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# HIS Revolution in Bangladesh:
# A Journey from Data to Decision

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# Background

Bangladesh has made remarkable progresses in education, poverty reduction and health since independence in 1971. Life expectancy has risen, the fertility rate has dropped, the proportion of fully immunised children has grown, and maternal and child mortality rates have fallen steadily. All of these have been achieved with relatively low total expenditure on health, only 3.8% of the country's Gross Domestic Product or USD 27 per capita in 2011 (WHO, 2014).

The Ministry of Health and Family Welfare (MOHFW) offers healthcare services to the citizens via a network of primary, secondary and tertiary level facilities throughout the country. The primary health care services in the rural area up to community level are provided by the MOHFW but in the cities, however, primary healthcare falls under the jurisdiction of the Ministry of Local Government, Rural Development and Cooperatives (MOLGRD). The MOHFW is also positioned in the lead role to administer the Health Information System (HIS) initiatives through its implementing entities, i.e., Directorate General of Health Services (DGHS), Directorate General of Family Planning (DGFP), Directorate General of Drug Administration (DGDA), National Institute for Population Research and Training (NIPORT), and Directorate of Nursing Services. On the other hand, many national and international organizations are working with these government entities to strengthen health information systems in alignment with their own donor-specific mandates. This has resulted in a number of fragmented and disjointed HIS initiatives across the health programs. Most of these are being implemented at smaller scale and many are at different stages of maturity and not necessarily linked with the national health management information systems that are led by DGHS and DGFP. In addition, there is no or little coordination among the stakeholders at any stage of designing or implementation, which also contributes to create duplication of effort.

Undoubtedly, these numerous independent systems have made positive impact on overall health system achieving MDG targets. Yet, these silo initiatives put a tremendous data collection burden on MOHFW staff, lead to poor quality of data from divergent sources and minimum data use, coupled with lack of standardization to operate across the HIS and lack of vision of sustainability which undermines these efforts overall.

## Introduction:

HIS more generally are the nexus of information, technology and the accompanying processes to provide strategic access to information for decision-makers. It is comprised of resources, mechanisms and methods that facilitate the acquisition, storage, retrieval and use of data in information driven policy and programmatic decisions.

In recent years, there have been tremendous activities, investments and innovations in the development of HIS in Bangladesh to streamline the entire HIS eco-system in the country, encouraged in large part by Honourable Prime Minister Shaikh Hasina's vision towards achieving "Digital Bangladesh" by 2021 and of course, technological advancement including mobile technology platform. Following through, the MOHFW adopted a gradual and systematic approach in 2009 to modernize routine HIS through shifting from paper-based to online data collection and management system for entire ministry. This transition has generated a good deal of interest among the stakeholders and paved the way for innovations in the health sector.

## Summary of Bangladesh's routine HIS before the digital revolution

The collection of routine health information in the public sector in Bangladesh was done manually,

using paper forms. Those were completed by health workers at a decentralized level and submitted upwards, through the administrative hierarchy, until they eventually reached head quarter. The following is the summary of the existing system:

**Parallel systems**: The MOHFW had two main management information system (MIS) units – one in the Directorate General of Health Services and one in the Directorate General of Family Planning – each responsible for collecting routine data about the health services it provided, as well as logistics (i.e. equipment and supplies) and personnel. There were also smaller MIS units embedded into vertical programmes. These multiple systems operated independently of one another and the information which they collected was not combined at any levels, but there are overlapping among services.

**Overlapping reporting requirements**: Facilities and field workers were responsible for collecting certain types of routine data using standardised reporting formats. These forms, however, were not harmonized as a result the same information would often be collected multiple times, sometimes according to different definitions by different departments and programmes. This increase heavy paperwork burden and also make data of questionable quality, as field workers struggled to keep up with the reporting demands of multiple, poorly coordinated sub-systems (Munshi et al., 2009).

**Paper forms and ledgers:** Data collection systems were paper-based, with aggregate data being captured electronically at certain levels of the system. Hard copies of reports would be sent to the next highest administrative level where they would be combined (aggregated) with similar data from other facilities, sent to the next higher level, and so on, until they reached the national level (Munshi et al., 2009). There were chances for mistakes at every step, as data was continuously being compiled and forwarded up the chain.

