

## ORIGINAL ARTICLE- PUBLIC HEALTH

# STRATEGIC COMPETENCY FRAMEWORK FOR DIGITAL INDIA HEALTHCARE: QUALITATIVE RESEARCH ON STAKEHOLDERS' PERSPECTIVE OF THE POST-IMPLEMENTATION PHASE OF ADMINISTRATIVE APPLICATIONS IN A STRUCTURED PUBLIC HEALTH SETTING, TAMIL NADU

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## ABSTRACT

**INTRODUCTION :** Healthcare personnel can monitor and record patient health data in different ways through technological efforts such as hospital information systems. The Central and state governments have released several applications to help patients and users. The primary aim of the study is to investigate how programmatic software, including HMIS and PICME, can be successfully integrated into everyday activities to enhance the quality of healthcare provided by the public health system.

**METHODS :** A qualitative study using constructivist grounded theory methodology was carried out per the Standards for Reporting Qualitative Research (SRQR) Guidelines. The samples were selected using the purposive sampling technique. A sample of urban and rural Primary Health Centers from the selected districts of Tamil Nadu comprised 53 Healthcare professionals and staff who use healthcare applications as respondents for the study.

**RESULTS :** The study's findings are categorized into three main sections: advantages, difficulties encountered when utilizing healthcare applications, and suggestions for improving their effectiveness.

**CONCLUSION :** The synthesis of study outcomes provides a comprehensive strategic framework for using healthcare applications. This research highlights the importance of healthcare applications and the necessity for stakeholders to focus on four main areas: User acceptability, operational effectiveness, human resource development, and healthcare technology infrastructure to enhance healthcare delivery.

**KEYWORDS :** Qualitative Research, Grounded theory, Healthcare Technology

## INTRODUCTION

Today, every industry including healthcare must undergo digital transformation. Doctors and other healthcare workers are shouldering a reasonable amount of responsibility as the workload at hospitals grows. This includes managing medical facilities and all associated tasks and activities. Patients and physicians no longer have to endure laborious, time-consuming consultation procedures and everyday treatments. This is a result of the increased effectiveness and delivery of healthcare brought about by new digital initiatives. The COVID-19 pandemic has also shown the value of innovative technology initiatives in the fight against health issues. Technology has been paving the way in the healthcare field by monitoring the work of healthcare professionals and patients. With the advancement of technology, patient records can now be accessed from anywhere. The Government has implemented various digital tools such as Pregnancy and Infant Cohort Monitoring and Evaluation (PICME), Health Management Information System (HMIS), Ayushman Bharat (AB) Portal, and eSanjeevani to improve data entry and

patient care. A hospital information system is a computerized or manual system (on paper) intended to fulfill all hospital information requirements. This covers a variety of data sets (heterogeneous information), including patient data, billing, finance and accounting, staffing, scheduling, ordering from pharmacies, managing prescriptions, supplies, inventory, maintenance, order management, laboratory diagnostic reports, patient monitoring, and decision support (Sanjuluca et al., 2022). The ultimate purpose of health information systems is to increase data quality to facilitate effective and efficient decision-making, which will subsequently improve the standard of healthcare services (Alipour et al., 2019).

Research in areas such as health, education, and



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justice can benefit greatly from the use of administrative data, which is information that is regularly gathered by organizations for operational purposes (Mc Grath-Lone et al., 2022). The patient data created by medical encounters is stored in administrative healthcare databases (Ulrich et al., 2021). The healthcare personnel and experts who create patient data are now storing patient data digitally. To improve the delivery of healthcare, it is necessary to take into account their perspective and experience.

Many healthcare applications have been in practice to monitor and document healthcare data. This study focused on two major healthcare applications: PICME, a milestone activity developed by the Tamil Nadu Government and HMIS a web-based monitoring information system established by the Ministry of Health & Family Welfare (MoHFW), Government of India. Healthcare workers devote a significant amount of time to uploading data that their supervisors review, leading to discussions on possible enhancements in healthcare services. However, literature on public health research studies involving user perspectives on the implementation of health administrative software is scarce. This study identifies the research gap and emphasizes the need to evaluate users' viewpoints.

The primary focus of this study is to explore how administrative applications like PICME and HMIS can be effectively integrated into daily operations to improve healthcare services. The study seeks to answer two research questions: What operating difficulties do District Health Officers (DHO), Block Medical Officers (BMO), Medical Officers (MO), Community Health Nurses (CHN), Sector Health Nurses (SHN), Village Health Nurses (VHN), Staff Nurses (SN), Mid-Level Health Providers (MLHP), Women Health Volunteers (WHV), and Data Entry Operators (DEO) face while using these applications? What is needed to increase the effectiveness of healthcare delivery?

**Pregnancy and Infant Cohort Monitoring and Evaluation (PICME):** One of the most important aspects of women's reproductive health is pregnancy registration, as it serves as a gateway to various care services, including institutional delivery, postnatal care, and prenatal care. Pregnancy registration enhances maternal healthcare usage, reducing adverse health impacts on mothers and infants (Mondal et al., 2023). PICME, deployed by the Tamil Nadu government, tracks all pregnant women and ensures continuous delivery care services for pregnant or lactating mothers and children. Each expectant mother must register with PICME to receive a unique PICME number, enabling tracking by the Public Health Department. Those enrolled

can benefit from the Dr. Muthulakshmi Reddy Maternity Benefit Scheme (MRMBS) if they meet financial criteria. PICME 3.0 registration aims to lower maternal and infant mortality rates and identify high-risk mothers for immediate assistance.

#### **Weekly Work Schedule and Usage of the PICME**

**Application:** The Village Health Nurse (VHN) will enter all data for pregnant women from a specific village. Each day of the week is dedicated to specific tasks: meeting expectant mothers on Monday, examining them on Tuesday, immunization visits on Wednesday, school visits on Thursday, Anganwadi visits on Friday, and uploading patient details on Saturday. Sundays are reserved for housekeeping at the headquarters. The Sector Health Nurse (SHN) at the PHC will verify and supervise the data, which will then be reviewed by the Community Health Nurse (CHN) before being sent to the Deputy Director's office.

