Health Management Information System: A Journey of digital health in India

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Abstract

Health information systems serve multiple users and a wide array of purposes that can be summarized as the generation of information to enable decision-makers at all levels of the health system to identify problems and make evidence-based decisions on health policy and allocate resources optimally. Prior to 2008, there was no uniform MIS portal to cater the need for Ministry of Health and Family Welfare in India. There was undue delays in receipt of data, Retrieval of old manual records was ineffective and time consuming, duplication of records was a setback to correct understanding, Monthly reports sent as hard copy was a challenge for data consolidation and analysis. Health Management Information System (HMIS) was thus developed in 2008 to facilitate better healthcare management system, as well as to integrate healthcare management at the various level such as village, Sub-district district and State levels. The Journey of HMIS started in 2008 with initial objective to upload district level consolidated figures on monthly basis, subsequently facility based reporting was initiated in 2011-12. Due to old technology (Hardware and Software), inter-operability issues, non-availability of web API, programmatic need and lack of decision support system, revamping of HMIS was initiated in 2019 and HMIS 2.0 was launched in 2020.

Key words: Health Management Information System (HMIS)

Background

Sound and reliable information is the foundation of decision-making across all health system and is essential for health system policy development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery and financing. A good Management Information System (MIS) has many roles to perform like the decision support role, the performance monitoring role and the functional support role. In today's world most agile and efficient data driven decision support system is needed by every organization be it Government or Private.

A good health information system brings together all relevant partners to ensure that users of health information have access to reliable, authoritative, useable, understandable, comparative data. Health information systems serve multiple users and a wide array of purposes that can be summarized as the generation of information to enable decision-makers at all levels of the health system to identify problems and needs, make evidence-based decisions on health policy and allocate scarce resources optimally (WHO, 2008). Data from different sources are used for multiple purposes at different levels of the health care system.

Prior to 2008, there was no uniform MIS portal to cater the need for Ministry of Health and Family Welfare. There was undue delays in receipt of data, retrieval of old manual records was ineffective and time consuming, duplication of records was a setback to correct understanding, monthly reports sent as hard copy was a challenge for data consolidation and analysis.

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The views expressed in this paper are of the author and they do not reflect the views of the Government of India.

In such a scenario, there was clearly a pressing need to provide tools and solutions that would improve healthcare management in the country. The only solution was to introduce a digital platform. World Health Organisation (WHO) identified Health Management Information System (HMIS) as a key building block of health system (WHO, 2007). In India, the emphasis has been laid on creation and utilization of an effective HMIS system under the National Rural Health Mission (NRHM), flagship healthcare program under the Ministry of Health and Family Welfare, Government of India.

National Health Mission (NHM) is a flagship programme of the Government of India to address the health needs of under-served rural areas and health concerns of the urban poor population. NHM encompasses its two Sub-Missions, the National Rural Health Mission (NRHM) and the newly launched National Urban Health Mission (NUHM). The main programmatic components include Health System Strengthening in rural and urban areas- Reproductive-Maternal- Neonatal-Child and Adolescent Health (RMNCH+A), and Communicable and Non-Communicable Diseases. The NHM envisages achievement of universal access to equitable, affordable & quality health care services that are accountable and responsive to people's needs (NHM, 2005).

HMIS was thus developed in 2008 to facilitate better healthcare management system, as well as to integrate healthcare management at the various level such as village, Sub-district district and State levels. The HMIS portal facilitates the flow of physical performance from the facility level to the Sub-district, District, State and National level using a web based HMIS interface. The portal provides periodic reports on the status of the health services performances and Human Resources and Infrastructure services facilities available.

Health facility level data enable health care managers to determine resource needs, guide purchasing decisions for drugs, equipment and supplies, and develop community outreach. The health facilities mapped on HMIS are Sub-centres (SCs), Primary Health Centres (PHCs), Community Health Centres (CHCs), Sub-District Hospital (SDH) and District Hospitals (DHs). Medical Colleges are mapped at SDH and DH level in respective States/UTs. As on 31st August, 2021, there were 726 districts and around 2.17 lakh health facilities mapped in HMIS Portal including 341 Medical Colleges (Mapped as SDH &DH in HMIS) and around 75 thousand Health and Wellness Centres (Mapped as SC & PHC in HMIS) reporting through HMIS (HMIS, 2020).