**Slow channels of communication:** Communication between levels of the public health system relied on the postal system, land lines and fax machines. Generating an answer to even a relatively simple data request was extremely time consuming, as letters had to be sent by post from one administrative level to the next and back again.

**Insufficient manpower**: The MIS unit in the Health Services directorate was understaffed (160 out of 660 sanctioned posts were vacant in 2009) and had few personnel with the knowledge and experience needed to modernise the existing paper-based system. Statisticians – the category of employees responsible for gathering, compiling and submitting reports – were overwhelmed by data entry tasks. Beyond this, most did not have statistical training which could be drawn upon in designing research or surveys, undertaking data analysis or preparing reports about various health issues (Munshi et al., 2009).

The Management Information System (MIS) unit of DGHS adapted and introduced the District Health Information System (DHIS 2) in hospitals and health offices, from national to sub-district level. These facilities along with all the community clinics and the community health workers were equipped with IT equipment (laptop/desktop/hand-held device) with internet connectivity to smoothly run the system. As part of moving towards to the enterprise architecture concept, the MIS unit also established the National Data Warehouse to streamline the vertical data repository silos through an interoperable and standardized framework. At the outset of this paradigm shift, the DGHS has adopted an innovative and integrated approach (*better known as 'butterfly model"*) towards HIS strengthening that goes beyond the data collection which has been illustrated below:

- Supporting the adaption of a uniform software and infrastructure development
- Capacity development (individual and institutional, building national and international networks)
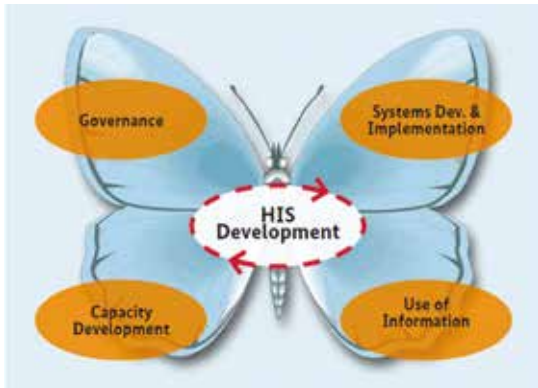- Strengthening HIS governance
- Building a culture of use of information

**Figure 1:** *The Butterfly Model*

A host of development partners which includes GIZ, UNICEF, USAID, WHO, UNFPA, EU etc. joined together with DGHS MIS to build capacity of health personnel at all levels for better data management and analysis and strengthening the feedback mechanism to improve the routine data systems. A pool of IT experts has also been identified and capacity was built on the management and maintenance of data centre including site support related to nationwide implementation of DHIS2.

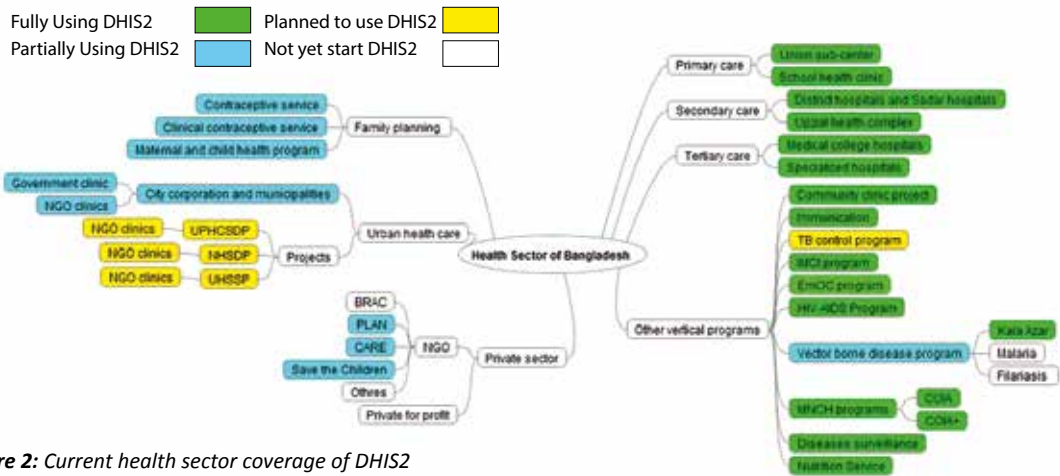The following diagram shows the current DHIS2 coverage in the health sector:



**Figure 2:** *Current health sector coverage of DHIS2*

The DHIS2 is firmly established with the MOHFW and more and more vertical programs are adopting it, the data is more comprehensive and readily available for usage and even the quality of data has been improved. As set of dashboard are developed in the DHIS2 system with the easy-to-use integrated tools for the managers and planners at the different level to monitor and evaluate their health program as well as improve the health service delivery. A regular set of hands-on training are being provided to the mangers from national to the sub-district levels to promote the decentralized decision making. DHIS2 Bangladesh implementation is now one of the largest implementation in the world.

