that underpin their practice and enable them to deliver high-quality care [12–14]. Nurses are increasingly expected to take on a diverse range of roles, which may

include direct patient care, public education, and active participation in multidisciplinary teams (e.g., [15]).

1.2 Research and education in supporting nurses in navigating to the changing healthcare landscape

Evidence-based practice serves as a valuable tool that can support nurses in making informed decisions and driving quality improvement across different healthcare settings and situations [13]. Research plays a crucial and foundational role in advancing evidence-based practice, while nursing education is essential for disseminating research evidence and best practices to nurses in the field [7, 16, 17]. Nurse educators, in particular, play a vital role in applying new knowledge and skills within nursing education, thereby assisting the profession in adapting to the ever-changing healthcare environment [7, 16–18]. This book critically examines the field of nursing research and places a strong emphasis on how both research and education underpin the provision of high-quality care across diverse populations.

In 1860, Florence Nightingale, who is often regarded as the founder of modern nursing, asserted that, at its core, the role of nursing is to alter and improve the environment in order to promote health and support the healing process. As a result, when modern nursing was first emerging, health promotion and disease prevention were key themes that formed the foundation of its holistic approach [19]. Contemporary definitions provided by the International Council of Nurses for the terms "Nurse" and "Nursing" highlight the profession as one that is grounded in a unique combination of scientific knowledge, technical skills, ethical principles, and therapeutic relationships with individuals who require nursing care [20]. In today's understanding, nursing requires a strong foundation of science-based knowledge in order to provide health and care services to populations across the entire lifespan [20]. Furthermore, nurses are expected to continuously build and maintain their capacities and skills through ongoing professional development, which encompasses research, education, and the consideration of best practices [20].

2. What can be found in this book

As emphasised by the International Council of Nurses, research in nursing is a fundamental and indispensable element in the ongoing advancement of nursing practice [20]. This book seeks to make a small but meaningful contribution to the continued development of nursing practice by highlighting themes relevant to evidence-based practice, including technological innovation, research on nursing education and practice, and valuable insights from real-world practice. Taken together, the chapters highlight the need for interdisciplinary working practices in nursing and how research can identify challenges and potential solutions to the identified problems. Finally, the chapters emphasise the diversity of roles that nurses can work and thus support individuals across their lifespan.

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Chapter 2

Recording of Nursing Care: Perceptions of Learner Nurses at a University in Limpopo Province, South Africa

Takalani Edith Mutshatshi, Ledile Edith Manamela and Gsakani Olivia Sumbane

Abstract

Nursing care recording is an essential part of patient care; however, recording of nursing care activities is usually incomplete in clinical practice. Learner nurses at a University in Limpopo perceive recording of nursing care as having some challenges. Learner nurses attend practicals at the clinics and hospitals to equip them with practical experience in nursing care recording. Students have the responsibility to ensure that they attend the entire practical to gain experience with the recording of nursing care during the practical. The study aimed to determine the perceptions of learner nurses towards the recording of nursing care in clinical areas of the Capricorn district, Limpopo Province. To explore and describe the perceptions of learner nurses towards the recording of nursing care in clinical areas of the Capricorn district, Limpopo Province. A qualitative, explorative, descriptive, and contextual research design will be used in the study. A non-probability purposive sampling method will be used in this study. Data will be collected through semi-structured interviews, using an interview guide. Data will be analyzed using Tesch's coding method, where themes and subthemes will be developed. The study findings revealed that challenges experienced by learner nurses during the recording of nursing care include inadequate stationery, a shortage of staff, and inadequate supervision of learner nurses. The study recommends in-service training on recording nursing care for nurses supervising learner nurses. Operational managers should ensure that nursing records are audited regularly to assist learner nurses in correcting errors.

Keywords: learner nurse, perception, nurse, nursing care, recording

1. Introduction

Nursing care recording plays a major role in patient care; however, recording of such nursing care activities is usually left incomplete in clinical practice [1]. Recording is an essential component of nursing practice, as it assists in improving the quality of nursing care and further promotes nursing professional standards.

Furthermore, recording allows nurses and other healthcare providers to communicate about the care rendered to patients, thereby promoting continuity of care [2]. Recording of nursing care that is not clear and accurate hinders interprofessional communication and results in a lack of optimal care, hence poor patient satisfaction and patient safety [3].

Globally, nurses are faced with challenges of ensuring that the care they have given to patients is accurately recorded in the patient's file, and such sub-standard recording practices are usually associated with unnecessary prolonged hospital stay for patients [4]. From the learner's perspective worldwide, the clinical environment has been described as non-supportive because of organizational deficiencies, a lack of relationship between learner nurses and instructors, which negatively affects their learning of nursing care recording [5]. Learner nurses have also described barriers to learning arising from instructors' lack of engagement and feedback after recording the nursing care, where they are not always involved personally, and/or not easy to reach. This results in learner nurses discovering that theory and practice are not clearly intergrated, leading to further supervision challenges and thus affecting student learning of the importance of recording in nursing practice [5].

In Africa, nurses viewed nursing recording as an important practice towards patient care, though the act of recording remains problematic due to a lack of pre- and post-service training, a lack of resources, a lack of comprehensive nursing education, a lack of time, and overcrowded hospital wards [6]. A study conducted in Tanzania [7] outlines that improvement of patient care in any hospital depends primarily on the nursing care documentation practices; thus, recording of nursing care is enhanced by the implementation of the nursing process approach, which could improve the quality of nursing care. Documentation is an important practice that has restraints limiting its implementation [8]. The findings of a study Harmini et al. [9] recommended that the initiation of nursing process training has the potential to improve effectiveness in prompting the documentation of the nursing process and that the training needs to be continuous, not just a once-off activity.

The improvement of patient care in any hospital depends primarily on the quality of nursing care and the documentation provided in the nursing records that are accurate, correct, and contain all the patient's details [10]. A study conducted in Indonesia concluded that intermittent supervision and the presence of new technology in terms of documentation can improve the quality of nursing recording [11]. Increasing knowledge, motivation, and supervision on recording is a necessity to protect both nurses and patients, as supervision activities are the tools to evaluate the nursing process and ensure continuity of care [12]. Recording of nursing care rendered to patients is a critical part of any nurse's work, as the old age goes, "if it is not recorded, it is not completed." What is written serves as a proof of what has been done, as well as giving an interested party an indication of the patient's medical condition [13]. The study aimed to determine the perceptions of learner nurses towards the recording of nursing care in clinical areas of the Capricorn district, Limpopo Province.

2. Clarification of the key concepts

The key concepts that are in use in this chapter are clarified in detail below to increase understanding of the aspects, and these include learner nurse, perception, nurse, nursing care, recording, and clinical area.

2.1 Learner nurse

A learner nurse is a person undergoing education and training in nursing and must be registered with the South African Nursing Council [14]. In this study, a learner nurse is a student registered with the Department of Nursing Science at a University in Limpopo Province regarding their perceptions during the recording of nursing care in clinical health care institutions.

2.2 Perception

Perception is the way in which we become aware of objects or events by using our senses [15]. In this study, it is defined as the learner nurses' understanding and interpretation of the recording of nursing care.

2.3 Nurse

A nurse is a person registered with the South African Nursing Council (SANC) under Section 31(1) in a category to practice nursing and midwifery [14]. In this study, a "nurse" refers to a trained personnel employed in a hospital who is responsible for rendering and documenting the nursing care given to patients throughout their hospital stay.

2.4 Nursing care

Nursing care is the arrangement and performance of nursing actions carried out when rendering patient care, which includes admission and discharge processes, the giving of treatment, carrying out doctors' orders, and interacting with the doctors on patients' wellbeing [16]. In this study, "nursing care" refers to all health care activities that will be rendered to patients to improve their quality of life when they are admitted to the health care institutions.

2.5 Clinical area

A clinical area, according to SANC practice standards, is any practice setting that is in a hospital or community [14]. In this study, a clinical area is any hospital or any community clinic where learner nurses are allocated for clinical learning.

2.6 Recording

Recording is the procedure of entering information on a patient's file to ensure patient safety [17]. Recording is explained as all written information concerning health care services rendered to patients [15]. Nursing recording is the writing down of all nursing care activities that were performed on the patient in the order of their performance [18]. In this study, "recording" refers to all written documents relating to all nursing care activities rendered to patients by nurses from admission until discharge, the period of admission in the hospital ward until discharge.

3. Research methodology

3.1 Research approach and design

The study followed a qualitative, explorative and descriptive design to collect data from learner nurses on their perception to recording of nursing care and the approach allowed the researcher instead of focusing on a single concept, qualitative study approach allowed the researcher to consider events fully and allowed the researcher to get in-depth information about the topic under study [19]. The study implemented a qualitative, explorative, descriptive, and contextual research design to explore and describe the perceptions of learner nurses regarding the recording of nursing care. This is a research approach that gathers and works with non-numerical data to translate context and better understand social life through the study of specific populations or locations.

3.2 Population, sampling, and sample size

All learner nurses registered in the Department of Nursing Science at a University in Limpopo province for the academic year 2021 constituted the study population of the study, a total of 283 learner nurses. The target population in this study consisted of all registered second to fourth level learner nurses. The accessible population in this study included the second, third, and fourth level registered learner nurses from a university in Limpopo who are enrolled in nursing science in the clinical area. The sampling of participants followed a non-probability purposive and heterogeneous sampling approach, where there was a prearranged inclusion criterion in place. The sample size was obtained when no new data emerged from participants; hence, data saturation was achieved at the twelfth participant.

3.3 Data collection and analysis

Data were collected using a semi-structured one-to-one interview, with the use of an interview guide, until data saturation at participant 12. The interview guide had a series of questions, see attached **Table 1**.

The interviews were triangulated by using an audiotape and field notes to capture the nonverbal cues, and permission was requested from participants, which was granted. The participants were asked a series of questions from the interview guide, and this was followed by probing questions based on the response of participants. The interviews lasted for about 25 to 35 minutes, and all the audio data were transcribed verbatim. Data were analyzed using Tesch's open coding method, which includes the following steps: reading the transcript, choosing a transcript, developing topics,

Interview Guide
Research question
• How do you perceive the recording of nursing care that you rendered to the patient in the clinical area?
• What are the challenges that you experience in recording of nursing care rendered to patients?
• What do you think contributes to those challenges?
• What suggestions can you give that could improve the recording of nursing care rendered to patients?

Table 1.
Interview guide.

coding, developing categories from coding, making the final decision, assembling data material, and re-coding of data, and then the themes and sub-themes emerged [20]. To ensure the trustworthiness of the study, the researcher agreed with the independent coder during analysis on the identified themes.

4. Results

Table 2 below represents the themes and sub-themes that originate from data analysis of the study.

Themes	Sub-themes
4.1. Challenges experienced by learner nurses during the recording of nursing care	4.1.1. Inadequate stationery to record the nursing care 4.1.2. Recording of nursing care in advance before the actual time 4.1.3. Shortage of staff in the wards 4.1.4. Inadequate recording and supervision of learner nurses
4.2. Suggestions to improve the recording of nursing care	4.2.1. Provision of adequate staff to supervise learner nurses on the recording of nursing care 4.2.2. Continuous auditing of patients' records 4.2.3. Provision of in-service training that includes learner nurses on the recording of nursing care. 4.2.4. Provision of adequate stationery

Table 2.
Themes and sub-themes.

4.1 Challenges experienced by learner nurses during the recording of nursing care

The study findings revealed that there are challenges experienced by learner nurses during the recording of nursing care. The following sub-themes were identified: inadequate stationery to record the nursing care, recording of nursing care records in advance before the actual time, shortage of staff in the wards, leading to increased work overload, inadequate recording of nursing actions in the nursing care records, and inadequate supervision of learner nurses.

4.1.1 Inadequate stationery to record the nursing care

This study indicates that there is inadequate stationery to record the nursing care, such as the progress report and implementation charts, which affects the recording of nursing care in a negative way. It occurs when there is poor budgeting from the operational manager. Inadequate stationery to record the nursing care was confirmed by the following participants.

Participant 1:" *ok, the challenges that I've experienced is that there is no adequate stationery for example, a correct chart to record on when you want to record the progress report of the patient, and there is no progress report form, and we improvise by using a wrong chart, like an implementation form.*"

Participant 3: "*Another challenge is the shortage of stationery, whereby we end up being limited to record only certain information and omit the rest of the information to save the stationery.*"

4.1.2 Recording of nursing care in advance before the actual time

The findings of this study revealed that one of the challenges experienced with the recording of nursing care is that nurses in the clinical areas record the patients' records in advance before implementing the care and procedures. These were supported by the following participants:

Participant 3: "*Yes, sometimes the ward is short-staffed, so the nurse when writing the morning report, she or he even writes the day report, such as medication given as prescribed, while the medication is to be given at 14h00.*"

Participant 6: "*At the hospital, the nurses record patient care beforehand and expect us to do the same, and around 11 AM, we are expected to write the morning report for around 6 PM.*"

Participant 11: "*Most of the challenges that we face in the clinical area is inappropriate recording. For example, when the health care workers record the procedures, or anything that they haven't yet done to the patient.*"

4.1.3 Shortage of staff in the wards

The findings of the study revealed that there is a shortage of staff in the clinical areas, which affects the recording of nursing care not done correctly. This occurs when there is a large number of patients under the care of a limited staff. The findings of the shortage of staff are confirmed by the following participants:

Participant 2: The *other challenge may be a shortage of staff, whereby in a day you find that you are admitting many patients and you do not get enough time to record the care rendered to the patients.*"

Participant 5: "*I think due to lack of staff or eh, if the patients are many in the ward we find it difficult to record, sometimes when you do a procedure, then you forget to record it and you move to the next patient without recording.*"

Participant 8: *"the challenge I'm experiencing is the sister not being able to record the procedures done to the patient due to too much workload and also due to the shortage of staff you find that there is too many admissions.*"

4.1.4 Inadequate supervision of learner nurses

Inadequate supervision of learner nurses has been found to contribute to challenges experienced by the learner nurses when recording the nursing care in the clinical areas. This occurs when the nurses are too busy or lazy to supervise the students in the clinical areas. This is supported by the following participants:

Participant 1: "*ok, the other thing regarding the challenges, like at times the registered nurses do not find it valuable for them to supervise us, like maybe if I record, they do not countersign us.*"

Participant 12: "*The other thing is a recording for critically ill patients, the nurses do not like to counter-sign for us, and do supervision so I feel like I'm insecure if something happens to the patient.*"

4.2 Suggestions to improve the recording of nursing care

The study yielded the following suggestions that can improve the recording of nursing care, which include adequate supervision of nursing students on recording of nursing care, employment of more staff to supervise learner nurses, provision of

in-service training that includes learner nurses on recording of nursing care, continuous auditing of patients' records, and provision of adequate stationery.

4.2.1 Provision of adequate staff to supervise learner nurses on the recording of nursing care

This study has revealed that adequate staff to supervise of learner nurses in the clinical areas is important to improve the recording of nursing care. Supervision promotes confidence and independence in student nurses in the clinical area, and as a result, records by student nurses become complete. Employment of more staff reduces work overload, enabling nurses to do their work without omitting any recordings. This is supported by the following participants.

Participant 8: "*Adequate staff and proper supervision whereby the sister supervises all her subordinates, the procedures done to the patient and is recorded*."

Participant 2: "*There should be enough supervisors who must supervise what the student nurses have recorded in the nursing records and correct where possible.*"

Participant 3:"*the department can provide enough nurses so that every care rendered to the patient will be recorded in the nursing care and at the right time.*"

4.2.2 Continuous auditing of patients' records

From the study conducted, it has been revealed that continuous auditing of patients' records ensures that the right channels of recording, together with the principles of recording, are followed. This is supported by the following participants.

Participant 1: "*I think the policies will encourage the nurses to do their work because there will be people coming to audit the files frequently.*".

Participant 4: The *recommendations could be that eish, as health care staff we should do file auditing so that we can check the gaps on the patients' records to improve the way they record*."

Participant 9: We *can also delegate someone who will audit the files to ensure that the nursing recording is well done. ".*

4.2.3 Provision of in-service training that includes learner nurses on the recording of nursing care

The study findings recommend continuous in-service training of nurses. In-service training helps nurses to constantly remember the principles to follow when recording the nursing care. This study is supported by the following direct quotes:

Participant 2: "*In-service training whereby all nurses are encouraged or taught how to record the nursing care. In the morning, we can have a meeting to share how to properly record the nursing care.*

Participant 6: "*I think they should have an in-service on how to audit recording of patient's file, and then every health personnel that touches that patient's file.*"

4.2.4 Provision of adequate stationery

From the study conducted, it has been revealed that the provision of adequate stationery improves the recording of nursing care by helping nurses to have access to charts, such as progress reports, when needed. This is supported by the following participants.

Participant 1: "*Provision of adequate stationery in the ward will help with recording of nursing care, and developing policies could also help*."

Participant 3: "*The only thing that can improve it is if we have enough stationery whereby we are able to record every detail of the care provided to the patients.*"

4.3 Discussion of findings

The findings of this study regarding the challenges experienced by learner nurses during the recording of nursing care. The findings of this study concur with those of a study conducted by Daire and Gilson [21], which implies that nurses have difficulty recording planned interventions to meet the objectives. Furthermore, Daire and Gilson [21] indicated that the lack of recording presents a challenge to nurses, and this lack of supplies and recording resources provides a major impediment for nurses to provide high-quality patient care and adhere to record-keeping practices. A study conducted by Mutshatshi et al. [22] recommends the supply of adequate recording materials to improve record-keeping challenges and that comprehensive record-keeping is essential in public hospitals to improve patient care. The study conducted by Marutha and Ngoepe [23] commends the introduction of an electronic records management system that can assist and provide access to a full patient record and easily follow paper records, regardless of the location.

The findings of this study regarding incomplete records are supported by the study conducted by Marinic [24], which states that inadequate, incomplete, or misleading nursing records not only jeopardize patient care but also expose nurses to legal claims arising from the breakdown in communication caused by inadequate, incomplete, or false records. A nurse is required by the South African Nursing Council Rules and regulations [25] relating to Acts and Omissions to keep clear, complete, and accurate records of all nursing activities performed on the patient, and failure to do so constitutes professional misconduct for which the SANC may take disciplinary action against the nurse [24]. Incompleteness, erroneousness, and inconsistency are common mistakes in medical records, which require implementing policies to enhance the quality of recording. Making steps towards electronic recording and regulating the process can improve the errors and deficiencies [26].

The findings of this shortage of staff are supported by a study conducted by Mahony, et al. [27], which states that many factors contribute to this, including a lack of manpower and a negative attitude among nursing staff towards recording; nurses believe they spend too much time on manual recording, resulting in incomplete records, necessitating the hiring of additional staff [27]. The findings of a study Milensky et al., and Ross [28, 29] concluded that there are shortages of nursing staff, and thus, nurse staffing shortages are placing patients in danger and recommend approaches to addressing nursing shortages in acute care.

Nurses demonstrate poor recording because of work overload [30], and nurses face severe impediments to documenting due to mismatches between staffing resources and workload. According to the study, when nurses are overworked, they are more likely to have low morale and use ineffective work methods, such as poor documentation, which puts a strain on the quality of care they provide to patients. Aserati et al. [30] concur with the findings of the study, stating that nurses struggle to cope with the recording of patient information on the numerous records used in health institutions, resulting in incomplete information written on patient records. The overview highlights of a study conducted alluded to the fact that nursing shortages have reached a serious point for healthcare services on both the local and global

levels, negatively impacting on quality of patient care [31]. Similar findings were reported in a study conducted by Marc et al. [32], where heavy workloads, high inpatient admissions, and a shortage of nursing staff were viewed as barriers to quality nursing care recording.

The following findings on supervision of nursing students is congruent to the findings of the study conducted by Nkoane [33], who found that nurse supervisors are important for nursing students' learning during clinical placement. Furthermore, challenges are inherent for nurses to supply supervision alongside their daily patient care activities, and the standard of the supervision depends on the nurse's competence in supervising nursing students' learning processes [33]. A good learning environment for students in clinical placements is dependent on where staff pay attention to the supervision of students and are easy to approach. Furthermore, the study also indicates that supervision based on peer learning can be more satisfying for students, leading to the promotion of knowledge, skills, self-awareness, creativity, and invention during the recording of nursing care [34].

The suggestion on employment of more staff to improve recording of nursing care is supported by a study conducted by other studies, which indicate that adequate numbers of well-trained nurses working in critical care areas can reduce the risk of patient mortality as the number of nurses has an impact on how patients receive the quality of health care [35]. Adequate nurse staffing level is linked to team composition, which improves recording of nursing care, as workload also reduces the ability of the on-duty nurses to adequately and properly record [36]. Staff shortage directly influences patients' increased risk of medical errors and adverse events and increases the risk of mortality and morbidity [37].

The finding on the recommendation of continuous in-service training to all staff is supported by the study done by the American Nurses Association and National Staff Development [38], which revealed that in-service training is a set of systematic professional learning experiences designed to broaden nurses' knowledge, skills, and attributes and thus improves their contributions to high-quality health care. Furthermore, in-service training enables nurse executives, nurse managers, and nurses already in the field to take on a variety of tasks, including recording of nursing care [39]. The continuous in-service training of nurses, especially in the recording of nursing care, is an inevitable requirement to achieve quality patient care in health care institutions [39]. The findings are also congruent with those of a study conducted by Mutshatshi, Mothiba, and Malema [40] which recommended that continuous in-service training is essential to improve the knowledge and skills of nurses in caring for their patients and that nurses should be included in doing needs assessment of their training needs before such in-service training is conducted to ensure they meet the needs of the nurses. The main recommendations based on the issue of staff in-service training are that management should support in-service training programmes and that a distinct training committee, which includes management and nurses, should be advocated to improve the in-service training on nurses' day to day recording of the nursing care [41].

The study outlined the need for the provision of adequate material resources to improve the recording of nursing care. The findings are congruent with those of a study conducted by Mahmoud and Bayoumy [42], which states that nurses need charts for effective recording of nursing care at a hospital; therefore, the provision of charts helps nurses to record more effectively the services rendered to patients. Another study conducted in Limpopo province, South Africa, also indicated that there is a shortage of material resources such as stationery to record nursing care

given to the patients, and this affected the continuity of care in terms of records as a means of communication within the multidisciplinary team [21]. Another study conducted by Abdelghany et al. [43] also revealed a challenge of nursing recording notes of patients and especially in intensive care units, which hinders quality patient care.

4.4 Limitations of the study

The study was limited to the selected university in Limpopo province, South Africa. The findings of this study can therefore not be generalized to other universities in the province and even to other universities in South Africa. Other learner nurses from different universities and colleges could have possibly generated different views and experiences in terms of recording of patient care in health care institutions where they are exposed for their experiential learning.

4.5 Implications for policy, nursing practice, and nursing education

The findings of the current study may benefit the following:

- *Policymakers*

  The findings may inform policymakers on the need to develop effective policies and procedures to enhance the effective recording of patient care in health care institutions to ensure quality patient care is achieved. Furthermore, the study findings may assist health care managers in case such policies and procedures are available, strengthen their implementation, and where a need exists, the review of such can be undertaken to meet the identified challenges.

- *Nursing practice*

  The findings of the study may assist nursing practice in reshaping patient care strategies in terms of clear and accurate recording of nursing care to meet the quality patient care standards that is aligned with the legal and regulatory standards to improve service delivery. Furthermore, the findings may promote and enhance continuous in-service training of staff on the importance of adhering to record-keeping principles in nursing practice, bearing in mind that in nursing practice, "what is not recorded has not been done."

- *Nursing education and training*

  The findings may inform nursing education institutions to be practical and strategic in their planning to reinforce good record-keeping practice during learner nurses' training, so this can be kept throughout a nurse's professional life. Nurse education institutions may improve learner nurses' teaching and learning by ensuring the recording of nursing core be enforced from the beginning of student training and throughout the training period in all nursing training programmes.

4.6 Recommendations for future research

The study findings may prompt and stimulate other researchers to explore more on factors and or barriers contributing to poor record keeping and the impact these

have on quality patient care. The study recommends that other researchers further explore the impact of poor recording of nursing care and its financial implications on the health care delivery system.

5. Conclusions

The chapter is a research publication focusing on learner nurses' perceptions of recording of nursing care at a university in Limpopo province, South Africa. Recording of nursing care remains a major challenge in health care institutions requiring intensive intervention through a multidisciplinary team approach. There needs to be strict measures in place to improve the recording of nursing care, as records serve as a means of communication within the multidisciplinary team to promote continuity of care. Further, records serve as legal documents during litigation in the court of law to protect the institution. This chapter presented the introduction, the clarification of key concepts used in the chapter, the methodology used, which included the research approach, the design, the population, sampling, and sample size, the data collection process, and data analysis methods. Furthermore, the presentation, interpretation supported by direct quotes, and discussion of the findings on the experiences of learner nurses on recording of nursing care were discussed in detail. Challenges such as a lack of material resources, with inadequate stationery to record the nursing care, recording of nursing care in advance before the actual time, a shortage of staff in the wards, and inadequate recording and supervision of learner nurses. The study recommended the provision of both human and material resources, provision of continuous in-service training on record keeping, and continuous auditing of the records as possible means to address the challenges with the recording of nursing care in health care institutions.

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Conflict of interest

The authors declare no conflict of interest.

Ethical approval

The study received ethical clearance from the Turfloop Research Ethics Committee (TREC/164/2021:UG).

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Chapter 3

Exploration of Challenges Experienced by Mothers with Children Admitted to Selected Public Hospitals in Limpopo Province, South Africa

Takalani Edith Mutshatshi and Mamare Adelaid Bopape

Abstract

Admission of a child to a hospital setting poses one of the greatest challenges to the family. The admission brings along family disorganization and emotional stress as the family tries to cope with the stress due to the hospitalized child and the fears associated with the admitted child's life. Implementing a family-centered nursing care approach enhances the inclusion of the family in the care and treatment of the sick child. The family-centered approach is an effective strategy for alleviating challenges inherent when children are admitted to the hospital, ensuring that quality child care is achieved. The study objectives were to explore and describe the challenges experienced by mothers with children admitted to selected public hospitals in South Africa. A qualitative, explorative, and descriptive research design was used. A non-probability purposive sampling method was used, and data were collected through interviews using an interview guide until data saturation was reached. Data were analyzed using Tesch's open coding. The findings revealed challenges related to the lack of implementation of family-centered care (FCC), which included inadequate information sharing about children's conditions, limited access to hot water supplies for mothers, negative attitudes among staff toward family involvement in their children's care, and a shortage of medicines not communicated to mothers. Furthermore, findings include family-centered care intervention strategies to alleviate challenges, which include in-service training for nurses on family-centered care during children's admission to the hospital, inclusion of family in the care of admitted children, and provision of baby-friendly wards that accommodate family during children's care when admitted to the hospital.

Keywords: exploration, challenges, children, mother, public hospitals

1. Introduction

Globally, the process of illness and admission of a child to a hospital remains a major challenge to both the family and the admitted child. The child's entry into a

completely unfamiliar environment with strange individuals, subjected to a new routine and a lot of therapeutic devices not known to them, causes an undesirable feeling of stress to the family [1]. The admission of a child in a hospital setting has always been a challenge for mothers, who consistently experience the feeling of separation and anxiety [2]. Mothers experienced this separation, self-blame, and different emotional alterations more acutely because children were usually hospitalized without their mothers, which, in turn, has led to a family-centered approach to childcare.

The nurses should be aware that family-centered care is a good and needed approach for delivering care to children [3]. However, hospitalization of a child has impacts not only on the child's life but also on the family, suggesting the need for support, consideration, guidance, and continuing care for the support person, such as the mother, since she is closely accompanying the child and suffers the most emotional side effects of the hospital stay. Furthermore, illness and hospitalization are regularly serious events in the child's life, and their stress can affect all family members [4]. Involvement in the care of hospitalized children can affect the well-being of parents, especially mothers who stay with their children while hospitalized. Furthermore, an increase in parental anxiety levels during child hospitalization impacts the parents' functioning in caring for the child, with the potential to stress the sick child [5].

Currently, many countries have adopted a family-centered care approach, where mothers stay at the child's bedside for the full time of hospitalization, participating in the process of taking care of the child [6]. Despite mothers being admitted with their children in the hospital to accommodate baby-friendly principles and family-centered care, mothers remain traumatized during the care of their admitted children. A study conducted in Europe revealed that challenges of mother lodgers are associated with a lack of information on diseases and medical and nursing procedures to be performed for their sick children [7]. In the United States of America (USA), there is a different version, where mothers with children admitted to hospitals stated they have fewer challenges in terms of their interactions with health professionals. Furthermore, the mother revealed their view on how they were treated by the health care team, with no complaints from the team during their difficult stay as buddies of their hospitalized child. Usually, the parents and health care teams may differ initially about the care of the child; however, they usually agree as each of them becomes aware of the long-term predictions becoming obvious [8, 9].

Another study finding in Asia alluded to the fact that mothers with children admitted to the hospital suffer stress and anxiety caused by the obligatory treatments, unfamiliarity with hospital rules and regulations, less collaboration with health professionals, and fear of asking questions [10]. A study conducted in Ghana indicated that the challenges that increase mothers' stress include financial constraints on the cost of drugs and inadequate and crowded environments, making them so anxious and worried about their children's condition, and more often, mothers become ill, especially as the length of stay increases [11]. In South Africa (RSA), mothers with admitted children also unceasingly faced frustration as they had to comply with medical and nursing treatments provided to their admitted sick children due to poor interaction with the multidisciplinary health care professionals, leading to trauma and witnessing their children being attended to with unfamiliar medical equipment [12].

Family-centered care is an important approach to child health care that is deferential and responsive and aligns with the needs of individualized families' needs, ethics, and moral values [13]. Family-centered care is profoundly rooted in the ideology that the best health care results are achieved when patients' family members contribute to care and involvement in high-level medical decisions; thus, it plays an active role

in providing emotional, social, and developmental support. The family serves as the child's primary source of strength and support; hence, children and their families are regarded as essential associates within the health care team [14]. Family-centered care was announced to reduce maternal anxiety by allowing mothers to stay with their admitted children; however, new challenges arose for mothers as they stayed with their sick children in the hospital, like their being potential agents to spread infections through overcrowding. Furthermore, another ideology among some medical professionals felt there is no need for mothers to stay with their sick children, with the rationale that they are reducing infections that might come with overcrowding [15].

Currently, health care institutions are reaching a more improved support and integrating the family as an essential part in the care of the newborn child and, in turn, including them as key caregivers from birth. Furthermore, other health care professionals believed family-centered care may inspire parents to disclose their concerns easily, which can be advantageous for the identification of possible problems, such as stress and constant anxiety that mothers might experience during their child's stay in a hospital [16]. To reduce the challenges that mothers faced when their children were admitted to a hospital setting, the family-centered care (FCC) approach was then introduced by Sir James in 1920 [17]. It is along this background that the study sought to address the need for family-centered care in the care of children admitted to the hospital.

2. Clarification of the key concepts used in the research

This section covers the clarification of the key concepts that have been used in the chapter to ensure understanding, and a detailed explanation is provided below.

2.1 Challenges

A challenge is regarded as a very difficult situation with a variety of conditions or circumstances at a given time [18]. In this study, challenges are those problems experienced by mothers staying with sick children admitted to the hospital.

2.2 Exploration

Exploration refers to the investigation and examination or searching into something to discover more about a particular thing [19]. In this study, exploration refers to the in-depth investigation of the challenges experienced by mothers with children admitted to the hospital.

2.3 Children

Children, according to the Children's Act, Act No. 38, 2005 [20], are defined as young people below the age of 18. In this study, it refers to any young child between the ages of 1 day and 12 years who is staying with the mother while admitted to the public hospitals.

2.4 Mother

Mother refers to a woman who is kept in the hospital waiting for her children, who are still admitted and being discharged from the hospital [21]. In this study, a mother is a woman who is staying with the admitted child for the full period of admission in the hospital.

2.5 Public hospital

A public hospital is any hospital that is sponsored and managed by the Department of Health, where patients pay a stated amount of money to receive services [22]. In this study, a public hospital is any hospital that offers services that benefit all people of the country and is supported and financed by the government.

3. Research methodology

3.1 Research approach and design

A qualitative approach with an exploratory, descriptive, and contextual research design was adopted for this study to get in-depth information on challenges experienced by mothers with children admitted to public hospitals in Limpopo Province, South Africa. The approach and design were appropriate for exploring and describing the challenges within the hospital context where they occur and confirming that family-centered care could be the option to solve the challenges.

3.2 Population

The study population comprised all mothers who were staying with their sick children admitted to the selected public hospital in Limpopo Province, South Africa. The target population was a total of 80 biological mothers who were staying with their sick children in the selected public district hospitals of Limpopo Province.

