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Health Informatics in Contemporary Healthcare Systems: Applications, Benefits, and Emerging Trends

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Abstract

Health informatics enables the methodical facilitation and utilisation of health data across every health system, from the health records of individuals to national health observatories, and therefore has become an integral component of contemporary health systems. In India, the need for health informatics has been established by the various implementations of the Ayushman Bharat Digital Mission, including the Ayushman Bharat Health Account (ABHA), digital health records, eSanjeevani, CoWIN, eHospital, and the Online Registration System and the national disease monitoring and management platforms. This paper outlines the major uses, advantages and emerging perspectives of health informatics in the context of the Indian health system. It is based on a narrative review of Indian-authored publications and official Indian datasets for the period 2019 to 2026. The datasets demonstrate that the ABHA accounts grew from 14.7 crs. in 2021 to over 90 crs. in 2026 with over 100 crs. health records linked to ABHA in May 2026. The eSanjeevani system provided services to 45.42 crs. users, and the National NCD platform enrolled 74.97 crs. beneficiaries by December 2025. These data indicate that health informatics in India has progressed from a pilot phase of digital informatics to the development of large-scale public health systems. Health informatics in India provides several services and benefits, including improved access, continuity of care, and clinical decision making and planning, as well as the monitoring of health services and increased patient engagement. Existing gaps such as the digital divide, data governance, and privacy; along with cyber security, the quality of data, and increased provider burden remain challenges. Health informatics has the potential to strengthen Indian healthcare and digital governance, user training, privacy protection, and equity focused interoperability remain imperative.

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1. INTRODUCTION

Timely and usable information is the backbone of the modern healthcare system. Every day, hospitals, clinics, laboratories, pharmacies, insurance organizations, and public health systems generate huge amounts of information. If this information is stored in the paper or electronic files in isolation, it becomes almost impossible to provide safe and efficient healthcare services. One of the answers to this problem is health informatics, which integrates healthcare, information, and management sciences and digital technologies. Its primary aim is to computerize healthcare records. However, this is not the end of the story. Its broader aim is to transform healthcare data into informative knowledge that helps to improve clinical services, public health, health system administration and health research [1].

Health informatics is especially relevant to the Indian healthcare system because of its size, diversity, and uneven distribution. India's major cities have highly advanced tertiary care hospitals, but many rural and even some semi-urban locations continue to face barriers to healthcare because of distance, high costs, limited availability of specialists, and fragmented health records. Many of these barriers can be reduced through the use of digital health technologies. For instance, teleconsultation, digital registration, digital prescriptions, health IDs, e-appointment scheduling, e-claim submission, and data-driven program evaluation can be accomplished with health digital technologies. Given the increasing availability of smartphones and digital public infrastructure, health informatics is becoming increasingly important for both public and private healthcare services in India [2].

In the last decade, India has greatly expanded digital health services like the Ayushman Bharat Digital Mission. Legal health ID systems and digital registries with consent-based and interoperable systems can help create a connected digital health ecosystem with the potential for unprecedented structuring and access to health data. The Ayushman Bharat Health Account provides every individual with a digital ID that can be used to store and access health data anywhere with their consent. This can improve the portability of health data across health services and help limit redundant testing. It shows potential to improve the tracking of patients and the continuity of health services [3-8].

Telemedicine has transformed health care delivery systems in India. Digital services like eSanjeevani have shown that in remote and underserved areas, even primary health services can be delivered via digital means. Many studies have shown that in India, telemedicine has the potential to improve access to health services and limit the need for health care consumers to travel, while also pointing to many challenges that are still present like internet access, lack of physical examinations, privacy challenges and unprepared health care service providers. The COVID-19 pandemic showed that health systems with digital components have the potential to support the continuity of health services in emergency situations [8-12].

Health informatics extends beyond patient consultation to the whole spectrum of health technologies, including hospital information systems, electronic health records, lab information systems, pharmacy systems, disease registries, health analytics, mobile health technologies, wearable technologies, IoT, AI, digital health claims systems, and health surveillance systems. These technologies may offer support for clinical and administrative processes as well as program evaluations and health-related research. For a country such as India, health informatics is valuable in offering the potential to align health service delivery with health system planning at the population level [7,13].

Health informatics and its applications in the contemporary health system are discussed in this paper with a focus on India. Major applications are explained, benefits are evaluated, a recent India-based data set is presented, and new innovations in health informatics are discussed. The paper is designed to be a simplified academic discussion to allow it to be used as a formal research submission.

