



Digital Health Transformation to Support Clinical Decision-Making in Primary Health Care Facilities

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ABSTRACT

This study aims to explore how digital health transformation supports clinical decision-making in primary health care facilities. The study responds to the growing use of electronic medical records, digital reporting systems, telemedicine platforms, and clinical decision support tools in primary care, while also recognizing persistent challenges related to infrastructure, workload, data integration, and user readiness. A qualitative case study approach was used to examine four primary health care facilities in Bandar Lampung City, Indonesia, from January to April 2026. Data were collected through semi-structured interviews, non-participant observation, and document review involving doctors, nurses, midwives, medical record officers, IT or data officers, pharmacy staff, and facility managers selected through purposive and snowball sampling. Thematic analysis revealed four main themes: digital systems improved access to patient information, digital documentation created both support and burden, health workers balanced digital recommendations with professional judgment, and organizational readiness shaped the effectiveness of digital use. The findings show that digital health transformation is not merely a technical process, but a sociotechnical change that depends on the relationship between technology, clinical workflow, staff competence, organizational support, and patient interaction. This study contributes to digital health literature by explaining how frontline health workers make sense of digital tools in clinical decision-making. The findings imply that policymakers and health facility managers should strengthen system integration, staff training, infrastructure readiness, and patient-centered digital communication. Future research should compare different facility contexts and include patient perspectives.



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1. Introduction

Digital health transformation has become a central agenda in health system reform because clinical services increasingly depend on timely data, integrated information systems, and evidence-informed decision-making. In primary health care facilities, this transformation does not only involve the use of electronic medical records, telemedicine, digital dashboards, mobile health applications, or clinical decision support systems. It also changes the way health workers collect patient information, interpret clinical symptoms, document care, coordinate referrals, and

monitor follow-up treatment. Digital health can support safer and more consistent clinical decisions when systems provide accurate information at the point of care. However, its effectiveness depends on the alignment between technology, clinical workflow, professional judgment, organizational readiness, and patient needs. Sutton et al. (2020) explain that clinical decision support systems can improve care processes, but their success requires careful integration into clinical practice. Kwan et al. (2020) also show that computerized decision support can improve care quality, although the size of improvement depends on how the system is designed and used.

The relevance of this issue is strong in primary health care because these facilities serve as the first contact point for most patients. In Indonesia, Puskesmas and primary clinics play a strategic role in early diagnosis, chronic disease management, maternal and child health, immunization, health promotion, and referral decisions. Digital transformation in this setting has grown through electronic health records, national reporting platforms, telemedicine services, and integrated health data policies. However, digital readiness remains uneven across facilities. Aisyah et al. (2024) found that the average information and communication technology maturity score in Indonesian health services was 2.74 on a five-point scale, which indicates that infrastructure, software, hardware, human resources, and governance still need improvement. This condition shows that digital health transformation in primary care cannot be understood only as a technical change. It also reflects the ability of health workers, managers, and institutions to convert digital data into meaningful clinical decisions.

At the service level, health workers often experience digital systems as both support and burden. Digital tools may help clinicians access patient history, identify risk factors, reduce documentation errors, and standardize referral decisions. Yet these tools may also create problems when the interface is difficult to use, data entry takes too much time, systems are not integrated, internet access is unstable, or recommendations do not match clinical realities. Frisinger and Papachristou (2023) emphasize the importance of listening to the voice of health care professionals when introducing digital decision support systems into primary care. Their study shows that digital change is complex because health workers assess technology through practical experience, workload, trust, and professional responsibility. Meunier et al. (2023) also found that barriers to clinical decision support use include workflow disruption, limited usability, lack of training, and low perceived relevance. These findings indicate that digital health transformation must be studied from the perspective of frontline users who directly apply digital tools in patient care.