3.3 Sampling method and sample size

This qualitative study opted for a non-probability purposive heterogeneous sampling technique to select a sample of 18 biological mothers to partake in the study [23]. The researchers had an inclusion and exclusion criterion in place that was utilized to select the participants from the study population. The mothers whose children were admitted for a period of 7 days or more were sampled. The participants who agreed to complete a consent form were included in the sample, while those mothers whose children were critically ill, the emotionally unstable mothers, and those who declined to give consent were exempted from the study. The size of the sample was achieved through data saturation at participant 18, and that was when there was no more new information that was shared by the participants.

3.4 Data collection

The process of data collection used a semi-structured one-to-one interview using an interview guide that had a series of questions asked to all participants, followed by rigorous probing. Off the ground question was "*What are the challenges experienced by mothers with children admitted to selected public hospitals in South Africa*?" Data saturated at participant 18. A voice recorder was used, with consent requested from the participants. Field notes were taken to capture the nonverbal signals, and this was further integrated with the transcribed verbatim. The interview session was conducted in a side ward free from interruptions and lasted between 30 and 45 minutes.

3.5 Data analysis

The data that were collected during the interview sessions were transcribed. The transcribed data was analysed and coded by the researcher with the inclusion of an independent coder where the two agreed on the themes and sub-themes. The researchers utilized Tesch's eight-step open coding method for qualitative data analysis, and the themes and sub-themes were established [23, 24]. According to Creswell and Creswell [23], the researcher read the transcriptions and wrote down the ideas to create a sense of the whole interview. During data analysis the researcher started by reading the interview which was the most interesting one, noting the meaning derived and documenting such views aside making a list of all topics. Similar topics were grouped together to come up with themes by writing them close to the relevant text, which would then assist in identifying sub-themes. An introductory analysis was done by collecting the data belonging to each category together and then recording the existing data [23].

4. Results

4.1 Biographic data of the participants

The aim of presenting biographic data is to describe the participant's characteristics that might influence the results of the study. The biographical data table of participants was relevantly included to place study results in context, to show which groups are represented in the selected sample, and to make inferences about the generalization of the study findings. The biographic data of participants are presented in **Table 1.**

In this qualitative study, eighteen (18) participants were used, all of them being the biological mothers of the admitted child. The participants' ages ranged from 16 to 42 years, with some being married while others were single. Other mother lodgers were still students, while others were employed, and some were unemployed.

4.2 Themes and sub-themes

The following themes and sub-themes emerged from the data analysis. The themes and sub-themes are presented in **Table 2**.

Table 2 represents the themes and sub-themes that were derived from the data and are relevant in this study. It can identify key themes that emerged during data analysis to enhance the ability to draw meaningful understandings and draw conclusions.

4.3 Presentation, interpretation, and discussion of findings

Two themes and eight sub-themes emerged during data analysis using Tech's open coding method. The themes and sub-themes are described below in detail.

4.3.1 Theme 1: Challenges experienced by mothers with children admitted to the hospital

This theme has identified the following sub-themes: provision versus lack of information, inadequate material resources, lack of parenting skills for mothers, and lack of coping with the admission of a child. The sub-themes are discussed in detail below.

No. of participants	Mother's age	No. of children	Marital status	Highest grade	Employment status
1	22	1	Single	Grade 12	Working
2	24	2	Married	Grade 10	Unemployed
3	38	6	Married	Grade 12	Unemployed
4	46	3	Single	Tertiary	Employed
5	32	2	Single	Grade 11	Unemployed
6	21	1	Single	Tertiary	Student
7	18	1	Single	Grade 12	Student
8	21	1	Single	Grade 12	Unemployed
9	24	1	Married	Grade 12	Employed
10	33	5	Married	Grade 12	Unemployed
11	35	3	Married	Grade 12	Employed
12	42	4	Married	Grade 10	Unemployed
13	16	1	Single	Grade 11	Learner
14	17	1	Single	Grade 10	Learner
15	25	1	Single	Tertiary	Unemployed
16	37	4	Married	Grade 11	Self-employed
17	19	1	Single	Tertiary	Student
18	33	3	Single	Tertiary	Unemployed

Table 1.
Biographic data of the participants.

4.3.1.1 Sub-theme 1.1: Provision versus lack of information

The data collected from mothers revealed a lack of information on children's health status updates by the medical professionals as the greatest challenge, as some felt like they were not being updated, while others felt like half the information was given to them. The following participant supported this perspective:

Participant 4 reported that "*Sometimes they take the baby's blood and never tell you anything about the results. Some of us need to know every step. They should inform us when the results are back and interpret them for us.*"

Participant 7 supported this by saying, "*I would like to hear medical professionals updating me about the improvement my baby is making; they should tell me.*"

These findings are supported by the study done in Sweden, which specified that at some units in the pediatric hospital during rounds, mothers were not allowed to be present, mothers were not informed about their child's condition, treatment, and procedures, and that this prohibition prevented their full participation in the child's well-being [25]. There are abundant challenges related to breastfeeding and instinctively parenting sick children in pediatric health, and if information is not given to mothers during admission, these also impact maternal mental health. Therefore, staff skill and knowledge gaps need to be addressed to ensure a conducive clinical environment to support mothers with information on breastfeeding and its impact on the health of children, even during admission in the hospital [26].

Themes	Sub-themes
1. Challenges experienced by mothers with children admitted to the hospital	1. Provision versus lack of information
	2. Inadequate material resources
	3. A lack of parenting skills for mothers
	4. Lack of coping with the admission of a child
2. Family-centered care intervention strategies to improve care of admitted children	1. Provision of in-service training on the provision of information in family-centered care
	2. Provision of material resources
	3. Provision of parenting health education during the hospitalization of children
	4. Involvement of mothers with admitted children to assist in coping with the admission

Table 2.
Themes and sub-themes.

4.3.1.2 Sub-theme 1.2: Inadequate material resources

Another challenge pointed out by the mothers was sleeping on the floor and sharing blankets, as they felt uncomfortable and woke up in the morning feeling tired and experiencing body pains. The following participants evidence this:

Participant 4 said, " *We sleep on the floor, the baby on the bed and the mother on the floor then in the morning you tidy up where you were sleeping*, *it could be better if they just give us a sponge mattress.*"

[Participant 3] confirmed all this by saying, "*They give us a blanket to share and tell us we didn't admit mothers, that they admitted children.*"

The findings in this study are consistent with the findings of the study done by DuBose and Hadi [27], who stated that sleeping on the floor is not good, as it comes with sleep deprivation, which has serious impacts, including feeling tired, and may also cause increased confusion, disorientation, higher blood pressure, and higher heart rate. The long-term impact includes decreased performance of activities of daily living and lower general physical functioning post-discharge from the hospital [27]. Mother lodgers also had clothes for days without changing them. The following participants point this out:

Participant 8 confirmed by saying, "*The thing that does not settle well with me is that we repeat the same clothes.*"

Participant 10 confirmed this statement by saying, *"I wish they could wash the clothes and the blankets we sleep with because you sleep with this blanket today, tomorrow with the other one.*"

Mothers with admitted children are at risk of contracting infectious diseases as they share the blankets at the hospital premises, while they came in with different conditions, and therefore, hospitals should develop individual-level policies and share these with staff and parents [28]. They are more at risk of getting sick since hospital hygiene is not maintained, as they reuse their clothes for a longer time. The findings are also supported by a study conducted in China, where five patients were infected due to poor handling of hospital clothing. The study findings support that the poor handling of bedding and clothes exposes mother lodgers to hospital-acquired infections. Poor hygiene includes a repeat of clothes for days in a hospital setting and sharing of blankets with other mother lodgers [29].

4.3.1.3 Sub-theme 1.3: A lack of parenting skills for mothers

The lack of parenting skills seems to be one of the dangers during the admission and lodging of the child, as some mothers are entirely unaware of their parental duties during this period, which might be due to poor orientation to the hospital setting and lack of guidance from medical professionals. The following participants reveal this.

"They didn't tell me, I just slept with her on the floor because he likes crying" [Participant 11].

Participant 7 also said: *"Yes!! oh well, we just wake up, bath, eat, and be there for the baby. If she wakes up, feed her and let her sleep. I think I just need help to take care of the child. Like I remember a few days back, she was vomiting, and I overfed her. I panicked as it was for the first time to see a child vomiting."*

The findings in this current study revealed roles of mothers and nurses as a challenge, which is congruent with those of other countries, as specified in the study conducted by Bedells and Bevn [30], which reviewed the literature on the nurses' and parents' self-perceived roles when caring for the children who are admitted to the hospital. The medical professionals' role was mainly administrative and technical duties, staff supervision, and equipment monitoring. In addition, medical professionals are "facilitators in," supervising and assisting mother lodgers to carry out their childcare roles. The findings of a study by Kokorelias et al., [31] revealed that, mother lodgers believed that their main role was to advocate for their child as an intercessor and champion to ensure that their child's needs are met.

4.3.1.4 Sub-theme 1.4: Lack of coping with the admission of a child

The study findings also pointed to the worries of mothers about other children who are left at home while still in attendance with the admitted child, and this worsens poor coping with the admission of the sick child. Although family-centered care was introduced to reduce maternal anxiety about the admitted child, the study findings prove that maternal stress still exists. The stress is mostly due to having other children out of their sight while lodging for the other one. Mother lodgers often worry about how other children are coping without them being around. The following participants verify this:

[Participant 13] *"I have been admitted for too long, I can not cope anymore, now I miss home. I keep asking myself how my other kids are coping."*

Participant 8 confirmed this by saying, **"***My stress is more, I can not cope with this admission, at home, because I think a lot about other children I left at home. There is another very naughty one."*

The study findings relate to the study conducted by Lerwick [32], which concluded that it is normal for mothers to unceasingly stress about children who are out of their sight, especially if they are still young. Despite this being a normal response, it could deprive the mother of being fully active in the care of the admitted child, where full active attention should be focused on the care of a sick child so that the best decision can be made. Mothers will often worry about other children who are out of their sight as a parent, even when caring for the sick child [33]. The continuous worrying of mother lodgers may start displaying ineffective responses as their attention is now divided, missing home and at the same time having to be active in deciding the best care for the sick child. Another study revealed that the mothers of preterm babies face huge challenges when caring for their hospitalized preterm babies, and this includes a need for emotional and financial support as well

as educational needs. It is the responsibility of the health team to assist mothers in overcoming these unexpected challenges by strengthening the available support structures [34]. Another study's findings concluded that there is a need for targeted interventions to address and manage increased parental anxiety in both mothers and children during hospital stays and further recommended that future research should pay attention to strategies to alleviate these anxieties and improve support for families [5].

4.3.2 Theme 2: Family-centered care intervention strategies to improve the care of admitted children

The theme has the following sub-themes, which are discussed in detail below. Provision of in-service training on the provision of information in family-centered care, the provision of material resources, the provision of parenting health education during the hospitalization of children, and involvement of mothers with admitted children to assist in coping with the admission.

4.3.2.1 Sub-theme 2.1: Provision of in-service training on the provision of information in family-centered care

The study findings revealed a suggestion that there should be in-service training on family-centered care where adequate information is given to mothers on the condition of their children to reduce stress. The following quotes evidence this:

Participant 7 supported this by saying, "*They must be trained* on care that includes us as parents. *I would like to hear medical professionals update me about the improvement my baby is making; they should tell me to make me feel good.*"

Participant 17 added by saying, "*Yes they do explain the procedure, but will never tell you the results when they come back, unless if it's for HIV or TB, maybe more training on how families feel when children are admitted can work.*"

The principles of the family-centered care approach that have to do with being honest, giving unbiased information to mother lodgers, and collaborating with them at all levels of care were violated, which is quite concerning. The study recommends a need for in-depth training programs to be provided for health care providers and nursing staff regarding dealing with mothers of hospitalized children [35]. Another study revealed that parents and staff should be trained for symptoms and disease management, as it is overbearing to understand multidisciplinary team collaboration, which needs to be complemented by regular review training and information to improve the care of children [35]. Nurses working with children must undertake training to support and implement a family-centered approach to successfully improve child health care in hospitals [4].

4.3.2.2 Sub-theme 2.2: Provision of material resources

The mother suggested the maintenance of available resources, such as geysers and taps, for easy accessibility of hot water and human resources. Some mothers think that an extension of the pediatric ward is necessary, as most of the time it is overcrowded. The following quotes support the study results:

[Participant 10] "*Let it be just maintenance, to fix the water, Just water, you understand water is life; we don't bath properly around this place as we do not have access to hot water as geysers are broken, so we wait for the sisters to plug water for us using urn.*"

Participant 11 reported that "*Let them just extend the ward, they are small because you find children being overcrowded in here, which increases chances of them contracting contagious diseases such as covid 19 from each other.*"

This was also added by participant 11, who said, *"Even the blankets, let it be something warm, not this light once we get, we feel cold with this once and you or the baby end up having other sicknesses such as flu*."

The study findings are congruent with those evidenced by the study conducted by Mohamed and Ali [36], which indicates that hospital hygiene plays a vital role in preventing nosocomial infections and safeguarding the well-being of patients, medical personnel, and visitors, so without water, patients are at risk for infections. This failure to provide water as a basic need could result in an ineffective adaptive response of mother lodgers toward hospitalization [36]. The overcrowding in the hospital wards, where more people are located within a given space than is considered, is another source of frustration to mothers with children admitted to the hospital [37].

Furthermore, Ngo [38] concluded that overcrowding results in poor ventilation, which is associated with an increased likelihood of infection and aggravated outbreaks of airborne disease. Nkosi et al. [37] supported the study findings by recommending that, to reduce the risk of disease transmission due to overcrowding, sufficient space is essential to promote the maintenance of clean circulating air. Therefore, this can result in an ineffective response according to Roy's theory of adaptation, as mother lodgers might feel that their physiological needs are not considered [39]. The shortage of staff also has an impact on the hospital capacity, which includes a limited number of beds, as well as the increased waiting time for medical procedures such as surgery or tests [40].

4.3.2.3 Sub-theme 2.3: Provision of parenting health education during the hospitalization of children

Another solution revealed was the importance of parental health education during hospitalization, as this could lead to adaptation and less panic when the child's condition changes. The medical professionals are in the best position to tell mother lodgers about the treatment of their child. This will help in alleviating the stress of the mother lodgers. Regularly updating them on the child's prognosis, interpreting blood tests, and fully engaging them in possible procedures and treatments for their child. This was pointed out by the following participants:

[Participant 1] "*And since we are not the same, we lack some information when coming to health, we need you to be patient and not deny us with information that we suppose to know, especially based on the baby, and the baby is mine. I know nothing, but the baby is mine. I panic when weird things happen. What I want from you (Medical professionals) is to tell me "things like this happen, you as a mother should wait for things like this", even if I panic, I'll know you informed me*".

Participant 2 added this by saying: "*They will never tell you not to panic that there is nothing wrong with your baby, is she was just born prematurely, you end up not knowing if the child is sick or just born prematurely or what's happening.*"

This finding is supported by the study done by the World Health Organization [41] that indicated that communication between children, mother lodgers, and medical professionals is a critical element toward safe care and the basis of child and family-centered care. Winning medical professionals and mothers reduce anxiety and enable mothers to understand the illness, treatment, and procedures offered [41]. Another study by Vasli and Salsali [42] also highlighted that giving the required information and education to the mother about the care and treatment process can help decrease

anxiety and stress. This makes it possible for mother lodgers to adapt effectively to respond well to the stress experienced during the admission of a child.

4.3.2.4 Sub-theme 2.4: Involvement of mothers with admitted children to assist in coping with the admission

The study findings revealed that requesting another mother to assist the newly admitted mother may facilitate a quicker adaptation to a hospital setting for this newly admitted mother. This is confirmed by the following statement.

Participant 1 commented by saying, "So this other lady told me about herself, how long she stayed in the hospital, and what she has been doing during all the days. She told me to take it ease just for the baby's sake, and I then told myself, for my baby let me just adjust to the conditions."

This is also confirmed by participant 3, who said, "*It's just that when I came in here, I found another mother lodger who now left, they told me how things are done and during mealtime, one of us will go and take all the plates for all of us and it helped me to adjust.*

In consistent with these study findings, [43] Bourke (2010) found that mother lodgers can be seen as a support system for each other because they are experiencing similar problems and fears; this is a unique and different type of support that could not be accessed from medical professionals. This kind of support is composed of respect and empathy, as it is believed that it is easier to listen to someone undergoing the same situation as you [43]. Adaptation occurs when people respond positively to environmental changes, and it is the process and outcome of individuals and groups who use conscious awareness and self-reflection [39]. Therefore, newly admitted mother lodgers are more likely to adapt positively to environmental changes with the assistance of other mother lodgers who place them in the hospital environment. Mother lodgers cannot only be seen as caregivers for their child but also as an important support system for others. Mothers who have been admitted for a long time are able to make the stay of the newly admitted mothers better by showing them the hospital routines in detail and what is expected of them, as they are in direct contact with each other all day long.

5. Implications for policy, nursing practice, and nursing education

The findings of the current study may benefit the following:

5.1 Policymakers

The findings may inform policymakers on the need to develop effective policies and procedures to enhance the comprehensive and effective strategies to accommodate mothers with children admitted to the hospital to ensure the family-centered care approach becomes a success. The findings may also assist health care managers in case such policies and procedures are available; they can review them if a need arises and strengthen their effective implementation.

5.2 Nursing practice

The findings of the study may assist nursing practice in considering new approaches to child health care to align with the current and be abreast with the latest developments in child health care to meet the quality patient care standards that are

aligned with the legal and regulatory standards of ensuring quality children's care is achieved. Furthermore, the findings may trigger a need to strengthen continuous in-service training of staff on the importance of adhering to family-centered care in nursing practice.

5.3 Nursing education and training

The findings may inform nursing education institutions to actively ensure that child health issues and the involvement of the family in their care are re-examined as a matter of concern to the general public. During learner nurses' training, the issue of baby-friendly environments and family-centered care should be emphasized to enhance compliance with the approach throughout the training programs to ensure that the approach is fully implemented in the workplace.

6. Recommendations for future research

The study findings may prompt and stimulate other researchers to explore more on factors and/or barriers contributing to stress among mothers with children admitted to the hospital and the impact these have on children" recovery. The study recommends that other researchers further explore the impact of poor parental support of mothers with admitted children and non-implementation of family-centered care for children.

7. Conclusions

The chapter is a research report focusing on challenges experienced by mothers with children admitted to the hospital. Child health care services remain an integral part of improving the health of children when admitted to the hospital. Since parents remain the primary caregiver, their social and mental health needs to be considered; if this is ignored, it can adversely impact how the family supports health care professionals in caring for the sick child. Concerns about the noninvolvement of the family in the care of their admitted child remain a worrisome issue, especially due to the infrastructure that is not designed to accommodate family-centered care for child health. There is a need for the use of the multidisciplinary team approach toward ensuring the care of children is taken as a priority to improve their care while admitted to hospitals. This chapter presented the introduction, the clarification of key concepts used in the chapter, the methodology used, which included the research approach, the design, the population, sampling, and sample size, the data collection process, and data analysis methods. The presentation, interpretation of findings supported by direct quotes, and discussion of the findings on the experiences of mothers with children admitted to hospitals. Challenges such as Provision versus lack of information, Inadequate material resources, A lack of parenting skills for mothers, and Lack of coping with the admission of a child were presented and discussed. Furthermore, strategies to improve such challenges include the Provision of in-service training on family-centered care, the Provision of material resources, the Provision of parenting health education during the hospitalization of children, and the Involvement of mothers with admitted children to assist in coping with the admission.

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Conflict of interest

The authors declare no conflict of interest.

Ethical approval

The study received ethical clearance from the Turfloop Research Ethics Committee (TREC/483/2019:PG).

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Chapter 4

Vacuum-Assisted Closure and Nursing Care

Princess Busisiwe Siphiwe Mbatha

Abstract

Vacuum-assisted closure (VAC) is a type of therapy that is used to treat wounds using a machine that works by creating suction; thus reducing exudate and promoting granulation. Wound care nurses work hand in hand with the multidisciplinary team in the management of patients on a VAC dressings. Nurses assess the wounds and create nursing care plans for patients that will help promote healing and prevent the wound from worsening. There is a protocol for the application of a VAC dressing. The function of a VAC dressing includes removing excess exudate from the wound, reducing inflammation, keeping the wound moist, and increasing the blood flow. It also assists with pulling the wound edges together, in order to make the wound smaller. While nursing a patient on a VAC dressing; the nurse must maintain an aseptic technique, observe and act accordingly if the suction machine or device is no longer working, monitor any leakage and report any abnormalities to the surgeons. The dressing may also need to be changed regularly, and the patient must receive their antibiotics at a scheduled time. The nursing team must formulate a nursing care plan for a septic wound depending on their scope of practice and their knowledge of wound care and management. Patients' general health status may also hinder patients healing. Conditions such as diabetes mellitus affect the healing process of the wound.

Keywords: NPWT, VAC dressing, septic wound, nursing, wound healing

1. Introduction

Vacuum assisted closure [1] is an alternative method to the conventional methods of wound management [1], which uses the negative pressure to prepare the wound for spontaneous healing or by lesser reconstructive methods. Method of VAC application includes thorough debridement, adequate homeostasis, and application of sterile foam dressing [1]. VAC refers to wound dressing systems that uses a machine or a device to continuously or intermittently apply subatmospheric pressure to the surface of wound to aid with wound healing. VAC is also called negative pressure wound therapy (NPWT) [1]. The whole system consists of a sealed foam dressing, a tube that is connected to the dressing, another tube that connects to the canister, and a suction device or a VAC machine. Most VAC dressings are done in theatre post debridement, but the nursing team is also capable and trained to apply these dressings in the ward under aseptic conditions. Nursing team is trained on the contents of a VAC dressing

set, how to operate the device, how to apply the dressing, how to monitor the dressing as well as red flag signs to report to the surgeon in charge of the unit.

2. Mechanism of action of wound VAC therapy

VAC therapy is effective through four mechanisms of action:

- Macrodeformation

The subatmospheric pressure that is applied to the sponge reduces its size by almost 80%. If the sponge is attached firmly to the edges of the wound, the surface area of the wound is reduced. The shrinkage is dependent on the deformability of the surrounding tissues, which explains why wounds surrounded by loose excess skin will be approximated faster compared with wounds located on high tension surfaces [1, 2].

- Drainage of fluids

The suction applied by the VAC system helps to remove extracellular fluid that decreases edema. The removal of exudates also releases the pressure caused by the accumulation of fluid around blood vessels, which is beneficial for the perfusion of the wound [2].

- Stabilization of the wound environment

The use of VAC therapy assures stability in the environment surrounding the wound. This results in less frequent dressing changes compared to normal dressings that must be removed daily. The foam is covered by a polyurethane drape that is impermeable to proteins and microorganisms, which helps to prevent bacterial colonization of the wound [2].

- Microdeformation

The suction created by VAC causes a movement of fluids through the cellular matrix, which produces shear and deformation forces on the cells. Microdeformations are a key element of VAC therapy, as they promote cellular proliferation, angiogenesis, and granulation tissue formation [2].

3. Indications

- Traumatic wounds such as open fracture and open laceration [3]
- Diabetic ulcers [1, 4, 5], venous insufficiency, or arterial insufficiency
- Grade III and IV pressure injuries that need long-term wound care [4]
- Surgical wounds, particularly skin grafts and flap reconstructions [1, 4, 6–8]
- Chronic nonhealing wounds that require enhanced healing support

- Infected wounds that need continuous drainage and management
- Burns and degloving wounds [1, 3]
- Fasciotomy wounds [6]
- Spine injuries
- Dehisced wounds [3, 8]
- Osteomyelitis
- Acute or surgical wounds at high risk for infection
- Chronic wounds that have not responded to other treatments [8]

4. Contraindications

- Untreated osteomyelitis within the wound [1, 5, 6, 8]
- Sensitivity to the material used due to fragile skin. This can be caused by advanced aging or use of corticosteroids [2]
- Exposed tendons, nerves, and blood vessels [2, 5, 8, 9]
- Necrotic wounds [1]
- Patients on anticoagulants [1, 5]
- Fistula [1, 5, 6, 8]
- Necrotic tissue with eschar present [3, 5, 6]
- Allergy to adhesives
- Malignancy in the wound [1–3, 5, 8]
- Actively bleeding wounds [1, 5]
- Full thickness burns [8]

5. Benefits of wound VAC therapy

1. VAC removes excess fluid build-up that can cause swelling, increase the risk of infection, and delay healing. This happens a lot after surgery. This can put pressure on the stitches that are holding the wound closed. VAC assists in wound healing by keeping the wound clean and dry. It also minimizes pain and reduces swelling [9].

2. Reduced levels of bacteria have been demonstrated in VAC treated wounds [5].

3. The application of vacuum reduces edema, infection, and increase local blood flow that promotes healing [1].

4. VAC shrinks the size of the wound and draws the edges of the wound together, making it easier for the body to repair the gap [9].

5. VAC therapy assures stability in the environment surrounding the wound [2].

6. VAC creates mechanical force that stimulates a biological response [9]

6. Advantages

1. Dressing changes are not as frequent as traditional dressings [6]

2. VAC therapy is suitable for all wound types including the wounds that are in close proximity with external fixators.

3. VAC therapy reduces the need for surgical procedures.

4. It enhances wound healing rate [9].

5. It reduces hospitalization [6].

6. It diminishes infection rate.

7. Low failure rate [6].

8. Positive patient outcomes [6]

9. Positive patient comfort and pain relief [6]

10. Limb preservation [6]

11. Less complexity required in surgical procedures [6]

7. Complications of VAC dressing

1. Patient may experience heavy bleeding due to suction power. Blood may be noted on the sponge or inside the canister during therapy. The suction power should be reduced, and the surgeon should be informed. If the bleeding does not stop, the dressing should be removed and changed depending on the surgeon's orders. Patient should not be on anticoagulants during therapy [2, 4–6, 10].

2. Patient may have constant pain by being squeezed tightly [11] and swelling noted from the wound site; the affected limb should be elevated with pillows or blankets to reduce edema [2, 5, 11].

3. If the wound is on the groin or sacral area, the nursing team may experience technical problems and wound healing may be delayed. This may be caused by the adhesive not holding properly on the skin or being disturbed every time the patient moves or uses a bedpan for elimination purposes. If it is impossible to reinforce the dressing, the dressing may be removed and a normal dressing must be used.

4. Physical limitations owing to being attached to the device [11].

5. Allergic reaction to foam or drape adhesive [1, 3].

6. Malnutrition due to protein loss during the removal of exudate from the wound.

7. Maceration due to leaking of exudate on surrounding tissue.

8. If the size of the wound is large or if the patient has pressure injuries, a large amount of fluid can be drained from the wound. This can affect the overall condition of the patient especially the fluid balance of the patient. Urea and electrolytes of the patient should be monitored, and fluid resuscitation should be initiated accordingly as prescribed [5].

9. Patient may feel mentally overwhelmed owing to odor and noises of the attached device [11]. Odor is very uncomfortable to patients and can cause distress. It is also a sign of infection. This can be avoided by proper wound cleaning with betadine solution. If the patient is allergic to iodine, the alternative should be acetic acid or metronidazole for intravenous infusion. In this case, analgesics may be administered before the application of the VAC dressing. If the odor is severe, a silver dressing can be applied underneath the foam. The changing of the dressing must also be more frequent; it can be changed every 48 hours [2].

10. Occurrence of infections has been reported, which can be prevented by adequate debridement of nonviable tissue prior to VAC installation as well as respecting sterile techniques during sponge changes [2, 5].

11. Infection of the wound caused by left-behind foam that is attached to the tissues.

12. Excessive growth of granulation tissue [10].

13. Necrosis of the tissue around the wound edges [10].

8. Disadvantages

1. Patients are required to carry the devices around all the time [11].

2. It is highly expensive compared to conventional methods [10].

9. Duration

Length of time for the VAC depends on the improvement of the wound and factors that affect the wound healing such as:

1. Conditions such as diabetes [12].

2. Stress [12].

3. Age and gender [12].

4. Medication such corticosteroids, nonsteroidal anti-inflammatory drugs, and chemotherapy [12].

5. Lifestyle of the patient such as smoking and alcohol use [12].

6. Nutritional status of the patient [12]

7. Knowledge deficit; sometimes patient will disconnect or switch the machine off at will. This can be caused by patient feeling like they are in prison because of the device or not understanding the pathophysiology of the VAC therapy.

10. Types of VAC machines

1. Single-use machines that are disposable and easy to apply and they reduce risks of cross infection. These do not have a canister.

2. Traditional VAC machines that are larger and more powerful with multiple settings and modes to accommodate different types of wounds.

3. Advanced VAC machines with advanced technology such as sensors that monitor the wound progress and adjust the machine therapy accordingly. They also allow tracking of data for monitoring the progress of the wound.

4. Specialized VAC machines such as pediatric VAC that is designed for pediatric patients.

5. Wall-mounted suction system that is powered by electricity and is reliable, cost-effective, and delivers consistent suction power. This is used for custom-made negative wound therapy dressings.

11. Infrastructure required for VAC therapy

1. Space – There should be enough room for VAC equipment and application of VAC on the patient's bedside.

2. Equipment and materials [13]. There should be enough devices in the ward, and they should be of different sizes and models.

3. Maintenance – The devices should be serviced regularly by the firms supplying the institution with the devices.

4. Safety protocol – The nursing team should be given a proper in-service training regarding the handling of the machines to avoid putting patient's lives at risk.

12. VAC dressing components

Depending on the company that supplies the institution, the VAC dressing kit may contain the following:

1. Therapy unit (device) [3, 14]
2. Sterile gauze or foam [3, 15]
3. Paraffin gauze if the foam is going to be in contact with bone or tendon [14].
4. Sterile Transparent film or VAC drape that is usually in the same pack with the foam [3, 15]
5. Pair of scissors [14]
6. Canister with gel [14]
7. Dressing pack [14].
8. Sterile irrigation sodium chloride [3, 14]
9. Povidone iodine solution [3]
10. PPE: Sterile gloves, mask, gown, goggles [14].

13. Factors to consider before application of VAC dressing

1. There are different brands for VAC devices and consumable used of each brand. The consumables need to match the device chosen [14], for example; Smith &Nephew ®, KCI ®, or NEW Hospivac ®.
2. Follow guidelines on the instruction manual [14].
3. Do weekly wound measurements to monitor if there is any progress [14]. If there is no reduction of the wound after 2 weeks, the use of VAC should be evaluated. This must be discussed with the surgeon.
4. Wound needs +/− 2 cm of intact skin around in order for the nursing team to be able to drape it [14].
5. The dressing should be changed every 3 days in case of infection [14].
6. Dressing applied on the skin graft or FLAP should be kept for 5–10 days. It should run continuously to ensure splinting effect [14]. This type of VAC should be changed in the presence of the surgeon.
7. The device can run continuously or intermittently. The device must run continuously before first dressing change. It must also run continuously if there is

high level of exudate from the wound. The VAC on a skin graft must also run continuously. Intermittent therapy must be used if continuous therapy is too painful for the patient [14].

8. Patients with chronic osteomyelitis must be treated with antibiotics as well if they are on VAC therapy [14].

9. Patients must be nutritionally stable while on VAC therapy because wound healing may be delayed. Monitor patient's albumin level and involve the dietician in the care of the patient [14].

10. Canisters need to be changed when they are full [14].

11. Paraffin gauze, for example Jelonet® should be used underneath the foam if the patient is feeling too much pain during the dressing changes. If paraffin gauze is not available, a small piece of gauze should be cut in shape of the wound and be soaked in sterile water and applied before the foam [14].

12. Provide enough and appropriate analgesic to the patient on VAC therapy [14].

13. Malignant wounds must not be treated with VAC due to the risk of bleeding [14].

14. Measure the output and record on the patient's progress report chart.

15. Ensure the way the dressing tube is placed does not put pressure on the patient's skin [14].

14. Old dressing removal

1. Switch the device off [14].

2. Wait 15–30 minutes for the foam to decompress [14, 16].

3. Separate canister tubing from the dressing tubing. If the canister is less than 7 days and it is not full, cover it with a sterile aseptor bag or gauze to maintain sterility [14].

4. Remove old dressing gently; moisten it with saline if it has adhered to the skin [14].

5. If the dressing is still adhered, push warm saline mixed with xylocaine, with a syringe into the drainage tube [16]. Leave it for 30 minutes to soak, and try to remove the dressing again [14].