2. Conceptual Background of Health Informatics

Health informatics specializes in the management of health data using digital technologies, standardized methodologies and analytical approaches. It spans the entire information continuum from the collection, storage, processing and exchange of data to its interpretation and the resultant decision making. Health informatics systems are only as effective as their applicability to the clinical and administrative services that they are designed to support. Accordingly, the applicability of health informatics systems hinges on the appropriate amalgamation of technology, the human factor and the institution.

The most frequent clinical use of health informatics is the creation of an electronic health record (EHR). An EHR captures patient related data including demographic information, clinical diagnoses, prescribed medications, documented allergies, lab and imaging studies, discharge summaries and notes. With the appropriate maintenance and sharing of records, clinicians are better informed to make decisions, as they are able to access the patient’s prior clinical history and the results of previously conducted studies. Additionally, shared electronic records facilitate audits, quality improvement and research activities.

Public health informatics employs digital systems for use in health programs at the level of the population. It is useful for disease surveillance as well as the tracking of immunizations and the monitoring of maternal and child health as well as the screening of noncommunicable diseases and drugs logistics. India has implemented digital public health systems for the management of its telemedicine, outpatient services, vaccinations and noncommunicable disease management [6-8]. These systems have the potential to address the needs of both an individual patient and the broader public health system.

Today's health informatics focuses on privacy, security, and ethics. Health data has the potential to disclose a person's illness, treatments, and even their location and identity making the data extremely sensitive. Consequently, digital health systems must uphold consent, confidentiality, minimum data, and require secure access, audit logs, and clear responsibility. Citizens and providers will avoid digital health systems if they do not trust the system. Health informatics models must be innovative while balancing the rights of the patient and the interests of the public.

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3. OBJECTIVES AND METHODOLOGY

This paper looks at how health informatics is used in modern healthcare systems in India, describes the benefits and how it has been evolving, and looks at how it may evolve in the future. This paper also looks at how the digital health data in India may have evolved recently, provides some important data, and describes the challenges that need to be addressed to improve health informatics in India.

This paper discusses how health informatics impacts clinical care, public health, and administration. It looks at digital health adoption in India and the implications for patients, health service providers, hospitals, and public health. It describes the challenges of health informatics in India. It talks about the use of artificial intelligence, digital health and mobile health, telemedicine, health record interoperability, and digital health claims in India.

The methodology incorporates both a narrative review and analysis of secondary data. To strengthen the academic discourse, recent Indian-authored journal articles published from 2019 to 2026 were used. Secondary data includes official Indian datasets published in 2026 from national government releases and public digital health updates. These datasets include indicators related to ABHA accounts, ABHA-linked health records, eSanjeevani telemedicine, CoWIN, the National NCD platform, and major state-level participation. These indicators were chosen as they reflect extensive and recent digital health activity in India. The paper focuses on descriptive analysis and not statistical hypothesis testing. The applications, indicators, benefits, challenges, and trends are summarized in tables. Growth related to ABHA accounts and state-wise linked health records is shown along with eSanjeevani NCD platform and eSanjeevani telemedicine. All references related to Indian digital health, telemedicine, ABDM, health informatics, and digital health implementation are from 2019 and after.

4. Applications of Health Informatics in Contemporary Healthcare

Health informatics spans several areas of health care delivery. At the level of direct patient care, health care workers gain access to earlier consultations, lab and imaging reports, and earlier prescriptions due to electronic health records. This access helps avoid duplication of services and promotes continuity of care. Digital prescriptions improve record legibility and, when interfaced with the pharmacy management system, reduce prescription errors [9]. The integration of lab and imaging information systems helps store, track, and share diagnostic information easily [10].

In India, the use of health informatics through the example of telemedicine, has been perhaps the most prominent [11]. It allows the patient to connect to the health care worker without the long distance travel. For the most part, it is useful for the rural population to obtain the services of counseling for chronic diseases, follow-up visits, and other non-urgent care [12]. Research in India supports the use of telemedicine for accessing health care services. However, the use, access, and quality of the internet, privacy, and the digital literacy of the users are important for successful telemedicine.

Health informatics systems extend to the management of hospitals. The hospital management information system can integrate patient registration, appointment scheduling, billing, bed management, health records, discharge summaries, and other administrative functions. Well integrated hospital management systems reduce the waiting time for services and increase the transparency of hospital operations. Digital systems for outpatient registration reduce physical crowding in the hospital and streamline the flow of patients.

Health informatics is used for disease surveillance and the management of public health programs. Digital platforms help track the burden and the service delivery gaps for specific health conditions, and assist in monitoring the coverage of health screening and informing health interventions in a timely manner. In India, the digital monitoring of Non-communicable Diseases (NCDs) has been integrated at the national level to provide services for the management and follow-up of hypertension and diabetes [8]. Digital health dashboards help managers and administrators visualize health data in real time, facilitating timely and effective health program interventions.