Use of DHIS2 has the capability to promote an information culture that could trigger interest on data for various service delivery, patient follow-up and medical records of the patient. Easily scalable DHIS2 has extended the support to help different programs. For example, analysed data revealed that there were several child deaths due to pneumonia which triggered a need for adding a new vaccine to the immunization program and Pneumococcal Conjugate Vaccine (PCV) was introduced. Surveillance decreasing number and concentration of Kala-Azar patient in specific areas. In response, DHIS2 based Kala-Azar tracker was introduced to track. To improve health service delivery and improve the quality of

*Source: http://dashboard.dghs.gov.bd/*
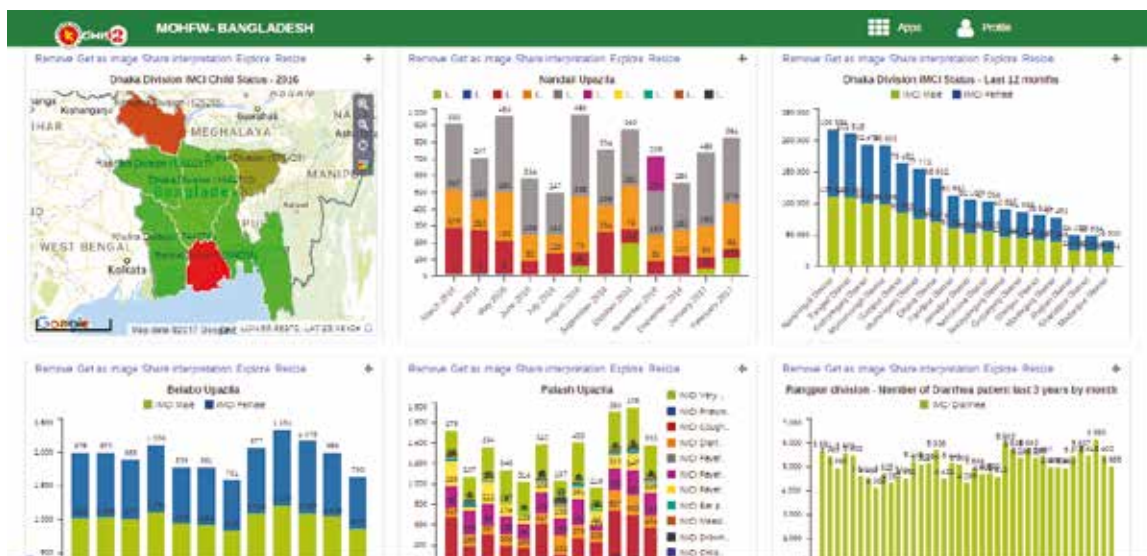
the collected data, several 'DHIS2 tracker' have been introduced; e.g. maternal health tracker, child health tracker, HIV-AIDS tracker, causes of death and few others. While, disease-specific patients monitoring is also started through DHIS2 tracker; e.g. cervical and breast cancer tracker. In order to get an overview, a brief on different MOHFW supported HIS tools are presented at the end of this report.

## Sustainability of DHIS2 as the national HIS platform

Currently, DHIS2 implementation in Bangladesh is supported by the HISP community worldwide. However, the key to sustain DHIS2 in the country is relying on the successful adaption through building local capacity (technical, technological and organizational), allocation of budget for management and maintenance and ensure smooth integration into different health programs. Understanding the value and magnitude of the deployment of the system in Bangladesh, the MOHFW has already allocated budget, created necessary IT infrastructure and built a pool of local developers to successfully implement the system without donors' support in the long run.