6. Assess and measure the wound.

15. Application of dressing

1. Review doctor's prescription. The prescriptions should include material, (foam or gauze), negative pressure, (50–125 mmHg), therapy setting (intermittent

or continuous), and the frequency of dressing change. The VAC dressings are changed on 3rd day [1, 17].

2. Wash hands. Use PPE as required.

3. Gather all the required equipment [14]. Open packages on a clean dressing trolley.

4. Identify the patient.

5. Screen for the patient.

6. Explain the procedure to the patient [18].

7. Assess the patient's pain and the need for an analgesic [17].

8. Position the patient to suitably expose the wound site [3].

9. Ensure the machine is plugged in and is switched on.

10. Connect the canister and the second tube to the machine. Ensure that all the clamps in the tubes are open.

11. Use appropriate aseptic or sterile technique [18].

12. Gently remove old dressing and discard as per local institutional protocol [5].

13. Clean the wound aggressively [5], and thoroughly dry the skin around it. Ensure the skin is hair-free by shaving it, if necessary [5].

14. Assess and measure the wound length, width, and depth. Record at each and every dressing change.

15. Assess wound for change in appearance, odor, and drainage.

16. Apply paraffin gauze if indicated.

17. Select the dressing type and cut it to the size and shape of the wound.

18. Shape and apply foam or gauze dressing directly on the wound. The foam must fit the wound it must not be larger than the wound [5].

19. Foam or gauze should not be in contact with intact skin [19].

20. Trim film drape to size, peel back one side of the layer. Place adhesive side on top of the foam and remove stabilization layers [20].

21. The drape must not cover more than 5 cm of the border.

22. Apply the drape onto the skin, avoid making creases. Cut a hole in the film to make a small opening [21]. It is not necessary to cut the foam.

23. Apply the tubing over a small opening in the clear film or according to the device specification. The tube must not sit on the patient's body [16] or bony prominences [17].

24. Connect the two tubes; one from the dressing and the one that is connected to the canister and to a VAC machine [21].

25. Follow instructions and set the pressure as prescribed by the surgeon and press the start button [20]. The recommended range is typically between –75 mmHg and – 125 mmHg.

26. The vacuum circuit is immediately completed, preventing any further wound leakage under the dressing [22].

27. Ensure there is a good seal and that the machine is working.

28. Once the vacuum is switched on, the air is sucked out of the foam causing it to collapse inwards drawing the edges of the wound in with it [23].

29. If the dressing is not collapsed, gently press around the edges of the drape and check for air leaks. This may be identified by a whistling sound. An extra drape may be applied to patch air leaks.

30. Put the device on the level surface; avoid putting it under the patient's bed.

31. Label the drape with date and your initials.

32. Document [17, 18] in the file in accordance with the institution's record-keeping standard. Nursing team should include findings, wound measurements, pain assessment, and tolerance during application of VAC, weight of the soiled dressing, type of dressing used, settings of the device, as well as health education given to the patient in their documentation.

16. Wound care precautions

1. Protection of friable structures within the wound are achieved through an interposition layer such as mesh or petroleum gauze, which is positioned between the foam and wound bed [24].

2. Avoid packing the wound tightly with foam; the negative pressure will not reach the wound bed [17].

3. Ensure that the patient receive uninterrupted therapy at least 22 hours daily.

4. If the dressing is interrupted for more than 2 hours, it must be removed and a new dressing must be applied.

17. Nursing management

17.1 Assessment

- Nursing professional should assess dressing for drainage [18], color, quantity, and odor four hourly. Any problems should be noted, recorded, and reported [18] to the attending surgeon.

- Neurological system assessment is an important skill for the orthopedic nurse because nervous system has such an overlap with the musculoskeletal system [25]. Neurovascular assessment should be done four-hourly to evaluate the sensory and motor function and peripheral circulation [26] of the limb distal to wound.

- Patient should be monitored for signs and symptoms of localized wound infection such as redness, warmth, and tenderness around the wound [18, 27].

- Wound should be checked during dressing change for progress, size, tissue color, exudate type and amount, as well as margins for tunneling [27].

- Wound VAC therapy must be monitored routinely to ensure that:

  1. The tubing leading from the wound to the pump is free of kinks [28].

  2. The canister is filling correctly and does not need changing [14].

- All nurses should be able to:

  1. Trouble-shoot the dressing and machine and be able to change the canister.

  2. Appropriately discard all items after dressing change on the relevant waste box, keeping with the institution's Infection Prevention and Control Policies.

- Assess patient for wound healing issues, for example, poor nutritional status, diminished oxygenation, smoking, and anemia.

- Assess and manage patient holistically. A holistic approach should take into consideration the overall health of the patient, including their physical, psychological, social, and spiritual well-being [29].

18. Trouble shooting the device

1. Confirm that the device is switched on and the pressure is set appropriately [30].

2. Check that the foam has collapsed [30].

3. Check the seal for any leaks; reinforce with a clear adhesive film drape [30].

4. Ensure that the tube is not kinked and all clamps are open [30].

5. Address issues with the alarm, for example, low battery, leak, blockage, or canister is full [30].

6. Check if the canister is full [30], or filling up correctly.

19. Dressing changes

- Dressing changes vary depending on the state and type of the wound that is being treated [10].
- Position patient to maximize comfort and wound perfusion.
- Dressing should be changed and reapplied as prescribed by the surgeon usually 3–4 days [21].
- Air leak in the dressing should be avoided as it leads to continual flow of air over the wound surface leading to desiccation of tissue and formation of eschar [1].
- If the therapy is interrupted for more than 2 hours, the dressing must be removed to prevent the development of an infection. A new dressing must be reapplied and therapy reinitiated [31].
- Obtain specimen for wound as prescribed. It is feasible and safe to insert a collecting piece in the tube to collect wound fluid during ongoing NPWT [32].
- A comprehensive wound assessment should be performed to determine wound size (length, width and depth), presence of infection, undermining, tunneling sinus tracts, exudates, presence of necrotic tissue, granulation tissue status, and epithelialization [33].
- Commence the VAC system as per company's instruction manual by setting the amount of negative pressure, whether the VAC system should be in intermittent or continuous mode [14, 31].
- Avoid turning off VAC machine unless necessary, for instance, mobilizing for physical therapy or X-rays.
- Keep VAC machine plugged into an electrical outlet unless patient is mobile. The pump should be plugged back into the electrical outlet after the patient returns to a sitting or resting position to ensure the battery remains charged [34]. A fully-charged battery may last up to at most 4 hours.
- Attach vacuum pump machine to the footboard of the patient bed or clamp it securely onto an appropriate pole such as a drip stand.

20. Factors that increase the risk of adverse events

1. Anticoagulant administration or any factor that will increase the patient's risk for hemorrhaging. NPWT is contraindicated in patients with high risk of bleeding or hemorrhage or those who are on chronic anticoagulation or antiplatelet treatment [35].

2. Osteomyelitis. Although negative-pressure wound therapy can help prevent infection, it is contraindicated in patients with untreated infections, including osteomyelitis [35].

21. Patient health education

1. Do not shower with VAC therapy. Keep the device away from water [14].

2. Ask the nursing team to assist with disconnection of the device if you cannot carry it to the bathroom.

3. Call a nurse if the device is on but the foam is not collapsed.

4. Call a nurse if you feel a tingling sensation around the wound.

5. Call a nurse if the alarm is continuously ringing.

6. If you are bleeding, turn off the machine immediately and call for assistance.

7. Put the electric cord in such a way that it will not trip you when you are mobilizing or getting out of bed [14]

8. The vacuum tube must also not be placed where it will cause a tripping hazard [14].

9. When mobilizing, you must ensure that the tubes are not caught in bed or door handles [14].

22. Conclusion

The main functions of the VAC dressing are to draw wound edges together and to remove excess fluid from the wound. The nursing team should be well equipped with the necessary skills to be able to apply the VAC dressing, to monitor the progress of the wound, and to report any complications or adverse events caused by the therapy. The wound care nurses should offer in-service training to the junior nurses at least once in 3 months and assess their understanding of the therapy. They should not rely on the in-service training offered by company representatives because some of them are not nursing personnel or healthcare workers and they are not allowed to apply the dressing on the patient, and to learn the art of applying the VAC therapy, one needs to see it being demonstrated to them by a person who is trained and experienced to do so.

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Chapter 5

Digital Health for Equitable Access to Universal Health Coverage: Lessons from Makueni County in Kenya

Ruth Wambua, Collins Oduor and Jimmy Macharia

Abstract

Despite the growing global recognition of digital health's potential, there remains a lack of comprehensive, context-specific models to guide integrations that support equitable access of health interventions, particularly in resource-limited settings. This chapter draws lessons from Makueni, a resource-limited county in Kenya, where digital health tools and technologies, services, programmes, and information systems influence on equitable access to healthcare was explored to develop and validate a digital health model for equitable access to Universal Health Coverage (UHC). A structured questionnaire with closed-ended questions was employed for data collection, and logistic regression was employed for data analysis. From the study findings, access and availability of digital health interventions, including services, programmes, information systems, and digital health tools and technologies, influence equitable access to healthcare, with demographic factors moderately influencing the relationship between digital health and equitable access to UHC. Generalizable to Kenya and beyond, digital health interventions should align with the target population, for impactful healthcare and acceleration of UHC.

Keywords: universal health coverage, developing countries, healthcare, digital health, equitable access

1. Introduction

Even with digital health innovations, recent research highlights that approximately 800 million people, which is 12% of the global population, faces unequitable access to health, including Universal Health Coverage (UHC), with nearly 100 million individuals pushed into extreme poverty annually due to out-of-pocket (OOP) medical expenses [1]. Globally, 99% of maternal deaths occur in developing countries, a statistic underpinned by unequal access to essential healthcare services. Regionally, inequities persist due to systemic barriers, including inadequate digital health opportunities, limited access to technologies, and persistent socioeconomic divides [2]. Marginalized and rural communities are particularly affected, as digital health research and

interventions in these areas remain underexplored and require substantial improvement [3]. In Kenya, inequities in health access are further compounded by high OOP medical costs, which account for approximately 50% of total health spending [4]. In Makueni county, for example, 34.6% of the population faced financial hardship related to healthcare costs, even with county-level initiatives, such as MakueniCare [5]. The systemic nature of these challenges highlights the inadequacy of existing digital health models to address disparities effectively.

The WHO health system framework outlines that applying access, coverage, quality, and safety to the system's building blocks—which include service delivery, health workforce, information, medical products, vaccines, and technologies, financing, and leadership/governance—leads to improved health outcomes (level and equity), responsiveness, social and financial risk protection, and efficiency [6, 7]. Furthermore, according to WHO, the three action lines (axis) for realizing UHC are the population axis, services axis, and costs axis. The use of information and communication technologies (ICTs) to improve health outcomes informed digital health and included eHealth, health informatics, telehealth, mHealth, health IT, and all cases where health was delivered and accessed electronically [4]. In addition to this, digital health interventions powered UHC in Kenya, and particularly in Makueni county, where digital health considered the remote areas in the county, elucidating geographical barriers. Furthermore, having digital systems in health led to enhanced quality of care, increased efficiency in health processes and resource allocation, and in empowerment and engagement whereby residents continued to be empowered to use available digital interventions in the county [8–11].

Therefore, guided by the WHO health system framework [6, 7], digital health tools and technologies, digital health services, digital health programmes, and digital health information systems were key elements of the system building blocks to inform the outcome of improved digital health. Furthermore, leveraging ICT [5, 12] and focussing on the population action line for realizing UHC, access and coverage were reviewed through a focus on digital health tools and technologies, digital health services, digital

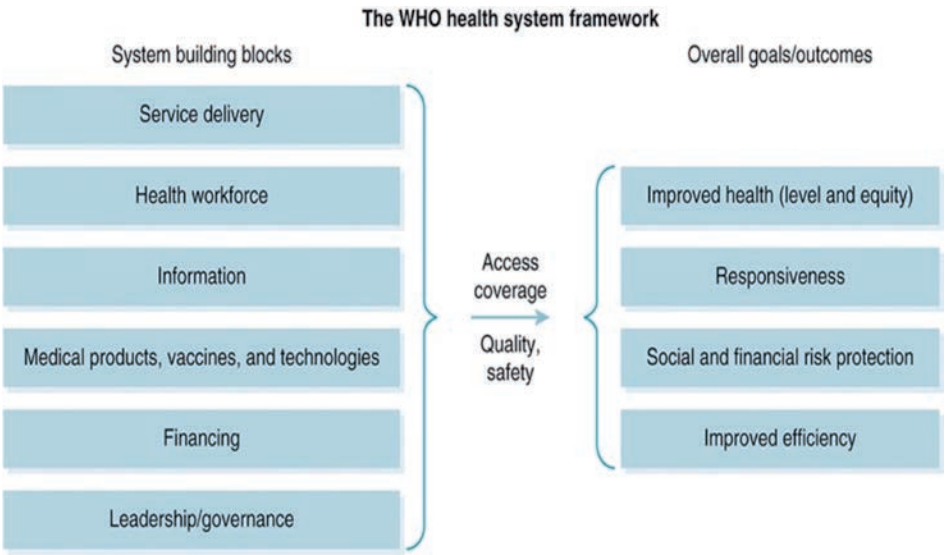


Figure 1.
WHO health system framework.

health programmes, and digital health information systems. This was also in line with the recommended WHO system building blocks shown in **Figure 1** [6, 7].

Calls for action emphasize the urgent need for guiding models that harness digital health tools, services, and information systems to achieve equitable health outcomes. This chapter, therefore, summarizes lessons from Makueni county in Kenya, where digital health dimensions—tools and technologies, services, programmes, and information systems—are explored to develop and validate a digital health model for equitable access to UHC, in line with the WHO health system framework.

2. Digital health in UHC

2.1 Digital health tools and technologies for equitable access to UHC in Kenya

In previous studies, to achieve online consultations, for example, a variety of tools such as smart devices, sensors, and cameras were deployed in addition to advanced technologies, including blockchain, the Internet of Things (IoT), and analytics [13, 14]. Previous research has pointed to the problem of access and availability of digital health tools and technologies to support fair healthcare [15–17]. Among the health system building blocks are technologies, that should be safe, of appropriate quality, have been procured at the best available prices, and usable in cost-effective ways, to facilitate the attainment of the overall goal of a health system. Digital health technology adoption required years of incremental work. On the other hand, the integration of technology and healthcare enhanced access to treatment while also raising the standard of care, but its application was to be thoughtful, strategic, and aware of concerns about patient rights and privacy [4]. According to WHO's Thirteenth General Programme of Work (2019–2023), for a region to realize its own Flagship Priority Programmes, digital health tools and technologies were crucial enablers. Moreover, all health factors, should be considered when calculating UHC since they are important and have a big impact on systemic health and health equity. According to the World Health Organization, digital transformation of healthcare can be disruptive but important. The following are example cases where digital health tools and technologies were advancing healthcare and UHC. First, tools for data capture like in the case of Myanmar, a WHO South-East Asia Region nation, where tablets were supplied and used to frontline healthcare personnel for data capture and learning, as well as for patient registration. To support universal and equitable access to health care, each patient would be assigned a unique identifier (UID) to create a master patient index (MPI) [13, 18].

Other tools and technologies in healthcare included digital therapeutics, clinical trials, smart wearables, artificial intelligence, blockchain, Internet of Things, virtual care, remote monitoring, artificial intelligence, and big data analytics [13]. For instance, Indonesia was using artificial intelligence in healthcare and getting ready for big data analytics, through its massive data repository, with plans to use this data to forecast future illness load and to foresee demands nationally, and on the health system. On the other hand, Thailand was advanced in the use and application of medical robots in surgery, diagnostics, rehabilitation, and other healthcare services. The award-winning Khon Kaen city smart health project in Thailand also featured wearable technology for preventative healthcare, a smart ambulance, and the development of a platform for exchanging medical data using big data analytics and blockchain [13]. Tools and technologies in health created a continuum of care

and improved medical diagnosis and treatment decisions based on data. They also increased the amount of evidence-based knowledge, skills, and competence that professionals needed to support healthcare, as well as support in the deployment of applications that were safe for use by the young generation. However, device ownership, technical expertise, and societal knowledge of health needs and disparities had an impact on access to digital health tools and technologies [1, 19].

Digital health tools and technologies presented inefficiencies mostly on equity, access, adoption, use, and affordability, especially in remote settings [15–17], as well as among groups such as people with low-income levels, people who are geographically isolated, and older adults [16]. This called for creative strategies around digital health services, digital health information systems, and in digital health programmes, which would involve corporation with other sectors, disciplines, and systems to achieve UHC [15]. From the review, a device was smart in that it was a digital tool running a smart technology, hence a smart device [13, 14] and it required internet to be available and accessible [20].

2.2 Digital health services for equitable access to UHC in Kenya

Within the digital health ecosystem, digital health services were the instances of digital health that provided support [21, 22]. The study by Meessen [21] referenced digital health services; in this case, a financial digital health service that supported payment processes. This study, therefore, adopted digital health services as a variable in the development and evaluation of a digital health model for equitable access to UHC. Considering that varied digital health services were a key component of digital health output, this study variable reviewed all digital health services in Makueni county to inform the study model.

Health services were provided through health systems with the goal of advancing health. The delivery of healthcare services was greatly facilitated by digital health, which also could help achieve the goal of UHC. However, the health industry had challenges in expanding resource allocations due to economic pressures, aging populations, increased health spending in response to more complicated health requirements, and high citizen expectations regarding health services [19]. Furthermore, access to digital health services was influenced by sociodemographic traits, and a blend of other issues, including limitations of medical supplies and human resources, physical inaccessibility, lack of knowledge and education, general health literacy, device ownership, material resources, technical skill, and social recognition of health needs and inequities [1, 19]. Consequently, improved financial incentives, expanded patient involvement, and new service delivery models were required to support equitable, efficient, and productive health systems.

Digital health services, such as healthcare services that employed smartphones and other mobile devices for consultations, were among the outcomes of digital interventions in health [5, 23, 24]. A case like in the Democratic People's Republic of Korea [13] and in Ghana, where virtual care services (mHealth, telemedicine), virtual clinical trials, and virtual consultation services existed. In addition, there were online medical support services and financial services [17, 21]. Example support services included online rehabilitation services in Thailand, mHealth tobacco cessation services in India (WHO-ITU Be he@lthy) [13], and Safermom and Mobicure mobile health services in Nigeria [25]. Moreover, SMS-based health programs and eLearning services were available [22, 26]. To add to this, Sustainable Development Goal 3.8 was facilitated using digital financial services (DFS) for health [22]. Digital

health insurance; health savings accounts; credit, transfers, remittances, and loans for health purposes; vouchers for medical services; beneficiary payments for insurance or medical treatment; and bulk purchases/payments throughout the health system, including payments to medical personnel, were among the key DFS applications. Among the implementations in Kenya, we had Loans from the Medical Credit Fund (MCF), including cash advance and Mobile Asset Financing (MAF), and the M-TIBA-based i-PUSH program [22].

Digital technology advancements had reduced costs and increased efficiency in providing key health services to the public [16]. Moreover, digital health services led to streamlining of both medical and non-medical expenditures, and financial operations [21]. Digital health services availability and accessibility was important to reap the benefits thereof [16, 21]. Moreover, information on the availability and access of digital health services when available to the population was a progressive move [16, 21]. To conceptualize UHC, quality of care, equity, financial risk protection, and a wide range of services were essential, pointing to a lack of a comprehensive systems approach to health policy and structures. Furthermore, Oleribe [27] reported that the lack of models for equitable access to health, including UHC, was majorly due to marginalization, yet most problems and their solutions were within human resources, budget allocation, and management. In addition, the poor bore the highest burden of disease and were more likely to be unwell and to incur expensive, debilitating medical costs, and thus suffered the most from the lack of digital health models for equitable access to health, including UHC. Abdelrahman [28] identified that unequitable access to health, including UHC, required transnational and intersectional cooperation for technically oriented innovative healthcare, with a focus on improving patient care, lowering health disparities, and increasing patient engagement, through digital health.

2.3 Digital programmes for equitable access to UHC in Kenya

Attaining digital health output required that the system building blocks and interventions were properly disseminated for impact [13]. Digital health programmes encompassed digital health educational resources and programmes, as well as government policies and regulations that were availed and accessible online [20, 29]. Leveraging technology, health programmes were better prioritized according to WHO Thirteenth General Programme of Work (2019–2023). Moreover, these programmes were availed in various digital platforms, including SMS-based health programmes [22]. Digital health programmes were initiatives to break access barriers of digital health services, which were either economic, cultural, geographic, or, at times, epidemiologic, where the health service did not meet the need of the population.

For equitable accessibility, digital health programmes needed to integrate digital health equity [16, 30]. Furthermore, considered digital literacy skills [17, 31] were key to ensuring that the digital health programmes were disseminated and consumed as desired, like was the case with mHealth tobacco cessation programme in India (WHO-ITU Be he@lthy) [13]. The work by Azzopardi-Muscat and Sørensen [20] reported that digital health required keen focus on digital health literacy engagements, digital health community programmes, and digital health policy developments. Issues of equity, access, diversity, and inclusivity were key inefficiencies around digital health programmes.

The study by Chattu [23] pointed to the problem of lack of sustainable digital health models for equitable access in health, including UHC, and guided that digital health equity (DHE) needed to be incorporated into health policy, especially in rural regions and availed to all regardless of gender. Miller reported that prioritizing equity was vitally

crucial while researching digital health and that there was a need for continual communication, awareness, and strategy improvement in the medical field [16]. Furthermore, Sen [32] reported that markers of social exclusion and marginalization were to remain a focus to UHC, and that UHC policies and programmes were wanting in equality. Moreover, the study by Udenigwe and Yaya [30] on inclusion and participation in digital maternal health programs in sub-Saharan Africa reported that delivered digital health programmes were required not to leave anyone behind, but be all inclusive.

2.4 Digital health information systems for equitable access to UHC in Kenya

The platforms and information systems used in the digital health ecosystem, are digital health information systems, which cover all information systems in the digital health ecosystem, including transactional, decision-making, management, and other information systems [7, 13]. A financial information system, for example, is an online platform that integrates financial services with the health ecosystem; a patient treatment system, on the other hand, is an online platform and information system that facilitates patient care [13]. According to Moosa [33], systems, workforce, and financing were crucial pillars of UHC, and healthcare systems required to focus their efforts and provide extra resources to support UHC. On the other hand, the public, caregivers, and frontline healthcare professionals required timely access to trustworthy, useful health information for people-centred healthcare to be effective; but, in many regions of the world, this was often challenging for people to get.

With the advancements in technology, digital health had seen the emergence of various information systems aimed at enhancing healthcare and advancing UHC [13]. These systems were a factor of inter-institutional and inter-sectoral collaborations, and included systems on financial management, human resource management, and even information management. For instance, through technology, Nepal implemented an open-source insurance management information system (OpenIMIS), which unified patient, provider, and payee data on a single integrated platform [13], electronic reproductive health management information system (eRHMIS) in Sri Lanka, and the case of the WHO Open Smart Register Platform (OpenSRP) to monitor expectant women and their offspring in Bangladesh [13]. In addition, development of a platform for exchanging medical data using big data analytics and blockchain in Thailand [13] was a case of a platform for exchanging medical data (Medical care system). Furthermore, the Kenyan mobile health wallet application (M-Tiba) was another case of a finance information system, within the health sector [27].

2.5 Demographic factors

Global research has continued to illuminate the moderating role of demographic variables, where digital health was influenced by demographic variables [1, 2]. SMS-based health interventions for COVID-19 case management in Rwanda demonstrated limited efficacy among older people with lower levels of digital literacy, despite its high scalability. Similar to this, the adoption of telemedicine during the pandemic in Mexico showed notable gender differences, with women reporting lower levels of satisfaction because of usability and accessibility problems. Furthermore, Sub-Saharan Africa's health outcomes have continued to improve as a result of mobile health (mHealth) initiatives that offered health education and antenatal care appointment reminders. However, access to and use of these technologies were still unequal, frequently due to demographic reasons [2].

Progressively, cognisant of the varied demographic factors, digital health technologies were revolutionizing healthcare delivery by providing creative ways to increase care quality, efficiency, and accessibility. To start with, the work by Hadjiat [17] proposed economic, social, and developmental factors and emphasized that digital health innovations and developments had to consider age, gender, ethnicity, income, and geography, as social factors with influence on digital interventions. The work by Kristjánsdóttir Ó [3] assessed monthly wages, education levels, age, gender, and residency, as the informing socioeconomic and demographic variables. Furthermore, in identifying and describing the inequities of digital health care services, Yao [25] considered age, race, region, economy, and education level, together with health conditions and eHealth literacy, as study variables. The age variable analyzed access across varied age groups [3, 17]. Second was the variable of gender, which investigated the existence of gender-based disparities [3, 17]. In addition, the income-level variable reviewed income level to assess how the economic factor impacted equitable access [17].

On the other hand, the geographic location variable reviewed the place of residence of the target population and investigated possible regional disparities [17]. Furthermore, there was the variable on level of education, which reviewed the existence of disparities based on educational attainment, by investigating the levels of education (primary, secondary, and university) [24]. Moreover, a variable on digital literacy skills which assessed equitable access in relation to computer and technical skills those users possessed [17, 24]. Therefore, following the review, and to inform background information, age, gender, income level, geographic location, level of education, and digital literacy skills were considered to inform demographic factors.

3. Research method

Considering the extensive local and global efforts devoted to digital health, a deductive approach, which was highly organized, considered large sample sizes, and used quantitative methods of analysis, was considered [34, 35]. The research onion as proposed by Saunders [35] in **Figure 2** was used to conceptualize this research design.

3.1 Data collection methods

Data collection methods included a questionnaire for obtaining primary quantitative data. A five-point Likert scale, where 1 represented *strongly disagree*, 2 *disagree*, 3 *neutral*, 4 *agree*, and 5 *strongly agree*, was used in the questions for each of the research constructs, to allow for data quantification. In addition, to improve reliability and validity, questions were referenced from other previously published credible sources [34]. The structured questionnaire was composed of sections, informed by the specific study objectives, and included questions on the demographic characteristics of the respondents. On the other hand, data collection for this study was conducted between 1 July 2024 and 1 October 2024 and did not reflect any changes or developments occurring outside this period.

3.2 Target population and sampling

The population embodied the characteristics that the study's findings were meant to summarize. The population of this study was composed of people either living or working in Makueni county and those who used the county's health facilities.

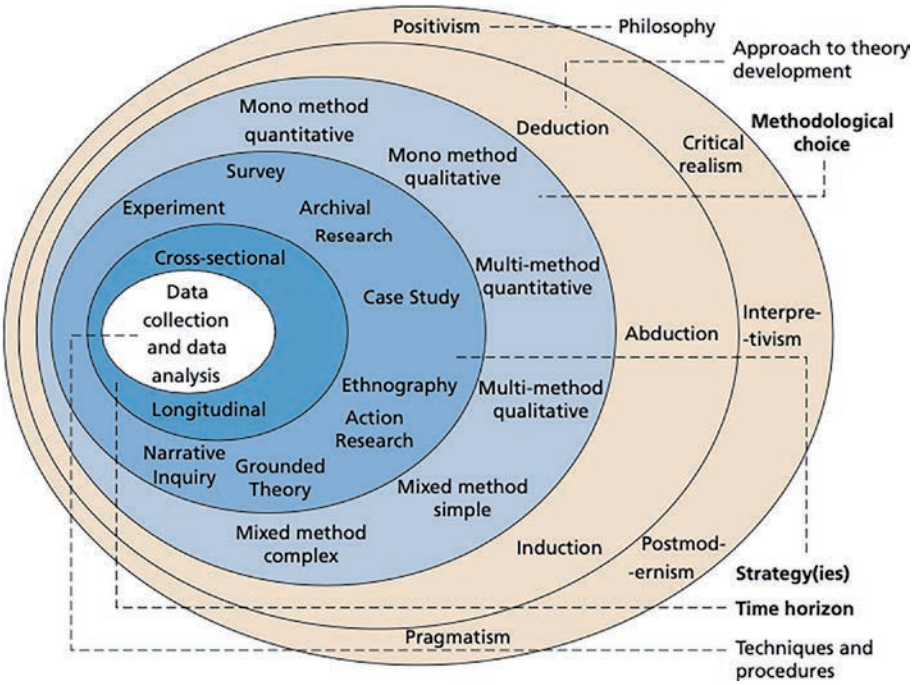


Figure 2.
Research onion.

Makueni county population was estimated to be 987,653 people according to the 2019 Kenya population and housing census [36]. Furthermore, according to the Makueni county UHC policy (2022), 34.6% of the population in Makueni county was not covered by any prepayment plan and was likely to suffer financial hardship, informing the study percentage of the target population proportion of the total population estimated to have the characteristics being measured. **Table 1** is a summary of the Makueni county population presented according to the sub-counties based on the latest recent census report [36].

The sample frame illustrates how the population to be studied is chosen based on accessibility, which is then utilized to choose a sample representation to be employed in the study without bias or straining the research endeavor to meet the stated objectives. In this research, the sampling frame consisted of 34.6% Makueni county constituents. This was the percentage of the population in Makueni county that was not covered by any prepayment plan, according to the Makueni county UHC policy (2022), and was likely to suffer financial hardship, informing the study percentage of the target population proportion of the total population estimated to have the characteristics being measured. A two-tier sampling was used, first, the total sample population of Makueni county was considered per the census sub-counties. Thereafter, proportionate random sampling of the population estimated to have the measured characteristics was considered across the sub-counties.

A representative sample includes a sufficient number of items from the population under study. The following sample size determination by Cochran [37] formula, presented as Eq. (1), was used to arrive at the sample size for the study respondents

Sno.	Sub-county	Population	Percentage Population (%)
1	Kathonzweni	79,780	8
2	Kibwezi	197,000	20
3	Kilungu	60,952	6
4	Makindu	84,946	9
5	Makueni	130,375	13
6	Mbooni East	97,756	10
7	Mbooni West	102,594	10
8	Mukaa	107,549	11
9	Nzaui	126,701	13
Makueni County		987,653	100

Table 1.
Kenya population and housing census.

$$n = \frac{\left(Z^2 \times p \times q\right)}{d^2} \tag{1}$$

where n was the sample size; Z was the significance level set at 95% confidence interval, which corresponded to Z value of 1.96; p was the target population proportion of the total population estimated to have the characteristics being measured (0.346); q was a variable, calculated as (1- p); and d was the acceptable error level, set at 0.05 for this study for maximum variability, tabulated as follows

$$n = \frac{1.96^2 \times (0.346) \times (1 - 0.346)}{0.05^2}; n = 348 \tag{2}$$

Therefore, from the Cochran [37] formula and the corresponding tabulations in Eq. (2), the sample size for this study was 348 (n = 348). Consequently, to determine the proportionate random sample sizes per county, Eq. (3) was used, and the sample sizes per county were as presented in **Table 2**.

$$n_i = \frac{N_i}{N} \times n \tag{3}$$

where n_i was the sample size per sub-county i; N_i was the population of sub-county i; N was the total population of Makueni county; and n was the overall sample size.

3.3 Design procedure and ethical considerations

Following research approval from the Institutional Review Board (IRB) at the United States International University-Africa (USIU-Africa), research permission was obtained from the Kenya National Commission for Science, Technology and Innovation (NACOSTI) to support the research. A pilot study was then conducted to

Sno.	Sub-county	Sample	Percentage population (%)
1	Kathonzweni	28	8
2	Kibwezi	70	20
3	Kilungu	21	6
4	Makindu	31	9
5	Makueni	45	13
6	Mbooni East	35	10
7	Mbooni West	35	10
8	Mukaa	38	11
9	Nzaui	45	13
Makueni County		348	100

Table 2.
Proportionate random sample sizes per sub-county.

test the reliability and validity of the research instrument and to mitigate ambiguity. Questionnaires were then distributed to respondents, with regular follow-ups to ensure completeness. Thereafter, analysis was performed.

The use of informed and voluntary consent was informed by the principle of respect for persons, which mandated researchers to safeguard respondents with impaired decision-making capacity and to ensure that the consent should permit participants to withdraw from the study at any time. Second, according to the beneficence principle, this research was careful about risks that would cause psychological suffering from prejudice, stigma, and confidentiality violations, whereby risks had to be kept to a minimum. Third, this study reached the population in Makueni county, including marginalized areas, to inform the research process and outcome because the criteria fit the objective of the study, and not because of their accessibility, cooperation, and follow-up. Therefore, the justice principle was enforced [38].

4. Results

Following the data collection exercise, 100% response rate was achieved across all the sub-counties of Makueni county, (Kathonzweni, n = 28; Kibwezi, n = 70; Kilungu, n = 21; Makindu, n = 31; Makueni, n = 45; Mbooni East, n = 35; Mbooni West, n = 35) and the overall target sample size (N = 348), giving a response rate of 100%.