Health informatics is beginning to include insurance and claims processing. Health informatics is beginning to include insurance and claims processing. Digital claims systems promise to improve verification and decrease the amount of paperwork while also increasing transparency and reducing the time it takes to receive reimbursement. To streamline the way claims are processed and to increase efficiency, the National Health Claims Exchange has been situated in the context of the digital health architecture [7].

Artificial intelligence and decision support applications are on the rise in clinical and public health. There are many ways that AI-assisted tools can be used including screening, triage, alerts and differential diagnosis. These tools should not minimize the importance of clinical judgement. Validation, fairness, transparency and safety are the frameworks under which these tools need to be regulated and used.

Table 1: Major applications of health informatics in contemporary healthcare systems

Application area	Practical function in healthcare	Indian relevance or example
Electronic health records	Stores clinical history, prescriptions, test results, discharge notes and follow-up information.	ABHA-linked records under ABDM support consent-based portability of health data. [3-7,14]
Telemedicine	Enables remote consultation, follow-up, counselling and primary care support.	eSanjeevani has served patients across India and reduced distance barriers. [8-12]
Hospital information systems	Supports registration, appointments, billing, bed management, inventory and reporting.	eHospital and Online Registration System support digital outpatient and hospital workflows. [8]
Public health informatics	Tracks screening, disease trends, vaccination, surveillance and programme coverage.	CoWIN, NCD platform and public dashboards support national and state-level monitoring. [8]
Digital claims and insurance	Improves claim submission, verification, standardization and reimbursement processing.	NHCX is linked with the broader ABDM architecture for interoperable claims. [7]

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Decision support and AI	Provides alerts, triage support, risk prediction and diagnostic assistance.	AI tools are being explored for telemedicine, TB screening and diabetic retinopathy screening. [1,13]

Interpretation: The table demonstrates that health informatics operates as an integrated system instead of a standalone technology. Different parts of the healthcare pathway are supported by various electronic records, telemedicine, hospital information systems, public health, digital claims, and AI. In the Indian context, the examples suggest that national digital platforms are being utilized in the areas of treatment, follow-up, as well as for administration, surveillance, financing, and decision support.

5. Indian Dataset and Interpretation

The Indian dataset in this paper illustrates the magnitude of health informatics in the country. The official releases for 2026 indicate rapid advancement of digital health identities, linked health records, telehealth, digital public infrastructure and national disease control platforms. These indicators are essential as they showcase both the adoption of technology and the readiness of the system. Growth of accounts of the Ayushman Bharat Health Account (ABHA) is a primary indicator of the digital health transition. Between 2021 and 2026, the creation of ABHA accounts surged from 14.7 crs. to 90 crs. This shift indicates that digital health identity systems have progressed from the early adoption stage to the major public health infrastructure. This shift also establishes a foundation for health record portability and a consent-based, continuous care system [6].

The second primary indicator of digital health transition is the linking of health records with ABHA. As of May 2026, 100 crs. health records were linked. This is a critical advancement, as the creation of digital identity systems is only the beginning. For health informatics to be meaningful, clinical records must be connected and be accessible in secure systems. Among the telemedicine initiatives, the eSanjeevani system reached over 45.42 crs. patients in March 2026, and deployed over 0.023 crs. health care providers. This system integrates health informatics and service delivery and reinforces that digital health consultations are now a routine service of the public health system in India [8].

The National NCD platform demonstrates the utility of informatics in managing chronic conditions. By December 2025, it had enrolled 74.97 crs. beneficiaries, of whom 8.64 crs. were placed for treatment of Hypertension and Diabetes. This is an important scale, as chronic, non-communicable diseases will require tracking over the long-term, follow-up and continuity of care. Digital systems can identify and track patients and optimize treatment as well as public health plans [8].

Table 2: Latest Indian digital health dataset used in this study

Indicator	Latest reported value	Interpretation for health informatics
ABHA accounts created	More than 90 crs. accounts by May 2026 [6]	Shows wide adoption of digital health identity and a foundation for record portability.
ABHA-linked health records	More than 100 crs. records by May 2026 [7]	Shows movement from identity creation to actual clinical data linkage.
Technology solutions integrated with ABDM	More than 450 public and private solutions [7]	Shows growing ecosystem participation and interoperability potential.
eSanjeevani telemedicine	45.42 crs. patients served by 5 March 2026 [8]	Shows large-scale use of remote consultation and digital primary care.
National NCD platform	74.97 crs. beneficiaries enrolled by December 2025 [8]	Shows use of informatics for long-term disease screening and follow-up.
CoWIN	Over 220 crs. vaccination doses managed [8]	Shows capacity of digital public infrastructure to support national health campaigns.