## Conclusion

Evident shows that the availability of necessary health data at every level of the health system contributes to better decision making which ultimately affects better health outcomes. At the country level, there is an imperative need to make health data public to ensure transparency and increased accountability. But this will require ensuring compatibility of different data systems to link with DHIS2 through an interoperability framework and bringing synergy among them in adherence to health data standards. The development of HIS in Bangladesh has been noteworthy, however, HIS sustainability calls for better coordination, partnership and collaboration among MOHFW and its entities and development partners to avoid potential fragmentation and improve data availability, quality and use for better programmatic and policy decision making.

# Brief overview on MOHFW supported HIS tools

## 1. Human Resource Information System (HRIS):

The HRIS gathers and stores a comprehensive set of MOHFW's human resources-related information to avoid redundant data burden for data management, and ensures effective verification process. The software does not only collect HR data, but has an automated transferring process used for transferring and posting of any staff. HRIS saves time, promotes uniformity and transparency and ensures integrity and accuracy of human resource related data. Noteworthy, any citizen can access the HRM database to get real-time vacancy rate with GIS data presentation.
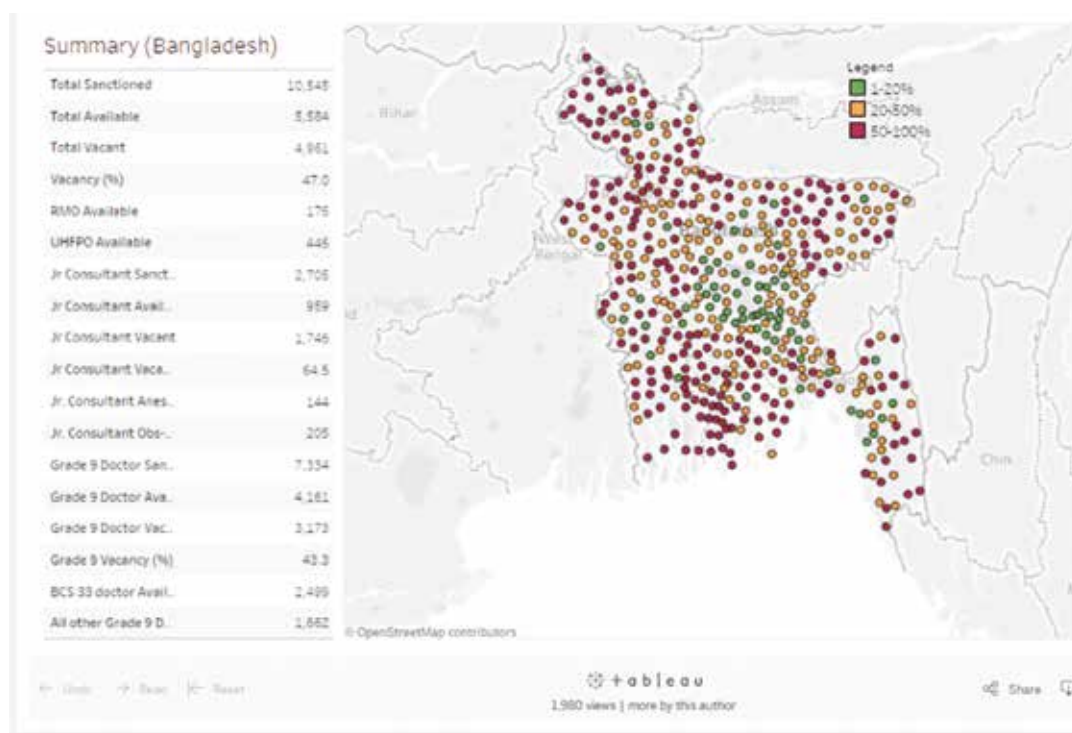


*Figure 3:* HRIS Dashboard (source: http://dashboard.dghs.gov.bd/)

## 2. Health call centre – Shastho batayon

Since April 2016, MOHFW with financial assistance from UKAID introduced a 24-hour call centre to get a free health consultation from registered doctors. People can avail this service by dialling 16263, or through facebook (www.facebook.com/shasthobatayon) or through website (http://16263.



*Figure 4:* IEC material for health call centre

dghs.gov.bd), or through SMS (to 015113 16263) or by e-mail (16263@mis.dghs.gov.bd). Besides the health-related consultation, this client-centric service is now extended to populate information about nearest hospital, clinic provide, ambulance service or even lodging complaints about public hospital, clinic and service.