4.1 Age of the respondents

The age of the respondents ranged from 18 to above 55 years, as presented in **Table 3**. From the analysis, fewer responses were recorded from the young and the most aged population. The proportion of the young respondents, in this case below 25 years was 9%, whereas that of the most aged, in this case above 55 years, was 16%. The middle-age groups recorded higher responses, with the middle age group (36–45 years) recording the highest proportion of 31%.

Age	Number of respondents	Proportion (%)
18–25 years	30	9
26–35 years	67	19
36–45 years	108	31
46–55 years	86	25
Above 55 years	57	16
Target sample size, N	348	100

Table 3.
Age of the respondents.

4.2 Gender of the respondents

Figure 3 below represented the gender of the respondents, whereby 60% were female and 40% were male. From the results, the rate of encountering a female respondent was higher compared to that of male. Most people of the male gender were reported to either be working out of the county, or away for varied work-related engagements at the time of this survey. Further, more women than men in Makueni county appeared to be more engaged in health-related issues, both at household and community levels following their availability and willingness to undertake a health-related survey.

4.3 Monthly income levels of the respondents

The monthly income levels of respondents sampled in Makueni county indicated that 90% of the respondents earned below Kes. 20,000. Moreover, 64% of the respondents earned below Kes. 10,000, 26% earned between Kes. 10,000 and 20,000, whereas 7% earned between Kes. 20,000 and 30,000. The highest proportion of the

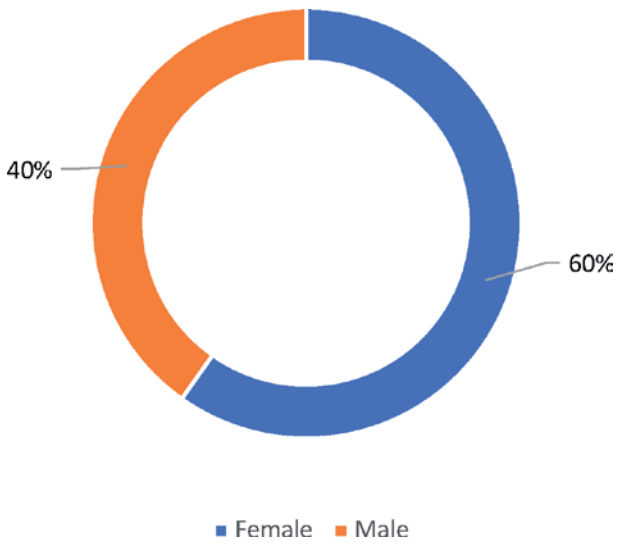


Figure 3.
Gender of the respondents.

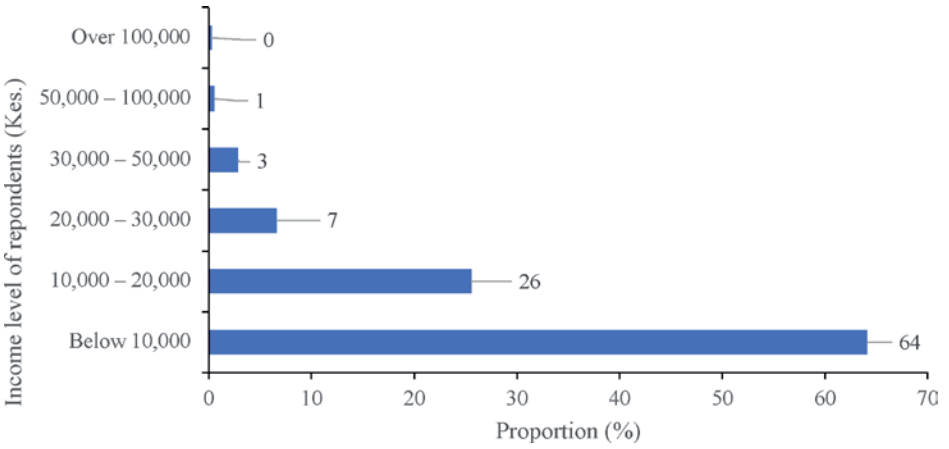


Figure 4.
Monthly income levels of the respondents.

respondents earned below Kes. 20,000, and a very small proportion earning more than Kes. 50,000. This represented low-income levels for the majority in Makueni county as shown in **Figure 4**.

4.4 Education levels of the respondents

From the analysis, **Table 4**, most of the population had formal education. A majority of the respondents, 54%, had attained secondary school education, whereas a smaller proportion, 13.2%, had an undergraduate degree. There were no respondents recorded to have had a graduate, and a doctoral degree, within the population reached during the research survey period.

4.5 Personal devices owned by the respondents

The study results, **Table 5**, in Makueni county showed that 63.8% of the respondents owned smartphones, 46% had basic phones, 5% had laptops, 3% had tablets, and 1% had desktop computers. From the collected data, several people owned both a smartphone and a basic phone. Furthermore, people who owned a tablet, laptop, and desktop computer, also had a smartphone. This showed that a larger proportion had access to smartphones and were likely to use them for online engagements.

Education level	Number of respondents	Proportion (%)
No formal education	7	2
Primary school	106	31
Secondary school	189	54
Undergraduate degree (Bachelor's)	46	13
Target sample size, N	348	100

Table 4.
Education levels of the respondents.

Type of device	Number of respondents	Proportion (%)
Smart phone	222	63.8
Basic phone	160	46.0
Laptop	16	4.6
Tablet	11	3.2
Desktop computer	3	0.9

Table 5.
Devices owned by the respondents.

4.6 Technology and computer skills levels among the respondents

The study results, **Figure 5**, indicated a majority 82% of the respondents had basic technology and computer skills, in that they could navigate smart gadgets with minimal to no assistance at all. Further, 10% of the respondents recorded intermediate skills which meant that in addition to performing basic tasks, they could also make configuration changes to computer programs and applications. On the other hand, 8% of the respondents had advanced skills, which meant that in addition to having basic and intermediate technology and computer skills, they could also configure new and additional computer programs and applications. Following the analysis, high uptake of digital services would likely require targeted training and support to assist those with lower skills so as to improve their technological proficiency and for impact. Furthermore, support mechanisms that addressed the needs of those with basic, intermediate, and those with advanced skills, would be required depending on the level of proficiency needed, and to ensure comprehensive and adequate coverage, in line with consuming digital services.

4.7 Awareness of digital health technologies

The data analyzed outlined the respondents' awareness of various digital health technologies. The responses varied significantly, with the largest group, 41% (142 individuals), selecting "others" to represent digital health technologies they knew

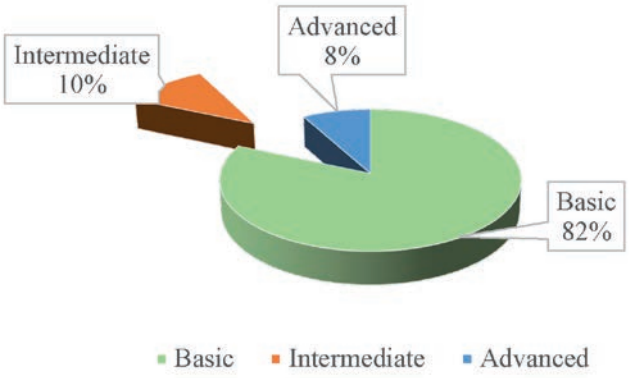


Figure 5.
Technology and computer skills levels among the respondents.

about, followed by 10% (33 individuals), indicating that they had no idea about any digital health technologies. Smaller percentages of respondents indicated awareness of specific technologies, such as the Internet of Things (IoT), remote monitoring, and smart ambulance services.

The largest group of respondents, 41%, selected "others," which suggested a significant portion of the population was likely familiar with some form of digital health technologies but could not clearly identify specific well-known technologies, such as AI, IoT, or blockchain. Additionally, 10% of respondents reported having "no idea," indicating a gap in awareness about digital health technologies. Together, these groups constituted over 50% of the sample, suggesting that awareness of digital health technologies was generally low in this population.

The data also indicated that some respondents were aware of specific digital health technologies. Remote monitoring was recognized by 8% of respondents, making it one of the most known technologies. Remote monitoring allowed healthcare providers to track patients' health data remotely, which was particularly useful in areas with limited healthcare infrastructure. The relatively high awareness of this technology was promising for the implementation of telemedicine and similar digital health services.

Internet of Things (IoT) was known by 6% of the respondents. IoT refered to the interconnectivity of devices, such as wearables and health sensors, which could monitor and transmit health information in real time. Awareness of IoT could pave the way for adopting connected health devices that monitored chronic conditions or fitness, potentially enhancing healthcare outcomes.

Smart ambulance services were known by 9% of the respondents, indicating some familiarity with advanced emergency response systems that incorporated real-time data sharing and advanced communications for patient care. This awareness likely reflected the growing recognition of technology's role in improving emergency healthcare services.

4.8 Respondents' time spent online in a day

Figure 6 showed the amount of time the respondents approximately spent online in a day. Following the analysis, 65% of the respondents spent less than 5 hours online

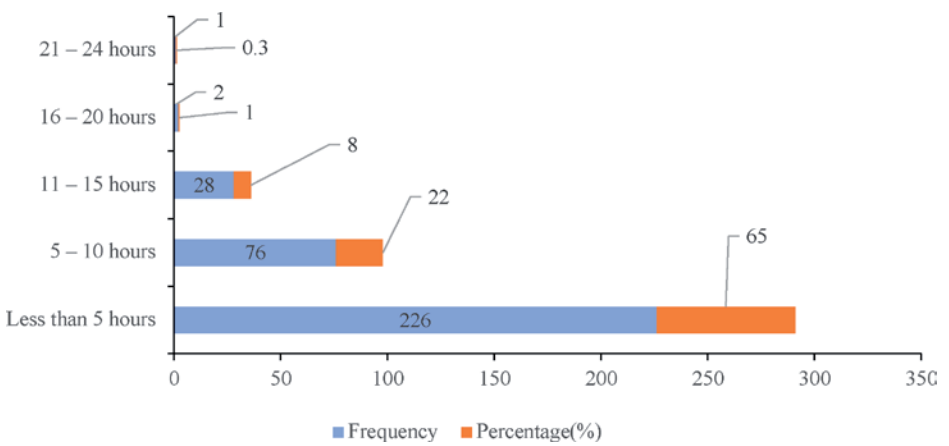


Figure 6.
Respondent's time spent online in a day.

representing 226 of the total number of respondents. On the other hand, 21.8% of the respondents spent 5–10 hours online, 8% of the respondents spent 11–15 hours online, 1% spent 16–20 hours online, and only one (1) respondent indicated to likely remain online for the better part of a day (21–24 hours of a day). The distribution indicated that most respondents spend relatively few hours online, with nearly two-thirds spending less than 5 hours per day. The remaining time was likely devoted to offline activities, suggesting that online engagement, while significant, did not dominate the daily routines of most respondents.

4.9 Other online services used by the respondents

Considering other online services, **Table 6**, that respondents would access and use, social media (64%) were mostly used by majority of respondents, followed by email services (37%), and online banking services (30%). A proportion of the respondents, accessed and used the internet for online learning (26%), whereas another small percentage used online shopping services (16%). On the other hand, 31% of the respondents reported not to use any of the listed online services.

4.10 Regression analysis

In addition to the demographic factors and following the study dimension of digital health tools and technologies (DHTT), digital health services (DHS), digital health programmes (DHP), and digital health information systems (DHIS), the structural path plot below illustrated the relationships between the study variables in these dimensions and their influence on the observed demographic factors. The demographic factors, which were the moderating variables (M_V), were location (Lct), age (Age), gender (Gnd), income (Inc), education (Edc), and digital literacy (Ltr), which in turn impacted equitable access to UHC. In this case, it showed the relationship between digital health (DHM) and equitable access to UHC (EA_), factoring in the demographic study factors. **Figure 7** shows the final validated SEM model.

The path analysis highlighted the contributions of each latent variable to equitable access to UHC. The regression weight value of the moderating variable (M_V) was 0.03. On the other hand, the values on the latent variables were 0.5 for DHM, 0.75 for DHIS, 0.7 for DHP, 0.59 for DHS, and 0.58 for DHTT. These were the R2 values, which translated to the variance explained by the variables. For example, 0.75 for DHIS meant that 75% of the variance in its indicators was explained by DHIS.

Online services	Number of respondents	Proportion (%)
Email services	127	37
Social media services	223	64
Internet for online learning	90	26
Online shopping	55	16
Online banking services	105	30
None	107	31

Table 6.
Other online services used by the respondents in addition to digital health services.

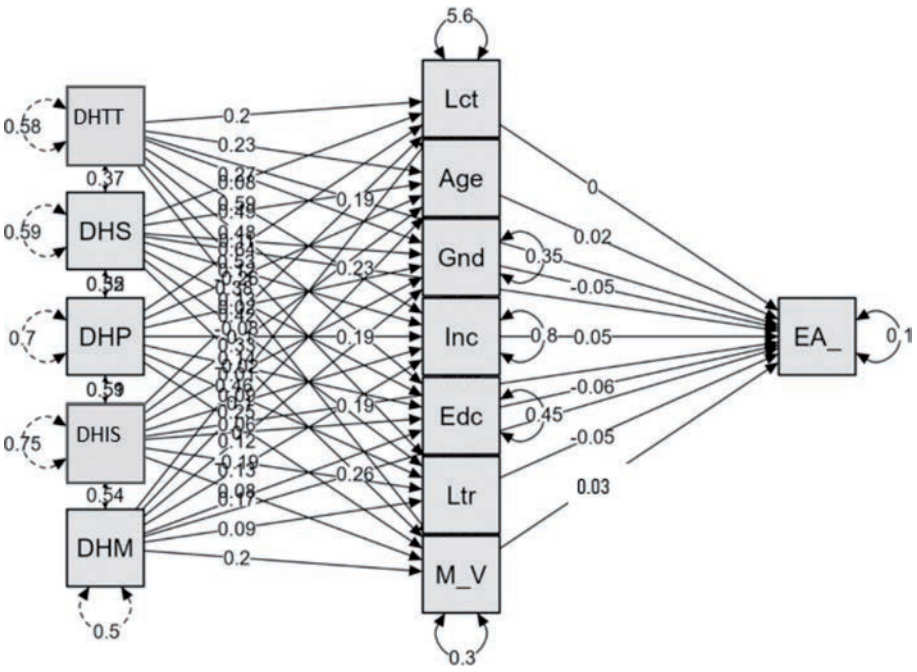


Figure 7.
Final validated study model.

Overall, the SEM underscored the significance of digital health in advancing equitable access to UHC in Kenya.

These findings implied that investments in enhancing digital health infrastructure and services were essential to improving healthcare equity. Stakeholders needed to focus on strengthening these areas to achieve equitable access to UHC. Consequently, the model equation that included the demographic factors as a moderator was presented as: Y = β0 + βiXi+ βiiXii + βiiiXiii + βivXiv + βvXv + βvilogXvi + βiXi * logXvi + βiiXii* logXvi + βiiiXiii * logXvi + βivXiv* logXvi + + βvXv* logXvi + Ɛi; where, Y = 0.1 + 0.19 digital health tools and technologies +0.23 digital health services +0.19 digital health programmes +0.19 digital health information system + 0.26 digital health model (DHM) + 0.03 demographic factors +0.19 digital health tools and technologies*0.03 + 0.23 digital health services*0.03 + 0.19 digital health programmes*0.03 + 0.19 digital health information system*0.03 + 0.26 digital health model*0.03 + 0.015.

5. Discussion

5.1 Digital health tools and technologies influence on equitable access to UHC in Kenya

In analyzing digital health tools and technologies influence on equitable access to UHC in Kenya: a case of Makueni county, it was found that device access to digital health was the most significant variable, followed by internet access. Availability of internet and smart device availability were less of a concern to the targeted population. The results of this study agreed with the findings that highlighted that majority

of adults owned smartphones and many low-income households shared devices. The study results in Makueni county showed that 63.8% of the respondents owned smartphones. Furthermore, people who owned a tablet, laptop, or a desktop computer, also had a smartphone. This showed that a larger proportion had access to smartphones and were likely to use them for online engagements. Sharing of devices among the respondents was not found to be a concern in this study.

The study by Miller [16] noted that interventions in digital health were likely to cause inequalities within the population, whereas Sanogo [19] noted that increased UHC efficacy was hampered by varied disparities. In this study, internet access reported an overall average of 2.54, which indicated that, on average, respondents moderately agreed with having reliable internet access, knowing how to connect, and having experience of using the internet. On the other hand, The overall average of availability of a smart device was 2.43, which showed that respondents most likely owned and used smartphones, while the ownership of other smart devices such as tablets, laptops, and desktop computers was low. In addition to the disparities especially in the kind of smart device owned, access to digital health information indicated an average mean of 1.9875 which showed that access to digital health information was generally low. The standard deviation value of 0.994 indicated moderate variability in access levels, which meant that access was inconsistent across the population. A positive skewness (1.079) revealed that more respondents experienced lower access, with very few enjoying higher access. The kurtosis value of 0.606 suggested a heavier-tailed distribution, which meant that there were more extreme cases of low access, further emphasizing the barriers respondents faced in accessing digital health information and, thereby, supporting the findings of Miller [16] and Sanogo [19].

Among the tools in use to access health solutions were tablets, smartphones, basic mobile phones, and desktop computers [5, 13, 18, 23]. The study results in Makueni county showed that 63.8% of the respondents owned smartphones, 46% had basic phones, 5% had laptops, 3% had tablets, and 1% had desktop computers. From the collected data, several people owned both a smartphone and a basic phone. Further, people who owned a tablet, laptop, and desktop computer, also had a smartphone. This showed that a larger proportion had access to smartphones and were likely to use them for online engagements and to access health solutions.

Among the technologies supporting health solutions were smart wearables, smart ambulance, blockchain technology, artificial intelligence, big data analytics, remote monitoring, and Internet of Things [13, 14]. This study sought to find out that these technologies were known and accessed by the population, which required smart devices accessing digital health. The mean value of device access to digital health ranged from 1.61 to 2.15, with an overall average of 1.80. This suggested that access to digital health technologies was generally low among the respondents, with smart wearable technology, AI, and IoT being less commonly known and accessed. The kurtosis values of device access to digital health variable ranged from 0.20 to 6.28. High positive kurtosis indicated a peaked distribution, especially in access to advanced digital health technologies, with most respondents reporting low access.

The study by Azzopardi-Muscat and Sørensen [20] noted that digital technologies that relied on smart device availability and availability of internet increased inequalities when not well aligned. However, this research found the variables 'availability of internet' and 'smart device availability' not to have high significant impact on equitable access to UHC. The users were mostly interested with access to internet and the fact that tools available accessed digital health.

5.2 Digital health services influence on equitable access to UHC in Kenya

To explore the digital health services influence on equitable access to UHC in Kenya: a case of Makueni county, this study checked whether the users used their smart devices to interact with the various digital health services, and most importantly to check whether the users were aware of the available digital health services and their use. Moreover, the main aim of this study was to statistically confirm the influence of digital health services on equitable access to UHC. Following the output of this research, among the digital health services available were virtual care services, virtual consultation services, and online medical support services. The work by Meessen [21] noted that it was important to be aware of the available services and that these services were best integrated to offer solutions instead of fragmentation of the services, which would result in inefficiencies and inequalities. In line with the work, this study explored digital health services available within the health ecosystem and how they integrated to offer solutions. The responses from Makueni county noted the availability of digital health services that ranged from financial services, treatment services, and human recourse services, and that the users were aware of these services within the county despite not being able to access them in some cases.

In addition, following the high numbers of users who owned and used smart phones and other smart gadgets such as laptops and tablets, this research supported the findings by [5] that there was a rising usage of smart devices and digital health services, and that the population was ready for technology. Further, the study supported the findings on inadequate digital health services to meet the need of the population, considering that availability of digital health services and availability of online digital services information showed significant positive correlations with the other variables, though they were somewhat weaker. Further, the availability of digital health services and information were key dimensions in influencing equitable access to health, including UHC. The availability dimension was a key dimension which was missed in the studies by Chattu [23], Yao [24], and Thorell [18]. This study output showed a strong relationship between the predictors (access to online digital services information, availability of digital health services, availability of online digital services information, and access to digital health services) and equitable access to UHC, explaining 78.01% of the variance in the dependent variable. The predictors were quite effective in explaining the dependent variable, as evidenced by the high R-square ($R2 = 0.78$) and adjusted R-square values (0.7776). The standard error value (0.382415) indicated a reasonably good fit, which was also significant ($p = 0.000$), unlike the studies by Wilson [22] and Meessen [21].

E-learning services were among digital health services for improved health according to Bundi [26] and as supported by this research output, where a proportion of the respondents accessed and used the internet for online learning (26%). On the other hand, availability of online digital services information had a strong correlation with access to digital health services (0.701) and access to online digital services information (0.770). In their health-related research, these studies by Wilson [22] and Meessen [21] did not consider equitable access of the digital health services, which found to be a key dimension especially in research that is in line with the population axis of the health system framework.

The output of this research confirmed that availability of online information/content that informed on available digital health services was important, as was reported by [16, 21]. Moreover, it was important to consider disparities in the availability and access of digital health services, Sanogo [19], cognisant of the fact that the

poor bore the highest burden of disease and were more likely to be unwell and to incur expensive, debilitating medical costs from having digital health services that are not equitably availed and accessed [27]. Further, innovative digital health needed to consider that the deployed essential services were available and accessible by the majority in the target population, which supported the research by Abdelrahman [28].

5.3 Digital health programmes influence on equitable access to UHC in Kenya

Investigating digital health programmes influence on equitable access to UHC in Kenya: a case of Makueni county, revealed that about 74.5% of the variability in equitable access to UHC was explained by the independent variables, which included access to government policies and regulations on digital health, availability of digital health educational resources and programmes, availability of government policies and regulations on digital health, and access to digital health educational resources and programmes on digital health. Moreover, an adjusted R2 of 0.742 was very close to the R2 value (0.745), indicating that the model was a good fit and would perform well when generalized to a larger population.

On availability of digital health educational resources and programmes, respondents moderately agreed that digital health resources and programmes were available online, with some variation in responses. This supported the research by Azzopardi-Muscat and Sørensen [20], which reported inadequacies in available digital health programmes.

Access to government policies and regulations on digital health was a significant factor ($p = 0.000$), though respondents disagreed that they had access to digital health resources online. This translated to mean that in as much as access was desirable, it was a challenge that needed to be addressed, and that there was a need for continual communication, awareness, to promote access as was also reported by Miller [16]. The results showed a moderate agreement that government policies and regulations were available online, but with low access.

Overall, the research output on this objective suggested a potential gap between availability and actual access, resulting to disparities in health as was also reported by Sen [32]. All the independent variables had a positive and significant impact on equitable access to UHC ($p = 0.000$), though availability of digital health educational resources and programmes was only marginally significant ($p = 0.047$). In addition, access to digital health educational resources and programmes was the most important factor in improving equitable access to UHC, with a beta-value of 0.5252, and a p-value of 0.000, followed by availability of government policies on digital health with a beta-value of 0.1755, and a p-value of 0.000. Therefore, government policies and regulations, and educational resources and programmes on digital health required to be both available and accessible to curb exclusionary practices in digital health, as was also noted in the research by Udenigwe and Yaya [30].

5.4 Digital health information systems influence on equitable access to UHC in Kenya

To establish digital health information systems influence on equitable access to UHC in Kenya: a case of Makueni county, this research considered access to digital health information, availability of digital health information, availability of digital health information system, and access to digital health information system. There seemed to be a consistent gap between awareness of availability of digital health

information systems and the actual access of these systems. Although awareness of availability was moderate, access remained low, with data showing that many respondents struggled to use these resources.

Overall, all variables exhibited robust positive correlations, with the greatest correlation coefficient of value 0.9232 seen between access to digital health information system and access to digital health information. The findings indicated that enhancing digital health systems and access to health information was essential in fostering equitable access to UHC. This supported the research by Udenigwe and Yaya [30], where various methods were used to ensure information was disseminated to the population. On the other hand, the research by Miller [16] emphasized on equitable access as a critical measure in designing digital health interventions, including digital health information systems, which also aligned with the findings of this research.

Following the research output, users accessed information systems that they were aware of, emphasizing on the availability dimension. This research considered availability of digital health information system and availability of digital health information, in addition to the access dimension. The research by Azzopardi-Muscat and Sørensen [20] reported that increased access to information, including digital health information systems information was key to promoting health, which is supported by this research. However, the research did not consider the availability dimension which this research output found to be a key dimension.

In addition to financial systems as was reported by Meessen [21], other digital health systems that impacted equitable access to health, including UHC, were human resource management information systems, insurance management information systems, and medical care information systems as was reported by Singh and Landry [13]. Therefore, this research supported the findings by Meessen [21] and Singh and Landry [13].

From the results, the rate of encountering a female respondent was higher compared to that of their male counterparts. Most people of the male gender were reported to either be working out of the county or away for varied work-related engagements at the time of this survey. Further, more women than men in Makueni county appeared to be more engaged in health-related issues, both at household and community levels following their availability and willingness to undertake the health-related survey. This supported the work by Sen [32] which focussed on gender equity and reported that gender was a key factor for digital health information systems that advanced UHC. However, focussing on digital health systems would ensure that regardless of gender and place, targeted population would access these systems and information provided if they have a smart gadget and access to the internet.

6. Conclusion

Following the output of this research and going by the lessons observed, it is recommended that related studies should consider the target population. It is important to interact with previously published literature and the population to confirm the existence of gaps. Furthermore, quantitative studies that employed the use of questionnaires needed to ensure that the research tool was available offline in cases where the areas of data collection suffered from internet instability, like was the case with Makueni county.

Additionally, health-related studies required that consent is sought at all levels, starting from obtaining authority to conduct such kind of research to the level of

the patient/people agreeing to give required research data. Moreover, to ensure a well-executed research process that aligned with the relevance and importance of the study's objectives, it is important to consider appropriate design procedures and data analysis methods.

To find ways to promote innovation in healthcare delivery while preserving safety and equity, future research should examine how to integrate cutting-edge digital technologies with current healthcare systems, evaluate their sustainability and scalability, and determine how well they work to reach marginalized communities. It should also look for ways to get over access-hindering financial, technological, and infrastructure obstacles. To make sure that the suggested solutions are workable, inclusive, and sensitive to the particular requirements of various areas, studies should also take into account the participation of a variety of stakeholders, such as legislators, medical professionals, and community leaders.

This study recorded users who indicated to use other technologies, and online services that had not been identified through this study. Future surveys on digital use could benefit from a more comprehensive categorization of online services that expanded the WHO health system. Additionally, future research should consider the presented validated model, from the case of Makueni county, to inform equitable access to UHC in Kenya and beyond.

Considering the diverse stakeholders within the healthcare ecosystem, to developers and innovators in health, this chapter recommends developing and validating a digital health model for equitable access that considered all the WHO action lines (axis) for realizing UHC (population axis, services axis, and costs axis). This was considering that this research study highly focussed on the population axis. To add to this, deployed digital health interventions needed to consider flexible, multi-platform approach to healthcare delivery that focussed primarily on basic usability, such that no one was cut out of service on issues to do with usability. To academia and research community, a quantitative study that considered more counties in Kenya would be a great variation in relating these research findings and adding research perspectives within the health sector.

On the other hand, considering the patients and the general population, digital health models needed to consider financial limitations of low-income individuals and preferences for offline activities. In doing this, health services would remain usable and accessible when online access was not favorable, and also adequately reach those in marginalized regions. Further, this chapter recommends that any provided interventions availed to healthcare practitioners, including practical tools and strategies to improve efficiency, enhance patient care, and facilitate communication by healthcare providers and practitioners, required to be utilized to benefit the population and to serve the purpose it was created for. Last but not least, policy-makers, including governments, need to ensure public health education initiatives are done to raise awareness on available digital health initiatives and to educate about access and how to benefit from these initiatives, hence impacting digital health outcomes.

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Chapter 6

Patients and Their Relatives' Experiences in Intensive Care

Dilek Tarhan and Şerife Engeloğlu

Abstract

Intensive care units (ICUs) are highly specialized clinical settings, fully equipped with advanced technology, and specifically designed to provide multidisciplinary care for patients suffering from life-threatening conditions or severe injuries. While essential for sustaining life, these settings are also linked to significant psychological and emotional challenges, affecting not only patients but also their relatives. Depending on their level of consciousness and the degree of intubation or sedation, patients often experience fear, pain, loneliness, spatial disorientation, and, in some cases, delirium. Communication barriers, especially for patients who are intubated or cognitively impaired, exacerbate feelings of vulnerability, misunderstanding, and helplessness. Patient relatives, in contrast, must cope with uncertainty, anxiety, fear, sadness, and a sense of loss of control, while also needing clear information and active involvement in care-related decisions. An increasing body of evidence suggests that clear and effective communication, the adoption of patient relative-centered care models, and the implementation of flexible visiting policies play a key role in enhancing the satisfaction and psychosocial well-being of both patients and their relatives. Therefore, the ICU experience should not be evaluated solely on the basis of clinical outcomes. Instead, it is also influenced by the quality of communication, the level of patient relative engagement, and the extent to which a compassionate and humane approach is integrated into care practices. Accordingly, in contemporary intensive care practice, the incorporation of patient relative-centered care principles, grounded in empathy, transparency, and mutual trust, emerges as an essential complement to medical interventions.

Keywords: communication, experience, intensive care, patient, patient relative

1. Introduction

ICUs are highly specialized clinical settings, fully equipped with advanced technology and staffed by multidisciplinary healthcare teams, with the primary objective of maintaining vital organ function, stabilizing critically ill patients, and attaining optimal clinical outcomes [1]. ICUs constitute one of the most resource-intensive elements of the healthcare system, in terms of both quality and quantity, as they cater to the most vulnerable and high-risk patient populations [2].

Patients admitted to ICUs are subjected to a wide array of stressors, including pain, immobility, continuous monitoring, disorientation in an unfamiliar environment,

confusion, and sleep disturbances. These stressors may lead to both short-term and long-term psychological and cognitive effects [3]. The risk of developing conditions such as delirium, post-traumatic stress disorder (PTSD), depression, and anxiety is well established among ICU patients. Importantly, the impact of intensive care extends beyond the patient, significantly affecting patient relatives as well [4].

Patient relatives often face uncertainty regarding the treatment process, limited communication, difficulties in accessing the patient, and challenges in comprehending complex medical information. These factors contribute to increased anxiety, feelings of helplessness, and difficulties in adaptation. In the literature, the concept of Post-Intensive Care Syndrome-Family (PICS-F) has been proposed to describe these psychosocial outcomes. PICS-F encompasses a spectrum of psychological conditions, including depression, anxiety, sleep disturbances, and PTSD, which develop among patient relatives following a patient's stay in intensive care [5]. Studies indicate that approximately 30% of patient relatives of ICU patients exhibit such symptoms [6]. Importantly, the quality of communication between healthcare providers and patient relatives during the ICU stay has been recognized as a key factor affecting the severity of these outcomes. Empathy-driven, transparent, and ongoing communication not only improves patient relatives' satisfaction but also reduces adverse psychological effects [7].

This chapter examines both the purpose and the multifaceted impacts of ICUs, focusing on the complex interaction of clinical, psychosocial, ethical, and human dimensions. By exploring the experiences of patients and their relatives, it highlights the importance of interventions informed by empirical evidence and supported by technological innovations. These encompass effective communication strategies, approaches to engage patients and their relatives, and structured psychological support programs. Finally, the chapter emphasizes the need to prioritize humane and compassionate care to improve the overall quality of the ICU experience.

2. Patient experience in intensive care

An exclusive focus on medical treatment in the ICU is neither adequate nor appropriate. The ICU experience should be approached holistically, taking into account not only clinical outcomes but also patients' psychosocial needs, the quality of communication, and the development of mutual trust [8]. It is well established that patients often experience anxiety, fear, and loneliness during their ICU stay [9]. Accordingly, interventions such as empathy-based communication, regular debriefing sessions, and the use of patient diaries have been shown to substantially enhance the overall patient experience. Additionally, managing environmental factors, such as noise levels, lighting, and privacy, plays a crucial role in enhancing patient comfort and sleep quality, thereby supporting a more positive ICU experience [10].

When assessing patient experiences in the ICU, it is essential to distinguish between the perspectives of conscious patients and those who are unconscious or sedated. Conscious patients often retain partial or fragmented memories of their ICU stay. While some recollections are accurate, such as voices, faces, or clinical procedures, others may be distorted or contain illusions. These patients often report fear, helplessness, and emotional distress. Even when aware of their surroundings, communication barriers resulting from mechanical ventilation or neurological impairment can increase frustration and psychological distress. In contrast, unconscious or deeply sedated patients may not form explicit memories; however, evidence indicates

that they remain responsive to indirect sensory stimuli. Recent studies show that even patients who seem unresponsive may detect environmental stimuli, auditory cues, and emotional tones [11].