#### **National Health Mission – Health Management**

**Information System (NHM-HMIS):** A Health Management Information System (HMIS) is a web-based monitoring system facilitating Government-to-Government (G2G) communication, introduced in 2008. Its primary purpose is to track the National Health Mission and other health programs, providing valuable insights for policy development and targeted interventions. HMIS data assists with planning, management, and decision-making based on numerous indicators at block, state, and federal levels. Currently, 2.25 lakh health institutions across all States and UTs upload data on infrastructure, training, and service delivery to the HMIS web platform annually (Ministry of Health and Family Welfare, 2024).

#### **Work Schedule and Usage of the HMIS**

**Application:** In the first week of each month, staff nurses will enter all PHC patient data from the previous month into HMIS. Healthcare workers record information in various registers to prepare consolidated reports. VHN will supply HSC data to the SHN, who will verify it with PICME entries. The data entry operator will combine and cross-check PHC and HSC data. The CHN is responsible for compiling all SHN reports and completing the HMIS report, which will be used in review sessions and decision-making. HMIS 2.0 requires full OP patient details daily. HMIS and HMIS 2.0 operate through separate online links, with plans to link Taluk GH hospitals for streamlined patient identification and reduced paperwork.

#### **Administrative setup of Primary Healthcare**

**Centers:** The hierarchical structure given in Figure 1 shows the well-organized setup of PHC. Each Health Unit District

(HUD) has one Deputy Director (DD) and the designation is now revised as District Health Officer (DHO). Each HUD is further administratively divided into Blocks and Blocks further as Additional PHCs for administrative and service delivery convenience. The block PHC will be called the upgraded PHC also called Community Health Centre. The rationale behind CHC is its integration of numerous Central Government initiatives and its acquisition of national quality assurance certifications. Each block has one medical doctor who is called Block Medical Officer (BMO). BMO is responsible for Primary Healthcare Center and Urban Health Care and Health Sub centers. Medical officers will be the charge of PHC/UPHC and they will report to BMO. SHN and staff nurse will report to MO. Each HSC consists of VHN, MLHP, and WHV. The VHN will report to SHN and SHN will report to CHN

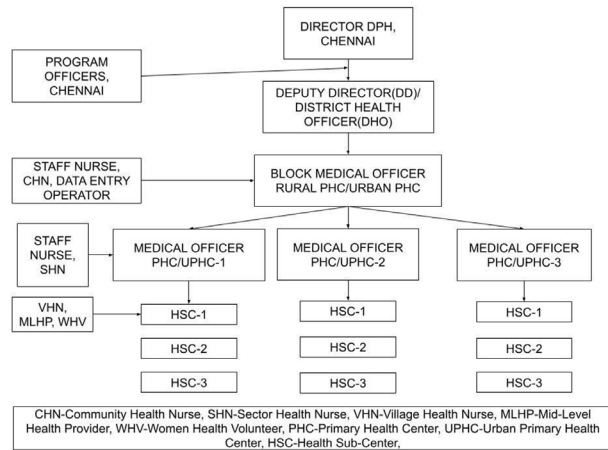


Figure 1 Primary Healthcare Hierarchical Infrastructure of one Block of Tamil Nadu

The description of each cadre who actively used the administrative software and reported to DHO, BMO, and MO are described below:

**Community Health Nurse (CHN):** Every block will have a community health nurse engaged to collect SHN reports from every PHC and UPHC. CHN will confirm the consolidated record, obtain authorization, and forward the necessary documents to the DD office.

**Sector Health Nurse (SHN):** The SHN will monitor the village health nurses' performance. She must deliver the report to the Block Medical Officer after verifying and confirming the correctness of the information and documents obtained from VHN.

**Village Health Nurse (VHN) and Urban Health Nurse (UHN):** Every VHN community has a fixed number of families. She knows every detail about every household's health. The village health nurse will be looking after the

immunization and the antenatal mother. The VHN conducts weekly home visits, monitors pregnant mothers, and records the information in the administrative database. VHN and the UHN utilize the Health sub-center and will take care of the OP at the PHC level. They will create the patient's record.

**Staff Nurse (SN):** Every SN will work in PHC or UPHC. She will enter the details of the patient and the information related to the disease in HMIS. She will make the call to the Medical Officer (MO) during the eSanjeevani process. In most cases, she will handle based on her experience by using the MO username and password.

**Mid-level Health Provider (MLHP) Worker:** Nursing and diploma holders need to finish the government-provided MLHP course to work in the community on a contract basis. MLHP employees will enter the OP case numbers in the Ayushman Bharat (AB) portal along with demographic information also in numbers and handle the eSanjeevani portal. She will meet the patient at their house and make the call between 9.00 am to 4.00 pm. She has a login ID enters the details and makes the call. Most of the time, she uses the direct contact number and tries to solve the issue, and for any query, the MLHP will visit the block.

**Woman Health Volunteers (WHV):** The WHV utilizes Makkalai Thedi Maruthuvam (MTM) to carry out its therapeutic procedures. WHV will concentrate on diagnosing and monitoring two important illnesses, such as diabetes and blood pressure. She visits and tests every member of the household determines their health status, and reports back to the medical officer of the specific supplementary PHC.

**Data Entry Operator (DEO):** The data entry operator will consolidate the PHC and HSC details. He or she will assist the staff nurse and SHN in generating reports and assist the field workers in entering data into the HMIS. They will assist the medical officer in submitting all Google forms and supply the information requested by the DD office. They will confirm the details with PICME, and HMIS software data, reporting any discrepancies to the staff nurse, MO, and SHN for correction.

