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Factors influencing the implementation of electronic medical records at a pioneering primary-level facility in Vietnam: a qualitative study using the Consolidated Framework for Implementation Research

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Research Article

Keywords: Electronic medical records, Implementation science, Consolidated Framework for Implementation Research, Qualitative research, Primary care, Vietnam

Posted Date: November 13th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10953000/v1

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Additional Declarations: No competing interests reported.

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Abstract

Electronic medical records (EMRs) are central to health-system digital transformation, yet in Vietnam their adoption at the primary and district level has been the slowest across the hospital system, and context-specific facilitators and barriers remain poorly understood. This study examined the factors influencing EMR implementation at one of the first primary-level facilities in Vietnam to adopt an EMR. We conducted a descriptive qualitative study at Duyen Hai Regional Medical Center in 2023, guided by the Consolidated Framework for Implementation Research (CFIR). Thirteen in-depth interviews and five focus group discussions with leaders, information-technology staff, physicians and nurses were analyzed thematically and mapped onto the five CFIR domains; reporting followed the Consolidated Criteria for Reporting Qualitative Research (COREQ). Facilitators and barriers spanned all five domains. The software enabled faster record creation through a unique patient identifier but lacked features and a picture archiving and communication system. National policy drove adoption but was not harmonized with health-insurance reimbursement. Limited infrastructure, funding and internal regulations constrained implementation, and dedicated information-technology staff were scarce, although a young workforce eased uptake. Planning and training occurred, but engagement was incomplete. Implementation was shaped by interacting policy, organizational, individual and process factors, and the constraints binding implementation at this level were institutional and financial rather than technological. Harmonizing insurance processes, investing in infrastructure and information-technology staffing, issuing internal regulations, and strengthening training are needed for sustainable implementation.

Keywords Electronic medical records · Implementation science · CFIR · Qualitative research · Primary care · Vietnam

Background

The digitalization of health care through electronic medical records (EMRs) is widely expected to reduce medical errors, improve data sharing and enhance the quality and continuity of care (Honavar, 2020). Yet evidence from low- and middle-income countries (LMICs) shows that EMR adoption is frequently constrained by limited infrastructure, equipment, financing and workforce digital skills, and that success depends on organizational and human factors as much

as on technology itself (Akwaowo et al., 2022; Robinson & Nivya, 2024). Qualitative studies across LMICs converge on a recurring set of determinants — leadership and governance, the availability of skilled information-technology (IT) staff, infrastructure and financing, and system interoperability — rather than the technology alone, and repeatedly show that progress can stall even where enabling policies are already in place (Zharima et al., 2023; World Health Organization, 2006). Vietnam, a lower-middle-income country undergoing rapid health-system digital transformation, illustrates these tensions (Tran et al., 2022).

EMR policy framework in Vietnam

The country has progressively built a mandatory legal framework for EMR. The 2023 Law on Medical Examination and Treatment recognizes the EMR as legally equivalent to the paper record. Circular 46/2018/TT-BYT established the first mandatory framework and evaluation criteria — spanning form digitization, storage, software requirements, patient identification, security and privacy, the picture archiving and communication system (PACS), the laboratory information system, and digital signatures — and required class-I and higher hospitals to implement EMR by the end of 2023 (Ministry of Health of Vietnam, 2018); complementary information-technology (IT) maturity criteria were set out in Circular 54/2017/TT-BYT (Ministry of Health of Vietnam, 2017). In June 2025, Circular 13/2025/TT-BYT replaced Circular 46/2018 and the EMR-related provisions of Circular 54/2017, specified minimum IT-infrastructure requirements (servers, storage with backup, networking, and security and digital-signature solutions), and revised the roadmap: all hospitals were to complete EMR implementation by 30 September 2025 and other treatment facilities by 31 December 2026 (Ministry of Health of Vietnam, 2025). These mandates were reinforced by a 2025 Prime Ministerial directive requiring 100% of hospitals to implement EMR with data interoperability across district, provincial and central levels, and by a national EMR implementation plan for 2026–2030 (Government News Portal, 2025).

