“Health Management Information System”

Health IT initiative of Govt. of Tamil Nadu

M.S. Shanmugam. IAS
Project Director
Tamil Nadu Health System Project
Three Tier Health Care delivery in Tamil Nadu

- Directorate of Medical Education
  - Tertiary Care
    - 69
- Directorate of Medical & Rural Health Services
  - Secondary Care
    - 266
- Directorate of Public Health & Preventive Medicine
  - Primary Care
    - 10,595

- Medical Colleges: 20
- MC Hospitals: 49
- HQ Hospitals: 31
- Taluk: 157
- Non – Taluk: 78
- HSCs: 8,706
- PHC (Rur): 1,754
- PHC (Urb): 135
Health Management Information Systems (HMIS)

- HMIS developed by Tamil Nadu Health Systems Project for:-
  - 267 secondary care hospitals
  - 20 Medical College (MIS along with CMS – college management system) & 49 hospitals
  - 1771 Primary Health Centres
  - One Medical University (UAS – University Automation System)
- Conceptualized to provide real time critical health data
- Rs. 215 Crores project funded by world bank (reimbursement loan)
- IT infrastructure provided for Govt. hospitals with centralized servers and TNSWAN Connectivity for web based application
- Ten thousand users and one lac patients are cycled in the system daily
- On & off site data back up available
- No data entry operators - Medical and Paramedical staff handle user friendly screens
Components of HMIS

- HMS - Hospital Management System
- MIS - Management Information System
- CMS - College Management System
- UAS - University Automation System
Hospital Management System (HMS) Modules

- Registration
- Out patient consultation
- Inpatient admission
- Lab, X-ray & other investigations
- Pharmacy & Main stores
- Biomedical Waste Management
- Blood Bank
- Diet
- Linen
- Online daily report generation
- Final diagnosis mapped to ICD-10 classification
- Medical Records department

The Modules are unique for the type of users
These modules are regarded as patient management information system
Advantages of HMS

For Patients

- Unique Patient identification number (PIN)
- On next visit, no registration queue
- Prescription & Lab reports printouts are given to the patient
- Old records available on line - safe for a longer period of time
- Patient can visit any secondary care hospital across TN with PIN

For Doctors

- Saves a lot of time
- Drugs/Lab investigations can be grouped into packages (Treatment Kits) for prescription.
- Can view previous clinical reports on line
- Repetition of previous prescription with a single click – useful in Chronic diseases
- In certain cases doctor can follow Standard treatment guidelines (Master data)
Advantages of HMS

For Pharmacist

- Drug stocks are updated upon each drug issue
- He can monitor expiry dates and batch number of each drug.
- Need not count the tokens & consolidate them for stock position.
- The Warranty / AMC of equipment can be easily tracked.
- Transparency and accountability in managing drugs, equipment stocks.
- **Interface with TNMSC** software for online indenting.
- Automated entries of drugs with Batch no. Expiry date etc. into main store stock from TNMSC warehouse.

For Nurses

- Saves a lot of time- need not maintain too many registers
- Diet, drugs & linen -indenting can be done from wards
- Ward inventory made easy, Drugs expiry dates monitored
- Lab investigations results can be viewed from the ward
- Discharge summary given to the patient as print outs
- Ward transfer in & out managed effectively
- Helps to monitor and manage the blood bag availability precisely
- Handing over and taking over of charges, patients census made accountable and transparent
Advantages of HMS

For Administrators

- This predominantly functions as decision support system
  - Hospital level for Chief Medical Officers
  - District level for Joint Directors of the districts
  - State level for HODs/Directors

- To allocate human resource to various departments based on the utilisation by patients
- To redistribute drugs between hospitals from where more stock is available
- To prepare the budget requirements based on the trend of utilisation drugs and other items.
- By viewing the TNMSC stock position decision can be made to procure by local purchase in case of warehouse shortages
- Ability to track the breakdown of systems and facilitate its early rectification
HMIS – Project Rationale

- No real time data available to monitor the performance of the hospital
- Evidence based program management was a challenge
- Undue delays in receipt of data
- Retrieval of old manual records was ineffective & time consuming. Duplication of records was again a setback within the hospital
- Monthly reports sent as hard copy - a real challenge for data analysis/comparison
- Drug & equipment inventory - maintenance and tracking of warranty/AMC more cumbersome
- Lack of standard names and codes
HMIS - Policy Initiatives

- Issue of government orders for:
  - Implementation, Sustainability & Usage
  - Fixing of responsibility on the end users
  - Budgetary provisions for maintenance & support
  - Removal of Manual records

- Creation of new posts at district level and state level to support ICT interventions

- Instructions to the Heads of Departments and Directorates to use data from HMIS for purpose of monitoring, review and analysis

- Instructions to dispense away with the system of manual reporting and instructions to audit teams

- Formation of a dedicated team at the Directorate

- Establishing a centralized help desk at the Directorate
Government Orders issued for HMIS