## METHODS

The application of qualitative methodologies in health-related research has led to an increased understanding of the hurdles to changing healthcare practice and the views of health professionals toward lay participation in care. In the social sciences, the grounded theory approach is a popular qualitative technique for inductively developing or discovering a theory from the data (Al-Busaidi, 2008).

The real implementation of PICME and HMIS health care applications in Tamil Nadu in PHC's were examined through a qualitative study employing the Grounded Theory technique. Following Grounded Theory, a researcher will develop a theory based on information that was jointly developed with participants, usually through interviews (Metelski et al., 2021). The results were reported per the Standards for Reporting Qualitative Research (SRQR) guidelines. Many stakeholders who use the healthcare administrative software participated in this study. Data was gathered and examined concurrently after a semi-structured interview guide was created. Interviews and observation were used to verify the interconnectivity. Constant comparison analysis compares data with data, codes with codes, and occurrences with incidents to establish categories and characterize them. The use of theoretical sampling to gather additional data needed to accurately establish the properties of a particular category.

We employed triangulation, which offers multiple perspectives on the same phenomenon and strengthens the validity and confidence of the study's conclusions. We contrast various viewpoints held by different individuals. The perspectives of DHOs, BMOs, MOs, CHNs, SHNs, VHN staff nurses, MLHPs, WHV, and data entry operators are compared to identify commonalities and differences which supported by reasonable explanations, could greatly enhance the reliability and validity of the results.

The study's focus was PHC/UPHC in each district of Tamil Nadu. The sample was selected using the purposive sampling approach. The rationale behind purposive sampling is to enhance the study's rigor and reliability of the data and findings by more closely aligning the sample with the research's goals and objectives (Campbell et al., 2020). Participants who have worked on documentation, verification, data uploading, data downloading, consolidated report downloads, and data reviews in PHC and HSC have been contacted.

Due to scheduling restrictions and the recommendation of the Institutional Ethics Committee (IEC), the researchers focused on four districts in the northern and southern areas of Tamil Nadu. The respondents' identities were kept confidential per informed consent requirements and the norms of the IEC. This investigation involved 53 health professionals in total: DHO(4), BMO (5), MO (8), CHN (3), SHN (6), VHN (10), SN (9), MLHP (4), WHV (2) and DEP (2). A thorough description of every participant is given in Table 1.

Table 1: Characteristics of Study Respondents

## APPENDIX

S.No.	Location of PHC	Code	Year of Experience
1	District -1	District Health Officer (DHO)-1	13
2	District-2	DHO-2	14
3	District -3	DHO-3	12
4	District-4	DHO-4	10
5	Rural-PHC	Block Medical Officer (BMO)-1	23
6	Rural-PHC	BMO-2	21
7	Urban-PHC	BMO-3	25
8	Rural-PHC	BMO-4	19
9	Urban-PHC	BMO-5	21
10	Rural-PHC	Medical Officer (MO)-1	12
11	Urban-PHC	MO-2	11
12	Rural-PHC	MO-3	17
13	Rural-PHC	MO-4	12
14	Rural-PHC	MO-5	7
15	Urban-PHC	MO-6	14
16	Urban-PHC	MO-7	6
17	Rural-PHC	MO-8	14
18	Urban PHC	Community Health Nurse (CHN)-	38
19	Rural PHC	CHN-2	36
20	Rural PHC	CHN-3	37
21	Rural PHC	Sector Health (SHN)-1	31
22	Rural PHC	SHN-2	30
23	Rural PHC	SHN-3	32
24	Rural PHC	SHN-4	34
25	Urban PHC	SHN-5	33
26	Urban PHC	SHN-6	29
27	Rural PHC	Village Health Nurse (VHN)-1	25
28	Rural PHC	VHN-2	26
29	Rural PHC	VHN-3	22
30	Urban PHC	VHN-4	21
31	Urban PHC	VHN-5	23
32	Rural PHC	VHN-6	25
33	Rural PHC	VHN-7	21
34	Rural PHC	VHN-8	19
35	Rural PHC	VHN-9	22
36	Rural PHC	VHN-10	24
37	Urban PHC	Staff Nurse (SN)-1	5
38	Urban PHC	SN-2	6
39	Urban PHC	SN-3	4
40	Rural PHC	SN-4	6
41	Urban PHC	SN-5	7
42	Rural PHC	SN-6	10
43	Urban PHC	SN-7	6
44	Rural PHC	SN-8	2
45	Rural PHC	SN-9	8
46	Rural PHC	Mid-Level Health Provider	2
47	Rural PHC	MLHP-2	2
48	Rural PHC	MLHP-3	1
49	Urban PHC	MLHP-4	3
50	Rural PHC	Women Health Volunteer (WHV)-	2
51	Rural PHC	WHV -2	1
52	Urban PHC	Data Entry Operator (DEO)-1	16
53	Rural PHC	DEO-2	14

We contacted each district's DHO for their input on digital health services. Based on their guidance we approached the BMO of each block after obtaining approval from the DHO of each district and informed them of the purpose of data collection from May 2023 to January 2024.

Data were collected from DHOs in April-June 2024 to verify the operational state and acquire current information. After interacting with BMO, we interviewed CHN, SHN, VHN, staff nurses, MLHP, WHV, and data entry operators. Since everyone's jobs are interconnected, we can relate each person's workload and obligations to healthcare applications. We were granted permission to visit six districts in Tamil Nadu. We went to both urban and rural PHCs in

each district. We regularly had our queries answered and cross-verified one district process with another district. We proceed to the next district and repeat the process there until we achieve theoretical saturation. We observed the procedures, activities, and processes. Each respondent verbally consented after being told about the goals and parameters of the study. We addressed every question they posed regarding the reasons behind doing this research. Nobody was forced to take part in this research. We had no control or influence on the respondents.