Implementation progress and the district-level gap

Despite this policy momentum, implementation has been slow and markedly uneven. At the time of this study, only about 37 of 135 class-I-and-above hospitals (~20%) had implemented EMR under Circular 46, and by mid-2025 only around 50 facilities had formally converted from paper to electronic records. A rapid acceleration followed the 2025 directive and Circular 13: approximately 881 hospitals had met the roadmap by late 2025, rising to more than 1,200 facilities by mid-2026. However, coverage remained tiered. Among hospitals meeting the roadmap in late 2025, district-level facilities showed the lowest coverage — 339 of 684

(49.6%) — compared with 66.9% at the provincial level and 60.0% among central hospitals, while private facilities lagged at 38.2%; a substantial number of hospitals completed only in early-to-mid 2026 (Vietnam Medical Informatics Association, 2025). Progress was also geographically uneven, with some provinces reaching full coverage while others lagged well behind.

Infrastructure, financing and workforce context

Several systemic factors underlie the district-level gap. National assessments have identified three principal bottlenecks: hospital leaders being insufficiently proactive and awaiting direction from higher authorities; the absence of specific, sufficiently strong sanctions for delayed implementation; and the lack of a clear financing mechanism for health IT — service prices contain no IT-cost component, so facilities largely rely on their own development funds (Government News Portal, 2025). These constraints fall hardest on financially autonomous lower-tier units operating on thin margins. In addition, many facilities lack dedicated, well-retained IT staff; depend on vendor cloud platforms rather than in-house servers, raising reliability and data-security concerns (Bani Issa et al., 2020); operate ageing equipment; and face interoperability challenges, since digitization alone does not guarantee a successful, connected digital transformation (Tran et al., 2022). A recent assessment of five top-tier Vietnamese hospitals found that even well-resourced facilities still faced gaps in digital infrastructure and interoperability (Tran et al., 2025); such gaps are likely to be wider at lower-tier facilities. Such infrastructure, financing and workforce constraints are typically most acute at resource-limited primary/district-level facilities.

The present study

Most available reporting on Vietnam's EMR rollout is administrative and aggregate; facility-level analyses that apply an implementation-science lens — particularly at the pioneering primary level — remain scarce. The Consolidated Framework for Implementation Research (CFIR), proposed by Damschroder and colleagues, is a widely used determinant framework for identifying and explaining facilitators and barriers to implementation across five domains: intervention characteristics, outer setting, inner setting, characteristics of individuals, and process (Damschroder et al., 2009). It enables a systematic, comparable analysis that moves beyond isolated lists of advantages and difficulties.

Duyen Hai Regional Medical Center is a class-III general hospital and one of the first primary-level facilities in Vietnam to implement EMR, becoming operational in 2023. As an early

adopter at the level where national progress has been slowest, it offers an informative illustrative case with lessons for implementation practice. This study used the CFIR to analyze the facilitators and barriers to EMR implementation at this facility in 2023, illustrating the factors that shape implementation at the primary/district level. To our knowledge, this is among the first qualitative studies to apply the CFIR to EMR implementation at Vietnam's primary care level.

Methods

Study design and framework

We conducted a descriptive qualitative study to explore the factors influencing EMR implementation from the perspectives of staff involved in its adoption and daily use. This qualitative study constitutes the qualitative component of a broader evaluation of EMR implementation at the facility; its quantitative component — describing implementation status and staff satisfaction — is reported separately in a companion quantitative study (reference withheld to preserve author anonymity for double-anonymous review). The CFIR was used as an overarching determinant framework to guide the interview topics, coding and interpretation, allowing facilitators and barriers to be organized within its five domains (Damschroder et al., 2009); construct labels were interpreted consistently with the framework and its 2022 update (Damschroder et al., 2022). The study is reported in accordance with the COREQ guidelines (Tong et al., 2007; see Online Resource 1).

Setting

The study was conducted at Duyen Hai Regional Medical Center, a class-III general hospital in Vinh Long province in the Mekong Delta region of Vietnam (the facility was located in Tra Vinh province at the time of the study; Tra Vinh was merged into Vinh Long in July 2025). The center is one of the first primary-level facilities in the country to implement EMR, which became operational in 2023 using a commercial, cloud-based hospital information system. As a district/regional-level facility with a young workforce and limited resources, it shares key features of the primary level, where national EMR progress has been slowest; its early adoption makes it a useful case for studying implementation.