Digital transformation in clinical decision-making also has social, cultural, and educational dimensions. Health workers must combine clinical knowledge, digital literacy, ethical awareness, and communication skills when using digital tools during consultation. Patients may benefit from faster assessment, better care coordination, and more personalized services. However, they may also worry about privacy, reduced face-to-face interaction, data security, and limited access for groups with low digital literacy. Madanian et al. (2023) show that patient acceptance of digital health tools depends on trust, usability, privacy protection, and perceived value. Sze et al. (2024) also explain that digital health can influence the patient-physician relationship in primary care, especially when technology changes communication patterns during consultation. In this context, clinical decision-making is not only a technical process. It is also a relational process shaped by trust, patient narratives, local culture, professional ethics, and the ability of clinicians to balance digital recommendations with contextual judgment.

Previous studies have examined digital health adoption, ICT maturity, electronic health records, telemedicine, clinical decision support systems, and artificial intelligence in health care. Many of these studies focus on system readiness, user acceptance, clinical outcomes, or technology performance. For example, Bayor et al. (2025) discuss the importance of user-centered

design in clinical decision support systems, while Knop et al. (2022) highlight human and technological factors that influence professional interaction with AI-enabled decision support. However, fewer studies explore how primary health care workers interpret digital systems in real clinical encounters, especially in Indonesian facilities. Limited attention has been given to how clinicians negotiate between digital recommendations, patient narratives, local service constraints, and professional judgment. This gap is important because digital transformation in primary care is not only about whether technology exists, but also about how health workers understand, trust, adapt, and use it in daily decision-making.

Based on this gap, this study aims to explore how digital health transformation supports clinical decision-making in primary health care facilities. The study focuses on the experiences of doctors, nurses, midwives, medical record officers, data officers, pharmacy staff, and facility managers in using digital systems for patient assessment, diagnosis support, documentation, referral decisions, and follow-up care. This study uses a sociotechnical perspective because digital clinical decision-making emerges from the interaction between technology, users, tasks, organizational structure, and service context. Theoretically, the study contributes to digital health literature by explaining how frontline workers construct meaning around technology in primary care. Practically, the findings can help Puskesmas managers, local health offices, and digital system developers design tools that are usable, trusted, workflow-sensitive, and relevant to clinical needs.

2. Materials and Methods

This study used a qualitative case study approach. This approach was selected because the research aimed to understand digital health transformation as a real-life process within primary health care facilities. A case study design allows the researcher to examine how digital tools, clinical workflow, organizational support, infrastructure, and professional experience interact in a specific service context. The study did not seek to measure the statistical effect of digital transformation. Instead, it aimed to interpret how health workers experience, use, question, and adapt digital systems during clinical decision-making. This design is consistent with qualitative digital health research, which emphasizes user experience, meaning-making, contextual barriers, and implementation processes. Ginsberg et al. (2024) argue that qualitative methods are important for understanding participants' experiences with digital health interventions because they can reveal meanings and contextual factors that are often missed by quantitative measurement.

The research was conducted at four primary health care facilities in Bandar Lampung City, Lampung Province, Indonesia. The study period was determined from January to April 2026. Bandar Lampung was selected because it represents an urban primary care context where digital health systems are increasingly used, while differences in infrastructure, staff capacity, patient volume, and service readiness remain visible across facilities. The research participants included doctors, nurses, midwives, medical record officers, IT or data officers, pharmacy staff, and facility managers. Participants were selected using purposive sampling based on three criteria: direct involvement in primary care services, experience using digital health systems for at least six months, and willingness to explain their experience in detail. Snowball sampling was also used when initial informants recommended other staff who had relevant experience with electronic medical records, digital reporting systems, referral platforms, telemedicine, or clinical decision support tools.