After getting consent from the healthcare personnel and professionals, in-depth semi-structured interviews were used to gather data. Depending on how open the participants were to offer information, the length of each interview ranged from thirty to forty-five minutes. A small number of interviews were recorded with the participants' permission. The interviews that were audio recorded were transcribed and added to a Word document. Since most respondents did not want their interviews to be audio recorded, the research assistant and associate took notes during the interviews and then double-checked and verified the material with the respondents. After the interview, memos were written to move on to the next round of interviews with another district. The administrative software work process is interconnected with multiple stakeholders, allowing us to readily relate to their points of view. The data collection was discontinued after theoretical saturation was reached.

To comprehend the data more abstractly, coding was applied. Concurrent analysis of the interview transcripts and the data collection process were required by Grounded Theory. The authors' interview transcripts were examined to conduct open coding. Using axial coding, the gathered codes were arranged into categories. The codes were examined and authorized by the study team. The data analysis process has employed a constant comparison method.

This study obtained Scientific Advisory Committee approval (DPHPM/SAC/2023/131, R.No.011575/HEB/A2/2023) and complied with the requirement of Institutional Ethics Committee of Directorate of Public Health and Preventive Medicine, Chennai (IEC No. DPHPM/IEC/2023/109) and Institutional Ethics Committee of Sri Ramachandra Institute of Higher Education and Research (IEC-NI/23/APR/86/13).

## RESULTS

Stakeholders' perspective of benefits of using healthcare applications: According to user descriptions of healthcare applications, healthcare delivery is gradually

moving towards digital technology. Healthcare professionals have adapted to using digital applications. Their opinions were comprehended and presented in Figure 2. The theoretical sampling revealed that there are two major benefits of using PICME and HMIS (i) Data storage and analysis and (ii) Patient support and progression.

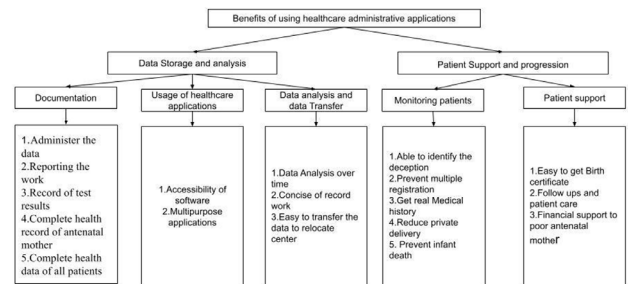


Figure 2: Benefits of using healthcare administrative applications  
(authors' elaboration)

(i) **Documentation:** Documentation is the main benefit of using healthcare applications.

- It helps in administering, reporting, and recording patient health data. The respondents' views are given below:

Administer the data: Data management must be methodical and meticulous due to the creation of huge data in primary healthcare.

- VHN4 expressed: very easy for officers at the District Level and State Levels to administer the data. VHO3 stated: I will get all the details through the dashboard and very easy to administer the data. DHO2 stated: I can quickly inspect the records and confirm the early registration or late registration. Report the work: VHN4 declared: PICME is very useful for us for reporting related work.

- Record test results: PICME has the facility to record all these test results and serology report results etc (SHN4).

Complete health records of antenatal mothers: The goal of digital healthcare is to obtain a patient's whole medical history and utilize it in the future. VHN5 stated: PICME we can know the full history of a mother. BMO 1 expressed: I checked the early history and was able to know the registration of PICME. All the data will be available over there.

- Complete health data of all patients: VHN6 explained: that all health-related data can be extracted from the PICME and HMIS. CHN1 expressed: We will provide the consolidated health data of the patients report to higher officials (CHN1)

(ii) **Usage of healthcare applications:** The usage of healthcare applications has the benefit of accessibility of software and multipurpose applications. The HMIS is employed in maintaining IP & OP case details of patients, evening cases

are maintained as causality cases and the PICME application helps in maintaining mother and child care services. Accessibility to software is the basic requirement for using the healthcare application. VHN4 stated that she could be able to access the software anywhere. DHO-4 expressed: HMIS allows us to gather data from healthcare facilities and use it to enhance the quality of healthcare services. Through this system, I can identify high-performing centers and provide support to those in need. Additionally, I closely monitor medication usage and take proactive measures to ensure effective and safe treatment.

The healthcare applications are used for multiple reasons. VHN 5 declared: We employ PICME for mother and child care, Tamil Nadu Population Health Registry (TNPHR) for OP and IP case details, and HMIS, a hospital-based program that displays morning cases as OP and afternoon cases as causality cases.

**(iii) Data analysis and data transfer:** It benefits in creating analysis reports from the initial phase of registration itself and it helps in the easy transfer of patient records in case of patient relocation. Data can also be retrieved and analysed over time. BMO1 explained: Initially, if there is an infant death or maternal death at that time only we will be using or verifying the PICME software. But nowadays we are starting to verify in the registration period. Data can be stored in concise form not necessary to maintain too many notebooks. VHN 1 declared: We had 32 records which has been decreased to 12 records. DHO2 explained: We are using manual entry because, in certain cases, if someone enters a lengthy entry on the portal, they can cross-check it with the notebook and enter the correct entry on the portal.

Healthcare applications offer the advantage of easily transferring data to the new center. VHN4 expressed: if the mother has relocated to another city for work or for some other reason when she is registered, she doesn't need to come to us to get reports. The village health nurse in the relocated city applies a re-locate in the system itself, and then all the information will be transferred.

**Patient support and progression:** The other major benefit of health applications is patient support and progression, which is categorized into two such as monitoring patients and patient support.

**(i) Monitoring Patient:** Monitoring pregnant mothers could be done effectively using PICME3.0. The statements made by the respondents revealed some of the monitoring system's results.

- Able to identify the deception: Some patients may provide false information about the pregnancy. The software can

identify the deception. VHN5 stated: Some mothers will deceive us that the child will be their fifth child but will deceive us that this is their second child but after PICME every patient has an ID.