➤ **Software**
- G.O (2D) No. 68 H&FW (EAP1/1) Dept. Dated: 29.08.2005 - Pilot, Phase I & II
- G.O (MS) No. 102 H&FW (EAP1/1) Dept. Dated: 01.03.2011 - Phase III

➤ **Hardware**
- G.O (MS) No. 223 H&FW (EAP1/1) Dept. Dated: 08.07.2008 - Pilot
- G.O (2D) No. 87 H&FW (EAP1/1) Dept. Dated: 29.07.2008 - Phase I
- G.O (2D) No. 102 H&FW (EAP1/1) Dept. Dated: 16.09.2010 - Phase II
- G.O (MS) No. 102 H&FW (EAP1/1) Dept. Dated: 01.03.2011 - Phase III

➤ **Human Resource**
- G.O (2D) No. 88 H&FW (EAP1/1) Dept. Dated: 21.10.2009 - Phase I
- G.O (2D) No. 87 H&FW (EAP1/1) Dept. Dated: 14.08.2010 - Phase II
- G.O (MS) No. 102 H&FW (EAP1/1) Dept. Dated: 01.03.2011 - Phase III

➤ **Fixing up of Responsibilities**
- G.O (Ms) No. 10 H&FW (F1) Dept. Dated: 14.01.2011
## HMIS Budget

### Hardware Budget

<table>
<thead>
<tr>
<th>S.No</th>
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<th>Budget in Crore Rs.</th>
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### Software Budget

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**HMIS - Process Initiatives**

- For Software requirement specifications (SRS) thorough study of the entire health system and its process were studied by the Software Application Developer - TCS
- Extensive training sessions were conducted for various categories

  **Stakeholders meetings**
  - Weekly reviews &
  - Follow up action taken

  **Help desk set up**
  - Protocol established
  - Escalation matrix followed
  - Central helpdesk for facilitation and coordination
  - Equipment breakdown also monitored by HD

- **IT coordinators placed in each district**
  - All infrastructure issues related activities
  - Application support and training
- Form e-core team in individual hospitals and solve IT issues
- Three Server Administrators for Server Management
HMIS Project Management Unit Structure

- Project Director
  - Deputy Director
    - Medical Officer
    - Medical Officer
    - Help Desk
    - DITC
    - Server Admin
    - e-Core Team at the hospitals
- ELCOT
  - Vendors
  - TNSWAN & VPN
  - State Data Centre
Procurement Process

- TNMSC (Pilot & Phase I) & ELCOT (Phase II & III) are the procurement agencies for TNHSP
- World Bank Procurement methodology was adopted for the procurement process
- The Software Consultant was initially identified by Quality Cost Based Methodology and then the services were extended by Single Source Selection Methodology
- The hardware vendors were identified by Competitive bidding (International & National) and national shopping methodology
- The following were the vendors involved in the HMIS implementation in various process
Software Development Process

1. Software Requirements gathered from the Eminent Professors in the field
2. SRS documents prepared by TCS and approved by TNHSP
3. Templates were designed and approved through User Acceptance Testing
4. Central training & onsite handholding
5. Implementation in Pilot Followed by three Phases
6. Change request from the end users incorporated into the application after TNHSP approval
7. Certain application bugs were notified and corrected as a maintenance support
HMIS (HMS/MIS/CMS) Application Software

- GoTN owner of the application
- Developed by Tata Consultancy Services
- Centralized web based application on open source platform
- J2EE (Java 2 enterprise edition)
- Postgre SQL data base
- Glass fish Application Server
- Solaris Operating System
- Follows industry standard-three tier architecture viz.
  - (Presentation, Business logic and Data layer)
- SUSE Linux OS at the end user level-user friendly screens
- Currently TNHSP is migrating MIS / CMS application into
  - Linux, Apache, Jboss, PostgreSQL platform
  - due to change in support of Glassfish
HMIS Application Training to Users

**Pilot, Phase I & II**
- Central basic computer knowledge training and introductory training on the HMIS modules at the district ELCOT centres
- Onsite training with handholding of all the users at the hospital premises itself.
- Approximately 18,000 users were trained by TCS in these phases.

**Phase III**
- Basic computer knowledge training and introductory training on the HMIS modules at the seminar halls available at the institutions
- Onsite training with handholding of all the users at the hospital premises itself.
- Approximately 20,000 users are proposed to be trained during the HMIS Phase III implementation.
Change Management

- The Change management was the biggest challenge faced during the implementation.
- It was managed by the issuance of a Government Order fixing the roles and responsibilities of each of the Hospital staff and officials.
- The users were given training and then refresher training so that they continue to use the application.
- The users were motivated by the reduction of work load by the application (even though there was delay during the training phase).
- The users who were utilising the application were appreciated for their effort during various review meetings.
- Marked reduction of work to pharmacist, made them motivate other users to come online in their institutions.
- The hospital workers who had less educational knowledge took the system well, since they had pride in using a computer (self motivation).
- DPMU coordinators continued to motivate and ensure the HMIS usage at the institutions.
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<tr>
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## Information Technology Hardware