Data were collected through semi-structured interviews, non-participant observation, and document review. Semi-structured interviews were used to explore participants' experiences in using digital systems, perceived benefits, workflow changes, barriers, trust in digital recommendations, data entry burden, patient communication, and decision-making practices. Each interview lasted around 45 to 60 minutes and was conducted face-to-face in a private room at each facility. Observation was conducted in registration areas, consultation rooms, pharmacy

units, and medical record units to understand how digital systems were used during service delivery. Document review included standard operating procedures, digital reporting formats, training materials, referral flow documents, and non-confidential system display records. The combination of interviews, observation, and documentation enabled the researcher to compare what participants said, what they did, and how digital procedures were formally structured.

Data validity was ensured through source triangulation, method triangulation, member checking, and audit trail. Source triangulation was conducted by comparing information from different professional groups, such as doctors, nurses, midwives, data officers, and managers. Method triangulation was conducted by comparing interview data with observation notes and documents. Member checking was carried out by returning key summaries to selected participants to confirm whether the researcher's interpretation reflected their experiences accurately. An audit trail was maintained by documenting interview guides, field notes, coding decisions, analytic memos, and theme development. These steps strengthened credibility, dependability, and confirmability. Ethical procedures were also applied by asking for informed consent, protecting participant identity, and excluding confidential patient data from the analysis.

Data were analyzed using thematic analysis supported by the interactive model of Miles, Huberman, and Saldaña. The analysis began with interview transcription, repeated reading, and data familiarization. The researcher then conducted open coding to identify important meanings related to digital workflow, clinical judgment, system usefulness, barriers, patient interaction, and organizational support. Similar codes were grouped into categories and developed into broader themes. Data condensation, data display, and conclusion drawing were conducted iteratively until the final themes were stable. The findings were interpreted through a sociotechnical lens, which views digital clinical decision-making as the result of interaction among technology, users, tasks, organizations, and service context. This analytical process allowed the study to explain not only what digital systems are used for, but also how health workers make sense of them in primary care practice.

3. Results and Discussions

The findings show that digital health transformation in primary health care facilities reshaped clinical decision-making through four main themes: digital systems as tools for improving access to patient information, digital documentation as both support and burden, professional trust in digital recommendations, and organizational readiness as a condition for effective digital use. These themes emerged from interviews with doctors, nurses, midwives, medical record officers, data officers, pharmacy staff, and facility managers. Observation in registration areas, consultation rooms, pharmacy units, and medical record units also showed that digital systems had become part of daily service routines. However, the level of use varied across units and depended on staff competence, internet stability, workload, and the perceived relevance of digital data to clinical decisions.

The first theme indicates that digital systems helped health workers access patient information more quickly. Several participants stated that electronic records made it easier to review patient history, previous diagnoses, medication use, and referral status. This access was important in primary care because patients often came with recurrent complaints, chronic conditions, or incomplete paper documents. A doctor explained, "When the patient comes again, I can see the previous diagnosis and medication. It helps me decide whether the treatment should continue or whether the patient needs referral." Observation also showed that health workers frequently checked digital records before making referral decisions or continuing treatment. This finding suggests that digital health systems supported clinical continuity by reducing dependence on memory, manual files, and fragmented documentation.

The second theme shows that digital documentation created a dual experience. On one side, participants viewed digital systems as useful because they made reporting more structured and reduced the risk of missing data. On the other side, some participants felt that digital documentation increased workload, especially when the same information had to be entered into different platforms. A nurse stated, “The system helps because the data are complete, but sometimes we enter the same data more than once. When many patients are waiting, it becomes stressful.” This pattern was also visible during observation, where health workers moved between service tasks, paper notes, and digital input. The finding reveals that digital transformation did not fully remove administrative burden. In some cases, it transferred the burden into new forms of digital work.

The third theme concerns trust in digital recommendations and professional judgment. Participants did not fully reject digital decision support, but they did not rely on it mechanically. Doctors and nurses used digital information as a supporting reference while still prioritizing clinical assessment, patient complaints, physical examination, and local service context. One doctor stated, “The system can help, but the final decision still comes from clinical judgment. Sometimes the patient’s condition is more complex than what appears in the system.” This finding shows that digital tools were interpreted as aids rather than replacements for professional reasoning. Trust increased when digital information was accurate, updated, and relevant to the patient’s condition. Trust decreased when data were incomplete, delayed, or inconsistent with clinical observation.