- Prevent multiple registrations: Once the registration is done through PICME then that will be final. RCHID is a unique number that aids in preventing duplicate registration. VHN5 stated: I can't register anything else, only one time when we re-register; it said 'Already Exists.'

- Get a real medical history: VHN7 indicated: Sometimes some mothers have serial abortions for example a mother is fifth gravida has hypertension but doesn't have any child in her hand if she goes to any other city she will tell others that this is my first child no one knows that she has four children abortions before this and no one knows she has hypertension.

- Reduce private delivery: Each VHN is in charge of the pregnant mother in the village that they have been assigned. The private delivery practices have been taken over by the government. Treatment for the pregnant mother cannot be provided by anyone without receiving RCHID. The government looked after the expectant mother and the unborn child by setting a target for VHN. BMO4 asserted: Out of a hundred deliveries in a month why can't they do 25 deliveries in government is that any more wrong in that? Target fixing is not an offense. To reduce the private delivery they are fixing the target. The motto of the government is to bring all the delivery.

- Prevent infant death: VHN5 PICME registration is a good scheme because all the details of the mother will be in that software so anyone can supervise or check that. This scheme has reduced the infant death (VHN5).

## **(ii) Patient Support**

Patient support describes helping the patient to obtain the assistance they require. VHN2 expressed: When a woman in our village becomes pregnant, I will care for her as if she were one of my daughters because we have duties that go beyond our jobs. I will always be there for them and keep in touch with them. Through Healthcare applications getting a health certificate becomes very easy. VHN5 mentioned that birth certificates can be obtained easily after we register everything on the website, they even go to the call center and ask for a number. Follow-ups and patient care can be done through the healthcare application. VHN3 stated: When we see a high-risk mother, we will follow them or not. Antenatal care is good. Financial support to poor antenatal mothers can be monitored effectively through healthcare applications. VHN6 communicated: People are below the poverty line so they will be receiving Dr. Muthulakshmi Reddy benefits, The

village health nurse registers directly the beneficiary should get the amount. VHN1 expressed: I will keep monitoring the patient because they are dependent on me for their well-being and cannot act without my consent.

**Challenges of using healthcare administrative applications**

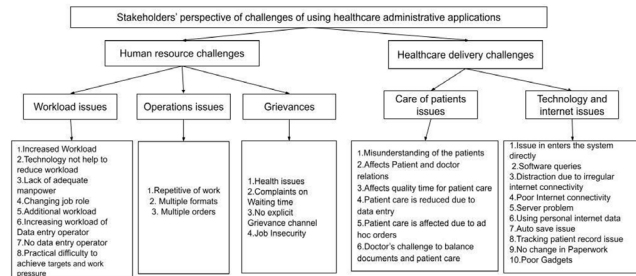


Figure 3 Stakeholders' perspective of challenges of using healthcare administrative applications (authors' elaboration)

Figure 3 shows the challenges faced by the stakeholders while using healthcare administrative applications. The theoretical sampling revealed that there are two major challenges of HMIS (i) Human resource challenges and (ii) Healthcare delivery challenges. The details of the codes are given in Appendix Table 2.

**(i) Human Resource Challenges**

The human resource challenges are related to workload issues. This consists of increased workload, technology not helpful in reducing workload, lack of adequate manpower, changing job role, additional workload, increased workload of data entry operator, no data entry operator, practical difficulty to achieve targets, and work pressure. SN2 expressed: first of all we need a data entry operator, staff nurses are here to care for the patient not for entering the data. Another issue is operational issues and the related supporting codes are repetitive work, multiple formats, and multiple orders. The data is entered in multiple formats and it time time- consuming which makes it difficult for the nurses to attend to the patients and this in turn leads to long queues.

The third issue is the grievances and the related supporting codes are health issues, complaints about waiting time, no explicit grievance channel, and job insecurity. SN4 expressed: Patients will call the helpline and they complain about us because of the data entry antenatal mother waiting time is increased. There is no proper channel of grievances for the employees. Hence they find it difficult to approach the higher officials.

**(ii) Health delivery challenges**

Healthcare delivery challenges are related to the care of patients' issues. The supporting codes consist of misunderstanding of the patients, affect the doctor-patient relationship, affect the quality time for patient care, patient care is affected due to data entry and ad-hoc orders, and doctor's challenge to balance documentation and patient care. BMO1 stated: that the patient and the doctor relationship is getting reduced due to administrative work and monitoring digital data. DHO has different perspective on using healthcare technology for healthcare delivery. DHO1& DHO3 expressed: 80–90% of healthcare workers are familiar with digital apps. Everything is based on mindset and uniqueness. It is not too hard to adopt after we go through the procedures. Adaptability and acceptance are mentalities. It is essentially feasible for people of any age.

Another issue is technology and internet issues and the related supporting codes are issues in entering the system directly, irregular & poor internet connectivity, server problems, usage of personal data, auto-save issues, tracking patient record issues, poor gadgets, and increased paperwork). Poor technological resources and unavailability make the work a burden to the staff involved in patient care.

**Stakeholders' suggestion**

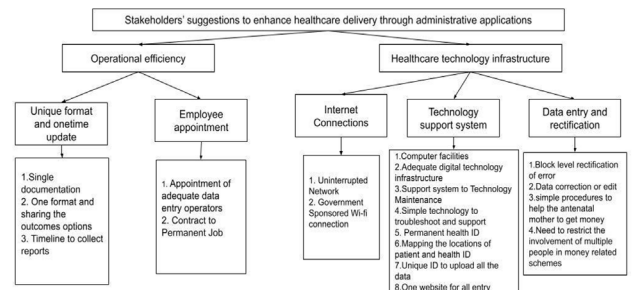


Figure 4 Stakeholders' suggestions to enhance healthcare delivery through administrative applications (authors' elaboration)

Figure 4 shows the suggestions by the stakeholders to enhance healthcare delivery through administrative applications. The major suggestions are to improve the operational efficiency and healthcare technology infrastructure. The coding details are given in Appendix Table 3.