## 3. Shared Health Record (SHR)

The Shared Health Record (SHR) is another system that facilitates the sharing of clinical information between health information systems to enable better patient care thus improving health outcomes. The SHR is the core to patient care. When a patient's clinical information is captured by a healthcare provider at any point of care, it is synced to the central SHR system. The SHR processes and aggregates information before submitting to the national HMIS for reporting and analysis based on DHIS2. The SHR is a means of allowing different services to share health data stored in a centralized data repository. One of the main features of SHR is that any system can be integrated with it using global standard interfaces, creating a seamless system for which any service provider can access to a patient record, regardless of their provider's location or facility type.
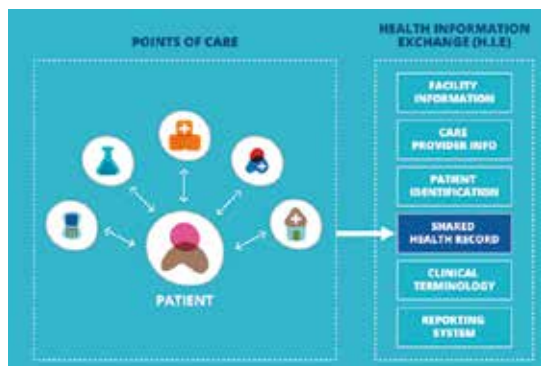


**Figure 5:** *Shared health record*

## 4. Public Dashboard on Health

The government of Bangladesh has already established a unique data visualization namely dashboard system for generating real-time health information. The data are publicly available with some limitations in terms of access to individual patient data due to privacy issues. Currently, the system idisplays different types of data that includes health data, human resources data, logistics data which is extensively helping all relevant. This innovation empowered and increased the efficiency of the managers in terms of utilization of data at optimal level during planning and program execution.



*Public Health Dashboard.* **Source:** *http://dashboard.dghs.gov.bd/*

## 5. Telemedicine

"Telemedicine is the remote delivery of healthcare services, such as health assessments or consultations, over the telecommunications infrastructure. It allows healthcare providers to evaluate, diagnose and treat patients without the need for an in-person visit". MOHFW started telemedicine initiative in the financial year of 2010-11. High quality telemedicine services have been provided in different levels of hospitals all over the country. Through this service, admitted patients in district and sub-district level hospitals can take suggestions from the doctors of specialized hospitals without need for visiting the higher-level hospitals. Besides hi-end video conferencing system and hi-speed internet, these telemedicine facilities are equipped with modern tele-gadgets. Now under DGHS, 43 hospitals are providing telemedicine service. 11 hospitals are upgrading to start these services and 10 hospitals have started procurement process. 'Info Sarker' project of ICT Division is providing support to another 25 sub-district hospital to start telemedicine service.

## 6. Telemedicine Service in Union Information & Service Centers

The Access to Information (A2I) programme under the Prime Minister's Office operates Union Information and Service Centers (UISCs) in 4,536 unions of Bangladesh. These centers provide various value added services to the local citizens against nominal charge using ICT tools. Local entrepreneurs run the centers while A2I provided computer, printer, digital camera, scanner and Internet modem to the centers. In 22 of the UISCs, telemedicine service using skype has been started on pilot basis. Doctors, sitting at the MIS office, are giving medical consultation on working days. The rural people are really welcoming the service and now the telemedicine service is one of the most popular value added services in the respective UISCs. Telemedicine is the appropriate approach for patients' to get video consultation on real time basis from a medical doctor in time of need which mitigates the challenges of non-availability of doctors in community clinics.

## 7. National Health Bulletin:

National health bulletin is automatically prepared based on the accumulated data from 13,000 community clinics, all upazila health complexes, all district hospitals and specialized hospitals. Any health facility can easily view its health service related information, critical



health indicators, human resource related data, attendance information etc. from regularly recorded evidences. Besides, divisional and district health administration can view comparative information of different health facilities at a glance, so that these can be presented in monthly meetings. This information can be stored in pdf format and does not even require internet connection.

## 8. Office Attendance Monitoring System

To ensure accountability of health personnel, the MIS of DGHS have established an Office Attendance Monitoring System at the health facilities (district and district and sub-district levels) which is linked with central server to transfer data on real time basis.