Interpretation: The data show a steep increase in the establishment of digital health systems in India. ABHA accounts and linked records show that both digital identity and clinical data exchange are expanding. eSanjeevani, CoWIN, and the NCD platform exemplify the application of health informatics for consultation, vaccination, and the monitoring of chronic diseases respectively. The indicators also show that the shift in health system adoption has gone from isolated pilots to the implementation at the level of an entire population.

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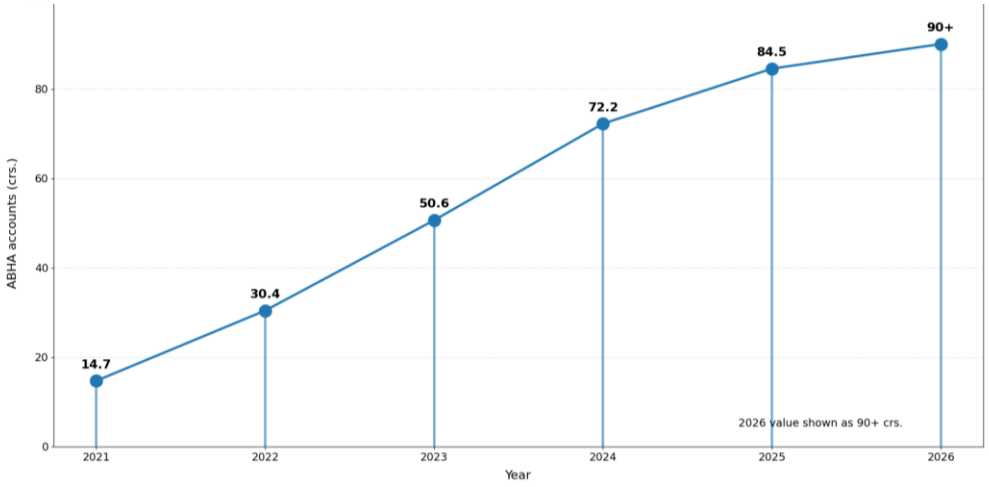

Figure 1: Growth of ABHA accounts in India, 2021-2026.

Interpretation: The line chart indicates the number of ABHA accounts in 2021 was at 14.7 crs. and projected to cross 90 crs. mark in 2026. The account surge between 2021 and 2024 shows public and private sector interest and rapid growth after the implementation of ABDM. The increase after 2024 indicates the digital health identity system is becoming the primary means for record linkage and patient-centered health information exchange in India.

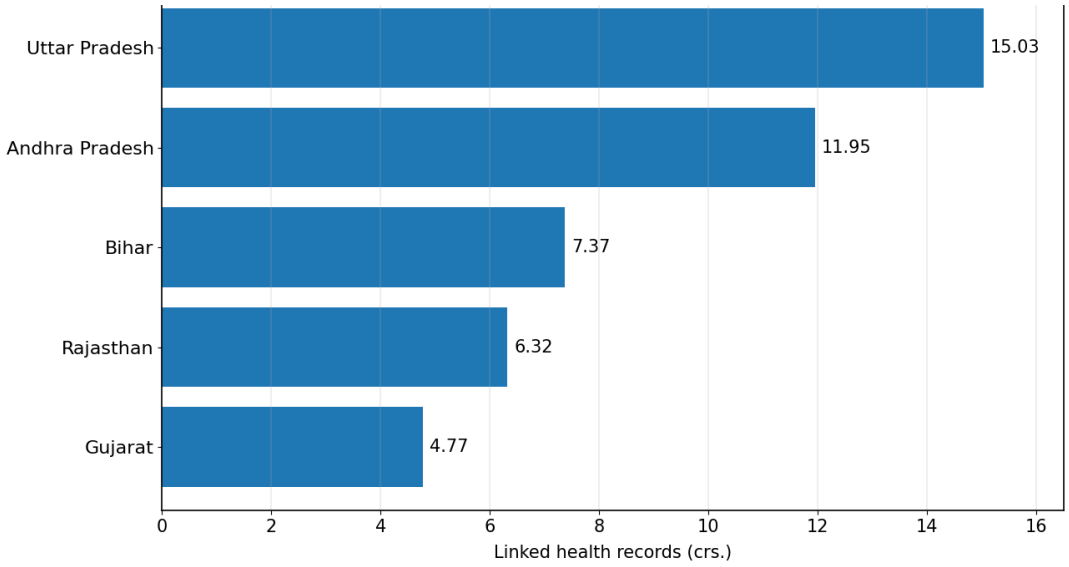

Figure 2: Leading states by ABHA-linked health records, May 2026.