HMIS captures over 300 plus data items under Service Delivery and over 400 plus data items under Infrastructures and Human Resources on monthly basis. Service Delivery data items includes Reproductive, Maternal and Child Health, Immunization, Family Planning, Vector borne disease, Tuberculosis, Morbidity and Mortality, OPD, IPD Services, Surgeries etc. and Infrastructure and Human Resources includes Human Resources, Equipment, Cleanliness, Building, Availability of Medical Services such as Surgery etc., Super Specialties services such as Cardiology etc., Diagnostics, Para Medical and Clinical Services etc.

Journey of HMIS in India

In 2008, HMIS was developed with initial objective to upload district level consolidated figures on monthly basis for NHM programme monitoring. Subsequently from 2011-12, the facility based reporting was initiated and in 2016-17. The revamping and development of

new HMIS (HMIS.20) was initiated during 2019-20 and finally in December 2020, HMIS 2.0 was thus launched. The details of journey of HMIS in India is provided at Figure 1.

Due to proactive, timely and regular release of datasets/resources through Web Services/APIs on the Open Government Data (OGD) Platform (https://data.gov.in) in compliance with the National Data Sharing and Accessibility Policy (NDSAP), Ministry of Health and Family Welfare received Digital India award in 2016 and 2020 under Open Data Champion category (DIA, 2020). This award was received by the ministry primarily due to HMIS, timely and regular release of datasets in Open Government Data (OGD) Platform.

The development of a new HMIS was felt need in old HMIS (HMIS 1.0) due to its old technology (Hardware and Software), inter-operability issues, non-availability of web API, programmatic need and lack of decision support system. Therefore, keeping in view the need to revamp the old HMIS application and also ministry's view of brining of all health information system at a single Platform; it was decided to get a new HMIS portal on Integrated Health Information Platform (IHIP).

The primary objective of IHIP was to enable the creation of standards compliant Electronic Health Records (EHRs) of the citizens on all India basis along with the integration and interoperability of the EHRs through a comprehensive Health Information Exchange (HIE) as part of this centralized accessible platform. The IHIP of MoHFW has provision for capturing data at facility and beneficiary level (IHIP, 2017). The integration of HMIS online portal with IHIP ensure full use of all applicable government standards, including standardized facility listing, geographic and entity names, all geographic boundaries (up to the level of villages), population data and other relevant information.

The new HMIS was developed with technical support from the WHO. This was developed after series of discussion/deliberation with the software developers of the WHO.

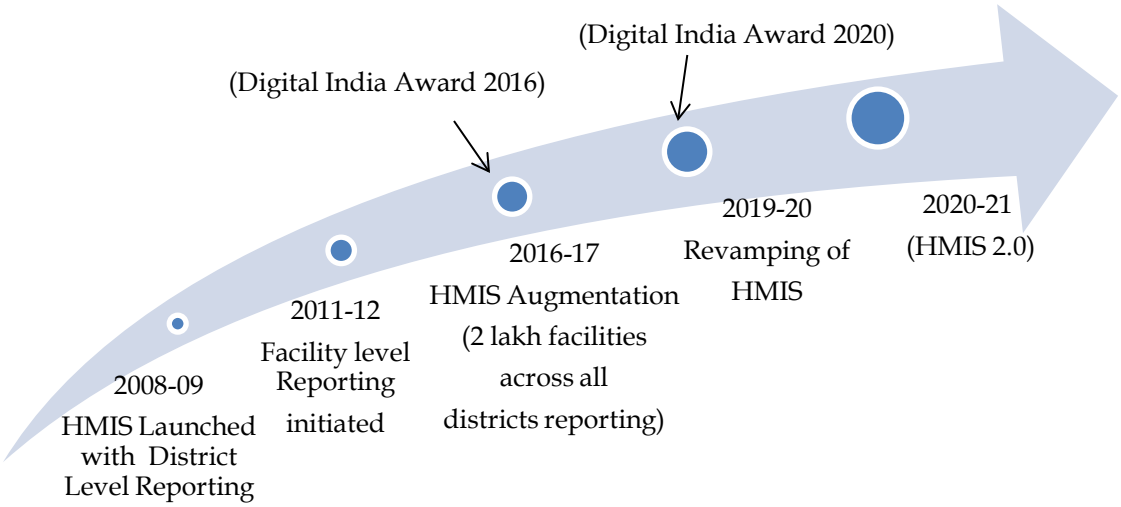

Figure 1 Journey of Health Management Information System (HMIS) in India

The key features of new HMIS portal are following:

I. Person Specific User Credentials (mapped to an Individual) for fixing responsibility to user for entering complete and correct data in the system.
II. Compatibility with multiple devices such as Mobile, Tab etc.
III. Flexible: Multiple facilities to one credentials, one facility to one credential
IV. National Identification Number (NIN) and Local Government Directory (LGD) have been used for unique identification of health facilities at village/block levels.
V. State specific administrative hierarchy as per LGD has been implemented and States can tag their health facilities and generate report accordingly.
VI. Provision for real time data entry and real time monitoring, Alerts, Analytics GIS Integration with layers up to road, village boundary etc.
VII. Data Visualization through GIS and Interactive Dashboard
VIII. API (Application Program Interface) developed to ensure direct linkage of HMIS online portal with other programme/software application of the ministry to enable automated extraction of aggregate data to HMIS.
IX. State specific generic API for fetching data from State MIS portal and
X. Interactive Dashboards and GIS

The new HMIS system developed is an excellent example of Re-engineering of Digital Transformation under Government of India which will be able to reduce the work-load on the frontline workers at facility level by integrating multiple health applications/software under single platform. HMIS 2.0 architecture is based on eGovernance Data and Information Standards (UID, NIN, ICD-10/11, LG Code etc.). It has ability to connect with My Health Record, eHospital Systems, AB-PMJAY etc. It has ability to connect with public and private hospitals, laboratories, and to exchange health data. There are 16 cloud servers procured from BSNL for HMIS 2.0. The Cloud servers are distributed among States as per requirements for efficient data management.

Quality Assurance in HMIS

Data from health facilities can provide immediate and ongoing information relevant to public health decision-making. The data must be of high quality, relate to all facilities (public and private), and be representative of the services available to the population as a whole. Although predominantly public health facilities are reporting in HMIS except around 12 thousand private health facilities (of around total 2.17 lakh health facilities reporting in HMIS).

Data quality of statistics is measured in the following Dimensions: (i) relevance, (ii) accuracy (iii) timeliness and punctuality, (iv) accessibility and clarity, (v) comparability and (vi) Coherence; however, all these criteria do not apply to Administrative Data.

Administrative data quality dimensions can be described by (i) Technical Checks: Technical usability of the file and the data in the file (iii) Accuracy: The extent to which data are correct reliable and certified (iv) Completeness: Degree to which a data source includes data describing the corresponding set of real-world objects and variables (v) Time related Dimension: Indicators that are time or stability related.

HMIS data is extensively validated at different levels before it is used for performance

monitoring of National Health Mission and other National Programmes. The details of Data quality assurance mechanism adopted and in-depth analysis done for performance Monitoring is provided at Figure 2.

Accuracy is defined as the extent to which data are correct, reliable and certified. In HMIS all these checks are built-in to see the accuracy of data.

Compare option: Compare option compare data with previous month compared. Data fields are highlighted as per comparison status. This gives instant view to data entry operator for any data quality/data entry related issues.

Inter-data validation checks: While saving data, as per prior inbuilt validation rules. There are two types of error shown on windows, which include warning and validation error. This informs the data entry operator for data quality issues (if any) and accordingly correction can be made. e.g., Number of registered women within 1st trimester (within 12 weeks) cannot be greater than Total number of pregnant women registered for ANC during the reporting month is example of validation error.

Random Check of Registers: Random checks of HMIS data in the registers at Facility Level is undertaken during field visits. Supportive supervision visits undertaken by the Staff at the various levels to verify HMIS data. During Common Review Mission of National Health Mission also, HMIS data is extensively used and verified. Population Research Centre (PRCs) are also involved in the data verification exercise of the HMIS data.

Scale of HMIS uses in India

There are 36 States/UT's, 726 Districts, 6858 Sub-districts, over 2 lakh health facilities, more than 3 Terabytes of database size (approx.) and around 1500-2000 concurrent users. Number of health facilities reporting through HMIS (HMIS, 2020) is provided at Figure 3.