**(i) Operational efficiency**

Operational efficiency is categorized into two themes such as (i) unique format and one-time update and (ii) employee appointment. In unique format and one-time update, the staffs suggest that the data can be entered in

either written or online format instead of doing both. This will increase the efficiency of work by reducing repetitive tasks. The supporting codes are single documentation, one format and sharing the outcome options, timeline to collect reports. Likewise reports can be submitted during a specified timeline. MO7 expressed: There should be a standard timeline to send Google forms and demand reports.

Regarding the other issue of employee appointment, the staff suggests appointing adequate manpower to perform the designated tasks and issuing permanent contracts to the employees instead of holding them on a temporary contract basis. The supporting codes are appointment of adequate data entry operators, contract to permanent job.

### (ii) Healthcare Technology Infrastructure

Healthcare technology infrastructure is categorised into three themes which are (i) internet connection (ii) technology support system and (iii) data entry and rectification. To address Internet connection issues employees suggest, uninterrupted Wi-Fi connectivity with government aid. (supporting codes: uninterrupted network and government-sponsored Wi-Fi connectivity) SN3 expressed: we need Wi-Fi which should be recharged annually by the government.

The other issue of the technology support system is suggested with building adequate infrastructure, availability of computers, technology maintenance system, creating permanent health ID, improving the trouble-shoot system, single website source for all data entry, generating unique ID to upload all data to reduce redundancy. The third issue of data and rectification, the key suggestion for this issue is to maintain block level error rectification system. MO4 expressed: If the rectification was done among the health workers that will lead to misuse of data. So the rectification permission can be given among the block level. Involvement of multiple employees in monetary schemes should be limited, single manhandling should be implemented to reduce error.

## DISCUSSION

All healthcare professionals convey in their unique ways, enabling us to recognize the digital transformation. Nobody said that applications are useless. Circulars from the government offering guidelines for new programmes or new technologies were distributed. They have worked quite hard to integrate the modifications into the current system. It is necessary to confirm whether the implementation of technology has changed current procedures, people, or

strategies. The results of the study indicated the areas on which we should concentrate to accomplish our goals to enhance the use of administrative applications. The synthesis of the outcome of the study is given in Figure 5.

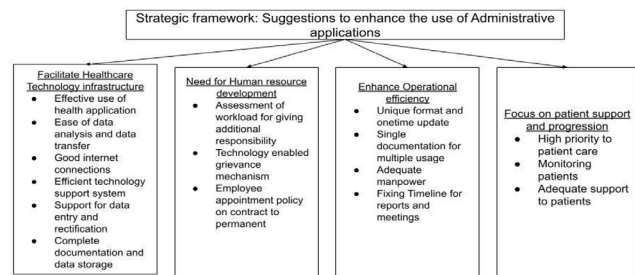


Figure 5 Strategic framework: Suggestion to enhance the use of administrative applications (authors' elaboration)

Primary healthcare facilities in both urban and rural areas actively utilize PICME, a state government application, and HMIS, a central government application, to serve a variety of purposes. The application can be accessed from anywhere with a mobile phone; the only limitations faced by healthcare personnel are server problems or intermittent internet connectivity. They expect to use wi-fi or that the government will give them resources to use for mobile data usage connected to work, therefore they don't want to spend their mobile data in this manner.

Following their prior practices, the healthcare professionals and staff are maintaining several records and submitting information to the portal. Once more, the data was submitted using a Google Form for their regular decision-making process. Information about a single patient needs to be submitted to multiple applications for a variety of reasons. It was anticipated that a centralized uploading system would be required and that data could be retrieved and used for any reason. Their rapport with patients and the amount of time they spend with them are affected when they use their valuable time to complete the same activity repeatedly. Every user of a healthcare application stated that uploads and paperwork had taken precedence over patient care.

The health professionals and staff stated that the current system does not enable them to fix errors by following easy steps. To fix it, they must go to the deputy director's office, which interferes with their normal workflow. In the event of erratic internet connectivity, they advise turning on the auto-save feature for editable forms to avoid having to type everything again.

Nurses are devoting valuable time to tracking, confirming, investigating, and resolving problems with



the Dr. Muthulakshmi Reddy Maternity Benefit Scheme (MRMBS). They suggested restricting the number of heads involved in the problem-solving process. Additionally, they requested for the funding process to be streamlined.

Healthcare personnel can manage patient information, record test findings, maintain patient and antenatal mother histories, and turn in tasks on time by using healthcare software. They can easily transfer any file with the strategic method, which helps them analyze the data over time. The statistics are typically determined by the individual entering the data into the system; however, by using a permanent health ID, this process can be streamlined to aid in accuracy and minimise repetition.

Healthcare professionals and staff need to be oriented when they use modern methods of delivering treatment and adhere to conventional grievance redressal practices. Therefore, management must make use of digital applications to facilitate the simple resolution of their grievances.

The digital-based stable work environment will enable them to deliver higher-caliber services. Both MLHP and the staff nurse have degrees and are awaiting employment confirmation. Their comments and the quality of the healthcare they receive indicate job insecurity, which can be taken into account when determining employee welfare policies.

The district health officers have reported that healthcare software has been developed and is currently in the process of being modified to better meet the needs of the end users. Any difficulties faced by the users will lead to necessary modifications. All digital-related issues will be directed to the technical personnel for updates and upgrades. With time, it is expected that the software will become fully functional.

## LIMITATIONS

The managerial features of PICME and HMIS applications in healthcare were considered in this study. The clinical features of applications are outside the purview of the research. The selection of respondents was governed by procedures and permission, and the demographic analysis was restricted to particular respondent cadres. Therefore, only those who are available and willing can be included in the permitted research field. The themes and strategic framework were constructed based on a user-centric approach. Future research can take into consideration the patient-centric approach to healthcare application, which is not included in this study. The researchers analyze stakeholder comments

and develop codes by focusing just on managerial aspect responses. The clinical implications of managing healthcare applications were not covered in the study.