Interpretation: According to the chart, Uttar Pradesh has the highest ABHA-linked health records of the selected states, followed by Andhra Pradesh and Bihar. The variation among states indicates that record linkage relies on the ability of a state to implement the necessary processes, the degree to which the health facilities participate, and the integration of the processes in a digital workflow. The states in the lead show that ABHA has the capability of providing clinical record linkage at a massive scale if the health facilities and outreach institutions are willing to participate.

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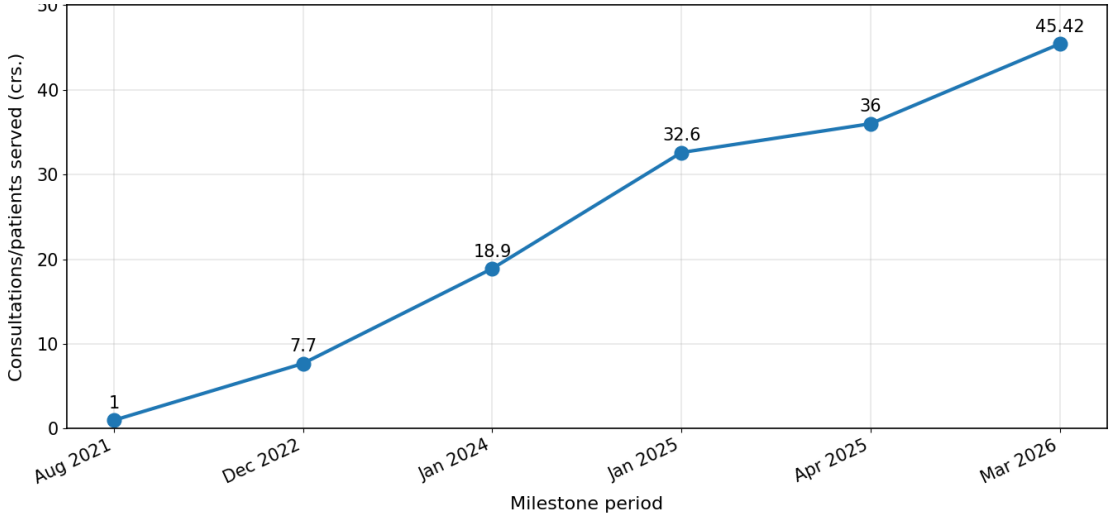

Figure 3: Selected eSanjeevani telemedicine milestones in India.

Interpretation: The eSanjeevani consultations chart shows an increase from 1 crs. in August 2021 to 45.42 crs. in March 2026. An increase in consultations is apparent in the largest spikes from January 2024 to January 2025. This represents growing use of telemedicine and integration of public healthcare. This growth in remote consultations confirms that healthcare provided through remote consultations is here to stay. This becomes especially important as access to primary and follow-up healthcare remains a challenge.

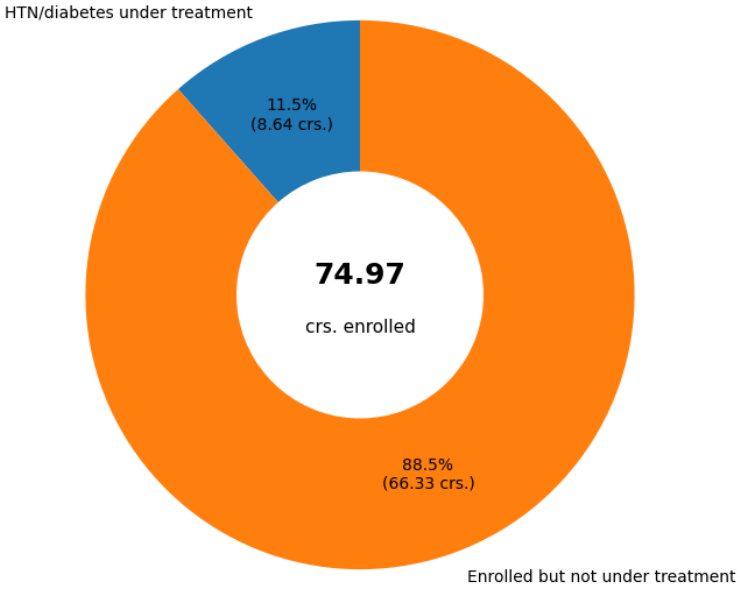

Figure 4: National NCD digital platform scale in India

Interpretation: According to the donut chart, about 74.97 crs. users completed their enrollment on the National NCD digital platform, while only 8.64 crs. were reported to be receiving treatment for either hypertension or diabetes. This discrepancy illustrates the necessity to address the gap that exists between enrollment and confirmed diagnosis, continuous treatment, and follow-up care. The chart also illustrates the role of informatics in identifying a significantly large user base that will potentially benefit from being screened, monitored, and provided with long-term care.