The fourth theme highlights the role of organizational readiness. Facilities with stronger leadership support, clearer service flow, internal training, and responsive technical assistance showed smoother digital use. Participants noted that digital transformation worked better when staff received practical guidance and when managers allowed time for adaptation. A medical record officer explained, “The problem is not only the application. We need training, stable internet, and clear division of tasks. If one part is weak, the service becomes slow.” Documentation review also showed that some facilities had standard operating procedures for digital reporting and referral systems, while others relied more on informal practices. This finding indicates that digital health transformation requires organizational coordination, not only individual competence.

The fifth theme relates to patient interaction. Some participants felt that digital systems improved service because data became more organized and follow-up was easier. However, others worried that screen-based work reduced eye contact and made patients feel ignored during consultation. A midwife stated, “Sometimes patients think we are not listening because we are typing. So, I try to explain that I am entering their data for the service record.” This finding shows that digital clinical decision-making also affects the social atmosphere of care. Health workers must balance data entry with communication, empathy, and patient trust. In primary care, this balance is important because patients often expect personal attention, clear explanation, and reassurance from health workers.

Overall, the results suggest that digital health transformation supported clinical decision-making when digital systems improved information access, strengthened care continuity, and helped structure documentation. However, the same systems could also create workload, reduce consultation flow, and raise trust issues when infrastructure, usability, and staff readiness were limited. The findings confirm that digital transformation in primary health care is not a single technical process. It is a sociotechnical process shaped by interaction among health workers, patients, digital platforms, organizational routines, and local service conditions.

Discussion

The findings support the sociotechnical view that digital health transformation depends on the relationship between technology, users, tasks, organizations, and clinical context. Digital systems

improved access to patient information and supported more consistent clinical decision-making, but their value depended on how well they fit daily work. This result aligns with Sutton et al. (2020), who argue that clinical decision support systems can improve care processes when they are integrated into workflow and supported by appropriate implementation strategies. It also supports Kwan et al. (2020), who found that computerized clinical decision support can improve care, although the level of improvement varies based on system design and use. In this study, digital tools did not automatically produce better decisions. They became useful when health workers could connect digital data with clinical reasoning and patient context.

The finding on digital documentation as both support and burden is consistent with studies that describe the complexity of digital health adoption in primary care. Frisinger and Papachristou (2023) emphasize that digital decision support systems must respond to the real needs and pressures of health workers. Meunier et al. (2023) also found that workflow disruption, limited usability, and lack of training can reduce the use of clinical decision support systems in primary care. The present study adds a local perspective by showing that workload does not disappear when services become digital. In facilities with fragmented platforms, health workers may experience double documentation and time pressure. This condition can affect the quality of clinical interaction because staff must divide attention between the patient and the system.

The study also shows that health workers maintained professional autonomy when using digital recommendations. They treated digital systems as decision aids, not as final decision-makers. This finding is important because clinical decision-making in primary care often involves uncertainty, incomplete information, and social complexity. Knop et al. (2022) explain that interaction between medical professionals and AI-enabled decision support systems depends on human factors, technological characteristics, and trust. Bayor et al. (2025) also highlight the need for user-centered design in clinical decision support systems. The current findings confirm that trust grows when digital tools are accurate, relevant, and compatible with clinical judgment. When data are incomplete or inconsistent, clinicians return to professional experience and direct patient assessment.