## 9. Complaints-Suggestions through SMS

An exciting and effective innovation has been added to the existing service line of MIS of DGHS of Bangladesh. Citizens are now taking part in ensuring accountability of the service providers in health system. This has been possible through introduction of a SMS-based complaints-suggestions box. In each of about 800 public hospitals, display boards, fixed to walls, describe *how to send complaints or suggestions by SMS* for improving services. Patients, their relatives and visitors of those hospitals who are not satisfied with the services, could send SMS which eventually hit to a web portal; ultimately informing MOHFW assigned staffs. The staffs call back to the senders of the SMS to understand more about the real situation; and then talk to the local authority to implement immediate solutions to the problem. This system ensures accountability of public hospitals. The difference between the traditional and this new system of suggestions or complaints box is that the suggestions or complaints are seen by the central authority directly, and therefore, corrective measures could be taken with stronger effects.



**Source:** *http://dashboard.dghs.gov.bd/*

## 10. eMIS Initiatives

USAID funded eMIS Initiatives is a program with an ultimate goal to establish elaborate HIS for rural areas. It began in January 2015 as a pilot in the districts of Tangail and Habiganj. The initiatives work through the government health systems—DGHS and DGFP—to replace paper-based data collection with software applications in tablets, laptops, or desktops. They are automating the work of rural health workers and of the family welfare visitors and sub-assistant community medical officers who provide services on behalf of the union health facilities. Details of all service encounters are captured electronically and saved in a database, which also serves as a population registration system (PRS), similar to the census. The RHIS data will be the basis for relevant online reporting to DHIS 2 by DGFP and DGHS.

## 11. Bangladesh eHealth Standards and Interoperability framework

The MIS of DGHS has taken an initiative to develop e-health standards and inter-operability framework for use in the database systems developed or to be developed by the health organizations and programs under the MOHFW and other ministries. Health organizations and programs of the NGOs, development partners and private organizations will also benefit from the standards and inter-operability framework. A draft guideline has been prepared which describes the standards and inter-operability procedures of the Bangladesh Health Information Systems Architecture (BHISA). Also, a geo-location and health facility registry have been developed:

### Geo Location Registry

To facilitate the establishment of interoperability between different health information systems, Bangladesh has developed standard registry system based on geographical areas. All the locations have been coded by the Bangladesh Bureau of Statistics (BBS) and made available online. The standard geo-codes used in the back of every software to make this interoperable while exchanging data.



### Health facility Registry

DGHS has developed a health facility registry system which is linked with HRM and DHIS2. The system has around 22,000 facility registered of both public and private with a unique 8-digit code. The system gives all the information about the facility with geo-location and also linked with the human resource management system.

## 12. Health Service through Mobile Phone

DGHS has initiated another service using which citizens can receive free health suggestions from doctors working in government health centers by calling certain numbers without need for coming to hospitals in person. Each district and sub-district hospital of Bangladesh were given mobile phones to provide the necessary health services. The numbers of these mobile phones have been publicized both locally and through the DGHS website (www.dghs.gov.bd). Doctors receive calls in these numbers 24 hours. This service has created opportunity to get medical advice by rich or poor people living particularly in rural areas

## 13. Defaulter tracking system

MOHFW with support from development agencies developed defaulter tracking system using DHIS2 - an open sources web-based software. The software is used by 14,000 community clinic (CC) located at lowest level of health tier. Every pregnant mother and under 5 (U5) children is registered online using laptop provided at CCs. The community health service providers (CHCPs) working in the CC work together with the Health Assistant and Family
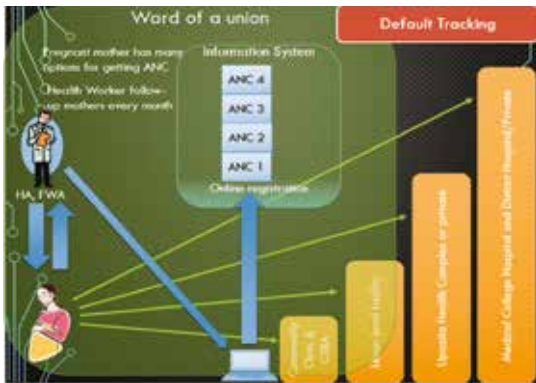
Welfare Assistant to make a unique list of pregnant mothers and U5 children in a weekly basis. They register them online and time to time update information by visiting household. The system allows to get list of all defaulters in it's dashboard and helps them to monitoring through system. Using online list, the CHCP makes phone call to motivate the mother and child to come to facility for scheduled services. The health managers sitting in higher level can also monitor online and can provide timely direction to the supervisors to ensure adequate maternal and child services. The system captures all services including provider's information in one platform. The data shows significant reduction on maternal and child deaths at community level.