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6. Benefits of Health Informatics

Improved continuity of care is the first important advantage of health informatics. When health records are digitized and can be linked across different health care facilities with the patient's consent, the patient no longer needs to transport several paper files. Health care providers can review the patients' past reports, medications, and diagnoses prior to making an informed decision. This is helpful in the management of chronic diseases and in the process of referrals, emergency, and post hospitalization care follow up.

The second advantage is enhanced service access. With health care practices employing telemedicine, the need for the patient to travel is drastically reduced, and in many cases, the patient can interact with the required medical specialist directly or indirectly through a telemedicine system. This is especially important for the Indian population as the rural and remote areas face challenges with a lack of and high cost of transportation to available medical specialists. eSanjeevani is a good example of a digital health care system to provide scalable health care services in the public health system [8].

The third advantage is effective administration. All of the services provided by a hospital can be automated, i.e. check-in, check-out, appointment scheduling, report generation, and billing, resulting in a huge decrease in the workload of hospital staff and long waiting lines. Health care facilities can use dashboards to monitor and manage the flow of patients, the occupancy of beds, and the utilization of services and supplies. With the immediate availability of administrative data, managers can optimize services and reduce administrative costs.

The fourth advantage is the use of health informatics and data to design new health care services. Health informatics has the potential to provide data and information for public health services resulting in new patterns of diseases, health service coverage, health care gap services, and follow up of health care services offered. This information can be instrumental for public health service managers in resource allocation, planning public health services, and evaluating the impacts of public health services. An ideal example is the National NCD platform, which provides data for the screening and management of chronic diseases to the public health care system to support integrated services [8].

The fifth benefit is patient empowerment. With health information technologies (HITs) such as electronic health record systems, mobile applications, and web-based portals, patients can access their own prescriptions, lab results, and appointment information. HITs give patients tools to view and even distribute their health information, thus encouraging them to become more involved in their own care. Patient empowerment, however, is accompanied with concerns about one's digital literacy, access to the language, and one's confidence in the protection of their personal information.

Health informatics also helps with research and the improvement of quality. With the right technologies and the appropriate help with the health data, researchers can understand the clinical meaning of the data, look at what the data says about the different health interventions, and aid in the improvement of clinical practices. Hospitals can look at their digital offerings and use them to evaluate the quality of care, assess adverse events, and look for lags in their care offerings. These benefits are only seen when there is proper coding and a commitment to quality governance of health data.

Table 3: Benefits of health informatics for key stakeholders

Stakeholder	Major benefits	Expected outcome
Patients	Record portability, teleconsultation, online reports, easier follow-up and reduced travel. [2,14,20]	Improved access, convenience and continuity of care.
Doctors and nurses	Availability of history, diagnostic data, alerts and decision-support information. [12,20]	Better clinical decisions and safer care when workflow integration is strong.
Hospitals	Digital registration, billing, inventory, bed management and reporting. [18]	Reduced administrative delays and improved service monitoring.
Public health authorities	Dashboards, disease surveillance, programme tracking and population-level analytics. [8]	Evidence-based planning, resource allocation and rapid response.
Researchers	Structured datasets, registries and anonymized health information. [1]	Improved research quality, evaluation and innovation.

Interpretation: The table illustrates how all primary healthcare stakeholders are positively impacted by health informatics. Health informatics systems improve access and convenience for patients, improve the quality of decisions for clinicians, enhance operational oversight for health care organizations, improve planning for public health agencies, and provide useful and organized datasets for health care researchers. This demonstrates that, in the context of digital health systems, the greatest potential value for the health care system and its stakeholders is achieved when clinical, administrative, and public health system functions are integrated.

7. Challenges and Risk Management

India's health informatics systems have significant potential, but their implementation is complicated. One of the main issues is the digital divide. In many rural communities, as well as the elderly and low-income people, many individuals do not have safe access to the internet or digital literacy. Because of this, digital health services can't take the place of traditional health services; but can strengthen traditional health services.

The second issue is data privacy and security. The unauthorized use of personal health data may result in identity and medical discrimination. A good first step is to ensure data is only used with the consent of the patient, but the patient must know what data they are consenting to be used. Digital health service providers must ensure security and data integrity with strong authentication mechanisms and controls, as well as a provision for an audit and the ability for users to register complaints.

The third issue is the implementation of health informatics systems that communicate with each other. Many healthcare

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providers use disparate software applications, systems and coding. The lack of communication results in loss of value with digital health records.

The fourth issue of systems and informatics is the provider burden of the documentation. If the systems do not assist with the flow of health informatics, the systems can be a burden to the providers. The systems require a high degree of flexibility to assist with the flow of health informatics systems.