Participants and sampling

We used purposive sampling to recruit participants with direct, varied experience of EMR implementation and use, seeking maximum variation across professional roles and departments. Thirteen in-depth interviews were conducted with the center's leadership, the

head of the general planning department, IT staff, five department heads and five treating physicians (from the Emergency, Internal Medicine, Surgery, Obstetrics and Pediatrics departments), complemented by five focus group discussions with nurses, who represent the largest group of front-line EMR users. This combination was intended to capture both strategic/managerial and front-line perspectives. Staff who declined to participate or who had worked at the facility for fewer than six months were excluded.

Data collection

Data were collected between February and October 2024. Interviews and focus group discussions were conducted by two members of the research team — a physician based at the facility (the second author) and an academic public-health researcher holding a doctorate and experienced in qualitative methods (the first author) — who together comprised both female and male interviewers and had no prior research relationship with the participants. Semi-structured interview and focus-group guides were developed around the five CFIR domains (Online Resource 2), covering perceptions of the EMR software, the external policy and financing environment, organizational resources and readiness, individual skills and attitudes, and the implementation process. Sessions were held in a private room at the facility, lasted 20–30 minutes each, and were audio-recorded with participant consent and transcribed verbatim in Vietnamese. Only the interviewer and the participant(s) were present during each session, and the interviewer took field notes during and after the sessions. Interviews were not repeated; at the end of each session the interviewer summarized the key points and invited participants to confirm or clarify them. Data collection continued until the team judged that no substantially new themes were emerging across the participant groups. Quotations presented in this article were translated into English, with attention to preserving the original meaning.

Data analysis

Transcripts were analyzed using thematic analysis following the six phases described by Braun and Clarke — familiarization, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report (Braun & Clarke, 2006). A hybrid inductive–deductive approach was applied: codes were generated inductively from the data and then organized deductively within the five CFIR domains using a framework matrix, allowing facilitators and barriers to be identified for each domain. Transcripts were coded independently by two researchers; coding was managed manually using Microsoft Excel, without a dedicated qualitative-analysis software package, and discrepancies were resolved through discussion to enhance consistency. Representative quotations were selected to illustrate each domain.

Trustworthiness

Several strategies were used to enhance rigor. Credibility was supported by including participants from diverse roles and departments and by grounding each finding in participants' own words. Reflexivity was considered: the interviewing team combined an insider (a physician working at the facility) and an outsider (an external academic researcher), and this dual perspective was taken into account during data collection and interpretation. Dependability and confirmability were promoted by using a structured CFIR-based framework, independent double-coding, and an audit trail of codes and analytic decisions. Transferability was supported by a detailed description of the setting and policy context, enabling readers to assess the applicability of the findings to comparable primary-level facilities.

Ethical considerations

The study was approved by the Institutional Review Board of Hanoi University of Public Health (Decision No. 155/2024/YTCC-HD3, dated 8 May 2024). All participants were informed of the study purpose and participated voluntarily after providing informed consent; data were kept confidential, de-identified, and used solely for research purposes.

Results

A total of 13 in-depth interviews and five focus group discussions were conducted with participants spanning managerial and front-line roles (Table 1).

Table 1 Characteristics of study participants

Participant group	Data collection method	Number
Center leadership	In-depth interview	1
Head of general planning department	In-depth interview	1
Information technology staff	In-depth interview	1
Department heads (Emergency, Internal Medicine, Surgery, Obstetrics, Pediatrics)	In-depth interviews	5
Treating physicians	In-depth interviews	5
Nurses	Focus group discussions	5 groups
Total	**13 interviews; 5 focus groups**	**—**

Facilitators and barriers were identified across all five CFIR domains, summarized in Table 2 and detailed below.

Table 2 Facilitators and barriers to EMR implementation across the five CFIR domains

CFIR domain	Key construct(s)	Facilitators	Barriers
Intervention characteristics	Relative advantage; design quality & complexity	Faster record creation via a unique patient identifier; pre-stored data reused	Incomplete software features; no PACS; dependence on internet connectivity
Outer setting	External policy & incentives; cosmopolitanism	National policy and roadmap as drivers; provincial and Department of Health investment	Some provisions ill-suited to primary care; not harmonized with health-insurance reimbursement
Inner setting	Available resources; leadership engagement; readiness	Committed, supportive leadership	No physical server; ageing/insufficient equipment; limited funding; no internal regulations
Characteristics of individuals	Knowledge & beliefs; self-efficacy	Young workforce (~80%) with quick technology uptake	~19% older staff with limited digital skills; scarce and poorly retained IT staff
Process	Planning; engaging; executing; reflecting	Planning, preparation and pre-implementation training	Incomplete, perfunctory training participation; parallel paper records retained