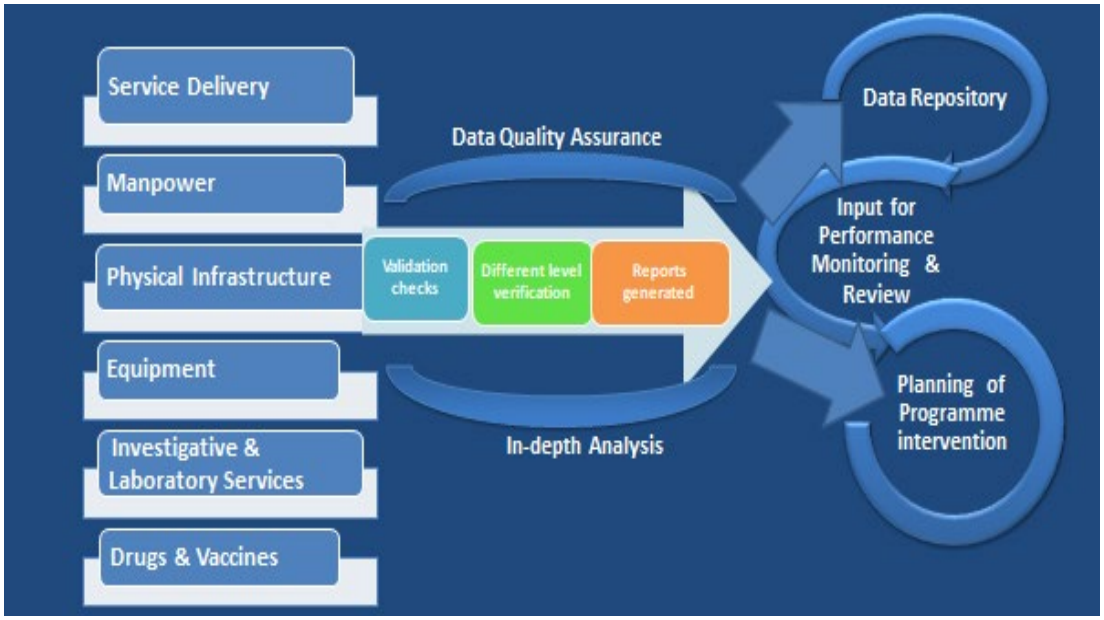

Figure 2 Data Quality Assurance and Performance Monitoring through Health Management Information System (HMIS)

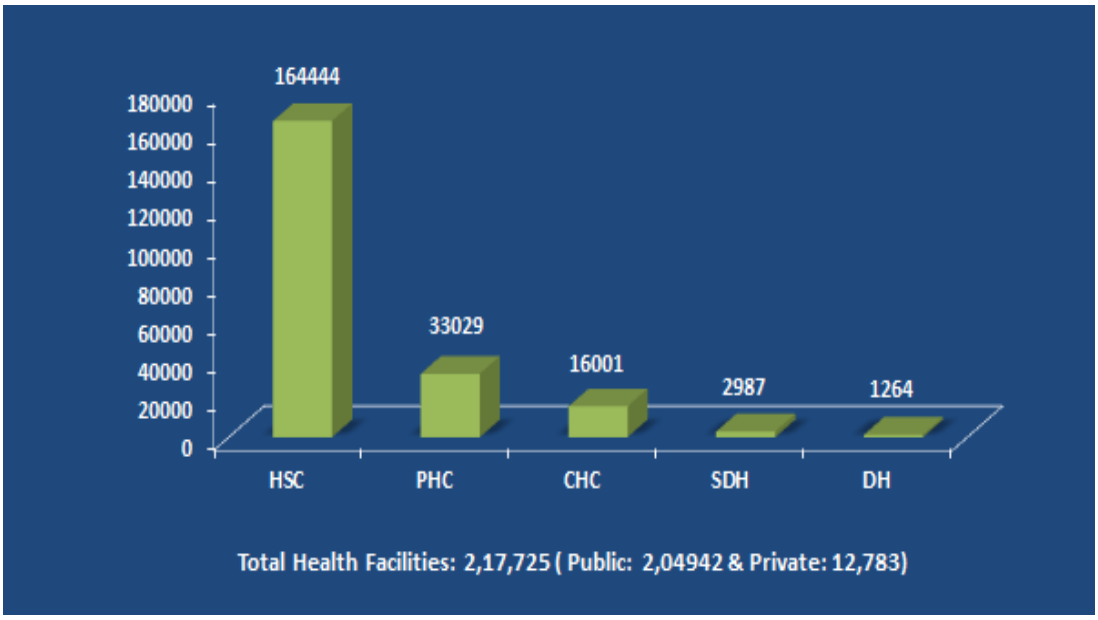

Figure 3 Number of Health facilities reporting through through Health Management Information System (HMIS)

Uses of HMIS

Apart from Monitoring and Evaluation of National Health mission, HMIS data is extensively used for performance evaluation of States/ UTs for Annual Plan of States/UTs. HMIS data is used Prime Minster Office Dashboard/Union Health & Family Welfare Minister Central Dashboard. It is also used in monitoring and supervision visits by officer of Central, State and district to health facilities. It is also used in annual Common Review Mission of States/UTs by Ministry of Health& Family Welfare.

It is also used in Grading of health facilities (CHC and PHCs) and DH Ranking and State Health Index of NITI Aayog for conditionality framework for incentive or dis-incentive under NHM to States/UTs. HMIS data is also used by different ministry/department for monitoring of their health related targets. The analytical reports generated through HMIS also provides gap analysis and evidence based course correction.

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