Importantly, patient experience should not be viewed solely as an individual-level phenomenon but also as an organizational responsibility. Healthcare organizations should systematically measure patient experiences, incorporate findings into quality assessment and continuous improvement programs, and develop care policies that prioritize patient-centered care. At the organizational level, the systematic integration of patient experience into strategic planning not only improves patient satisfaction but also reinforces patient safety and overall quality of care [12].

3. The patient relative experience in intensive care

The experience of patient relatives in the ICU is deeply emotional, shaped by a complex interaction of fear, uncertainty, helplessness, and hope. While the primary focus of care appropriately remains on the patient, patient relatives simultaneously experience psychological, emotional, and occasionally physical crises that reflect the patient's condition. Within an environment defined by high-intensity care, invasive technology, and unpredictable outcomes, the emotional trajectory of patient relatives is fragile yet often overlooked.

One of the most prominent emotional responses among patient relative is stress, frequently accompanied by severe anxiety and persistent uncertainty. Admission to the ICU typically follows unexpected, traumatic, or emergency events, leaving patient relatives unprepared for the sudden transition. Many patient relatives experience feelings of guilt when leaving their loved ones in an unfamiliar, highly technical environment dominated by complex devices and rapidly changing clinical conditions. In addition to these emotions, they must also cope with restrictive visiting policies, limited communication, and uncertainty regarding treatment outcomes. Studies have consistently shown that over 60% of patient relatives of ICU patients experience significant psychological distress, including acute stress disorder, depressive symptoms, insomnia, and loss of appetite [13]. When such symptoms persist beyond the ICU stay, they may progress to PICS-F, encompassing long-term psychological consequences.

Another challenge commonly reported by patient relatives is the sense of exclusion from the care process. The predominance of technical and medical terminology can create barriers, heightening anxiety and undermining trust in healthcare professionals and institutions. In contrast, involving patient relative in discussions, encouraging their questions, and facilitating their participation in visits contributes to improved psychological outcomes. Active engagement in decision-making processes enhances their sense of control, fosters confidence in the ethical and respectful care of their loved ones, and mitigates long-term regret [14].

In response to these needs, patient relative-centered models of ICU care have emerged. These approaches reconceptualize patient relatives not as passive visitors but as integral partners in care. By promoting shared decision-making, open communication, emotional support, and physical presence, such models aim to establish a therapeutic alliance between healthcare professionals and patient relatives. Evidence suggests that these interventions reduce stress, improve satisfaction, and may even shorten ICU length of stay. Structured patient relative meetings, real-time provision of medical updates, flexible visitation policies, and the assignment of dedicated

patient relative liaison nurses are among the strategies shown to strengthen resilience and enhance trust in the ICU team [15].

Visitation policies remain one of the most debated aspects of the patient relative experience. Historically, restrictive visitation practices were justified by concerns regarding infection control and patient overstimulation. However, growing evidence challenges these assumptions. Flexible and open visitation policies have been associated with reduced anxiety and depression among patient relatives, increased satisfaction, and even lower delirium rates in patients [16]. Conversely, restrictive visitation, particularly during crises such as the COVID-19 pandemic, heightened feelings of isolation, helplessness, and trauma. Many patient relatives described such periods as profoundly distressing, as they were deprived of the opportunity to be present with their loved ones during critical or final moments [17].

In conclusion, addressing the needs of patient relatives in the ICU such as timely access to information, opportunities for emotional connection, meaningful involvement in care decisions, and physical presence, is both an ethical imperative and a clinical necessity. Patient relative-centered models of care that prioritize empathy, communication, and participation not only mitigate trauma and strengthen relationships between patient relatives and healthcare professionals but also contribute to improved outcomes for patients and their relatives. In the context of the uncertainty and suffering inherent to intensive care, such human-centered approaches ensure that patient relatives are provided with the clarity, comfort, and dignity they most require.

4. Factors influencing the experience

The patient experience in intensive care is influenced not only by medical treatment but also by a variety of interrelated factors. Psychological dimensions such as anxiety, fear, loneliness, and uncertainty, are particularly significant and may prolong the recovery process. Cognitive factors, including delirium, sedation, and fragmented memories, complicate patients' perceptions of their ICU stay and may impede psychological adjustment during the post-recovery period. Physical factors, such as pain, sleep disturbances, repeated interventions, and dependence on mechanical ventilation, further compromise patient comfort. Furthermore, environmental conditions (particularly noise, lighting, and privacy) play a critical role in shaping both patient and their relative experiences. A poorly managed environment can heighten distress, whereas a supportive and well-structured environment can promote comfort and improve overall outcomes [12].

4.1 Environmental influences

Environmental conditions exert a significant influence on the experiences of both patients and their relatives in the ICU. Noise, lighting, and lack of privacy constitute major challenges that directly impact psychological well-being and recovery trajectories. Continuous noise generated by alarms, ventilators, monitors, and staff activities creates a persistently intrusive environment for patients. Such ongoing auditory stimulation disrupts rest and sleep, elevates stress levels, and contributes to delirium, ultimately delaying recovery [18]. For patient relatives, the same environment fosters increased anxiety and helplessness, impairing their capacity to provide effective emotional support [19].

Lighting represents another critical factor with profound physiological and psychological effects. Prolonged exposure to artificial lighting, in the absence of natural day-night cycles, disrupts circadian rhythms. Such disruption diminishes sleep quality and is strongly linked to cognitive impairments, including ICU delirium, which subsequently prolongs hospital stays and complicates recovery [20]. Equally important is the issue of privacy. Shared rooms, continuous monitoring, and frequent interventions deprive patients of control over their personal space. This lack of privacy heightens vulnerability, stress, and even shame, with adverse consequences for emotional well-being and the overall ICU experience [21].

Beyond these physical aspects, the technical and sterile environment of ICUs contributes to a sense of alienation. The pervasive presence of machines, tubes, and monitors can create a cold, impersonal setting, distancing patients from their sense of humanity. This predominance of technology may inadvertently shift care toward task-oriented practices, limiting opportunities for holistic, person-centered interactions. Patient relatives, similarly, may feel disoriented in such an environment, where unfamiliar medical devices and terminology heighten confusion and fear, complicating their participation in care and decision-making [22].

The reliance on advanced technologies, while essential for sustaining life, may inadvertently restrict interpersonal engagement. Healthcare professionals frequently devote more time to managing devices than to fostering empathy, trust, and meaningful communication with patients and their relatives. This imbalance can exacerbate feelings of isolation, anxiety, and depression [23]. Therefore, maintaining a balance between technological interventions and human-centered, compassionate care is crucial for optimizing the ICU experience.

In summary, environmental factors within the ICU exert a substantial influence on the psychological well-being and overall experiences of both patients and their relatives. Creating a more humane care environment is essential for promoting conditions that address both medical and emotional needs. This can be achieved through the systematic regulation of noise and lighting, enhanced privacy, and a balanced integration of technological and interpersonal elements. Targeted interventions in these areas not only support clinical recovery but also improve patient and their relatives satisfaction, ultimately contributing to the development of a more compassionate and human-centered intensive care environment.

4.2 Psychological and emotional influences

Patients in the ICU frequently encounter significant psychological and emotional challenges arising from both their clinical condition and environmental stimuli. Among these, delirium is particularly noteworthy, representing one of the most distressing complications of intensive care. Delirium is characterized by acute confusion, distorted thinking, perceptual disturbances, and altered levels of consciousness, and may be precipitated or exacerbated by infections, sleep deprivation, or pharmacological interventions. Patients who develop delirium often report frightening hallucinations, such as being attacked, buried, or imprisoned. They may also misinterpret medical procedures as forms of torture or punishment. These experiences generate not only immediate distress but also enduring trauma, with emotional dysregulation that persists well beyond hospital discharge. Evidence indicates that ICU delirium substantially elevates the risk of depression, anxiety, and post-traumatic stress symptoms [24].

Pain, both physical and emotional, remains a prominent aspect of the ICU experience. Despite advances in pain management, patients with limited communication abilities frequently report insufficient relief, contributing to increased suffering. This is further compounded by prolonged periods of isolation due to infection control protocols and restrictive visitation policies. The absence of familiar voices and human contact intensifies loneliness and diminishes patients' coping capacity. Many patients report feeling objectified, perceiving themselves not as individuals receiving care but as passive bodies subjected to medical procedures [25].

Distortions in the perception of time and space are also common in the ICU. Patients frequently struggle to distinguish between day and night or to estimate the duration of their ICU stay. Contributing factors include continuous artificial lighting, the persistent presence of machines, and disrupted sleep-wake cycles. These conditions may give rise to so-called "ICU dreams," which are nightmarish hallucinations that blur the boundary between reality and imagination. Such perceptual disturbances can manifest as vivid auditory and visual experiences, accompanied by profound fears of death, entrapment, or abandonment [26].

The long-term psychological consequences of the ICU experience are of significant concern. Post-Intensive Care Syndrome (PICS) encompasses cognitive impairments, emotional disorders, and physical debility following critical illness. Among its most severe sequelae is PTSD, characterized by intrusive memories, nightmares, hypervigilance, and avoidance behaviors triggered by reminders of the ICU stay. Risk factors include prolonged mechanical ventilation, episodes of delirium, and profound feelings of helplessness during care [5].

Importantly, the severity of these outcomes is not determined solely by the medical condition but is strongly shaped by the quality of interpersonal interactions within the ICU. Empathic communication, clear explanations of procedures, attention to physical comfort, and provision of emotional support by healthcare professionals can substantially mitigate traumatic perceptions. When patients perceive that they are treated with dignity, actively listened to, and acknowledged in their suffering, their emotional resilience is enhanced, improving their capacity to cope with critical illness.

In conclusion, the psychological and emotional experiences of ICU patients are complex, encompassing fear, pain, isolation, and trauma. While the provision of physiological care in intensive care is essential for survival, the human experience of critical illness must also be recognized and addressed. Strategies such as enhancing communication, engaging patients' relatives, proactively managing delirium, and providing psychological support during and after the ICU stay are crucial for optimizing the overall patient experience and mitigating the risk of long-term psychiatric morbidity.

4.3 Communication

Effective communication in the ICU is a critical determinant of patients' emotional well-being and their overall perception of care quality. For critically ill patients, particularly those who are conscious or experience fluctuating levels of consciousness, the capacity to articulate needs, receive comprehensible information, and feel understood provides reassurance. It also reinforces autonomy and alleviates anxiety throughout the course of intensive care.

A fundamental pillar of communication in healthcare is the delivery of planned, structured, and interactive information. In the ICU context, however, this process

demands heightened sensitivity, precision, and continuity. Communication should extend beyond the mere provision of medical data; the patient's condition must be explained in clear, accessible language, complemented by opportunities for patients to express feelings and concerns. This bidirectional, interactive approach ensures that patients perceive communication not as a unidirectional transfer of information but as a meaningful dialogue.

The engagement of patients' relatives constitutes another essential dimension of ICU communication. Patient relatives frequently experience uncertainty, anxiety, and emotional strain, necessitating clear, transparent, and consistent updates. Debriefing sessions should not only convey information but also address emotional needs, promote active participation in care-related decisions, and provide psychosocial support. At the conclusion of these sessions, both patients and their relatives should feel valued, reassured, and confident that their questions have been addressed. Such an approach enhances the overall care experience and fosters a relationship of trust between the healthcare team, patients, and their relatives.

Communication barriers are particularly pronounced in the ICU. Many patients are intubated and therefore unable to speak. Evidence suggests that nearly half of these patients experience substantial distress due to their inability to communicate verbally, a factor strongly associated with increased anxiety, frustration, and emotional isolation. Additional challenges (including muscle weakness, sedation, fatigue, and cognitive impairment) further impede effective communication [27]. Within this context, healthcare professionals, particularly nurses, often prioritize technical tasks over emotional dialogue. While technical care remains essential, the relative paucity of empathic communication may lead patients to perceive interactions as mechanical or impersonal, even when they report overall satisfaction with the quality of clinical care.

Research consistently demonstrates that empathic, patient-centered communication mitigates these negative perceptions. Active listening, validation of emotions, and acknowledgment of uncertainty not only alleviate patients' psychological distress but also strengthen their trust in the care team [28]. By adopting proactive, adaptive, and compassionate communication practices, healthcare providers can substantially enhance the ICU experience, enabling patients to feel valued, understood, and supported throughout the course of critical illness.

4.4 Ethical, religious, and cultural considerations

One of the most challenging ethical dilemmas in intensive care involves end-of-life decision-making, which must be guided not only by the patient's perceived quality of life and clinical prognosis, but also by the ethical values and preferences of both patients and their relatives [29]. While active euthanasia is not legally recognized in many countries, including Turkey, the withholding or withdrawal of life-sustaining treatments that may inadvertently prolong suffering remains a recurrent topic of ethical debate. At this juncture, the fundamental ethical question arises: should life be sustained under all circumstances, or should considerations of quality of life take precedence? [30]. Because many ICU patients lack decision-making capacity, respect for autonomy necessitates reliance on advance directives or the views of legally appointed representatives. Such circumstances frequently generate intra-patient relative conflicts; while some relatives may advocate for the continuation of all possible interventions, others may prioritize comfort-focused care and the withdrawal of non-beneficial treatments [31]. Addressing these conflicts requires transparent

dialogue, openness, and trustworthy communication, alongside careful balancing of the patient's best clinical interests with the expectations and emotional needs of relatives [32]. Beyond the individual level, the scarcity of ICU resources, such as limited bed capacity, also raises pressing questions of equitable allocation, which must be addressed according to the principles of justice, proportionality, and medical necessity. Throughout these processes, safeguarding patient privacy, dignity, and respect for personhood remains a fundamental ethical obligation.

The religious and cultural dimensions of intensive care substantially shape both patient and patient relative experiences. Spiritual beliefs often influence how illness, suffering, and death are understood, and certain practices such as the recitation of prayers, the presence of sacred texts at the bedside, or the performance of specific rituals, can provide families with a profound sense of comfort and meaning [33]. Respecting such practices not only acknowledges patients' cultural and religious values but also promotes their relatives' psychosocial well-being. Cultural backgrounds additionally shape communication preferences: while some cultural contexts favor indirect, softened, or patient relative-mediated disclosure of a poor prognosis, others place value on direct, explicit, and transparent communication. For this reason, culturally sensitive communication strategies are indispensable for delivering care that is both effective and meaningful. Moreover, ICU visitation policies should be designed not solely around clinical imperatives such as infection control but also with attention to the emotional, relational, and spiritual needs of patients and their families, thereby ensuring alignment with a patient- and patient relative-centered care model [34].

In conclusion, the experiences of patients and their relatives in intensive care are shaped not only by medical interventions but also by ethical considerations, religious beliefs, and cultural values. Healthcare professionals who demonstrate transparency, respect cultural and spiritual diversity, and engage in compassionate, trust-based communication not only uphold fundamental ethical principles but also foster patient dignity, strengthen patient relative resilience, and enhance the overall quality of intensive care.

5. Experience enhancing strategies

Improving the ICU experience for patients and their relatives requires multidimensional strategies that address both clinical and psychosocial needs. Among these, the ICU diary has emerged as a widely recognized and effective intervention. ICU diaries are maintained collaboratively by healthcare professionals and patient relatives, recording daily events, treatment processes, and observations regarding the patient's progress [35]. Because many ICU patients experience delirium and memory fragmentation, they often struggle to reconstruct their ICU stay, which heightens the risk of psychological distress and PTSD [36]. By providing a coherent narrative of the hospitalization, diaries help patients integrate their fragmented memories, reduce anxiety and depression after discharge, and facilitate healthier psychological adjustment. For relatives, the act of writing in the diary provides an outlet for emotional expression and strengthens their sense of involvement in the care process. Moreover, ICU diaries foster communication and create a shared narrative that reinforces social support networks and strengthens trust between patients, their families, and the healthcare team [37].

Effective communication constitutes another critical element in optimizing the ICU experience. Patient relatives frequently face profound uncertainty and fear,

which can be alleviated through structured information sessions and sustained dialogue with the healthcare team. To this end, communication training programs for ICU staff emphasize competencies such as active listening, empathic engagement, and the compassionate delivery of difficult news [38]. Such training not only enables clinicians to address relatives' emotional needs and clarify complex medical information but also fosters shared decision-making. Ultimately, these practices strengthen trust, enhance patient-relative satisfaction, and reduce the risk of conflict during critical care decision-making.

The adoption of a multidisciplinary care model further enhances the ICU experience by integrating the expertise of physicians, nurses, social workers, psychologists, and chaplains into a unified framework of care. Within this model, psychosocial support teams deliver targeted interventions such as counseling, stress management, and individualized spiritual support. By addressing patients' and relatives' emotional and spiritual needs alongside medical treatment, this holistic approach alleviates psychological distress, strengthens coping mechanisms, and facilitates smoother transitions to recovery or, when necessary, end-of-life care. Empirical evidence demonstrates that multidisciplinary care not only improves clinical outcomes but also contributes significantly to the psychological well-being and satisfaction of both patients and their relatives [34].

Regular implementation of patient and relative satisfaction surveys, coupled with structured feedback systems, is essential for driving continuous quality improvement in the ICU. These tools enable healthcare teams to systematically evaluate the effectiveness of care practices, identify deficiencies, and implement evidence-based modifications that better align with patient and relative expectations. Establishing a feedback-oriented culture not only promotes transparency and accountability but also reinforces the principles of patient-centered care. Moreover, involving patient relatives in quality improvement initiatives enhances mutual trust, fosters collaboration, and contributes to a more responsive and compassionate care environment [39].

In conclusion, the systematic integration of ICU diary applications, targeted communication training, multidisciplinary psychosocial support, and structured feedback mechanisms constitutes a comprehensive framework for optimizing patient and relative experiences in intensive care. These strategies acknowledge and address the intricate interplay of emotional, informational, and clinical needs inherent in ICU settings, thereby fostering a more humane, empathetic, and patient- and relative-centered care environment.

6. Conclusion and recommendations

ICUs are complex, high-risk healthcare environments where patients and their relatives encounter profound physical, emotional, and ethical challenges. The ICU experience is shaped by multiple interacting factors, including environmental stressors such as excessive noise, inadequate lighting, and limited privacy, as well as ethical dilemmas surrounding end-of-life decisions and the consideration of cultural and religious sensitivities. In addition, the psychological effects of technological dependency, social isolation, and communication barriers further complicate recovery and patient relative engagement [40]. Addressing these dimensions in a comprehensive manner is essential for optimizing patient outcomes and patient relative satisfaction.

ICUs are complex, high-risk healthcare environments where patients and their relatives face profound physical, emotional, and ethical challenges. The ICU

experience is shaped by a multifaceted interplay of factors, including environmental stressors such as excessive noise, inadequate lighting, and restricted privacy, alongside ethical dilemmas concerning end-of-life decision-making and the integration of cultural and religious considerations. Moreover, the psychological impact of technological dependency, social isolation, and communication barriers can hinder recovery and limit patient-relative engagement [40]. Addressing these dimensions through a comprehensive, patient- and relative-centered approach is critical for optimizing clinical outcomes. It also enhances satisfaction and fosters trust within the ICU setting.

Enhancing the patient and relative experience in the ICU constitutes not only an ethical imperative but also a key determinant of improved clinical outcomes. Empirical evidence indicates that supportive ICU environments significantly reduce the incidence of post-intensive care syndromes in patients. These syndromes include anxiety, depression, and PTSD, and supportive environments benefit their relatives as well [36]. Furthermore, effective communication and active patient-relative engagement reinforce the quality of care and foster emotional resilience. They also enhance adherence to treatment plans and mitigate conflicts, underscoring the indispensable role of psychosocial support alongside medical interventions.

Clinically, several evidence-based interventions have been demonstrated to enhance the ICU experience. Among these, ICU diaries which record daily events, care processes, and patient status help bridge memory gaps, mitigate psychological distress, and facilitate emotional expression for both patients and their relatives. Structured communication training programs equip healthcare professionals with competencies in empathy, active listening, and the compassionate delivery of complex or distressing information, thereby enhancing trust and satisfaction. Multidisciplinary psychosocial care teams, comprising physicians, nurses, psychologists, social workers, and chaplains, address the comprehensive emotional, social, and spiritual needs of patients and their relatives. These teams foster resilience, support recovery, and, when necessary, guide end-of-life care [34]. Finally, the systematic collection of patient and relative feedback enables continuous quality improvement, ensuring that ICU practices remain responsive to evolving needs and expectations.

Environmental modifications also constitute a pivotal determinant of the ICU experience. Strategies such as noise reduction, optimized lighting, and enhanced privacy contribute to alleviating stress, improving sleep quality, and promoting overall patient comfort, while concurrently supporting patient-relative engagement and psychosocial well-being.

At the policy level, these approaches should be formally incorporated into quality standards and accreditation frameworks. Health systems must allocate sufficient resources for staff training, environmental enhancements, and psychosocial support services, while fostering a culture that prioritizes patient- and relative-centered care. Furthermore, the systematic measurement and monitoring of patient experience are essential to promote accountability, inform evidence-based resource allocation, and sustain long-term systemic improvements.

In conclusion, enhancing the ICU experience necessitates a multidimensional strategy that integrates clinical excellence with psychosocial support, effective communication, environmental optimization, and policy-level commitment. This comprehensive, evidence-based approach not only improves patient safety and facilitates recovery but also reinforces patient-relative resilience, trust, and satisfaction, ultimately fostering a more humane, patient- and relative-centered, and effective intensive care environment.

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Chapter 7

Personalised Care in the Digital Era: Enabling Alternative Care Pathways through Dynamic EHRs and Digital Twin Technologies

Adrian Attard Trevisan

Abstract

Digital transformation of the healthcare system opens new possibilities of redesigning care delivery in the spirit of the patient experience. In this chapter, the role of Dynamic Electronic Health Records (D-EHRs) and digital twin technology in the delivery of alternative, personalised care pathways into non-clinical settings will be explored. Such innovations make it possible that the biometric, behavioural, and environmental data can be integrated in real time that promotes proactive, predictive, and participatory care. Patients have access to more open, consistent, and context-specific services since the usage of these tools is embedded within health systems. Digital solutions do not only imply efficient operations but also a transformation of how a patient and a clinician interact and engage in different emotional terrain, including home-based surveillance and predictive care. This chapter is based on case studies, architecture frameworks, and ethical analysis that will help explore the possibilities and challenges of these systems in transforming patient satisfaction, safety, and trust within an ever-more data-driven healthcare ecosystem.

Keywords: digital health transformation, patient experience and satisfaction, dynamic electronic health records, digital twin technology, alternative care pathways

1. Introduction

It is not only technological innovation that governs the transformation of healthcare in the digital era but also patient-centred healthcare has become the renewed focus. With rising costs, ageing populations, and the marked rise in chronic illnesses, health systems across the globe are struggling to make ends meet and adapt to the new reality; digital tools are redefining the delivery of care in a world where the biggest challenge is ensuring that patients are satisfied with the kind of care they receive.

This transition comes as an extension of a more lengthy historical change. Up until the early twentieth century, there was mainly hospital-based care with handwritten medical records stored in paper folders. They were very passive participants in the

care of their patients. The emergence of the computer in the 1960s allowed the first generation of electronic medical records (EMR) to appear, yet they were serving the purpose of billing, administrative work, and documentation, rather than patient visit improvement [1]. EMRs progressed to become electronic health records (EHRs) a decade later in the coming years due to a larger and more holistic perspective about patient care. Even these systems have tended to be fixed and hospital-based with little capacity to portray the everyday reality of a patient.

The popularisation of telemedicine, wearable health technology, remote patient monitoring, and mobile health apps in the beginning of the twenty-first century took healthcare outside of the hospital setting. However, these innovations are sure to be as convenient and accessible as possible, but their greatest value is that they can be choreographed into an intelligible, personalised healthcare journey. It is here that dynamic electronic health records (D-EHRs) and digital twin technologies become the main supports. Once they integrate real-time data at the device, setting, and time layer, they will enable a new level of care: anticipatory, continuous, and highly personalised.

In the classical model, patients most of the time receive the care. The interactions with health professionals are event-based and responsive and are, in most cases, confined to clinical encounters. It works on an after-the-fact basis, and interventions are more often than not after deterioration has occurred. Such a model is not compatible with the needs of the current patients, particularly those with chronic conditions who cannot merely be provided with episodic treatment but have to be supported, reassured, and guided on an ongoing basis.

The current healthcare situation is defined by an overwhelming number of challenges: the increasing burden of non-communicable diseases, staff losses, and inequitable health. These issues require a paradigm change in favour of a model that is provider-institution-centric to a patient-experience-centric model. D-EHRs are meant to work specifically in the sense that they constantly progress along with the condition of a patient and will attract biometric information, patient-reported outcomes, and the environmental factors. In association with patient-centred digital twins, model-based simulations simulate, forecast, and personalise care paths. This brings out a responsive system that remains dynamic, listening, adjusting, and responding [2].

This digital transformation symbolises a major reorientation in the context of the patient experience. Patients no longer have to chase the records, explain the histories, and wait weeks to get the result because digital systems allow them to feel 'known' and 'seen' in real time. D-EHRs and digital twins have the benefits of transparency, feedback in a timely manner, and personalised communication, which are known to be the basis of patient satisfaction.

Such a new vision is represented by the European Health Data Space (EHDS) initiative, where the movement of data between countries is safe and facilitated by powerful individuals, meaning that cross-border transfer of data already empowers people and plays a critical role in systemic innovation [3]. In this chapter, we learn how D-EHRs and digital twin technologies do not only facilitate new care pathways, home-based monitoring, management of chronic diseases, and decentralised care but also improve the nature itself of patient experience. Using case studies and a breakout of architectural frameworks as well as discussing the ethical and regulatory implications of such a process, we demonstrate how such tools have the potential of bringing the journey of healthcare to a greater level and turning it into a cohesive, attentive, and meaningful relationship between the user and the tools.

2. Background

2.1 Electronic health records: From static to dynamic

Electronic Health Records (EHRs) were first conceived to computerise or digitalise records, and enhance access. Yet, they were only retrospective and aimed at documentation subsequent to the care incidents, which made these sources less capable of promoting reactive clinical choices. Besides, these systems have tended to appear non-visible, impersonal, and transactional from the patient's perspective.

Dynamic Electronic Health Records (D-EHRs), in comparison, however, are a radical change in data structure and patient experience. Instead of functioning as retrospective logbooks, as retrospective journals might do, D-EHRs are real-time reflections of the physiological condition of a patient, his/her behaviour, and his/her course. They capture and analyse information provided by a range of sources: wearable and implantable devices, environmental sensors, mobile health and digital walkaround diagnostics, and classic clinic-based tools.

As a patient, it implies that the healthcare system will no longer be blind between appointments. Patients with atrial fibrillation can be confident that any rhythm disorder will be identified and responded to in a timely manner, in most cases, even before symptoms of the disease emerge when wearing a connected ECG device. This active, quiet alertness enhances self-confidence and a sense of security. D-EHRs are also capable of facilitating contextual communication, sending at the right time, the right kind of reminders, feedback, or alerts. This back-and-forth circle decreases the mental load of the patients, and they feel safer and more confident about their care.

Also, D-EHRs help personalise care by updating treatment suggestions in response to new data. The digital health record that belongs to a diabetic patient could already identify trends of deteriorating glycaemic control and raise alarms to intervene early before the patient is taken to a clinic. This feature of the proactive approach creates a feeling of trust and feelings of emotional security for the patients, particularly those who live with chronic illnesses.

According to numerous studies, people tend to adhere to their treatment regimens much better when they are active participants in the process of monitoring their health in real time and accessing their digital health data [4, 5]. Moreover, they have been observed to improve communication quality and appropriate care management, which are the main aspects of patient satisfaction [6].

D-EHRs are potentially game-changing to the patient experience because of their potential to enable inclusive, multilingual, and accessible interactions in interfaces, which are extremely important to demographics with a history of digital social exclusion. Therefore, D-EHRs will not only achieve better clinical outcomes but will also increase health equity. According to Hzynninen, Saranto, and NykFrom [7], they observe that the quality and availability of health information is core in enhancing the outcomes of care and patient satisfaction when using integrated digital systems.

From a practical perspective, D-EHRs also provide notable advantages for care coordination. In multi-provider environments – such as those involving primary care physicians, specialist consultants, physiotherapists, and community nurses – a dynamic EHR acts as a common, updated platform for collaboration. Patients often report frustration with care fragmentation, where information shared with one provider fails to reach another. The real-time synchronisation of D-EHRs reduces

this administrative burden, which often falls on patients, eliminating redundant data collection and ensuring consistent communication.

D-EHRs are being integrated with patient-facing applications, providing features such as symptom diaries, visual trend trackers, and health goal management. These platforms promote daily engagement with one's health status and encourage active participation in care planning. Patients feel more 'present' in the process and become co-stewards of their own health outcomes.

The evolution of D-EHRs has also played a major role in value-based healthcare models. By illustrating outcomes and patient-reported experiences over time, these systems have contributed to a more accurate measurement of care effectiveness and satisfaction. This methodology not only enhances care delivery but also aligns incentives for providers to be more responsive to patient needs (see **Figure 1** below).

2.2 The rise of digital twin technologies in healthcare

The digital twin technology was originally developed as an aerospace technology but is emerging as a disruptive technology in healthcare. A digital twin refers to an active, up-to-date model of the physiology, behaviour, and clinical path of a single patient. Such digital simulations implement an expansive amount of data showing information about heart rate variability, respirations, lifestyle inputs, and genomic markers, among others.

The concept of a patient having their own 'digital self, supporting and guiding their care is a powerful and reassuring one to the patient. The patients with long-term conditions, such as heart failure or diabetes, can sometimes feel abandoned as they have to cope with a challenging regime on their own. As a virtual assistant, a digital twin will be able to operate silently and with high intelligence, guiding patients through the expectation to potential decompensation, providing them with explicit

STATIC EHR	DYNAMIC EHR
Periodic, manual updates	Continuous, automated updates
Patient Interaction	Interactive, real-time engagement
Adaptability	Context-aware, flexible
Predictive Capability	Advanced, anticipatory care

Figure 1.
Comparative table that shows the differences in functional and experiential terms between traditional static electronic health records (EHRs) and dynamic EHRs. Main differences lie in the frequency of the update on data, patient engagement, accommodation of context, and the ability to conduct analytics and real-time support of predictions.

lifestyle recommendations, and training them in advance as well as their clinicians. The resulting capabilities translate into a reduced number of surprises and less emergency care from the point of view of the lived experience.

Digital twins also have the potential to bring about a change in the expectations of patients regarding care by promoting participatory action within decisions. This new type of agency can be achieved by making patients see how they can shape their health by making certain changes or alterations, such as altering the amount of medication required or adjusting the activity levels. This is a degree of simulation that has only been possible in research scenarios with the aid of complicated modelling but is currently being implemented in direct clinical practice.

Notably, when patients have visibility into their digital twin via applications, visual dashboards, or shared decision tools, patients start writing their health story together. Such a participatory study will involve patients, assist them in following health regimens, and result in their increased satisfaction with the outcomes. Patients are reconceptualised as equal as opposed to being the passive custodians of care.

Moreover, digital twins appear to be the chance to incorporate psychosocial factors in the care model. The information incorporated in the comprehensive model includes emotional well-being, sleep disorders, or environmental stressors. By being examined through some of the most basic items that money can buy, patients are able to feel that they are being perceived as identities and not just collections of symptoms or measurements.

Recent research by El Saddik [8] focuses on the digital twin as a smart health-care assistant, allowing hyper-personalised interventions and rather adaptive care delivery. In addition, programs such as virtual physiological human [9], have been preparing to transform complex life processes into operational and patient-relevant information. Such initiatives prove that digital twin infrastructure is not only a far-fetched vision but also a steadily factoring reality, with real-world patient outcomes.

Moreover, digital twins can also promote relevant and inclusive care of various groups of patients. In other words, the digital twin environment could be used to model culturally tailored recommendations or simulations in patients with certain dietary or religious requirements. These might assist clinicians in dealing with complicated sociocultural processes and enhance patient's rapport and adherence.

A new study has also explored the incorporation of behavioural nudging and adaptive feedback into digital twin configurations. It might suggest that at-risk patients who are predisposed to hypertension may be subjected to gentle reminders on a daily basis, not relying on some generic advice, but on the predictive modelling of their own risk pattern. Over time, these habits, strengths, and self-efficacy can be developed through these minute interventions.