Intervention characteristics

Participants consistently described a clear relative advantage of the EMR over paper records: because each patient was managed through a single unique identifier, previously stored information could be reused, making record creation faster and reducing duplicate data entry. At the same time, aspects of the software's design quality and complexity were experienced as

barriers. The system did not yet include all required functionalities, the PACS had not been implemented, and, as the software was cloud-based, its usability depended on stable internet connectivity, so that any network disruption could halt record-keeping. Physicians also highlighted a workflow mismatch: without mobile devices, they still relied on paper during ward rounds and re-entered data afterwards, which diminished the intervention's practical advantage.

> *"...with the EMR, creating a record is very convenient — we just use the patient's unique identifier and the information is already stored, so we do not have to re-enter it…" (FGD, nurses).*

> *"...the EMR has all the required sections… but when a physician goes on rounds, they still have to carry the paper record, write by hand and then enter the data; a tablet would be very convenient…" (IDI, physician).*

Outer setting

In the outer setting, external policy and incentives were a strong influence. National regulations (notably Circular 46) and the Ministry of Health's roadmap created a clear mandate, while investment from the provincial People's Committee and the Department of Health provided important external resources. However, the outer setting also generated a key barrier linked to the facility's dependence on coordination with external organizations. Some regulatory provisions were perceived as ill-suited to the realities of a primary-level facility, and — most consequentially — the lack of harmonization between the health authorities and the social health-insurance agency over claims settlement made it difficult to move away from paper records, because reimbursement processes were not fully aligned with the electronic system.

> *"...there is no agreement between the Department of Health and the provincial social insurance agency, so facilities face difficulties in claims settlement…" (IDI, planning department).*

Inner setting

Within the inner setting, engaged leadership was a key facilitator, with managers actively directing and championing the rollout. Nonetheless, several structural characteristics and resource constraints acted as barriers. Available resources were limited: the facility had no physical server and relied on a vendor cloud platform, equipment was ageing and insufficient (notably a shortage of mobile devices), and funding was tight because the center is a group-III financially autonomous unit whose revenue largely covers only salaries and recurrent costs.

Implementation readiness was further limited by the absence of an internal regulation governing EMR management, which left procedures and responsibilities incompletely formalized.

> *"…when the network fails, record-keeping is interrupted…" (FGD, nurses).*

> *"…our revenue is only enough to cover salaries and recurrent expenditure… not enough to upgrade infrastructure or equip all departments with tablets…" (IDI, leadership).*

Characteristics of individuals

At the individual level, staff knowledge, skills and self-efficacy shaped uptake. A predominantly young workforce (about 80%) with basic computer literacy adapted quickly and was comfortable with the new system. Conversely, a substantial minority of older staff (around 19%) had limited digital skills and a persisting attachment to paper-based practice, which slowed their transition. Human-resource constraints compounded these individual factors: the facility lacked dedicated IT personnel, and the absence of competitive remuneration and retention incentives meant that IT staff were difficult to recruit and retain, as public-sector salaries lagged behind those offered outside.

> *"…nearly 20% of the staff are not proficient with computers and did not perform well when switching to the EMR…" (FGD, nurses).*

> *"…salaries are relatively low compared with IT engineers outside, so the hospital frequently loses staff and has to recruit replacements…" (IDI, planning department).*

Process

The implementation process showed clear planning and execution but weaker engaging and reflecting. The facility planned the rollout, prepared the software and equipment, and delivered training before go-live. However, engagement was uneven: participation in training was incomplete and, at times, perfunctory, leaving some staff without a firm grasp of the new workflow. During the early phase, paper records were maintained in parallel with the electronic system, reflecting a cautious, transitional execution rather than a full switch, and there was no structured mechanism for reflecting on and evaluating progress.