## 14. MOHFW Supply Chain Management Portal (SCMP)

The MOHFW Supply Chain Management Portal (SCMP) (https://scmpbd.org/) is a web-based portal accessible by the ministry, procuring entities, line directors, drug administrators, hospital staff, and stakeholders. This comprehensive system tracks procurement; maintains specifications in a comprehensive product catalogue; facilitates procurement planning of goods and services, package development, and tracking; and maintains linkages with drug registration to efficiently and effectively monitor the health ministry's procurement management. In addition, the electronic logistics management information systems (eLMIS) for both DGFP and DGHS are part of the SCMP and track the stocks of reproductive, maternal, newborn, and child

health commodities up to service delivery points and Coummunity Clinic levels. This platform has been made interoperable so that DHIS2 and SCMP and DHIS2 and eMIS can exchange logistics data, and it is serving as the national central logistics data repository. The SCMP visualizes the logistics data through an interactive "business-intelligence," drilled-down dashboard with GIS features to facilitate data-driven decision making.



*Source:* DGFP eLMIS https://scmpbd.org/index.php/lmis-dashboard

### Asset Management System (AMS)

Electronic AMS tracks the status of costly and lifesaving medical equipment at different levels of health facilities under DGHS on real time basis. This system enables MOHFW and donors to track information related to medical and non-medical equipment, and thus improve transparency, minimize loss and misuse, and allocate equipment where the need is the greatest, ultimately improving access to services.

## 15. DGDA web Portal

This web portal is a repository of drug registration related data    and also contains information, circulars, documentation, meeting minutes related to drug registration in Bangladesh. The site also has the dynamic list of pharmacies (drug stores), allopathic and traditional drug database, manufacturers, imported drug information, valid source of raw materials. One  of the section contains option for monthly report submission by field staff, which contains visit, license update, name change, sample

collection and test result collection etc. As part of national pharmacovigilance program, the system also incorporated the Adverse Drug Reaction (ADR) database to track the adverse events of patients.



*Source: http://www.dgda.gov.bd/*
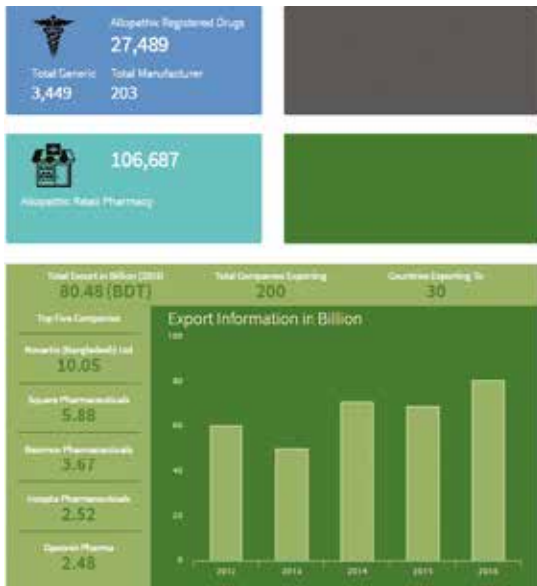
## 16. Maternal Perinatal Death Surveillance and Response (MPDSR)

In 2016, Maternal Perinatal Death Surveillance and Response (MPDSR) which has been aligned with the global Maternal Death Surveillance and Response (MDSR) developed by World Health Organization (WHO). The government is in process of its national scale up to establish a comprehensive surveillance and response system to address maternal and newborn deaths. The health care providers at different level at community and facility will able to implement MPDSR activities by notifying maternal, neonatal deaths and stillbirths as well as reviewing deaths (cause of death) to prepare action plan based on the findings for reduction of future maternal and neonatal deaths in Bangladesh.

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