Lastly, by enabling a two-way exchange of insights between patients and professionals, digital twin-enabled platforms set the stage for more compassionate, real-time interactions. Rather than being viewed only through test results, patients can be seen in the full context of their lived health experiences – past, present, and projected.

3. System architecture

Deploying dynamic electronic health records and digital twin technologies requires a robust, layered system architecture that integrates data collection,

interoperability, real-time analytics, and patient-centred interfaces. The technological configuration is not just a back-end concern, but it also directly impacts how patients engage with their care and how clinicians deliver it. System architecture, in this context, must support responsiveness, personalisation, security, and seamless communication across care pathways (for details, see **Figure 2**).

3.1 Data sources and integration

At the core of the D-EHR is an integrated system of diverse data sources, including wearable devices (e.g., smartwatches, ECG patches), home-based sensors, mobile applications, and traditional clinical inputs, such as laboratory results and imaging. These data streams are harmonised using industry standards, such as HL7 and FHIR, ensuring semantic consistency and data portability [10].

Walker et al. [11] found that interoperability of data across systems improves coordination of care and reduces medical errors, while simultaneously enhancing the patient's sense of continuity in the healthcare experience. When patients see that their latest data are immediately available and understood by every provider, it instills trust and reduces the emotional burden of repeating personal medical history (see **Figure 3**).

3.2 Digital twin synchronisation layer

The synchronisation of patient-specific digital twins requires continuous ingestion of validated physiological and behavioural data. These models evolve dynamically to reflect the patient's current state and anticipated future health trajectory. The digital twin layer interfaces with a rule-based AI engine to trigger alerts, simulate treatment pathways, and personalise care plans [8].

As Olivares-Rojas et al. [12] argue, digital twins 'transform the notion of real-time feedback into anticipatory medicine', creating a paradigm in which patients are not just monitored but actively guided. From a user perspective, this means receiving relevant prompts and recommendations that evolve with their condition. See **Figure 4**.

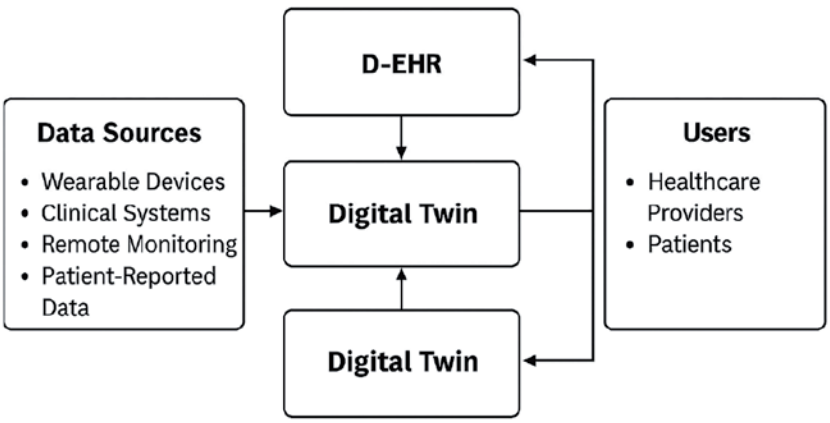


Figure 2.
High-level architecture of dynamic EHR and digital twin integration across data input, real-time analytics, and patient-provider interaction.

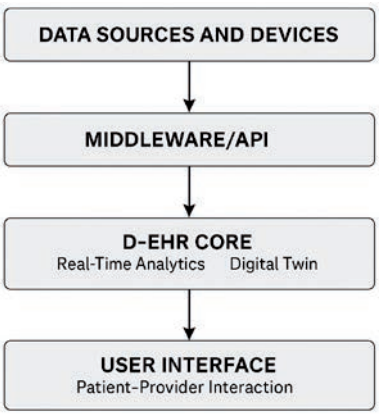


Figure 3.
A layered architecture model illustrating the flow from data sources and middleware through to the core analytics engine and user interfaces, supporting real-time feedback and digital twin simulation.

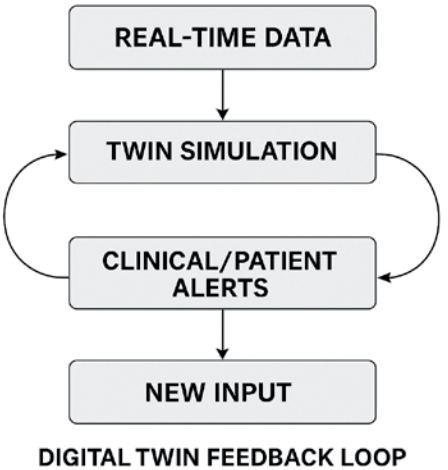


Figure 4.
The digital twin feedback loop showing continuous integration of real-time data, patient simulation, clinical alerting, and adaptive input.

3.3 Analytics, AI, and decision support

A subsystem uses advanced analytics, machine learning models, and population health algorithms to process vast amounts of structured and unstructured data. It identifies patterns and generates predictive risk scores. Patients, in turn, receive simplified, contextualised summaries that improve health literacy and actionability.

Topol [2] emphasises that 'AI in medicine must augment the human element, not replace it', underscoring that transparency and explainability are vital. Effective integration allows patients to ask, 'Why am I receiving this alert?' and understand the answer bolstering both adherence and satisfaction. For details, see **Figure 5**.

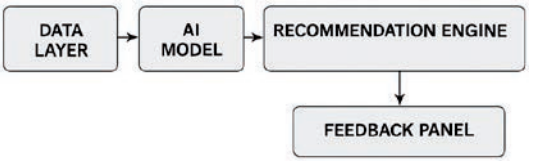


Figure 5.
AI decision engine pipeline, showing the flow from raw data through model processing, recommendation generation, and patient/clinician feedback loop.

3.4 User interfaces and experience design

Interfaces must accommodate varied literacy, cognitive, and cultural needs. Wang et al. [13] found that personalised interfaces improve patient satisfaction and adherence. For patients, user experience often hinges not on the power of the technology, but on how comprehensible and humane it feels.

Visual timelines, progress indicators, and interactive education tools can help patients contextualise their health data. For clinicians, seamless integration with existing workflows is a key to adoption. Dashboards must be uncluttered, intuitive, and provide drill-down capability (see **Figure 6**).

3.5 Security, consent, and ethical architecture

Security must be 'baked into' the architecture. Real-time encryption, federated identity management, and audit logs ensure compliance. However, ethical

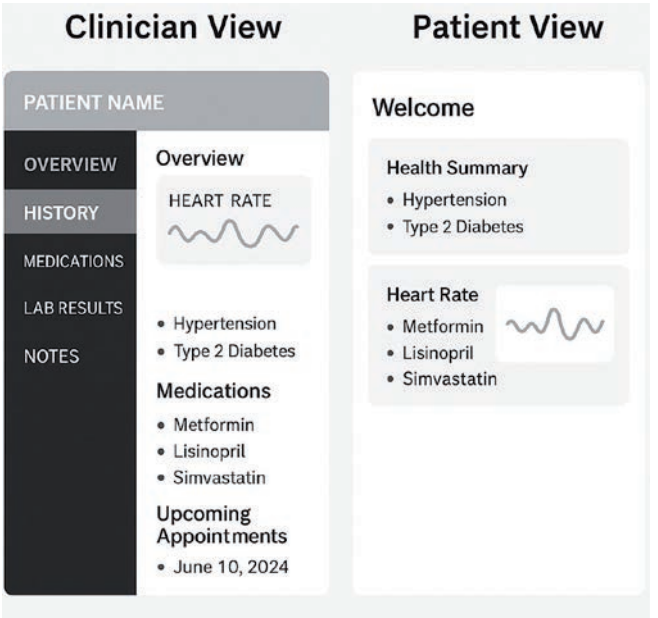


Figure 6.
Interface mock-up comparing clinician and patient views within a digital health platform. The clinician view emphasises structured data access and decision support tools, while the patient interface focuses on clarity, emotional reassurance, and actionable guidance—illustrating the importance of role-specific design in improving engagement and satisfaction.

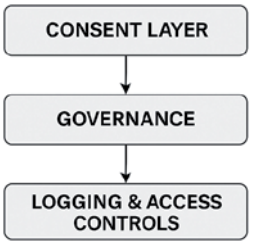


Figure 7.
Multi-layered ethical framework integrating consent management, governance protocols, and logging/access control to ensure transparency and accountability in digital health platforms.

architecture goes further: it includes adaptive consent models, role-based data views, and mechanisms for patients to contest algorithmic decisions.

As Mittelstadt and Floridi [14] argue, ethical oversight in algorithmic systems is 'not a feature[;] it is a framework'. The system must be built with the assumption that transparency, consent, and accountability are ongoing processes rather than one-time policies (see **Figure 7**).

Each architectural component plays a functional and experiential role. By designing systems that respect user agency, protect data, and present information in meaningful ways, D-EHR and digital twin platforms become not just infrastructure but instruments of better care, trust, and satisfaction.

4. Alternative care pathways enabled

Dynamic EHRs and digital twin technologies are not merely enhancements to existing care models, but possibly the foundation for new, alternative care pathways that shift the centre of gravity away from hospitals and clinics and towards the patient's daily environment. These pathways include home-based monitoring, decentralised chronic disease management, proactive preventive care, and real-time patient engagement platforms. The driving principle behind all of them is the same: to meet the patient where they are, both physically and emotionally, by tailoring care to real-life contexts and timelines.

These pathways challenge the traditional healthcare architecture, in which institutional visits anchor diagnosis and intervention. In contrast, alternative care pathways expand longitudinal care beyond formal facilities, enabling ongoing monitoring, risk assessment, triage, and even virtual intervention. From the perspective of patient satisfaction, these models reduce waiting times, travel burden, and the fragmentation often experienced when navigating siloed systems [15].

4.1 Remote monitoring and home-based care

D-EHR and digital twin integration has the potential to be transformative in its ability to offer clinically robust care without requiring patients to be physically present at a medical facility. Home-based monitoring systems, often integrated with wearable devices and mobile apps, enable daily biometric tracking of patients with chronic conditions, such as heart failure, diabetes, or COPD.

Studies show that remote monitoring reduces readmission rates and enhances patient satisfaction by increasing their sense of safety and continuity [16]. Elderly

patients and those with mobility constraints have care come to them, avoiding navigation difficulties, complex transport needs, and scheduling barriers. In turn, patients report higher confidence and a deeper sense of being cared for in their own environments.

When combined with automated feedback systems and family caregiver portals, this model also improves family engagement and care transparency. Patients who once felt isolated or overwhelmed by chronic illness management have reported greater peace of mind and reduced anxiety [17].

4.2 Early intervention and predictive care

D-EHRs and digital twins create a healthcare environment that is predictive rather than reactive. By continuously analysing real-time and historical data, these systems generate alerts well before clinical deterioration occurs. For example, subtle weight fluctuations in a heart failure patient may be detected and flagged early, enabling a medication adjustment that prevents hospitalisation.

According to Topol [2], 'the transition to pre-emptive care is the greatest promise of digital medicine'. In this model, the patient is no longer waiting for illness to reach a tipping point but becomes an active participant in prevention. This model fosters empowerment and autonomy, which are central pillars of patient satisfaction.

Importantly, predictive systems must also preserve clinician discretion. Alerts generated from AI algorithms must be interpretable, relevant, and context-sensitive. Clinicians need to trust the signal and patients need to feel their care is still guided by human expertise.

4.3 Multidisciplinary and coordinated care

Alternative pathways thrive when care is not only continuous but also collaborative. D-EHRs and digital twins allow for simultaneous access by stakeholders, including GPs, nurses, physiotherapists, dietitians, caregivers, reducing silos and improving communication. This multi-disciplinarity aligns with evidence showing that shared care models improve both clinical outcomes and patient satisfaction [18].

A patient recovering from orthopaedic surgery might receive remote physio support, wound monitoring, and pain management through a unified platform, eliminating the need for multiple clinic visits and paperwork. More importantly, patients feel the system is 'joined up', increasing their confidence and perception of quality.

This approach also enhances continuity. Instead of fragmented episodes of care, patients experience an integrated journey where communication flows among all professionals involved. The patient becomes the common focal point, not a transient case file. For details on this collaboration, see **Figure 8**.

4.4 Personalisation and adaptability

At the heart of these new pathways lies personalisation. Digital twins allow scenario simulations tailored to the individual, including environmental, genetic, and lifestyle factors. Instead of applying a generic guideline, clinicians and systems adapt recommendations to each patient's evolving status.

Rojas et al. [12] found that patients respond more positively to contextually relevant interventions, with fewer dropouts and higher adherence when technology 'learns' and

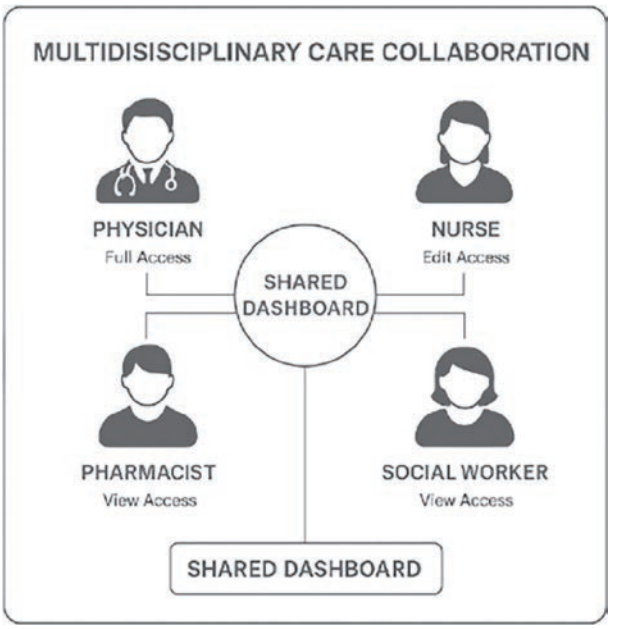


Figure 8.
Visual representation of a shared digital dashboard used by multidisciplinary healthcare teams. It illustrates differentiated access levels, real-time communication, and coordinated task management, ensuring continuity, safety, and patient-centredness across specialties.

responds in kind. This ability to personalise not just treatment, but the entire interaction with the health system, represents a key differentiator of the digital era.

Furthermore, personalisation drives emotional engagement. When systems refer to previous experiences, understand patient values, and adjust tone and format accordingly, they create a sense of being understood. This psychological alignment contributes directly to patient's loyalty, adherence, and satisfaction (see **Figure 9**).

4.5 Empowerment through digital engagement

Digital health tools do not merely extend clinical reach; they redefine patient roles. Portals allow access to records, care plans, AI-generated insights, and direct messaging. Bærøe and Miyata-Sturm [19] argue that true empowerment in healthcare must be 'reciprocal, sustained, and technologically facilitated.' Platforms built on D-EHRs embody this reciprocity, allowing patients to set goals, receive personalised nudges, and collaborate in decisions.



Figure 9.
Timeline view illustrating the personalised care process supported by digital twin simulation: data integration, pathway forecasting, and continuous plan adaptation based on individual patient context.



Figure 10.
Pyramid model illustrating the progressive levels of patient engagement in digital health systems, from initial awareness of health information, through active involvement in decision-making, to collaborative partnership and full empowerment in care management.

Moreover, longitudinal digital engagement opens opportunities for life planning, not just disease management. A well-structured platform can help a patient track changes over years, set lifestyle milestones, and even document personal preferences in end-of-life care. These touchpoints have the potential to make digital healthcare deeply human (see **Figure 10**).

5. Implementation challenges and considerations

While the promise of D-EHRs and digital twin technologies is compelling, real-world implementation faces technological, organisational, ethical, and human challenges. Recognising and addressing these barriers is essential to achieving equitable access, clinician adoption, and sustained patient engagement.

5.1 Technological infrastructure and interoperability

The legacy status of healthcare IT systems remains a primary challenge. Many hospital systems cannot yet integrate real-time external data from wearables or third-party applications. Interoperability remains a significant hurdle, especially when proprietary formats inhibit seamless data exchange. Cresswell et al. [20] found poor interoperability to be one of the leading causes of clinician frustration with health IT systems.

Moreover, ensuring continuous, secure, and real-time data transfer between patient devices and centralised health platforms requires robust cloud architecture and reliable connectivity—still major limitations in rural or under-resourced regions [15]. For a flowchart of this architecture, see **Figure 11**.

5.2 Clinical adoption and workflow disruption

Even with well-designed platforms, clinician resistance can derail implementation. Concerns about data overload, alert fatigue, and perceived threats to professional autonomy (i.e., from the technology) often surface. Successful systems are deployed by co-designing them with end users to ensure alignment with clinical workflows and cognitive load limits [21].

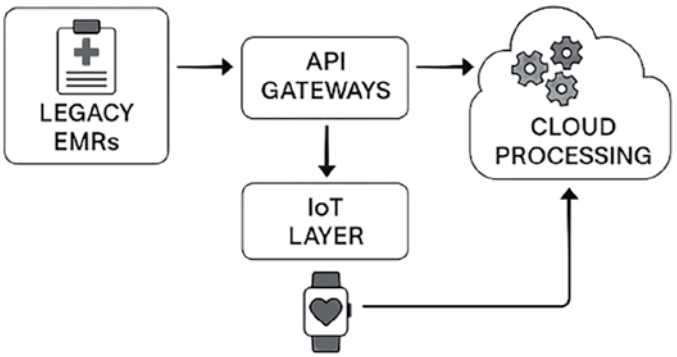


Figure 11.
Diagram illustrating the architecture required to integrate legacy EMRs, IoT data streams, secure API gateways, and cloud-based processing layers into a cohesive Dynamic EHR ecosystem. This landscape supports interoperability, scalability, and real-time responsiveness across diverse care environments.

Training and change management strategies are the key factors. Institutions that invest in clinician training, including digital health literacy and multidisciplinary simulation sessions, see greater buy-in and less burnout. Gagnon et al. [22] argued that 'organisational readiness and perceived usefulness are stronger predictors of technology adoption than technical performance alone'. See **Figure 12** for an illustration.

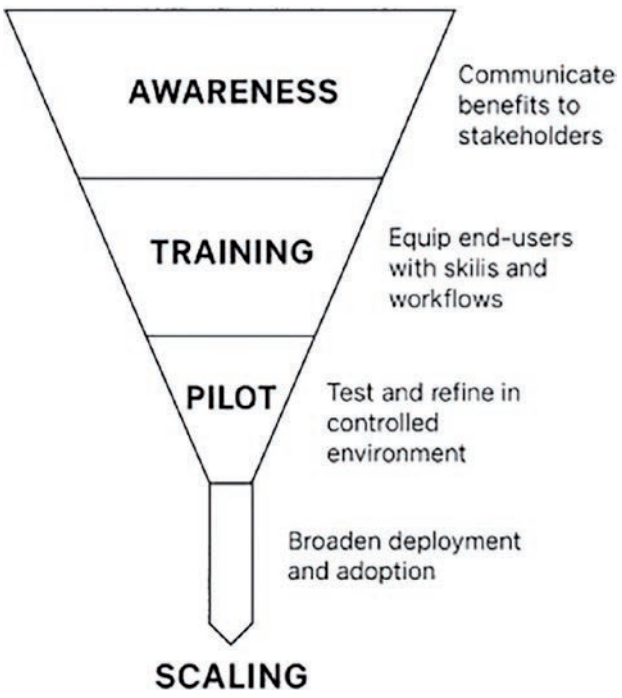


Figure 12.
Funnel-style model illustrating the staged process of implementing digital transformation in healthcare. Beginning with stakeholder awareness, progressing through training and pilot projects, and culminating in large-scale adoption, the model emphasises the need for engagement, education, and gradual scale-up.

5.3 Data privacy, consent, and governance

Increased data highlights the significance of data security, informed consent, and ethical stewardship. Patients must understand what data is collected, how it is used, who can access it, and under what conditions it is shared. Role-based access, audit trails, and data minimisation principles are essential safeguards [14].

In addition, models of adaptive and dynamic consent are being explored, where patients can modify data-sharing preferences over time. This is especially critical for vulnerable populations, including minors, elderly patients with cognitive decline, and communities historically under-represented in digital health initiatives (see **Figure 13**).

5.4 Ethical and legal frameworks

As algorithms start to impact health-care decisions, questions of bias, accountability, and transparency become more urgent. D-EHRs and digital twins must operate within frameworks that ensure equitable care, particularly for patients with atypical physiology, rare conditions, or those outside standard population datasets. Floridi et al. [23] argue that algorithmic decision-making in healthcare must meet a higher standard of scrutiny, given the stakes involved.

Regulatory bodies such as the European Medicines Agency and the forthcoming EHDS governance boards will play a pivotal role in standardising these frameworks. National regulations still vary widely, making cross-border implementation complex (see **Figure 14**).

5.5 Equity and digital divide

The most significant risk is that digital transformation may unintentionally widen health disparities. Those without access to broadband, smart devices, or basic digital literacy are at risk of exclusion from alternative care pathways. Addressing this digital divide requires multi-sectoral action, public health outreach, device subsidies, and community-based digital education programs [24].

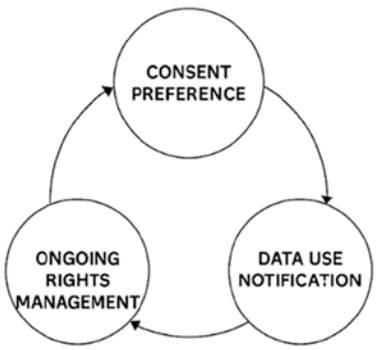


Figure 13.
Flow diagram illustrating a dynamic consent model in digital health. Patients initiate preferences, are notified transparently about data usage, and retain ongoing control to adjust access rights over time, ensuring ethical, user-centred data governance.

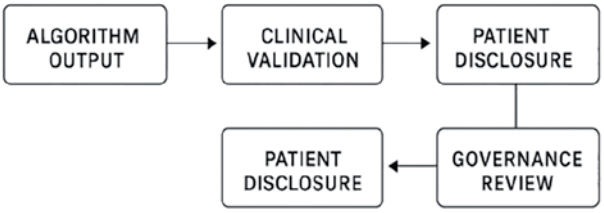


Figure 14.
Flowchart illustrating the structured process of ethical oversight in AI-supported care. The pathway begins with algorithm-generated output, followed by clinician validation, transparent patient disclosure, and formal governance review to ensure accountability, transparency, and equitable outcomes.



Figure 15.
Circular model representing the key dimensions of digital health equity: access to technology, digital literacy, cultural and linguistic inclusivity, affordability, and trust. Addressing each dimension is critical to ensuring that personalised digital care does not exacerbate existing healthcare disparities.

To guarantee asset and relevance across diverse populations, designers must also have cultural competence and consider the essential nature of multilingual resources (see **Figure 15**).

D-EHRs and digital twins offer immense promise, but implementation is not a purely technical task. It requires cultural, legal, ethical, and infrastructural readiness. Without careful planning, stakeholder alignment, and a strong governance backbone, the risk is not just of failed systems, but of deepening the very inequities these technologies aim to solve.

6. Measuring impact on patient experience

To have meaningful (and measurable) effect on patient experience and satisfaction, D-EHRs and digital twin systems must be quantified and continuously optimised. Measuring patient-centred outcomes is not only a clinical responsibility but also a strategic imperative. Health systems worldwide are increasingly moving towards value-based care models, where patient-reported outcomes and experiences (PROMs and PREMs) take the centre stage.

6.1 Defining metrics that matter

Traditional healthcare metrics such as length of stay, mortality, and readmission are essential measures, but are incomplete. Dynamic care pathways require new indicators that reflect the quality of interaction, responsiveness of care, emotional well-being, and perceived autonomy. Key dimensions might include:

- Timeliness and relevance of feedback from digital tools
- Sense of personalisation in treatment and communication
- Ease of access to data and self-management tools
- Continuity across care teams
- Psychological safety and confidence in digital decision aids.

These indicators must be developed with patient input to ensure they reflect real-world concerns. As Wolf et al. [25] assert, 'The experience of care is itself a vital clinical outcome'. See **Table 1** for a sample of what these metrics might be.

6.2 Real-time feedback and adaptive systems

D-EHRs make it possible to integrate real-time patient feedback directly into care processes. Patients can rate interactions, express concerns, and adjust preferences immediately, creating a dynamic feedback loop that helps clinicians and systems continuously adapt. Machine learning can identify patterns in this feedback to drive quality improvement.

For instance, a high number of user drop-offs during medication reminders may signal usability issues or misunderstanding, prompting a redesign. Likewise,

Dimension	Description	Measurement approach
Timeliness of feedback	How quickly patients receive meaningful responses from the system	Response time logs, patient-reported timelines
Personalisation of communication	Degree to which messages and alerts are contextually relevant	NLP audits, patient satisfaction surveys
Accessibility and usability	Ease of use and inclusiveness for patients of varying digital literacy	System usability scores (SUS), qualitative feedback
Patient autonomy and control	Extent to which patients can adjust preferences and engage in decisions	Interactive logs, consent management statistics
Trust and transparency	Patient perception of fairness and clarity in system behaviour	PREMs, open feedback loops
Emotional reassurance	Level of confidence and psychological support felt through the system	Narrative responses, anxiety and confidence scales

Table 1.
Outlines key patient-centred metrics for evaluating digital care models, focusing on usability, trust, personalisation, and emotional support – core drivers of patient experience [25, 26].

continuous sentiment analysis from patient comments can reveal trends in trust or frustration (see **Figure 16**).

6.3 Longitudinal patient satisfaction tracking

Digital platforms also facilitate long-term engagement tracking. By examining how a patient's satisfaction evolves over months or years and correlating these trends with interventions, outcomes, and personal changes, care providers gain a holistic view of what drives satisfaction over time. See **Figure 17** for an example of such a trendline.

Such insights are invalid for continuous service development. As Doyle et al. [1] note, 'Patient experience should be treated with the same level of rigor and attention as clinical safety and effectiveness'.

The Plex Diagnostics Platform, for example, enables dashboard visualisation of longitudinal engagement metrics, helping care teams adapt educational content, notification strategies, and communication styles to the preferences of individuals or patient cohorts.

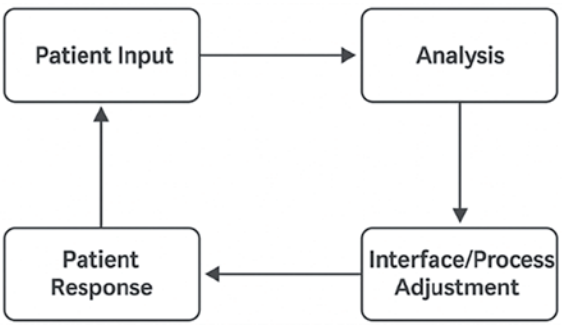


Figure 16.
A closed-loop feedback system that captures real-time patient input, processes it through analytics, informs adjustments in interface or clinical processes, and reflects outcomes back to the patient; in whole, the system supports adaptive, responsive care delivery.

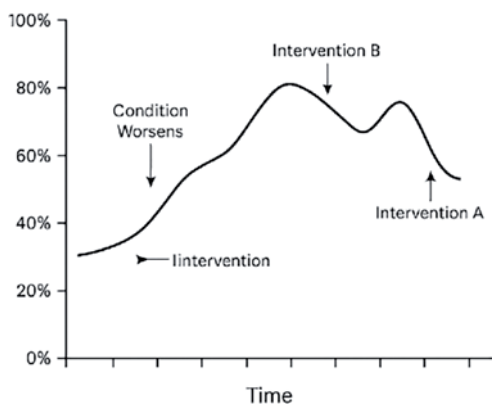


Figure 17.
Line chart illustrating how patient satisfaction scores evolve across time, interventions, and care settings. The graph reflects how digital engagement strategies such as improved UI, personalised alerts, or care coordination can impact overall patient sentiment longitudinally.

6.4 Linking experience with outcomes

Studies demonstrate that excellent patient experiences correlate strongly with enhanced adherence, lower complication rates, and better clinical outcomes [27]. In digital contexts, this connection becomes even more tangible, as both experience and outcomes are recorded and monitored.

A satisfied patient is more likely to follow through on remote monitoring tasks, attend digital follow-ups, and participate in preventive care. This virtuous cycle not only improves outcomes but also creates a more sustainable and emotionally intelligent healthcare system.

When patients feel respected, heard, and included, their willingness to engage with digital tools increases, further enhancing data quality and decision support.

6.5 Beyond metrics: Narrative and meaning

Finally, quantitative data should be complemented by qualitative narratives. Patient stories, testimonials, and narrative medicine insights offer a rich understanding of lived experience. These stories can highlight what metrics may miss moments of empathy, feelings of abandonment, or the impact of cultural mismatch. For an example of such a layered approach, see **Figure 18**.

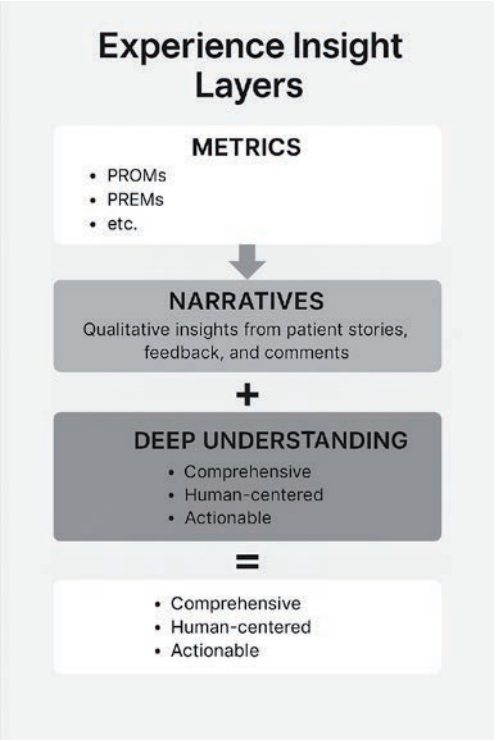


Figure 18.
Vertical infographic illustrating the multi-dimensional understanding of patient experience in digital health. Note the layered integration of metrics (quantitative data), narratives (qualitative insight), and interpretation (clinical relevance), emphasising that a true picture of patient experience emerges by combining structured evaluation with human context.

By making space for these perspectives in system design and policy-making, we move beyond compliance and into care that is truly meaningful.

Assessing patient experience in the digital era means treating it not as a byproduct but as a core outcome. Through adaptive technologies, meaningful metrics, and authentic patient partnership, health systems can ensure that digital transformation leads to not just better systems, but better lives.

7. Future directions for human-centred digital health

Digital health technologies, and dynamic electronic health records (D-EHRs) and digital twin systems, have opened a new era of personalised, predictive, and participatory care. Not just changing the nature of how healthcare services are delivered, these innovations are also reshaping the way patients perceive, approach, and derive value out of care services.

The new digital paradigm is opposed to the outdated and compartmentalised systems of yesterday and enables transparency, citizen empowerment, and proactive, data- and context-aware care. Patients are not supposed to be entitled to dance their way around the system anymore or be subjected to medical decisions in a passive manner. Rather, they are more likely to be assisted by on-time data, tailored knowledge, and digital interfaces, informing their health decisions in a transparent way and at a relevant time. This paradigm shift not only marks the shift to predictive, personalised, and participatory care but is also squarely in line with the principles of person-centred care [26].

Innovative technologies provide the possibility of not only better monitoring and diagnosis but also a redefinition of the patient-clinician relationship. Patients feel increasingly understood and 'heard' by caregivers in systems that learn from their feedback, anticipate their needs, and provide seamless coordination across healthcare providers. Patients' enhanced sense of recognition and responsiveness constitute a positive patient experience [28].

To ensure these benefits are equitably realised, future strategies must focus on five critical dimensions:

1. *Universal digital health literacy*: Policies must prioritise the education and support of patients in using digital tools, especially among underserved populations. User-friendly design, culturally appropriate interfaces, and multilingual options are essential for inclusivity.

2. *Seamless data interoperability*: A globally recognised framework for data sharing, such as that envisioned by the EHDS must be implemented to eliminate fragmentation and enable cross-border care continuity.

3. *Continuous co-design with patients*: Patients should not merely be end users, but active participants in the co-design and evaluation of digital health solutions. Their lived experiences can reveal design flaws, communication gaps, and usability challenges invisible to developers.

4. *Human oversight in AI*: Clinical AI must be interpretable, equitable, and augmentative. Transparency in algorithmic decision-making and the ability for human override must be foundational principles [2].

5. *Meaningful outcome measurement*: PROMs, PREMs, and narrative data must continue to evolve to reflect the nuances of experience, empowerment, and emotional resonance, not just clinical endpoints.