> *"…we organized training… however, participation was incomplete and perfunctory, so many staff did not fully master how to do it correctly…" (IDI, planning department).*

Cross-domain synthesis: the key determinants

Across the five domains, three determinants were most consequential, and they were linked. First, in the outer setting, the misalignment between EMR requirements and health-insurance reimbursement gave the facility a reason to keep paper records. Second, in the inner setting, limited financing and the absence of a physical server and internal regulations restricted what the facility could build and maintain. Third, among individuals, the shortage and turnover of IT staff weakened its capacity to run and troubleshoot the system. These barriers were connected. Limited financing reflected the lack of an IT cost component in national pricing, and it also made IT staff harder to recruit and retain, which in turn slowed responses to software and infrastructure gaps. The facilitators — the policy mandate, leadership support and a young workforce — helped, but did not offset these barriers.

Discussion

Principal findings

Using the CFIR to analyze a pioneering primary-level facility, we found that EMR implementation was shaped by interacting factors across all five domains. Facilitators clustered around a supportive external mandate, engaged leadership and a young, adaptable workforce, whereas the most prominent barriers lay in the inner setting (limited infrastructure, equipment and funding, and the absence of internal regulations) and among individuals (limited digital skills of older staff and a shortage of dedicated, well-retained IT personnel). A distinctive, cross-cutting barrier emerged in the outer setting: the misalignment between EMR requirements and health-insurance reimbursement processes.

Comparison with other studies

These findings are consistent with evidence from other LMICs, where limited infrastructure, equipment and staff digital skills are recurrent obstacles to EMR adoption (Akwaowo et al., 2022), and where the transition from paper to electronic records is rarely a clean switch (Hutten-Czapski, 2024). The reliance on a vendor cloud platform without an in-house server also echoes documented concerns about the privacy and security of electronically stored health data (Bani Issa et al., 2020). Our results add nuance by showing how these constraints concentrate at the primary/district level — the tier where Vietnam's national rollout has lagged furthest behind.

Our findings also closely mirror a qualitative study of EHR implementation in South Africa, another middle-income country, in which progress remained slow despite adequate national policies and the principal barriers were leadership and governance, a shortage of technically

skilled staff, and insufficient infrastructure and financing rather than the technology itself (Zharima et al., 2023). That study likewise reported reliance on rented cloud storage in the absence of dedicated data centres, and identified engagement of front-line clinicians and substantive training as decisive for uptake. That the same determinants appear in a different health system suggests this challenge is not unique to Vietnam. A qualitative study of hospitals in Indonesia, where EMR adoption was similarly mandated, reported the same pattern: inconsistent internet connectivity, low digital literacy among staff, and continued reliance on paper records during the transition (Hossain et al., 2025). The recurrence of these determinants across mandate-driven LMIC settings supports the transferability of our findings to other primary-level facilities.

One notable point is the two-sided role of the outer setting. National policy simultaneously drove adoption (through mandate and investment) and impeded it (through misalignment with insurance reimbursement). This suggests that, at the primary level, the main barriers are often not technological but institutional and financial, requiring cross-sectoral coordination rather than software fixes alone.

Linking determinants to implementation outcomes

Although this study focused on determinants, the findings can be read alongside implementation outcomes (Proctor et al., 2011). In a companion quantitative study at the same facility (reference withheld for double-anonymous review), 65.9% of record forms had been digitized and staff satisfaction with the software averaged 3.87 ± 0.72 out of 5, while paper records continued to be kept in parallel. Interpreted through Proctor's taxonomy, these signals suggest moderate adoption and penetration and reasonable acceptability among staff, but incomplete fidelity and as-yet-unproven sustainability. The insurance misalignment and the resource constraints identified here help explain why fidelity and sustainability lagged even though staff attitudes were positive.

Implications for policy and practice

The domain-specific pattern points to concrete actions. Harmonizing EMR requirements with health-insurance claims processes would remove a key barrier to abandoning paper records. At the facility level, completing core software functionality and the PACS, investing in reliable infrastructure and mobile devices, establishing a sustainable financing mechanism for health IT, and issuing internal EMR management regulations would strengthen the inner setting. Recruiting and retaining dedicated IT staff and delivering substantive, department-tailored

training — rather than one-off, perfunctory sessions — would address the individual and process barriers. Because these determinants are common to many primary-level facilities, the CFIR-structured lessons from this early adopter may inform others pursuing digital transformation.

To translate these into action, Table 3 maps the principal barriers to illustrative implementation strategies drawn from the Expert Recommendations for Implementing Change (ERIC) compilation (Powell et al., 2015).