The fifth challenge is data quality. Data that is incorrect, incomplete, or duplicated can be harmful to clinical and public health decisions. Quality data is a result of properly entered data, validation rules, coding standards, regular auditing and responsibility. Having a certain level of digitalization of processes shouldn't be mistaken for data quality.

Table 4: Implementation challenges and mitigation strategies in India

Challenge	Possible effect	Mitigation strategy
Digital divide [2,19]	Exclusion of rural, elderly, low-income and low-literacy groups.	Maintain assisted digital services, community support and multilingual interfaces.
Privacy and cyber security risks [4,15]	Loss of trust, data misuse and unauthorized access.	Use consent, encryption, audit trails, role-based access and clear grievance systems.
Interoperability gaps [3-7]	Records remain fragmented across facilities and software systems.	Adopt national standards, common terminology and ABDM-compatible integration.
Provider workload [17,20]	Resistance, poor adoption and inaccurate data entry.	Provide training, technical support and workflow-friendly designs.
Data quality issues [1]	Weak clinical decisions and misleading analytics.	Use validation, coding standards, data audits and clear responsibility.

Interpretation: The table shows that health informatics contains mainly non-technical risks. These include some social, organizational, and ethical risks. The digital divide and privacy risks, as well as gaps in interoperability and issues with provider workload and data quality, have the potential to impact the effectiveness of an e-health system. A number of risks have been identified and managed. These include trained staff and the provision of assisted access and data governance, as well as the adoption of security and interoperability standards.

8. Emerging Trends in Health Informatics

The first emerging trend is interoperable digital health systems with the possibility of user-controlled privacy. India is implementing unified health systems with health ID systems, health service provider registries, health service delivery facility registries, health record consent managers, and health information exchange systems. If privacy controls are implemented, this can make health records portable and accessible anywhere [3-7].

The second emerging trend is mobile health services. Booking health appointments, consultations, reminders, education, and accessing laboratory reports through mobile applications is emerging as a principal health service delivery method. Given the large population in India, this method is even more essential because traditional health services reach only a fraction of the health consumers. It is important that delivery through mobile technology includes regional languages, services for the differently abled, and provisions for use in low connectivity and no-connectivity environments.

The third emerging trend is the use of artificial intelligence as an integrated system for clinical and public health service delivery. Indian health systems are utilizing and investigating the use of several artificial intelligence tools for telemedicine, tuberculosis, and diabetic retinopathy screening, and for the automation of image analysis. Responsible use of artificial intelligence systems requires safety assessments and oversight by humans, as well as validation on the Indian population.

The fourth emerging trend is remote monitoring of health through the use of wearable and Internet of Things technology. This has great potential for the management of chronic diseases and the provision of health monitoring and early warning systems. However, this can only be realized if the monitoring systems are integrated with clinical health services and secure protection of the collected data is ensured [13].

The fifth trend focuses on digital health analytics used for improved planning and quality enhancement. Health managers get the ability to analyze the data and use dashboards and predictive analytics to locate high-risk and underserved areas and assess the outcomes of each given program. Data analytics will also empower hospitals to evaluate aspects such as the duration of patient stays, patient readmissions, the consumption of medication, and various quality indicators.

The sixth trend revolves around the digital integration of claims and financing systems. The advent of standardized digital claims will facilitate the reduction of the paperwork burden resulting in increased transparency for the patients, hospitals, and insurers. This trend is especially important for the Indian context, where the public insurance programs and the private health care systems have a need for reliable and auditable claims data that are interoperable [7].

The seventh trend emphasizes digital health literacy and digital health trust. The availability of technology is one of several factors; systems' comprehension and trust are also instrumental to the systems' adoption. Indian research reports that digital health trust, acceptance, and system usability are the primary factors driving the adoption of digital health systems [14-20]. These digital health systems will require an in-depth community engagement and education campaign to build the necessary trust and support.

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Table 5: Emerging trends in Indian health informatics

Trend	Current direction	Expected implication
Interoperable digital health ecosystem	Expansion of ABHA, registries, consent managers and health information exchange. [3-7]	Portable records and better continuity of care.
Mobile-first digital health	Use of smartphones for appointments, records, teleconsultation and reminders. [2,19]	Greater reach, especially when supported by local languages and assisted access.
Artificial intelligence	AI-assisted triage, screening, surveillance and decision support. [1,13]	Faster detection and better support for clinicians when tools are validated.
Remote monitoring and IoT	Wearables and connected devices for chronic disease and home monitoring. [13]	Early alerts and improved long-term follow-up.
Digital health analytics	Dashboards and predictive analysis for programme and hospital management. [1,8]	Data-based planning and quality improvement.
Digital claims exchange	Standardised electronic claims and verification. [7]	Faster reimbursement and improved transparency.