The patient interaction findings extend previous literature on digital health and the patient-physician relationship. Madanian et al. (2023) show that patients value digital health tools when they improve access, convenience, and involvement, but they remain concerned about privacy and human connection. Sze et al. (2024) also found that digital health can influence communication patterns in primary care. This study shows that these issues also appear in Indonesian primary care facilities. Health workers had to explain why they were typing during consultation and how digital records supported care. This indicates that digital transformation requires communication adaptation. Clinicians need digital communication skills so that technology does not weaken empathy, trust, or patient participation.

The finding on organizational readiness confirms that digital transformation is not only a matter of individual digital literacy. Facilities need leadership, training, technical support, stable infrastructure, and clear task distribution. This result is consistent with Aisyah et al. (2024), who found that ICT maturity in Indonesian health services remains uneven across infrastructure, software, hardware, and human resources. Jarva et al. (2022) also show that digital health competence includes not only technical ability, but also attitudes, ethical awareness, and the capacity to use digital tools in professional practice. In this study, staff competence improved when facilities provided practical assistance and peer learning. Without organizational support, digital systems risk becoming administrative obligations rather than tools for clinical improvement.

Theoretically, this study contributes to digital health literature by showing that clinical decision-making in primary care is a contextual and interpretive process. Digital systems provide data, but health workers give meaning to that data through clinical knowledge, experience, patient

communication, and awareness of local constraints. This finding strengthens the sociotechnical perspective because it shows that technology and human judgment cannot be separated in digital primary care. The study also contributes to qualitative health research by showing how frontline workers negotiate between system requirements and patient-centered care. This perspective is less visible in studies that focus mainly on readiness scores, technology acceptance, or clinical outcomes.

Practically, the findings suggest that primary health care facilities should strengthen digital transformation through workflow-sensitive system design, continuous training, integrated platforms, and responsive technical support. Digital systems should reduce repetitive documentation and provide information that is directly useful for clinical decisions. Facility managers also need to create internal routines for mentoring, feedback, and problem-solving. For policymakers, the findings indicate that digital health policy should not only focus on platform expansion. It should also address infrastructure gaps, human resource readiness, data quality, interoperability, and patient communication. For system developers, the findings show the need to involve frontline health workers in design, testing, and evaluation.

Further research should examine digital clinical decision-making in different types of primary care facilities, including rural Puskesmas, private clinics, and facilities with different levels of digital maturity. Comparative studies can help explain how infrastructure, organizational culture, and patient characteristics influence digital adoption. Future research may also explore patient perspectives to understand how digital systems affect trust, privacy, satisfaction, and participation in care. In addition, mixed-method studies can combine qualitative insights with service indicators, such as referral accuracy, documentation completeness, consultation time, and follow-up adherence. Such research would deepen understanding of how digital health transformation can support safe, efficient, and patient-centered clinical decision-making in primary care.

4. Conclusions

This study concludes that digital health transformation supports clinical decision-making in primary health care facilities by improving access to patient information, strengthening continuity of care, and making clinical documentation more structured. Digital systems helped health workers review patient history, monitor treatment, support referral decisions, and organize service data more efficiently. However, the findings also show that digital transformation did not automatically improve clinical practice. Health workers still faced challenges related to double documentation, unstable infrastructure, limited system integration, workload pressure, and the need to balance screen-based work with patient communication. These findings confirm that digital clinical decision-making is a sociotechnical process shaped by the interaction between technology, professional judgment, organizational readiness, and patient context.

The study contributes theoretically by extending the sociotechnical understanding of digital health in primary care, especially by showing how health workers interpret, trust, and adapt digital systems in daily clinical routines. Practically, the findings suggest that primary health care facilities need workflow-sensitive digital platforms, continuous staff training, stronger technical support, and better data integration to ensure that digital tools truly support clinical decisions. From a policy perspective, digital health development should not focus only on platform expansion, but also on human resource readiness, infrastructure equity, interoperability, and patient-centered communication. Further research should compare digital clinical decision-making across urban and rural primary care facilities and include patient perspectives to deepen understanding of trust, privacy, access, and service experience in digital health transformation.

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