Table 3 Principal barriers mapped to illustrative implementation strategies (ERIC)

Key barrier (CFIR domain)	Illustrative implementation strategy (ERIC)
EMR–insurance reimbursement misalignment (outer setting)	Change/influence policy; engage external stakeholders to align reimbursement with the EMR
No IT financing mechanism; limited funds (inner setting)	Access new funding; alter incentive/allowance structures; fund and contract for the innovation
No physical server; ageing equipment (inner setting)	Develop infrastructure; change physical structure and equipment
No internal EMR regulation (inner setting)	Develop a formal implementation blueprint; mandate change; develop and distribute organizational policies
Limited digital skills of older staff (individuals)	Conduct ongoing training; provide clinical supervision; create a learning collaborative
Scarce/poorly retained IT staff (individuals)	Alter incentive structures; identify and prepare champions; revise professional roles
Perfunctory training; weak engagement (process)	Conduct educational meetings; use train-the-trainer strategies; audit and provide feedback

Contribution and transferable lessons

The main message is practical. At the primary level, the key barriers were institutional and financial rather than technical, and they reinforced one another. Three transferable lessons follow. First, policy alignment is a precondition, not a detail: mandating EMR without harmonizing insurance reimbursement leaves facilities unable to abandon paper, so cross-sectoral alignment should accompany implementation deadlines. Second, sustainable financing

for health IT — including an explicit IT component in service pricing — is needed for financially autonomous lower-tier facilities to acquire servers, maintain equipment and retain IT staff. Third, engagement quality matters more than training coverage: substantive, department-tailored engagement is more effective than one-off sessions. These lessons can help other primary-level facilities anticipate where implementation may stall.

Strengths and limitations

A strength of this study is its use of an established implementation-science framework and reporting guideline, together with the inclusion of diverse professional roles, which allowed a systematic and transparent identification of determinants at an under-studied level of the health system. Several limitations should be noted. First, the study was conducted at a single facility, so findings should be transferred with attention to context. Second, one interviewer was a physician working at the facility; despite anonymization and independent analysis by an external researcher, staff may have under-reported sensitive concerns (social-desirability bias). Third, some key roles were represented by a single informant — notably information-technology and leadership staff — so findings on these areas rest on a narrow base. Fourth, interviews were relatively short (20–30 minutes), which may have limited depth on some topics. Fifth, quotations were translated from Vietnamese by the bilingual research team; formal back-translation was not performed, so some nuance may have been lost. Sixth, data collection continued until the team judged that no new themes were emerging, but saturation was not formally quantified. Data also rely on self-reports and were collected at a single point during an evolving rollout, so perspectives may change as implementation matures. The strategies in Table 3 are illustrative, derived from the identified determinants rather than tested here. Finally, the policy landscape has continued to change — including a revised national roadmap in 2025 — so the external context described here should be read as time-specific.

Conclusions

Analyzed through the CFIR, EMR implementation at Duyen Hai Regional Medical Center was driven by supportive policy, leadership investment and a young workforce, but constrained by limited infrastructure, equipment, funding and IT human resources, unresolved health-insurance issues, and ineffective training. Sustainable implementation will require completing the software and PACS, resolving insurance-related barriers, investing in infrastructure and IT staffing, issuing internal regulations, and strengthening substantive, department-level training. The CFIR provided a practical lens that can inform other primary-level facilities pursuing digital transformation.

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Online Resource 2 Interview and focus-group guide (topics mapped to the CFIR domains)

Intervention characteristics: Perceived advantages and disadvantages of the EMR software compared with paper records; ease of use, functionality, missing features (e.g., PACS); reliability and connectivity.

Outer setting: Influence of national policy and the implementation roadmap; external support and investment; coordination with the health-insurance agency and other external bodies; fit of regulations with a primary-level facility.

Inner setting: Availability of infrastructure, equipment and funding; leadership support; internal rules and procedures for EMR; organizational readiness and communication.

Characteristics of individuals: Staff knowledge, skills and confidence with the EMR; attitudes toward change; differences across age groups and roles; availability and retention of IT staff.

Process: Planning and preparation; training and staff engagement; how the rollout was executed (including parallel paper records); monitoring, feedback and lessons learned.