Interpretation: According to the data presented, health informatics in India exemplifies a more intelligent, interconnected and patient-centric approach. Use of Interoperable records, mobile health, AI and IoT combined with analytics and digital claims could enhance the seamlessness of health care, early detection, quality of management decisions and transparency in reimbursement. However, affordability, privacy, local language and workflow integration will determine the real value of these trends, along with validation.

9. Recommendations

Health informatics in India must have an equity-first approach. To maximize equity, a range of services must be available alongside digital resources, including: assisted registration, health workers, help desks, and offline tactics to avoid exclusion for those with limited digital access. Special consideration is needed for rural populations, older adults, and low-literacy groups.

Hospitals and health facilities must focus on the integration of workflow. Digital systems must ease the burden and not add paperwork. Frontline health workers must be involved in the design, testing, and iteration of the systems. The training must also be iterative and ongoing, rather than a singular orientation.

The privacy of individual's data and cybersecurity must be a primary focus of the entire health system. Each digital health system must employ consent, role-based access controls, encryption, and secure, authenticated audit trails with accountability. Individuals must be clearly informed in simple language about how their medical information is not involved in a trade and is controlled.

Maintaining interoperability must be a foremost priority. In the absence of interoperability, digital health systems must not work to contain separate silos within the health system.

Finally, India must invest in comprehensive efforts for the evaluation and research of digital health systems. While avoiding gaps in health informatics, evidence must be the primary guide in the design of digital health systems.

10. Scope for Future Research

Future studies on health informatics in India should focus on measurable health outcomes, rather than just platform adoption. There are huge datasets available through digital health initiatives. Research should focus on whether digital records, telemedicine, and online registries increase adherence to treatment, decrease time and cost to the patient, and improve the quality of the services offered. Comparing health services with and without digital health tools will shed light on how digital health is being utilized and where it is lacking.

Real world research on interoperability is also very important. Creating an ABHA account and linking digital health records is a positive step; however, the next step is to determine whether health service providers and recipients are able to access these records and use them in the course of providing and receiving health care. Research should focus on the experience of consent, the completeness and accuracy of the records, the workload, and patient trust. This type of research should focus on system design and promote the use of the systems in both public and private health care. Research should also focus on the use of AI and remote health care technologies. Digital health care technologies should promote equity and quality along with economic considerations.

Research on digital health should aim for privacy-preserving digital health governance that enables a beneficial exchange of health-related digital data for health-related governance, planning, and service delivery. India needs data on the understanding of consent, grievance redressal, data retention and audits, and the preparedness and the practice of cybersecurity for various health facilities. Such studies would support the promise of health informatics for citizens and customers. There is a need for research on the implementation of digital health for small hospitals, Community Health Centers, and Primary Health Centers. Much of the digital health discourse is focused on large systems and platforms, but the actual service delivery relies on the quality of health care these large systems enable at the point of care. There is a need to study the infrastructural readiness, the workloads of health care personnel, the training required, the reliability of electricity and the internet, and the cost of managing digital health systems in financially constrained settings.

Preferably, research should be designed to accommodate varying community needs for digital health services. Diverse, digital, and urban community members' needs may be quite different from the needs of health care users from rural and tribal communities, the elderly, women, Members of the Disability Community, and low-literacy users.

It is important that the economic evaluation of digital health systems is prioritized. Careful consideration should be given to estimating the innovations that digital health systems may offer and the costs they may replace: unnecessary laboratory tests, transportation, administrative delays, and health program leakage.

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11. CONCLUSION

Health informatics has become integral to modern healthcare. It adds value to healthcare at various levels including clinical, administrative, public health, research and health financing. This is made possible through input, processing, and output of information in a systematic and meaningful way. In India, the rapid growth of ABDM, ABHA, linked health records, eSanjeevani, CoWIN, eHospital, and the National NCD platform demonstrates that information and communication technology in health is an integral part of health infrastructure.

The Indian dataset that is the focus of this paper shows significant progress in health informatics at population level. There are over 90 crs. ABHA accounts, over 100 crs. linked health records, 45.42 crs. eSanjeevani users, over 220 crs. COVID-19 vaccinations through the CoWIN platform and 74.97 crs. users of the National NCD platform. With effective governance, these population-scale initiatives have the potential to transform health system access, and improve service continuity, planning, and accountability.

Health informatics is not merely a technical fix. Achieving population-scale health informatics relies on the protection of privacy, interoperability, digital and data literacy, and equitable access, as well as improving the quality of health data and health services. Digitization of health systems in India has the potential to transform health services. However, the integration of technology with a human-centered design is crucial.

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