## CONCLUSION

The technology has been embraced and is being used efficiently by district health officers, medical officers, nurses, staff, and other health workers. The authorities are examining the data and making the necessary corrections. Everyone is putting forth great effort to meet the goal set for that specific time frame. There are frequent meetings, training sessions, visits, inspections, and circulars. Everything for the management of healthcare is evident when we closely examine their activities. Their emphasis has been progressively shifting from a patient-centric to a digital-centric approach.

Any healthcare technology should never override the utmost priority in patient care. Physicians and nurses, the primary healthcare providers and data creators, must play an integral role in the documentation process. It is crucial to protect the involvement of doctors and nurses in healthcare delivery, ensuring that patient care remains uncompromised despite the operational challenges posed by digitization. To fully capitalize on the digital transformation of healthcare, it is imperative to assign the right individual to oversee the data input process as and when required.

## DECLARATION OF INTEREST

The authors declare no conflicts of interest. The funders had no role in the study design; collection, analyses, or interpretation of data; writing of the manuscript; or decision to publish the results.

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The authors declare no conflict of interest

## REFERENCES

- Al-Busaidi, Z. Q. (2008). Qualitative research and its uses in health care. Sultan Qaboos University Medical Journal, 8(1), 11–19. <https://doi.org/21654952>
- Alipour, J., Mehdipour, Y., & Karimi, A. (2019). Factors Affecting Acceptance of Hospital Information Systems in Public Hospitals of Zahedan University of Medical Sciences: A Cross-Sectional Study. Journal of Medicine and Life, 12(4), 403–410. <https://doi.org/10.25122/jml-2019-0064>
- Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. Journal of Research in Nursing, 25(8), 652–661. <https://doi.org/10.1177/1744987120927206>
- Faujdar, D., Sahay, S., Singh, T., Jindal, H., & Kumar, R. (2019). Public health information systems for primary health care in India: A situational analysis study. Journal of Family Medicine and Primary Care, 8(11), 3640. [https://doi.org/10.4103/jfmpc.jfmpc\\_808\\_19](https://doi.org/10.4103/jfmpc.jfmpc_808_19)
- Mc Grath-Lone, L., Jay, M. A., Blackburn, R., Gordon, E., Zylbersztejn, A., Wiljaars, L., & Gilbert, R. (2022). What makes administrative data research ready? International Journal of Population Data Science, 7(1). <https://doi.org/10.23889/ijpds.v7i1.1718>
- Ministry of Health and Family Welfare, G. of I. (2024). Health Management Information System. <https://hmis.mohfw.gov.in/#!/aboutus>
- Mondal, S., Anand, A., Awasthi, N., Singh, B., & Pradhan, M. R. (2023). Factors affecting pregnancy registration in India: does the pregnancy intention matter? BMC Pregnancy and Childbirth, 23(1), 674. <https://doi.org/10.1186/s12884-023-06002-9>
- Sanjuluca, T. H. P., de Almeida, A. A., & Cruz-Correia, R. (2022). Assessing the Use of Hospital Information Systems (HIS) to Support Decision-Making: A Cross-Sectional Study in Public Hospitals in the Huíla Health Region of Southern Angola. Healthcare, 10(7), 1267. <https://doi.org/10.3390/healthcare10071267>
- Ulrich, E. H., So, G., Zappitelli, M., & Chanchlani, R. (2021). A Review of the Application and Limitations of Administrative Health Care Data for the Study of Acute Kidney Injury Epidemiology and Outcomes in Children. Frontiers in Pediatrics, 9. <https://doi.org/10.3389/fped.2021.742888>

## APPENDIX

Table 2 Challenges for using administrative software: PICME and HMIS

Themes	Axial Coding	Initial Coding	Extracts
Workload issues		Increased Workload	The workload increased because everything we used to record on pen and paper, we now double-check, making our work busy. (VHN2)
		Technology does not help to reduce the workload.	After the intervention of Technology, the workload has been increased. We will be entering the note very soon. But for printing it takes time. From this, we can say the technology will not help the workers within the PHC (MO8)
		Lack of adequate manpower	The manpower for work available over here is very low. If we rectify that it will be easy for us (SN6)
		Changing job role	First of all, we need a data entry operator, staff nurses are here to care for the patient not to enter the data (SN2)
		Additional workload	We will update the private hospital entry (VHN1)
		The increasing workload of Data entry operator	For each block, there will be one data entry operator so that the workload of the data entry operator will be increased (MO3)
		No data entry operator	There is no data entry operator in our PHC (MO3)
		Practical difficulty in achieving targets and work pressure	For secondary care, we will be referring them to a tertiary care center or Medical College. At that time target fixing will give pressure. Setting a target in pregnancy will have a negative impact. Out of 10 pregnancies we will be sending some of the high-risk pregnancies to the medical college at that time the remaining cases will be 4 to 5 only (MO1)