Moreover, health systems should adopt a learning health system model in which every patient interaction generates data that contributes to real-time improvement. As Friedman et al. [29] argue, the most effective digital health environments are those that 'learn and improve continuously, with patients as partners'.

Ultimately, the future of human-centred digital health lies not in the sophistication of technology alone, but in the depth of connection, trust, and value it creates for those it serves. Systems that elevate the human experience while delivering safety, efficiency, and personalisation will define the next chapter in healthcare transformation.

Digital health technologies, especially dynamic electronic health records and digital twin systems, have ushered in a new era of personalised, anticipatory, and participatory care. These innovations promise to transform not only how care is delivered, but how it is experienced, remembered, and valued by patients.

Yet, with any systemic transformation, hurdles exist. The success of these technologies depends not only on technical infrastructure but also on policy frameworks, ethical design, and the trust and readiness of all stakeholders—especially patients and clinicians. Equitable access, cultural competence, and sustained investment in human-centred design are non-negotiable if we are to ensure that no one is left behind in this transformation.

The integration of D-EHRs and digital twins signals a maturing of digital health, not just as a field of innovation but as a vital force for patient dignity, safety, and satisfaction. As healthcare systems continue to evolve, those that prioritise experience alongside efficiency will be best positioned to deliver care that is not only technologically advanced but deeply compassionate and attuned to human need.

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Chapter 8

Standardization Procedures and Patient Safety Perception in Public Hospitals: The Interplay between Culture, Quality, and Trust

Georgia Kyriakeli

Abstract

Standardization procedures have emerged as fundamental components in healthcare quality and patient safety strategies. This chapter examines the impact of certified quality systems—specifically ISO 9001:2015 and EN 15224:2017—on healthcare professionals' perceptions of safety culture and institutional trust within a large public hospital in Greece. The study utilized the validated Greek version of the Hospital Survey on Patient Safety Culture (HSOPSC v1.0) and included a total of 877 participants across two phases: before (n = 441) and after (n = 436) the implementation of standardization protocols. Descriptive and inferential statistical analyses were conducted to assess perceptions across key safety dimensions, including communication openness, teamwork, nonpunitive response to error, leadership support, and staffing adequacy. The results indicated statistically significant improvements in several safety culture domains following the implementation of certified quality systems. In particular, enhancements were observed in feedback and communication about errors, teamwork across units, and supervisor support for safety. However, persistent challenges were identified in areas such as staffing and event reporting. Regression analysis highlighted organizational learning, leadership expectations, and communication climate as key predictors of trust in safety systems. The findings support the view that standardization, when embedded in a supportive and learning-oriented culture, can foster not only operational improvements but also deep-seated cultural transformation. The study underscores the need for healthcare policy to integrate certification frameworks with human-centered interventions that promote staff engagement, transparency, and trust. These elements are critical for cultivating resilient and trustworthy public healthcare systems, particularly in resource-limited settings.

Keywords: patient safety, standardization, safety culture, hospital accreditation, public hospitals, HSOPSC, quality improvement, healthcare perception

1. Introduction

Patient safety culture has emerged as a foundational element in contemporary healthcare systems, underpinning efforts to improve service quality, reduce adverse events, and foster trust among both patients and healthcare providers. The concept extends beyond technical compliance, encompassing the shared values, norms, and behaviors through which safety is prioritized and enacted within organizations. According to international bodies such as the World Health Organization (WHO) and the Agency for Healthcare Research and Quality (AHRQ), a robust safety culture contributes directly to the prevention of medical errors, supports continuous learning from incidents, and cultivates an environment where transparency, accountability, and resilience can thrive. As such, the development and measurement of safety culture have become integral components of modern healthcare governance frameworks [1, 2].

In the Greek healthcare system, efforts to institutionalize a culture of safety have historically been fragmented. Although accreditation and certification initiatives have gained momentum in recent years, particularly through the adoption of ISO 9001:2015 and its healthcare-specific derivative EN 15224:2017, systemic challenges persist. These include underdeveloped error-reporting systems, lack of standardized quality indicators, and limited investment in staff training and leadership engagement. Despite policy-level alignment with European Union directives, the operational integration of quality management systems often remains superficial and fragmented, with limited impact on frontline practices and professional attitudes. Within this context, assessing the actual perception of safety culture among healthcare professionals becomes critical—not only as a diagnostic exercise but as a means to evaluate the transformative capacity of standardization frameworks in real-world hospital settings.

Beyond the increasing interest in standardization and patient safety culture, the relevance of trust in healthcare systems has gained considerable attention in the literature. Trust operates not only as a relational mechanism between patient and provider but also as a systemic indicator of transparency, perceived safety, and institutional legitimacy. In healthcare environments characterized by high uncertainty and frequent organizational transitions, trust becomes a proxy for how patients interpret risk and safety assurances. Studies have indicated that organizational procedures and certification initiatives often have limited influence unless embedded in a wider trust-generating context, where communication, responsiveness, and staff-patient interactions reinforce the perception of care quality [1, 2].

In this framework, the integration of safety culture measurements—such as those provided by the Hospital Survey on Patient Safety Culture (HSOPSC)—with quality certification processes (e.g., ISO 9001 and EN 15224) represents a multidimensional strategy. Rather than merely tracking compliance, this combination allows for the identification of organizational patterns, areas of resistance, and levers of cultural transformation. For healthcare systems in Southern Europe, and particularly in Greece, this alignment is even more pertinent given the complex interplay of bureaucratic inertia, hierarchical decision-making, and resource limitations, as previously highlighted in the literature.

Moreover, the HSOPSC tool offers a granular lens into how different dimensions of safety culture operate independently and collectively. For instance, dimensions such as "Teamwork within Units," "Communication Openness," and "Nonpunitive Response to Error" often reflect not only internal dynamics but also broader cultural

expectations and leadership ethos. These dynamics are especially relevant when investigating the impact of standardization, as they mediate the way structural reforms are internalized by frontline staff.

The choice to use both the HSOPSC tool and ISO/EN standards in the current study was not only methodological but also conceptual. It recognizes that culture and formalization must not be treated as mutually exclusive or as oppositional logics. Instead, they interact dynamically: the presence of quality assurance protocols does not guarantee trust or safety, just as strong cultural norms may fail to produce measurable improvement without structured systems in place. Hence, exploring their intersection allows for a richer interpretation of safety outcomes.

Furthermore, international experience shows that successful standardization in healthcare requires more than top-down implementation. It depends on how well frontline professionals perceive its relevance, legitimacy, and utility in their daily practices. In this sense, cultural readiness and organizational learning emerge as key conditions for sustainable quality improvement. These theoretical assumptions directly inform the hypotheses and structure of the present study, which seeks to empirically test how standardization initiatives intersect with staff perceptions of safety culture and patient trust in a Greek public hospital setting undergoing dual accreditation efforts.

This chapter presents findings from a doctoral study that investigates the relationship between standardized quality systems and perceived patient safety culture in a major Greek public hospital. The study utilizes the culturally adapted Greek version of the Hospital Survey on Patient Safety Culture (HSOPSC v1.0), developed by AHRQ, to assess key organizational dimensions, including teamwork, leadership support, communication openness, staffing adequacy, and non-punitive response to error. Data were collected from 877 healthcare professionals across two distinct phases: before and after the implementation of ISO 9001:2015 and EN 15224:2017. By comparing perceptions across these phases, the study aims to determine whether certification frameworks can serve as catalysts for cultural transformation, trust enhancement, and sustained improvements in patient safety outcomes within resource-constrained healthcare environments.

2. Standardization and safety culture in public hospitals: Institutional mechanisms and healthcare professionals' perceptions

Standardization in healthcare refers to the systematic implementation of consistent processes, protocols, and quality control mechanisms aimed at minimizing variation in care delivery and optimizing clinical outcomes. At the institutional level, such efforts are most commonly operationalized through internationally recognized frameworks, including ISO 9001:2015 and its healthcare-specific derivative, EN 15224:2017. These systems provide structured methodologies for defining, documenting, and continuously monitoring healthcare processes, aligning organizational performance with regulatory expectations and patient needs [1, 3].

ISO 9001:2015 emphasizes process orientation, risk-based thinking, and continuous improvement as core principles for quality management. EN 15224:2017 builds upon these principles by integrating patient safety, clinical risk management, and evidence-based criteria tailored to healthcare contexts. The introduction of these frameworks into public hospitals in Greece has been largely policy-driven, responding to European Union quality directives and the need to modernize hospital governance

structures. However, their implementation in practice remains uneven, with variations in leadership engagement, staff training, and institutional readiness. While formal compliance with ISO protocols may be officially achieved, the deeper cultural transformation—particularly in settings with hierarchical inertia and resource limitations—remains a significant and under-addressed challenge [4, 5].

The concept of safety culture—understood as the collective mindset, values, and behaviors through which safety is prioritized and enacted—has been identified as a critical mediator in the effectiveness of standardization efforts. Unlike procedural adherence, safety culture operates at a relational and psychological level, influencing how healthcare professionals perceive accountability, risk, and communication within the organization. A strong safety culture fosters open dialog, encourages incident reporting, and supports nonpunitive responses to error. These attributes have been directly linked to improved patient outcomes and organizational resilience [4–6].

In public healthcare systems such as Greece's, where hierarchical structures and resource constraints may limit flexibility, the successful embedding of safety culture requires deliberate investment in leadership, education, and communication. Studies suggest that when standardization procedures are accompanied by genuine cultural engagement—rather than merely bureaucratic enforcement—they can enhance institutional trust and empower staff to contribute meaningfully to quality improvement [5].

To evaluate and benchmark safety culture in healthcare institutions, the Hospital Survey on Patient Safety Culture (HSOPSC), developed by the AHRQ, has emerged as a validated instrument. While primarily a research tool, it also offers practical insights into organizational climate by assessing dimensions such as teamwork, staffing, communication openness, and management support [7–9]. In the Greek context, the use of HSOPSC has been relatively recent but expanding, especially in hospitals undergoing accreditation. These efforts illustrate a shift toward measurable and participatory approaches to safety, where staff perceptions are treated not as peripheral data but as central indicators of organizational function. This version has been linguistically and culturally validated for use in Greek hospitals in accordance with international guidelines [9].

Ultimately, the integration of standardization frameworks and safety culture dynamics reflects a broader institutional challenge: how to move from formal compliance to authentic organizational learning. As later chapters demonstrate, the interplay between structured quality systems and the lived experience of frontline professionals holds the key to building sustainable, trust-based, and resilient healthcare environments [10, 11].

3. Methods

This study employed a quasi-experimental, two-phase design to assess the impact of certified quality systems on perceptions of patient safety culture among healthcare professionals in a large tertiary public hospital in Greece. Data were collected before and after the implementation of ISO 9001:2015 and EN 15224:2017, with the primary aim of examining whether standardization procedures could generate measurable changes in safety culture dimensions, as perceived by frontline staff.

The study population consisted of medical, nursing, administrative, and allied healthcare personnel with a minimum of 1 year of service in the hospital. A total of 877 respondents participated, with 441 completing the baseline (Phase A) survey

and 436 completing the post-implementation (Phase B) survey. A proportional stratified sampling method was employed to ensure adequate representation across departments and professional roles. The inclusion criteria emphasized direct patient involvement and long-term employment to enhance the reliability and internal validity of safety culture assessments.

Data were collected using the validated Greek version of the Hospital Survey on Patient Safety Culture (HSOPSC v1.0), developed by the Agency for Healthcare Research and Quality (AHRQ). The instrument comprises 42 items organized into 12 composite dimensions, including teamwork, staffing, organizational learning, communication openness, feedback and error communication, supervisor support, and management commitment to safety. Items were measured on a 5-point Likert scale, and domain scores were calculated using the AHRQ-recommended positive response rate (PRR) method. The questionnaire also included background variables such as age, gender, role, years of experience, and incident reporting behavior.

The intervention involved the formal implementation of ISO 9001:2015 and EN 15224:2017 over a 12-month period, focusing on redesigning internal workflows, documentation, risk management protocols, and feedback systems. Staff were trained in core quality principles, and quality assurance teams were established to support department-level adaptation. The post-intervention data collection took place 6 months after full certification was obtained, allowing sufficient time for institutional practices to stabilize and be perceived by personnel.

Data analysis was conducted using IBM SPSS v.26. Descriptive statistics were used to characterize the sample, while independent samples t-tests were performed to identify statistically significant differences in safety culture dimensions between phases. Pearson's correlation and multiple linear regression analyses were used to explore associations between composite scores and trust-related variables, aiming to identify predictive relationships. Statistical significance was set at $p < 0.05$ for all tests.

Ethical approval for the study was obtained from the Scientific Council and Ethics Committee of the General Hospital Papageorgiou. Participation was voluntary, informed consent was obtained from all participants, and anonymity was guaranteed throughout the data collection process.

4. Results: Safety culture perception and standardization impact

4.1 Descriptive statistics and sample characteristics

Participants were primarily women in both phases, accounting for 82.3% in Phase A and 78.4% in Phase B. The sample reflected a relatively mature workforce, with an average age of 43.34 years (SD = 9.40) in Phase A and 44.04 years (SD = 9.16) in Phase B.

Regarding educational background, the majority held a secondary (29.4% and 29.5%) or technological education diploma (53.0% and 47.6%) in Phases A and B, respectively. University-level degrees were reported by 17.7% of Phase A and 22.9% of Phase B participants. Furthermore, 42.9% of respondents in Phase A and 49.4% in Phase B had pursued additional studies. Among those, postgraduate qualifications (master's degrees) were the most common (54.5% and 55.6%, respectively), followed by professional specialization (39.7% and 38.0%) and doctoral degrees (5.8% and 6.5%).

It is important to note that due to the voluntary and anonymous nature of the paper-based questionnaire, valid responses per item vary slightly between variables. This discrepancy has been addressed in the presentation of descriptive statistics below **Table 1**.

4.2 Perceptions of safety culture dimensions: Pre- and post-standardization implementation

Table 2 presents the comparative analysis of the 12 dimensions of the Hospital Survey on Patient Safety Culture (HSOPSC) as perceived by healthcare professionals during Phase A (pre-standardization) and Phase B (post-standardization). The results are expressed as mean scores (± standard deviation), with higher values indicating more positive perceptions of patient safety culture.

Across both phases, the highest scores were observed in the dimension "Teamwork within units" (see **Table 2**) (Phase A: 3.78 ± 0.74; Phase B: 3.50 ± 0.63), followed by *"Supervisor/manager expectations & actions promoting safety"* (3.73 ± 0.67 vs. 3.62 ± 0.70) and *"Organizational learning – continuous improvement"* (3.63 ± 0.55 in both phases). These findings suggest that local-level cooperation, supervisory support, and learning mechanisms were consistently perceived as strengths, though a slight decline was noted in "Teamwork within Units;" it remained among the top-rated dimensions (see **Table 2**).

Conversely, the dimensions with the lowest scores in both phases were *"Staffing"* (2.52 ± 0.62; 2.41 ± 0.63) and *"Nonpunitive response to error"* (2.81 ± 0.78; 2.59 ± 0.79),

Variable	Phase A	%	Phase B	%
Gender				
Male	78	17.7%	94	21.6%
Female	363	82.3%	342	78.4%
Basic education				
Secondary (D.E.)	128	29.4%	129	29.5%
Technological (T.E.)	231	53.0%	208	47.6%
University (P.E.)	77	17.7%	100	22.9%
Further studies				
No	252	57.1%	221	50.6%
Yes	189	42.9%	216	49.4%
Specialization	75	39.7%	82	38.0%
Master's Degree	103	54.5%	120	55.6%
PhD Degree	11	5.8%	14	6.5%
Age				
Minimum	19	—	20	—
Maximum	65	—	65	—
Mean (SD)	43.34 (9.40)	—	44.04 (9.16)	—

Table 1.
Demographic and educational characteristics by study phase (valid responses per item).

HSOPSC Dimension	Phase A (Mean ± SD)	Phase B (Mean ± SD)	Cronbach's α Phase A	Cronbach's α Phase B
Communication openness	3.34 ± 0.79	3.26 ± 0.75	0.692	0.683
Nonpunitive response to error	2.81 ± 0.78	2.59 ± 0.79	0.734	0.740
Frequency of event reporting	3.39 ± 0.93	3.38 ± 0.91	0.834	0.827
Staffing	2.52 ± 0.62	2.41 ± 0.63	0.516	0.547
Management support for patient safety	3.43 ± 0.76	3.32 ± 0.76	0.728	0.737
Supervisor/manager expectations and actions promoting safety	3.73 ± 0.67	3.62 ± 0.70	0.734	0.756
Organizational learning – continuous improvement	3.63 ± 0.55	3.63 ± 0.57	0.497	0.556
Feedback and communication about errors	3.59 ± 0.75	3.61 ± 0.70	0.742	0.691
Handoffs and transitions	3.41 ± 0.64	3.40 ± 0.63	0.713	0.736
Teamwork within units	3.78 ± 0.74	3.50 ± 0.63	0.426	0.657
Teamwork across units	3.36 ± 0.60	3.41 ± 0.59	0.752	0.756
Overall perceptions of patient safety	3.62 ± 0.61	3.52 ± 0.61	0.585	0.598

Table 2.
HSOPSC dimensions – mean scores (± SD) and Cronbach's Alpha by study phase.

indicating ongoing concerns about workforce adequacy and a persistent culture of blame (see **Table 2**). These areas reflect systemic issues that were not sufficiently addressed even after the implementation of the ISO 9001:2015 and EN 15224:2017 standards.

Some minor fluctuations were also noted (see **Table 2**). For instance, a small decline was observed in "Communication openness" (from 3.34 ± 0.79 to 3.26 ± 0.75), while "*Teamwork across units*" slightly improved (from 3.36 ± 0.60 to 3.41 ± 0.59), suggesting possible effects of structural reorganization or targeted interventions.

Importantly, internal consistency estimates (Cronbach's alpha) for each dimension were generally acceptable across both phases, with values ranging from 0.426 to 0.834 in Phase A, and from 0.547 to 0.827 in Phase B. Dimensions such as *"Frequency of event reporting"* and *"Teamwork across units"* showed high internal reliability ($\alpha > 0.80$), while lower reliability coefficients were noted in *"Teamwork within units"* and *"Organizational learning,"* warranting careful interpretation of these subscale results.

Overall, while certain aspects of safety culture showed relative stability or slight improvement (see **Table 2**) post-intervention, the observed stagnation or decline in key areas such as nonpunitive error response and staffing highlights the complexity of cultural change processes in hospital settings.

4.3 Key correlations and predictive factors across phases

To assess how dimensions of safety culture are associated with perceived patient safety (see **Table 3**) and whether there were significant improvements between Phase A and Phase B, both correlation and t-test analyses were conducted. **Table 3** presents

Dimension	ρ with perceived safety	*t* (phase A vs. phase B)	*p*-value	Significance
Communication openness	.324**	1.533	.126	n.s.
Nonpunitive response to error	.231**	4.262	< .001	***
Frequency of event reporting	.188**	0.163	.870	n.s.
Staffing	.222**	2.789	.005	**
Management support for patient safety	.469**	2.131	.033	*
Supervisor/manager expectations and actions	.369**	2.360	.018	*
Organizational learning and continuous improvement	.340**	−0.112	.911	n.s.
Feedback and communication about error	.373**	−0.313	.754	n.s.
Handoffs and transitions	.362**	0.194	.846	n.s.
Teamwork within units	.360**	5.978	< .001	***
Teamwork across units	.249**	−1.225	.221	n.s.
Overall perceptions of patient safety	.477**	2.422	.016	*

*Note: All correlations significant at p < 0.01. n.s., not significant.*p < 0.05.*
***p < 0.01.*
****p < 0.001.*

Table 3.
*Correlations with perceived patient safety and phase comparison (*t*-test) for each HSOPSC dimension.*

the Spearman correlation coefficients between each HSOPSC dimension and the global patient safety rating, alongside the t-test results comparing mean scores across the two implementation phases.

All twelve HSOPSC dimensions demonstrated statistically significant positive correlations with the global safety perception (see **Table 3**) safety perception ($p < 0.01$), confirming that perceptions of safety are closely linked to multiple cultural attributes such as communication openness, managerial support, and teamwork. Among them, the strongest associations were observed for Overall Perceptions of Patient Safety ($\rho = .477$), Management Support ($\rho = .469$), and Feedback and Communication About Errors ($\rho = .373$).

The right columns of **Table 3** compare the mean scores of each dimension between Phase A and Phase B. Statistically significant improvements ($p < 0.05$) were observed for six key areas (see **Table 3**): Nonpunitive Response to Error, Staffing, Management Support, Supervisor Expectations, Teamwork Within Units, and Overall Perceptions of Safety. These findings suggest that standardization efforts had a positive impact particularly on dimensions related to leadership behavior, communication climate, and interdepartmental collaboration.

In summary, the results underline that the dimensions most strongly associated with perceived safety (see **Table 3**) were also those that improved significantly after the implementation of ISO 9001:2015 and EN 15224:2017. This reinforces the view that structural quality assurance systems can enhance patient safety only when they are coupled with substantive cultural change.

5. Discussion

The outcomes of this study contribute to the expanding empirical understanding of how standardized quality systems influence patient safety culture in public hospitals. The post-certification improvements observed in dimensions such as "Supervisor Expectations," "Teamwork Within Units," and "Management Support" are consistent with international findings. For example, a recent cross-sectional study in Kuwait documented significant gains in these same areas following the introduction of quality standards in public healthcare settings, emphasizing the role of managerial structures in shaping staff perceptions [12].

At the same time, the consistently low scores in "Staffing" and "Nonpunitive Response to Error" resonate with findings from multiple healthcare systems. Despite the implementation of standardization protocols, both "Staffing" and "Nonpunitive Response to Error" not only remained among the lowest-rated dimensions but also exhibited statistically significant deterioration. These findings highlight the structural rigidity and cultural barriers that certification alone cannot overcome. Vikan et al. [6], in a scoping review of patient safety culture and adverse events, similarly reported that these domains remain among the most resistant to reform, regardless of quality system implementation.

Furthermore, our regression analyses indicated that dimensions such as "Management Support," "Feedback and Communication," and "Organizational Learning" were significantly associated with global perceptions of safety. This aligns with results from a systematic review by Suhonen et al. [13], which confirmed that institutional trust and psychological safety are indispensable drivers of sustained safety engagement among healthcare staff. Notably, these dimensions are less dependent on policy and more contingent on leadership behavior, emotional intelligence, and participatory governance.

An important implication of this finding is that ISO 9001:2015 and EN 15224:2017—though robust in procedural architecture—require adaptive implementation rooted in human factors. Battard [14] and Carthon et al. [15] emphasize the importance of nurturing nonpunitive environments to encourage reporting and collective learning, arguing that systems based purely on compliance may inadvertently reinforce fear-based behaviors. Without a climate of psychological safety, the full potential of quality systems remains underrealized.

The Greek healthcare context adds a further dimension to the interpretation of results. A recent assessment of patient safety culture in primary care settings in Greece [16] has highlighted weak areas in leadership support and pronounced work pressure, reflecting the impact of hierarchical decision-making and resource constraints—issues that closely mirror those observed in our study. These findings reinforce the notion that any policy drive toward certification must be complemented by broader cultural transformation strategies, including leadership development, frontline staff empowerment, and systemic investment in communication and psychological safety.

In summary, the results of this study support the view that standardization efforts can generate positive shifts in specific domains of patient safety culture—particularly those mediated by communication and leadership. However, their effectiveness is bounded by cultural and structural variables that require deeper institutional transformation. Moving forward, a dual strategy is recommended: maintaining formal certification systems while actively promoting emotional safety, interdisciplinary

teamwork, and leadership accountability as cornerstones of a trustworthy healthcare culture. These findings are consistent with prior evidence and build upon earlier institutional research conducted at the same hospital [17], expanding its scope and offering a more comprehensive understanding of the mechanisms through which standardization interfaces with organizational culture and staff perceptions.

6. Conclusions

This chapter explored the influence of certified quality systems—specifically ISO 9001:2015 and EN 15224:2017—on the perceptions of patient safety culture among healthcare professionals in a large Greek public hospital. Through a two-phase, quasi-experimental design, it assessed changes in key organizational dimensions using the HSOPSC instrument before and after the implementation of these standards.

The findings offer a nuanced perspective: while notable improvements were observed in areas such as supervisory support, intra-unit teamwork, and feedback mechanisms, other critical domains—notably staffing and nonpunitive response to error—not only remained the lowest-rated but also exhibited statistically significant deterioration, underlining persistent systemic challenges.

These results underscore that quality standardization can catalyze cultural transformation, but its impact is not uniform across all aspects of safety culture. Procedural alignment alone is insufficient to shift deeply embedded professional behaviors or to mitigate structural deficits such as resource shortages. The success of certification frameworks appears contingent upon their integration within a broader strategy of human-centered organizational development—one that emphasizes psychological safety, leadership accountability, and staff engagement.

Moreover, the study highlights the centrality of trust in safety systems, as dimensions related to leadership, learning, and communication emerged as key predictors of perceived institutional safety. These insights suggest that safety culture must be cultivated not only through regulation and policy but also through relational and cognitive investments in the workforce. Importantly, the cultural context of public hospitals—especially in health systems characterized by resource constraints and hierarchical governance—should be acknowledged and addressed in the design of future quality interventions.

In conclusion, standardization procedures offer a valuable framework for promoting quality and safety, but their transformative potential depends on how they are operationalized within real-world healthcare environments. Sustainable improvement requires an integrated approach that combines formal compliance with cultural sensitivity, staff empowerment, and adaptive leadership. Future research should continue to investigate the mechanisms through which standardization intersects with trust, communication, and system-level resilience, especially in under-resourced public healthcare systems.

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Conflict of interest

The authors declare no conflict of interest.

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Chapter 9

Perspective Chapter: A Conceptual Framework for Assessing Food Service Quality in Selected Public Hospitals in South Africa

Lindiwe Julia Ncube

Abstract

The quality of food service in public hospitals is a critical yet often neglected component of healthcare delivery. In South Africa, where the public health system is under considerable strain, the urgent need to address the issue of hospital food services to support patient recovery, promote satisfaction, and enhance institutional performance is undeniable. Despite its importance, food service quality remains underexplored in the literature, and the robust frameworks for its evaluation are lacking. This chapter presents a conceptual framework to assess the quality of food service outputs in South African public hospitals. The framework, designed with practicality in mind, addresses the multifaceted nature of food service by integrating nutritional adequacy, cultural relevance, safety, efficiency, and patient perceptions. Its development is guided by systems theory and service quality models to deliver actionable insights to hospital administrators and policymakers. Through this lens, food service is positioned not as a peripheral function but as an essential contributor to patient outcomes and healthcare quality, providing a practical and applicable solution to the issue at hand.

Keywords: hospital food service, patient satisfaction, food service quality, public hospitals, nutrition, South Africa, healthcare management

1. Introduction

The quality of food service in public hospitals, particularly in resource-constrained contexts like South Africa, plays a crucial role in patient outcomes and overall healthcare performance. In these settings, food service is not just a logistical task, but a clinical support function integral to patient care. Hospitalized individuals often rely on hospital meals as their primary and sometimes only source of nutrition, underscoring the gravity of the situation and the importance of food safety, cultural acceptability, timeliness, and nutritional value in their recovery.

In many hospitals, food service quality is inconsistent, poorly monitored, and frequently undervalued in healthcare assessments. This chapter proposes a practical, context-sensitive framework to evaluate the food service quality from the patient's perspective. The framework, deeply rooted in a patient-centred approach, aims to identify systemic inefficiencies and service quality gaps, helping administrators implement evidence-based improvements. This empathetic and caring approach, which places the patient at the centre of the evaluation, contributes to a more holistic understanding of hospital food services and their role in the healthcare ecosystem.

This chapter proposes developing a practical and context-specific framework to evaluate the quality of food service outputs in South African public hospitals. The framework aims to assess patient satisfaction comprehensively while offering hospital administrators actionable insights for service improvement. By closing existing gaps in the evaluation practices, the framework contributes to better health outcomes and more.

1.1 Food service as a subsystem of the supra-system

Author [1] explains the food service subsystem as a systems approach that can be further classified into mutually interdependent subsystems (involving inputs, transformation, and outputs). Each subsystem contributes to and receives something from the food service subsystem. Together, they work to achieve common goals, such as maintaining food safety, ensuring nutritional value, and providing a positive dining experience (**Figure 1**). This chapter focuses on the quality variables classified at the output stage of the food service subsystem.

In assessing the quality of the food service output, Author [2] indicates that the food service output quality variables can be evaluated using a format divided into the following categories: promotion (patient feedback and satisfaction), product (meal presentation, ingredients, serving methods and organoleptic properties of food), place (eating environment and serving equipment), price (cash control, cost of wastage, pricing and employee integrity), people (service staff, hospitality, appearance and hygiene) and nutritional value (nutritional quality of food).

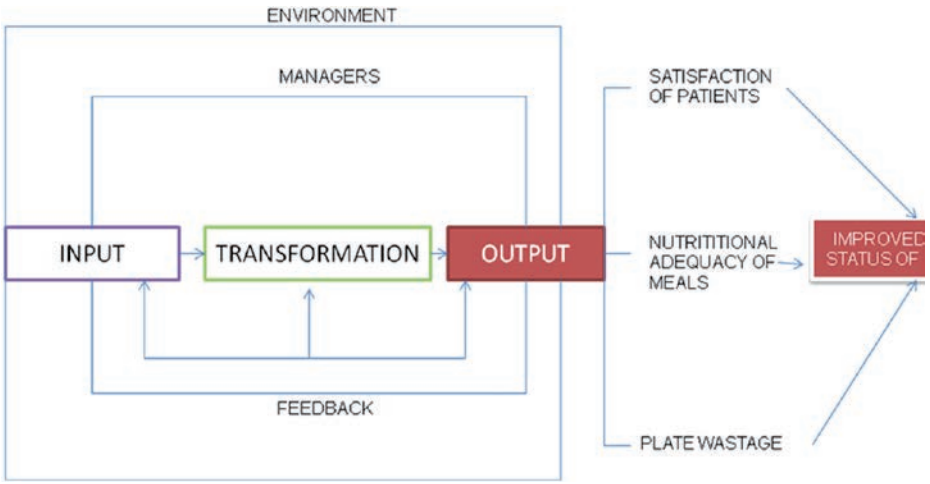


Figure 1.
Food service as a subsystem in a supra-system. Source: Adapted from Payne-Palacio & Thesis (2009).

1.1.1 Variables for determining the quality of food service outputs

The indicators and variables contributing to the quality of food service output are (1) patients' satisfaction; (2) the nutritional quality of meals and (3) food wastage to determine the acceptability to patients of food items in public hospitals [2–7].

1.1.1.1 Patients' satisfaction

The texture, color and overall appearance of hospital food are increasingly included in patient satisfaction questionnaires. A growing body of literature highlights the patient responses to hospital food, indicating a rising awareness of its role in the healthcare experience [8–13]. However, despite this growing interest, these surveys often fail to provide detailed insights into specific shortcomings in food service quality that are urgently needed. As a result, significant gaps remain in understanding the complex relationship between patient satisfaction, perceived quality, and the characteristics of hospital food services. Exploring these relationships is essential for developing meaningful tools to measure food service performance and monitor changes in patient satisfaction over time [14].

To assess patient satisfaction with hospital food services more effectively, it is necessary to consider multiple service quality dimensions. Drawing on the framework developed by author [3], five key dimensions emerge as crucial: tangibles, which refer to the physical appearance of facilities, equipment, personnel, and communication materials; reliability, or the hospital's ability to deliver services accurately and consistently; responsiveness, defined by the staff's willingness to assist patients and respond promptly to their needs; assurance, which encompasses staff knowledge, courtesy, and their ability to instil trust; and empathy, involving the provision of personalized care and attention tailored to each patient.

Building on this foundation, the author [3] further proposes a model for measuring service quality by identifying five critical gaps between patient expectations and service delivery. The management perception gap arises when hospital administrators misunderstand what patients expect from food services, such as underestimating the importance of food presentation. Second, the quality specification gap occurs when these misunderstood expectations fail to translate into appropriate service standards, such as not having a straightforward menu. Third, the service delivery gap reflects discrepancies between the established quality standards and their implementation, for instance, when food is not served at the right temperature. The fourth, the market communication gap, highlights inconsistencies between what hospital food services promise and what they ultimately deliver, such as overpromising on variety and underdelivering. Finally, the perceived service quality gap captures the overall difference between patients' expectations and their actual experiences with food services, which can be influenced by all the previous gaps (**Figure 2**).