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HMIS Server Hardware

- Phase I – 10 Sparc Servers
- Phase II – 6 Sparc servers
- Phase III – 19 X86 Servers
- SHDRC – 13 X86 servers
HMIS Server Architecture (Current)
Back-up at State Data Centre

- In case of disaster we have:
  - Tape back-up
  - NAS-Network array storage (cluster hard disc)
    (Two NAS available — on site & off site)
  - Disaster Recovery site for TNSDC — proposed

- STQC - Standardization Testing and Quality Certification ensures all mandatory requirements for TNSDC

- HIPS - Host intrusion prevention system is provided for the application
TNSWAN Connectivity

TNSWAN NOC → DISTRICT COLLECTORATE

TALUK OFFICE → BSNL EXCHANGE → HOSPITAL
Local Area Network in Hospitals

TNSWAN

Router → Ethernet Switch 1 → Ethernet Switch 2 → LAN → LAN → LAN

LAN
HMIS - Paradigm Shift

- Automation of work flow process at the hospitals
- Manual Registers/Records removed from hospitals
- Real Time monitoring of hospitals performances
- Electronic Medical records
- Standardization of health systems and processes
- Computer skill development among the hospital staff
- Online maintenance of drug inventory/equipment inventory
- No data entry operators-involvement of regular staff
Levers of success

- **Strong ownership and support from Top Health Administration**
  - Communication to hospitals – by State authorities
- **Supporting Government orders**
  - Mandating usage of Online system
- **End users trained to use system**
  - No data entry support
- **Procurement Policy**
  - TNMSC & ELCOT-as per norms
- **Implementation follow up by TNHSP**
  - Regular stake holders meeting to discuss various issues and resolve the issues
- **Utilizing State Investments in establishing the Infrastructure**
  - State Data Centre and TNSWAN
- **World Bank’s periodical monitoring and review helps to attain the benchmark during implementation**
OP Registration
OP Consultation
Pharmacy
Laboratory
The Ultimate Goal
OP Ticket

Before

After

PIN & Reg. details
Diagnosis
Findings
Lab Report
Prescription
M.O. Name
Management Information System (MIS) Modules

Unified Health Reporting system

- **Clinical Information (auto populate+)**
  - Patient census, Morbidity, Mortality,
  - Patient services, Immunization,

- **Ancillary Services**
  - ISMR-Institutional Services monitoring report
  - Blood Bank, Lab services, etc.

- **Administrative Information**
  - Buildings, Finance, Personnel, Vehicle, etc.

- **Program Information**
  - All the National programs like Malaria control, Filaria control, Blindness Control, Tuberculosis program, etc.

MIS reports (public health information) are sent every month online to HQs.
State Health Data Resource Centre

- It is being created as a central repository of data for all tertiary, secondary and primary health care facilities in the state (currently 17 verticals reporting health data)

- Cost of the project – Rs 10.82 crores; Contribution from ICMR / NRHM / WB apart from State Govt. fund

- To integrate and utilise the data and convert them into information and knowledge to improve the health outcomes in the state through performance, policy evaluation and enhancement

- Huge volume of Data collected through HMIS, other e-Health application and manual reports from few directorates has to be analysed, hence SHDRC proposed.
SHDRC: Goals

- Purpose Driven Data Monitoring for Evidence Based Decisions
- Preventive Action
- Corrective Action
- Epidemic Response
- Resource Planning
- Performance Management
- Policy Analysis
- Health System Research
Hurdles – But Still Running

- Lack of coordination among various vendors (no single vendor for IT infra)
- Mapping existing process and rationalization of input forms for standardization
- Damage caused by local factors – Construction, Drainage work etc.
- Power crisis and poor backup from UPS
- Mind-set and Involvement of the hospital staff
- Change Management and Total system transformation
- Disruption of connectivity
- Delay in server stabilisation
- Lack of basic computer knowledge among some employees
- Safe custody of HMIS supplies (hardware)
Recognitions

- Winner of the e- India jury award for “e- Health- best Government Initiative/policy for the year 2009”
- Selected paper for Oral presentation at e-Asia 2009 International conference at Colombo during Dec 2-4, 2009
- Selected paper for Oral presentation at Med-e-Tel 2010 International conference at Luxembourg during April 14-16, 2010
- International Publishing houses -VDM International Publishers, Mauritius and Lambert Academic of Publishing(LAP), Germany -have offered to publish HMIS implementation in the form of a book
- Finalist CSI –Nihilent e-governance awards 2011-12
- National e-Governance award-Gold 2011-12 under category ”Exemplary reuse of ICT based solutions”
- Juror’s Award – The Manthan Award, South Asia & Asia Pacific, Dec 2013
- e-India Awards 2014 – for implementation of HMIS by TNHSP
Thank You!