Human Resource Challenges	Operations issues	Repetitive of work	In the morning, we have to enter all the data in the notes in the afternoon we have to enter all the data in the computer mostly takes around 2:30 p.m. We will be entering every data twice a time nowadays (SN2)
		Multiple formats	We are entering the same data in many formats (BMO1)
		Multiple orders	Many patients will call the higher official or Helpline if not they will call the president of the village sometimes, they will call the block medical officer telling them that we are asking them to wait for a long period. But none of them will know the numerical order we are maintaining and following (SN4).
	Grievances	Health issues	Will be taking care of the administrative software and have to perform everything; I am having neck pain from doing all this work (DET 2)
		Complaints about Waiting time	When we enter on the spot, it takes so much time. The patient called the helpline and they complained about us because of the data entry antenatal mother waiting time is increased (SN4).
		No explicit Grievance channel	We don't have a grievance channel. On the grievance day we met the Deputy Director and talked about our grievance and the Deputy Director said he would be taking some action (SN4)
		Job Insecurity	Nowadays everyone is having an insecure feeling due to targets and maternal death (BMO1)
Health care	Understanding of the patient	Patients will think that we are simply using mobile phones for social media and not taking care of them but the actual reason is we will be entering all of the details in the software (SN4)	
Technology and Internet issues	Affects Patient and doctor relations	The patient and the doctor's relationship is getting reduced due to administrative work and monitoring digital data (BMO1)	
	Affects quality time for patient care	We are spending time entering the data, and find it difficult to spend quality time for patient care (SHN 5)	
	Patient care is reduced due to data entry.	The patient care is getting reduced due to the data entry the staff nurse and the other health nurse are saying that they are requesting us that they want to do their job and they are asking for a data entry operator to do this entry work (MO2)	
	Patient care is affected due to frequent report request	While we are concentrating on online entry patient care is getting affected. For example, They will be asking for some reports or other documents within 11:00 a.m. So that we will be concentrating on the report not the patient care (MO7)	
	Doctor's challenge to balance documents and patient care	For that, there must be a separate person medical officer or doctor should not sit and enter those data whatever the stages. If a patient is coming and I am entering all the data then it will be a disadvantage for the patient and I cannot do my job (MO5)	
	The issue enters the system directly.	However, you are unable to use PHC's software system alone if you have a separate data entry operator. The data entry operator needs to record all of the medical advice that I provide before uploading. MO5)	
	Software queries	We were struggling to troubleshoot the queries in that software initially (VHN1)	
	Distraction due to irregular internet connectivity	We will be constantly checking that internet connectivity and entering the data (SN2)	
	Poor Internet connectivity	Data will be entered within 5 minutes but it takes 1 hour because of the low internet connectivity (SN2)	
	Server problem	Another issue is that PICME always has some server problems in it. Due to the multi-users, the server is getting down (MO4)	
	Using personal Internet data	During the house visits, I make calls with my internet data to obtain clarity from MO. (MLHP1) The government gave us data cards for free three years that service was also stopped so we are using our money for recharging (VHN 3)	
	Autosave issue	If the data of a patient is entered correctly again in the next week we have to enter that new (SN2)	
	Tracking patient record issue	Most of the patients forget their notes and some say which mobile number they gave, so tracking the patient record is very difficult (SN7).	
	No change in Paperwork	BMO will check only the hard copy we carry (SN7)	
	Poor Gadgets	The government gave me a laptop but it's not working anymore it was working for days after that it did not, everyone will use their accessory for example I will use my computer in my home young VHNs use to update their mobile phones (VHN1)	

Table 3: Challenges for using administrative software: PICME and HMIS

Themes	Axial Coding	Initial Coding	Extracts
Enhance operational efficiency	Unique format and one-time update	Single documentation	We have to either enter the note in the written format or enter it in the software (SN3)
		One format and sharing the outcomes options	We are entering the same data in many formats is there any solution that must be one format from state to Central which makes the job easier? My opinion is, that we can give it to the state they can forward it to the central (BMO1)
		Timeline to collect reports	There should be a standard timeline to send Google forms and demand reports (MO7)
	Employee appointment	Appointment of adequate data entry operators	The system needs a separate person to enter the data known as the data entry operator. A separate person for entering the data is appointed it will be fine (MO2)
		Contract to Permanent Job	I worked as a contract employee for ten years; many others were in the same situation as me. We request that the government issue an order and employ us permanently (SN6)
Internet Connections	Uninterrupted Network	The only issue is the network though we raised our voice against the issue and waiting for the action (VHN1)	
	Government Sponsored Wi-fi connection	We need Wi-Fi which should be recharged annually by the government (SN3)	

Healthcare technology infrastructure	Technology support system	Computer facilities	All the Primary Health Centre must get a computer facility with an internet connection (MO2)
		Adequate digital technology infrastructure	There is no computer in our block; our staff must manually enter the information. Need to get adequate computers to enter the data. (BMO4).
		Support system to Technology Maintenance	The government needs to provide a hardware support system to maintain the computers (BMO4)
		Simple technology to troubleshoot and support	Simple step to be followed to track the delay and help the antenatal mother get the amount (VHN6)
		Permanent Health ID	Entering the health ID for access service becomes mandatory to access, provide service, or know the history of the patient (MO3)
		Mapping the locations of patient and health ID	Mapping is to locate the areas based on the ration card location, for example, they will segregate the villagers belonging to this primary health center or health ID. It is still in the process of implementing (MO3)
		Unique ID to upload all the data	A Universal number can be given to the patient it is a Central Government program they have a Universal code number. It does not matter whether private or government doctors any doctor can upload. If you have a good internet system and data entry operator you can upload everything (MO5)
		One website for all entry	A significant issue arises from the fact that officials demand that we finish applications or Google Forms within an inconceivable time frame. The team finds it extremely difficult to update the data at a precise time and date. (BMO3)
	Data entry and rectification	Block-level rectification of error	If the rectification was done among the health workers that would lead to misuse of data. So that the rectification permission can be given among the block level (MO4)
		Data correction or edit	If we enter any data, the system can permit us to edit within a period, based on the immediate hierarchy without wasting our time anymore (VHN3)
		Simple procedures to help the antenatal mother get money	There are many problems with the entry because of the Dr.Muthulakshmi Reddy maternity scheme then everyone will be thinking the staff will fix the eligibility criteria. Nowadays, the amount is also entered into village health nurse entry. My opinion is the village health nurses are going to the field and doing patient care so that they can observe and write everything in the notes and give them to the data entry operator.
		Need to restrict the involvement of multiple people in money-related schemes	If all the entry work is given to the data entry operator then the village health nurse's role will be affected (BMO2)