This chapter examines these five service quality gaps using a questionnaire adapted from prior research in the hospitality sector. This tool was specifically tailored to capture the expectations and perceptions of hospital patients, drawing on the well-established dimensions of service quality articulated by Parasuraman and his colleagues. Through this approach, the study aims to uncover the deeper factors shaping patient satisfaction with hospital food services. The practical implications of this research are significant, as it can guide more targeted and functional improvements in healthcare delivery, directly impacting the work of healthcare professionals, hospital administrators, and researchers in healthcare quality and patient satisfaction.

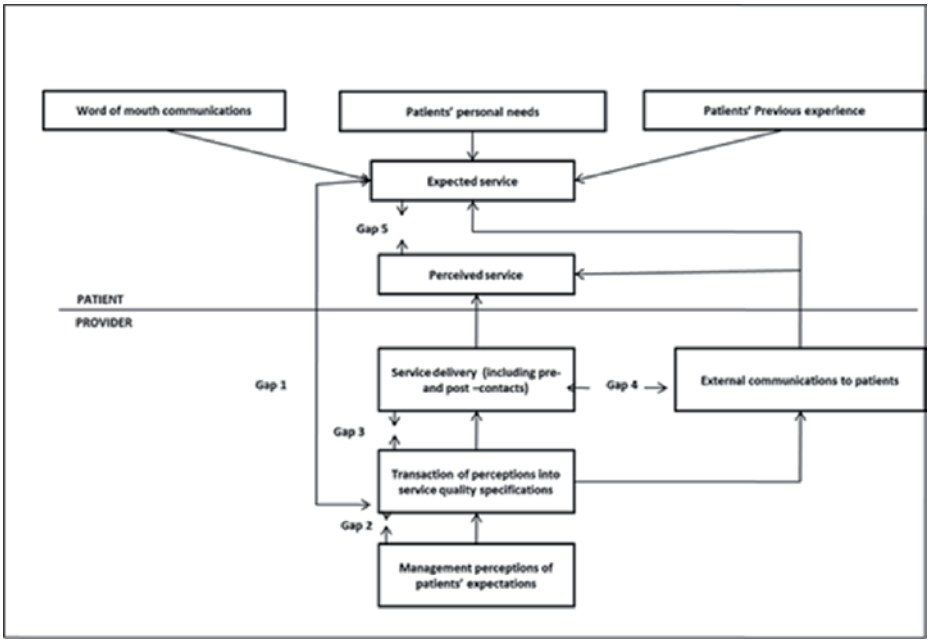


Figure 2.
SERVQUAL or gaps model. Source: Adapted from Lewis (1987: 1).

The food service subsystem is a systems approach that can be further classified into mutually interdependent subsystems (involving inputs, transformation and outputs). Each subsystem contributes to, and receives something from, the food service subsystem while working to achieve common goals (**Figure 1**) [1].

This chapter focuses on the quality variables classified at the output stage of the food service subsystem.

In assessing the quality of the food service output, the quality variables of the food service output can be evaluated using a format divided into the following categories: promotion (patient feedback and satisfaction), product (meal presentation, ingredients, serving methods and organoleptic properties of food), place (eating environment and serving equipment), price (cash control, cost of wastage, pricing and employee integrity), people (service staff, hospitality, appearance and hygiene) and nutritional value (nutritional quality of food) [1].

2. Patients' satisfaction with the tangibles of food service quality in South Africa

2.1 Patients' satisfaction with meal appearance

In South Africa, the quality of hospital food service plays a significant role in patient satisfaction, particularly regarding the tangible aspects of food service. A study assessed patients' satisfaction across various food service attributes, where participants were asked to rate their experiences on a visual analogue scale from 0, representing "never", to 10, representing "strongly agree". The results revealed varying satisfaction levels, reflecting consistency and notable regional differences.

One of the key areas examined was the appearance of the meals served. Three hundred and ninety-seven participants responded to the statement about the food's attractiveness; the average score was 6.9, suggesting that patients did not find the meals visually appealing overall. The temperature of the food was another area of interest. Patients were asked whether their hot meals were served at the correct temperature, and 393 participants responded. The average score for this aspect was 6.8, reflecting a general dissatisfaction as patients reported that hot meals were not always served hot. Similarly, 361 participants evaluated whether cold food was served at the appropriate temperature. The average score for this was slightly lower, at 6.6, signalling that patients were not entirely satisfied with how cold meals were maintained. The appearance of the food trays was also assessed, with 383 patients responding. The average score here was more favourable, averaging 7.0, which indicated that, overall, patients found the trays reasonably attractive.

Regarding the quantity of food served, 388 participants evaluated whether they were satisfied with the amount of food provided. The average score for this aspect was 7.2, indicating that patients generally felt satisfied with the quantity of their meals. Finally, the taste of the meals was scrutinized by 327 participants. The average score for this statement was 6.6, signalling that while patients acknowledged the taste of the food, it did not consistently meet their expectations, indicating that while the food's taste was acceptable, there was room for improvement.

In conclusion, the study underscored the urgent need for standardization and quality improvement in hospital food services. It revealed a clear pattern of regional variation in patient satisfaction with the tangible aspects of hospital food services. While the national scores reflected moderate dissatisfaction in several areas, one province consistently outperformed others, particularly in meal temperature and tray presentation. These regional differences suggest that improvements could be made at the national level to ensure more consistent and higher-quality food services across South African hospitals.

2.2 Patients' satisfaction with waiting times

In assessing patients' satisfaction with hospital food service in South Africa, waiting times for meals emerged as a critical point of evaluation. This aspect was measured through two key statements, each designed to capture both the occurrence of delays and the effectiveness of communication regarding those delays. Participants rated their experiences on a scale that reflected the degree of agreement or disagreement with the statements given.

For the first statement, *"I had to wait longer than expected for the meals served to me by the hospital,"* 371 participants provided responses. The average score for this question was 2.1, which corresponds to a general disagreement with the statement. This suggests that, overall, patients did not feel that meals were excessively delayed. Moreover, this trend was consistent across all provinces, with an overall provincial average of 2.0, reinforcing the perception that meal delivery times met patient expectations throughout the country.

The second statement explored how well hospitals communicated with patients in the event of a delay. It asked those who had experienced longer-than-expected waiting times whether they had been informed about the reason for the delay. Of the 158 participants who responded to this question, the average score was 3.5, indicating a general level of disagreement with the statement. This suggests that, even when delays did occur, patients were typically not informed about them. Most provinces

mirrored this national trend, though there were slight deviations in two provinces, where the average scores were slightly higher at 5.0, still on the disagreeing side of the scale but indicating a marginally better level of communication.

Overall, while waiting times themselves were not a major concern for patients, the study revealed a consistent lack of communication when delays did happen. This gap highlights an important area for improvement, suggesting that even though service is generally timely, better communication could enhance patient satisfaction further in instances where delays are unavoidable.

2.3 Patients' satisfaction with the responsiveness of the hospital food service system

Patients' satisfaction with the responsiveness of hospital food service in South Africa was evaluated using a scale from 0 (never) to 10 (totally agree). The assessment focused on several dimensions of responsiveness, including staff politeness, willingness to assist, communication about food content, respectful treatment, and handling special requests.

One of the most positively rated aspects was the politeness of the staff delivering meal trays. This high level of courtesy, as indicated by the average score of 8.0 from 389 participants, provides reassurance about the existing standards. Responsiveness to patient requests was also generally viewed favorably. When asked whether service staff responded when help was requested, 372 participants gave an average score of 7.0, reflecting general agreement.

In stark contrast, communication about the nutritional value of food items was rated poorly. Only 324 participants responded to this statement, but the results were conclusive: the average was just 1.0, indicating strong disagreement that staff provided nutritional information. This highlights a clear need for improvement in nutritional communication, motivating the audience for change.

Respectful treatment by service staff was another aspect that was positively viewed. Among 386 respondents, the average score was 8.0, suggesting that patients felt they were treated with dignity during meal service. However, when it came to handling special meal requests, satisfaction dropped.

In summary, the average score among 368. While patients generally felt respected and found the staff to be polite and helpful, there were apparent gaps in communication, particularly concerning nutritional information. Additionally, responsiveness to special dietary needs varied, pointing to an opportunity for more consistent service in this area. These findings highlight the strengths and limitations of current food service responsiveness in South African hospitals.

2.4 Patients' satisfaction with the empathy of the food service personnel

2.4.1 Patients' satisfaction with food service delivery

In evaluating the empathy of hospital food service personnel across South Africa, patients' feedback was of significant value. Patients were asked to rate their satisfaction on a scale from 0 (never) to 10 (totally agree). This dimension focused on the ability of service staff to communicate effectively and consistently, demonstrating attentiveness to patient needs and preferences.

One of the most striking findings emerged from the responses related to communication about menu options. When 324 participants were asked whether service

staff explained the food items on the different menus, the average score was just 1.0, indicating a strong consensus of total disagreement. This exceptionally low score was echoed across all provinces, with no average score above 2.0. These results underscore the urgent need for improved communication from staff about available food items, pointing to a significant gap in empathetic engagement.

Similarly, when 387 participants responded to the statement about being informed of the hospital's menu, the average score was slightly higher but still low, at 2.0. This further underscores the need for improvement in communication regarding meals, as it appears to be minimal or entirely absent. All provinces reflected this national trend, except one province, which recorded a modestly higher score of 4.0, still within the range of disagreement but indicating a slightly better effort in menu communication.

In contrast, patients expressed greater satisfaction with the consistency of the staff who provided food services. Among 322 participants who responded to this aspect, the average score was 7.1, suggesting a general agreement that services were delivered reliably. These findings reveal a mixed picture of empathy within hospital food services. While patients recognized the consistent delivery of meals as a positive aspect of their experience, the lack of communication, particularly regarding menu options and food item explanations, highlighted a critical weakness. For hospital food service personnel, enhancing empathy will require not only reliable service but also a stronger focus on informing and engaging patients in decisions about their meals, which should be a key area of improvement.

2.4.2 Patients' satisfaction with the attributes of food service staff

The research has evaluated patients' perceptions of the courtesy displayed by hospital food service staff, with a particular focus on whether staff greeted them during meal service. This aspect of interpersonal interaction is a simple yet powerful indicator of respect and attentiveness in patient care, and the findings are crucial for understanding and improving the patient's experience.

Three hundred and eighty-nine participants responded to the statement, *"The service staff greet me when they serve me with meals,"* and the results were overwhelmingly positive. The average score stood at 8.0, indicating strong agreement that staff consistently greeted patients during meal delivery, highlighting a widespread culture of courteous engagement that unites the healthcare system.

One province stood out significantly above the national trend, with an average score of 8.6, further reinforcing that food service staff in this region demonstrated exceptional friendliness and respect. This exceptional performance should be a source of pride and motivation for all healthcare staff, as it underscores the significant impact of simple gestures like greeting patients on the healthcare experience.

2.5 Patients' satisfaction with the attributes of food service staff

2.5.1 Patients' food service problem resolutions

The overall evaluation of patients' satisfaction with hospital food services in South Africa revealed a complex picture, shaped by both expectations and actual experiences. Using a satisfaction scale ranging from 0 ("never") to 10 ("totally agree"), the study aimed to measure how well hospital food services aligned with patient expectations and how effectively they addressed issues when they arose.

When asked about the quality of service they anticipated, patients generally described high expectations: they looked forward to meals that were nutritious, tasty, visually appealing, and aromatic, all served in a clean, odor-free environment. These expectations highlight the importance patients place not only on the nutritional content of their meals but also on the sensory and environmental aspects of food service in hospital settings.

However, when it came to whether these expectations were met, the response was more reserved. Among the 375 participants who answered the statement *"The food services met my expectations,"* the national average score was 6.7. This rating, which leans toward disagreement, suggests that many patients felt the service fell short of what they had hoped for. Most provinces reported similar scores, except for one province, where the average score was slightly higher at 7.1, indicating a modest level of agreement that expectations had been met.

In terms of problem resolution, a smaller group of 79 patients indicated that they had experienced issues with hospital food services during their stay. When asked if their problems were resolved satisfactorily, the national average score was 4.9, reflecting general dissatisfaction with how concerns were handled. This trend was consistent across most provinces. Notably, one province reported a higher score of 6.2, which, although still below the threshold for agreement, suggests relatively better performance in addressing patient complaints.

These findings point to a significant gap between patient expectations and the reality of hospital food service delivery. While most patients expect high-quality meals and respectful service, many feel that the actual experience does not consistently meet those standards. Furthermore, the low satisfaction with problem resolution indicates a need for more responsive and patient-centred approaches to service recovery. Overall, improving both the quality of meals and the mechanisms for addressing complaints could play a vital role in enhancing the patients' overall satisfaction with hospital food services.

2.5.2 Patients' satisfaction with the food services

Patients' overall satisfaction with the food services provided during their hospital stay was a key area of evaluation. The findings revealed a balance of positive and improvement areas, with many patients expressing satisfaction with certain aspects of the service.

Among the 387 participants who responded to the statement *"I am satisfied with the food services during my stay in the hospital,"* the average score of 7.0 serves as a benchmark. This score, indicating general agreement, suggests that there is room for improvement in overall satisfaction with the food services. However, four provinces showed notable deviations, hinting at a more varied food service experience across regions.

The willingness of patients to recommend hospital food services to others presented a less favourable picture. Of the 327 participants who responded to the statement *"I will recommend the food service system of the hospital to friends and family,"* the national average score was 6.7, reflecting disagreement. This suggests that, while some patients were content, many felt that the service fell short of being worthy of recommendation. Only one province scored 7.8, which indicates a stronger inclination to recommend the service compared to other regions.

Similarly, when 320 participants were asked whether they would be willing to use the hospital's food services again in the future, the average score was 6.6,

again, a slight disagreement. This result indicates that many patients were not entirely convinced of the food service's quality or appeal for future use. Once again, one Province displayed a more favourable response, scoring 7.8, reflecting a greater likelihood of future engagement with the hospital's food services than the national trend.

These results suggest that while hospital food services are generally considered adequate, there are apparent gaps in patient satisfaction. Many patients made reservations about recommending or reusing the services, particularly in regions outside one province, which offered a more favourable experience. This underscores the need for improving the quality of food service and addressing regional disparities to enhance patient satisfaction and encourage greater future use and recommendation of hospital food services.

When patients were asked to provide suggestions and opinions about the food services they received during their hospital stay, their responses highlighted several areas for improvement. A recurring theme was the desire to enhance the food's appearance, taste, and temperature. Many patients expressed that these elements were critical to their dining experience and comfort. Additionally, there was a call to increase the portion sizes, as some patients felt the servings were inadequate for their needs.

Cultural considerations also emerged as an essential factor. Several patients suggested that food preparation methods should better align with their artistic preferences, ensuring that meals feel more familiar and respectful of their diverse backgrounds. Beyond the food itself, there were concerns about the quality of the dining experience, with some patients recommending improvements in the cleanliness and condition of the cutlery and crockery, which they felt should be free from cracks and stains.

The atmosphere in which food is served also garnered attention. Patients indicated a desire for an eating environment that feels more like home, a suggestion that should make the healthcare staff feel empathetic and committed to improving the patient's experience. They highlighted the importance of a comfortable, familiar setting that contributes to a sense of well-being during their stay. Furthermore, there were suggestions to ensure that the dining areas are free of unpleasant odors, which could detract from the overall experience.

One of the key suggestions that emerged was the introduction of a selective menu. Patients expressed a desire for more choices that would better suit their preferences and dietary needs. This move toward a more personalized food service is a clear indication of the hospital's commitment to enhancing patient satisfaction and catering to diverse requirements.

It's worth noting that despite the areas for improvement, some patients acknowledged and commended the overall quality of the food services. They recognized that the hospital's efforts in providing reasonably good food services, particularly considering the price they pay for hospitalization, were commendable. This recognition of the hospital's value within the broader context of their healthcare experience is an important aspect to highlight.

In summary, while many patients highlighted areas for improvement, particularly regarding food quality, cultural sensitivity, and the dining environment, the hospital food service's value was also acknowledged within the broader context of their healthcare experience. Addressing these concerns greatly enhances patient satisfaction and overall dining experiences in hospital settings.

2.5.3 Patients' satisfaction with the appearance of food service staff

Patients' satisfaction with the appearance of hospital food service staff was another important aspect assessed in the national evaluation. Specifically, the focus was on whether service personnel presented themselves neatly while delivering meals. A total of 392 participants responded to the statement, *"The service staff wear neat clothes when serving food",* and the results were largely positive.

At the national level, the average score was 8.0, indicating a strong agreement among patients that staff maintained a neat and presentable appearance. This general perception of professionalism in appearance was consistent across most provinces, reinforcing the impression that cleanliness and grooming standards were upheld throughout the hospital food service system.

However, Province 1 presented a significant deviation from this trend. In stark contrast to the national and provincial averages, respondents in Province 1 gave an average score of less than 3.0, signalling strong disagreement with the statement. This suggests that patients in this province found the appearance of service staff to be unsatisfactory, raising concerns about adherence to hygiene and professional standards in that region.

Overall, while patients across the country generally viewed the appearance of food service staff positively, the markedly lower satisfaction in Province 1 highlights an important area for improvement. Ensuring that all service staff consistently present themselves in a clean and professional manner is essential not only for maintaining patient trust but also for reinforcing the broader standards of care and service quality within hospital environments**.**

2.6 Patients' satisfaction with the attitude of food service staff

2.6.1 Patients' satisfaction with the behavior of food service staff

Patients' satisfaction with the attitude of hospital food service staff in South Africa was assessed using a 0 to 10 scale, where 0 indicated "never" and 10 showed "totally agree". This aspect of the evaluation focused on how patients perceived the demeanour and interpersonal behaviour of the service personnel during meal delivery, a key element of patient experience and emotional comfort during hospitalization.

One of the most positively rated the aspects of staff attitude was their pleasant interaction with patients. A significant number of 392 participants responded to the statement *"The service staff pleasantly talk to me", with* the national average score being a strong 8.0, indicating a high level of agreement. This result reflects a widely shared perception that food service personnel communicate courteously and are friendly. The positive trend was consistent across all provinces, with some even surpassing the national average. Notably, provincial scores reached as high as 8.7, underscoring a consistently high level of satisfaction with how service staff engage with patients, which significantly enhances the patient's experience.

Similarly, 388 participants responded to the statement *"The service staff smile when they serve me with meals",* which also yielded a favourable national average of 7.0. While slightly lower than the score for verbal communication, this rating still reflected agreement that staff demonstrated a friendly and welcoming demeanour through non-verbal gestures such as smiling. Provincial results were closely aligned with this national average, with Province 3 standing out slightly by achieving an average score of approximately 8.0.

Together, these findings illustrate that the attitude of hospital food service staff is generally viewed positively by patients across the country. The consistently high verbal and non-verbal communication ratings suggest that staff perform their duties efficiently and contribute to a warm and respectful environment. While often overlooked in technical assessments, such interpersonal qualities are not to be underestimated. They are essential for enhancing patient comfort and satisfaction during hospital stays, underscoring the significance of these qualities in patient comfort and satisfaction.

3. The nutritional quality of hospital meals

Nutrition plays a central role in the holistic care of hospitalized patients, forming a foundational component of the healing process. Recognized as a fundamental human right in the National Patients' Rights Charter [15], adequate and appropriate nutrition is not simply a supportive measure; it is essential for maintaining bodily functions, preserving tissue structure, and facilitating recovery from illness. When hospital meals fail to meet these nutritional needs, the result can be institutionally induced malnutrition, a concern that has been documented in public hospitals across South Africa. This form of malnutrition often arises from several systemic issues, including poor planning and preparation of meals, inappropriate serving practices, and insufficient food intake by patients [16, 17]. To combat these challenges, portion control has been implemented as a key nutritional quality control measure. By aligning meal sizes with the Recommended Dietary Intakes (RDIs), hospital food service staff aim to ensure that each patient receives the correct nutrients necessary for their health needs [18]. Food service managers are thus charged with a vital responsibility: to provide meals that are safe, palatable, and nutritionally balanced and tailored to support the physiological demands of healing and survival [19].

The significance of this task is reinforced by the observations of the Authors [20], who emphasizes that the human body can obtain all required energy, structural materials, and regulatory agents from the food it receives. In the context of hospital care, this underscores the need for meals that do more than satisfy hunger; they must actively contribute to the patient's recovery. However, meeting this goal requires recognizing that patients vary significantly in their nutritional needs. Inpatients differ not only in age and gender but also in disease status and pre-existing nutritional conditions, all of which influence their energy and protein requirements [21]. Yet, hospitals often fail to account for these variations adequately.

Research conducted by Simon [22] in two U.S. hospitals revealed gaps in the nutritional content of hospital diets. While most diets met minimum standards for energy, protein, and vitamin A, they frequently lacked a range of other essential vitamins and minerals. Particularly with the restricted diets commonly prescribed in clinical settings, essential nutrients were often missing altogether. These findings were echoed in a study at Bern University Hospital, where meals' energy and carbohydrate content consistently fell below national dietary recommendations [23]. Similarly, author [23] found widespread deficiencies in hospital food served to patients, particularly in energy, protein, folic acid, iron, vitamin C, calcium, and dietary fiber. These nutritional gaps were compounded by operational issues such as poorly timed meals, inadequate ordering systems, inefficient service procedures, and a lack of structured support for patients with poor appetites or special dietary needs.

In essence, the quality of nutrition provided to hospital patients directly and indirectly impacts their recovery. Hospital food may be a powerful healing tool when thoughtfully planned and properly executed, but it may also undermine patient health when nutritional standards are compromised. Therefore, improving the nutritional quality of hospital meals must remain a key priority for health service management, grounded in clinical evidence and a deep understanding of patient-specific dietary requirements.

4. Food wastage

The provision of hospital food services plays a critical role in shaping the overall quality of life experienced by patients during their stay and is a key factor in preventing malnutrition, as highlighted by Scottish Government [24]. Nutritional goals cannot be achieved if patients consistently leave large portions of food uneaten. The challenge lies in supplying meals that meet clinical nutritional standards and ensuring that these meals are appropriate for patients of different age groups, cultural and religious backgrounds, and varying medical needs, as noted by Folio et al. [25]. It is not just about meeting nutritional standards, but also about respecting and embracing the diversity of our patients. Hospital meals must therefore be more than just nutritionally balanced; they must also be culturally sensitive, appetizing, familiar, and readily available. Most importantly, they must be enjoyable enough for patients to consume them fully. When food is eaten and not wasted, nutrition is optimized, patients' perceptions of care improve, and financial resources are better utilized, creating a ripple effect of positive outcomes, as observed by Parasuraman et al. [26].

Recognizing the critical role of hospital food services, it becomes evident that a comprehensive evaluation framework is needed. An effective way to assess a meal's performance is through food wastage studies, which measures the volume or percentage of food discarded after meals. This method provides a tangible indicator of how well meals meet patients' expectations and consumption patterns and reflects the success or failure of food service delivery [25]. In response to these challenges and insights, this chapter proposes a practical and contextually relevant framework for evaluating the quality of food service outputs within South African public hospitals. The goal is to establish a detailed, empirically grounded method for assessing hospital food services that captures both the nutritional adequacy and practical realities of meal provision in the public healthcare system.

5. Dimensions, sub-dimensions, and patients' food service quality satisfaction variables

Understanding patient satisfaction, a crucial indicator of food service quality in hospitals, requires a comprehensive, multidimensional framework. This study draws on the influential service quality model developed by [3, 26]. This model, widely recognized in the field, provides a structured basis for examining both tangible and intangible aspects of service delivery, enlightening us on the complexities of patient satisfaction.

The model outlines five key dimensions of service quality, each of which plays a significant role in patient satisfaction. These dimensions evaluate not only the physical attributes of food but also the interpersonal dynamics between service staff and

patients. The staff's politeness, willingness to accommodate special dietary needs, and ability to communicate effectively about meal options are all integral to the patient's perception of food service quality, underscoring the significance of their roles.

Beyond the dimensions themselves, the framework identifies five critical service quality gaps that can emerge between patients' expectations and their actual experiences. These are as follows:

- the management perception gap, which occurs when administrators misinterpret what patients expect.
- the quality specification gap, where known expectations are not translated into adequate service standards.
- the service delivery gap, arising from inconsistencies in execution.
- the market communication gap, caused by discrepancies between what is promised and what is delivered; and
- the perceived service quality gap reflects the mismatch between patient expectations and perceived outcomes.

In the context of hospital food services, the identified service quality gaps can significantly impact patient experience. These gaps manifest in various ways: lack of

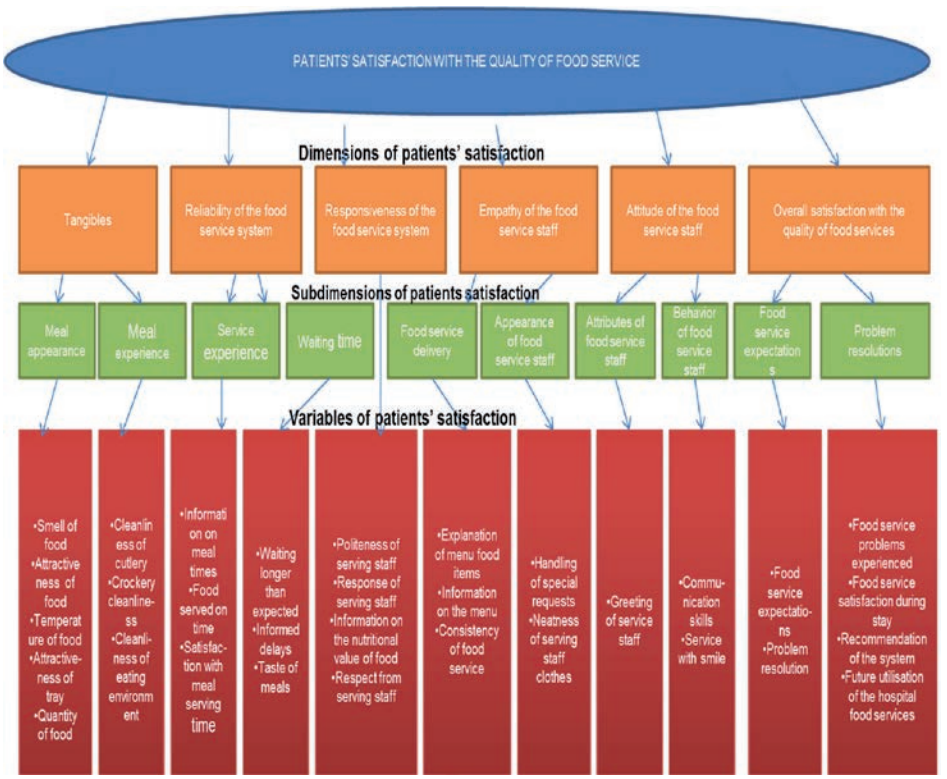


Figure 3.
Dimensions, sub-dimensions and variables of patients' food service quality satisfaction.

clear menu communication, inconsistent food temperatures, minimal responsiveness to patient feedback and the general absence of culturally appropriate or visually appealing meals. Addressing these deficiencies is urgent as they diminish the overall patient experience and undermine the hospital's broader healthcare objectives.

To systematically examine these service gaps and dimensions, the study employs a modified questionnaire, originally developed within the hospitality sector but adapted here for the hospital setting. This instrument was designed to gather perceptual data (what patients expect) and experiential data (what they receive), offering a richer, more actionable understanding of service quality shortfalls.

Figure 3 details the dimensions, sub-dimensions and associated variables used to assess the patient satisfaction with hospital food services. This framework provides the foundation for developing evidence-based strategies to improve food services' quality, consistency, and patient-centeredness in South African public hospitals.

6. A conceptual framework for assessing the quality of foodservice outputs in public hospitals in South Africa

In determining patients' satisfaction and perceptions of the quality of food service outputs, factors affecting patients' satisfaction can be divided into technical (food itself) and functional (people and systems) aspects. Different factors were found to affect and/or influence patients' perceptions and satisfaction with technical and functional aspects of the quality of food service output (**Figure 4**).

The findings underscore the need for a tailored, evidence-based framework that can be used across public hospitals in South Africa. The proposed conceptual framework places patient satisfaction at its core, supported by measurable indicators across

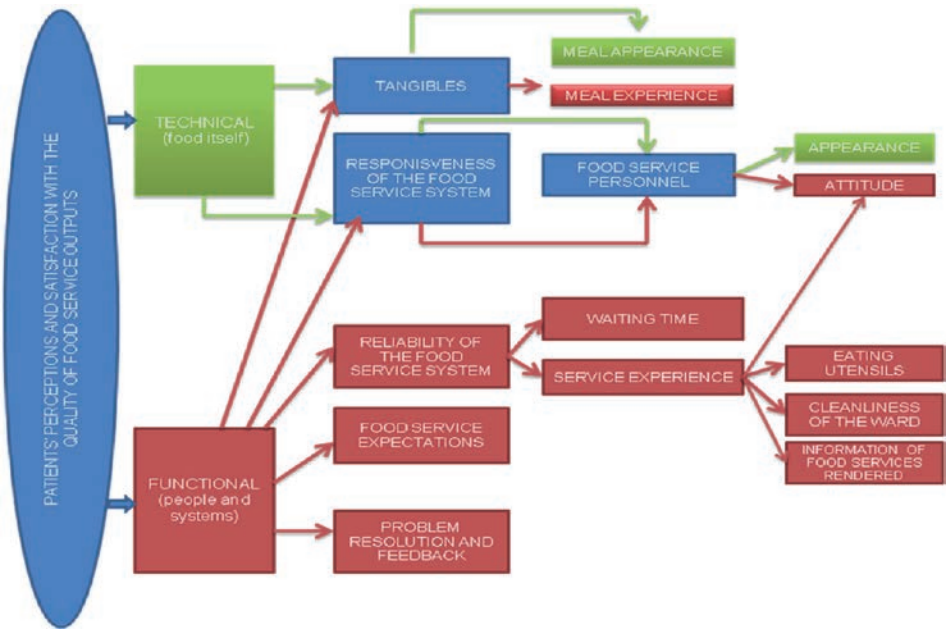


Figure 4.
Factors influencing patients' perceptions and satisfaction with the quality of food service outputs.

six interrelated domains: meal quality, presentation, delivery process, staff professionalism, communication and nutritional adequacy.

By incorporating feedback mechanisms, service quality dimensions, and health-based outcomes, the framework supports a shift from reactive to proactive service management. It offers hospital administrators a practical tool to evaluate and enhance food services in real time, with the goal of improving not only satisfaction but also recovery rates and operational efficiency.

7. Conclusions

This chapter examined the quality of hospital food services in South Africa's public healthcare system through the lens of patient satisfaction. Drawing on systems theory and the service quality framework developed by Parasuraman, Zeithaml and Berry, it presented food service as a critical output component of the broader healthcare delivery system. The discussion highlighted how the dimensions of service quality, responsiveness, assurance, empathy and reliability play a pivotal role in shaping patient experiences and perceptions of food service.

Empirical findings from a national patient survey revealed mixed levels of satisfaction. Patients generally expressed high levels of satisfaction with the appearance, politeness and hygiene of food service staff, as well as the reliability of service delivery. However, significant deficiencies were identified in the areas of food temperature, taste, portion sizes and, most notably, communication regarding menus and the nutritional content of meals. Furthermore, the ability of food services to address patient complaints and resolve problems was found to be inadequate in most regions.

The analysis also revealed substantial regional disparities, with certain provinces consistently outperforming others in both service delivery and patient satisfaction. These findings suggest the absence of a standardized, nationally enforced food service quality framework, resulting in inconsistent service levels and unequal patient experiences across the country.

Overall, the chapter emphasizes the need for a context-specific and patient-centred framework to evaluate and improve the food service quality in South African public hospitals. Such a framework should include both operational and experiential metrics, aiming to reduce service quality gaps, support clinical outcomes and enhance patient satisfaction in measurable and sustainable ways.

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Conflict of interest

The author declares that they have no financial or personal relationships that may have inappropriately influenced them in writing this chapter.

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In an era where global healthcare systems are rapidly shifting from volume-based to value-based care models, understanding the patient perspective is no longer optional; it is a strategic imperative. This edited volume, *Patient Experience and Satisfaction - Evolving Landscape of Healthcare*, provides a comprehensive analysis of the mechanisms that drive superior patient care. It distinguishes between the subjective nature of satisfaction and the objective realities of patient experience, exploring how these metrics directly correlate with clinical quality, safety, and institutional reputation. By integrating theoretical frameworks with practical management strategies, the book offers actionable insights into fostering a culture of empathy and efficiency. Addressing critical topics from communication barriers to organizational culture, this book will serve as an essential resource for healthcare administrators, clinicians, researchers, and policymakers seeking to navigate the complexities of modern medical practice and deliver truly patient-centered excellence.

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