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Building an statewide hospital information infrastructure in India

Lecture Nov 3rd 2014

(NB. some images removed..)
Articles:


• Plus:
Storyline

• HISP India worked with NSTATE on DHIS implementation
• 2009: MoU (Memorandum of Understanding) incl. «ehealth architecture», tender process
• Development, deployment, in pilot hospital + in 20 hospitals (contracted) + more…
• Spread to other Indian states, other countries
• Developed based on OpenMRS…
OpenMRS (Open Medical Record System)

• Established in 2004, non-profit (open source) community, led by Regenstrief Institute and Partners In Health (Boston)

• OpenMRS is “a software platform and a reference application which enables design of a customized medical records system with no programming knowledge”
  – Core: Concept dictionary

• But: EPR system, not «hospital system»
• INGO team: 4 developers, 7 public health people

• Team designed 10 core modules and new work processes in a participative process
ROUTINE PATIENT FLOW AT DDU

REGISTRATION → OPD → BILLING → REFERRALS → EXTERNAL REFERAL

- DRUG DISPENSING
- OPD Follow up
- INVESTIGATIONS (Gen lab/Radiology/national prog labs/blood bank)
- PROCEDURES
- MINOR PROCEDURES

- INTERNAL REFERAL
- IPD
- OTHER OPD'S & NATIONAL PROGS

PATIENT

- LABOUR ROOM → EXTERNAL REFERAL → OT → IPD → DISCHARGE
- EMERGENCY (Stabilization) → REGISTRATION → OPD → IPD → PROCEDURES → EXTERNAL REFERAL
Working with staff

• Participatory Design process
  – Work flow study, sketches, mock-ups, discussions with clinical and admin staff
  – Next slides: examples from what was presented in consultations with end users

• Example 1: documenting patient information
Provisional Diagnosis: Ac

Ac appendicitis
Ac. Cholecystitis
Acid Peptic Disease
Acute/chronic Retention of Urine

Management Plan:
Post for procedure: Search for Procedure

Internal Referral: -- Select CPD --
External Referral: -- Refer to --

OPD Visit Outcome:
- Follow Up
- Cured
- Died
- Admit

Conclude Visit
Patient ID: SHDDUXxxxxx

Name: 

Patient category: 

Diagnosis

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<thead>
<tr>
<th>A-B</th>
<th>C-F</th>
<th>G-L</th>
<th>M-P</th>
<th>S-ZA</th>
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<tbody>
<tr>
<td>A1 Diagnosis</td>
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<td>A2 Diagnosis</td>
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Provisional Diagnosis:

Ac appendicitis
Ac. Cholecystitis
Acid Peptic Disease
Acute cholecystitis

Add note:

Management:

Post for procedure

Internal Referral:

OPD Visit Outcome:

- Follow Up
- Cured
- Died

Admit

Conclude Visit

English (India) | English (United Kingdom) Last Build: Apr 09 2010 01:38 PM Version: 1.6.1 Build 12909
• HospIS: accumulate information for revisit patients
  – Better patient care + analysis of services

• OPD: high workload, sceptical to HospIS
  – Selective documentation: chronic conditions only
EXAMPLE 2: Standardization of radiology reports

BEFORE:
Radiology reports written in free text

Staff’s concern:
Too much to type into system
Hospital radiologist involved other colleagues in state, who jointly defined:
- List of tests (36 test but flexible to add more)
- For each test: relevant parameters to report on
- For each parameter: result options

Joint (state-wide) standardization process
- Community building and quality improvement

<table>
<thead>
<tr>
<th>Radology Tests</th>
<th>Parameters</th>
<th>Result Options</th>
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<tbody>
<tr>
<td>Pancreas</td>
<td>Size</td>
<td>Actual Size</td>
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<td></td>
<td>Outline</td>
<td>Regular / Irregular</td>
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<td>Echotexture</td>
<td>Isoechoic/Hypoechoic/Hyperehoic</td>
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<td>Mass Lession</td>
<td>Present / Absent</td>
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<td>Size of Mass Lession</td>
<td>Actual</td>
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<td></td>
<td>Echotexture of Mass Lession</td>
<td>Isoechoic/Hypoechoic/Hyperehoic</td>
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Re-organising work with HospIS

• Registration before:
  – Not compulsory for all services
  – Needed «OPD slip» to see an OPD doctor
  – (Patients might reuse old OPD slips)
  – No queue control, no overview of OPD load

• Registration after:
  – Compulsory registration of old and new patients
  – Placed in queues by HospIS system, queues displayed to OPD staff and patients called acc. to queue no.
  – Additional information collected
Re-organising work with HospIS

- Billing before:
  - Done distributed (labs/exam. rooms)
  - Referral to lab by OPD doctor: go to «room 31», then to lab to pay

- Billing after:
  - Centralized to one site (freeing time for lab staff)
  - Linked to labs (not bill for unavailable services)
  - Eliminated the visit to «room 31»
«Judicious design»

- Laser printers -> dot matrix, pre-printed paper

- Printing the «OPD slip» to be annotated along the process (tests, medicines)
Iterative, evolutionary, careful ‘cultivation’

- Reduce complexity
  - 10 “core” modules (clinical care, hospital adm) kept, while 10 ‘nice to have’ modules stripped off (e.g. modules for diet, laundry or archiving digital images)

- Context-aware design
  - Hybrid design (digital/paper), e.g. OPD slip. Dot matrix printers, local support

- Stepwise introduction
  - Start with ‘simple’ and visible modules
  - Adjust when going to new settings
Scaling to other hospitals

• Now in 20 district hospitals across state
  – Plus 2 medical colleges, + 15 PHCs
• Process: Site visit, situational analysis, customization of system, initial support
• INGO’s emerging realization what a «hospital information infrastructure» really is and demands.
  – More than a number of identical systems installed in a various sites.
  – Something distinctly «infrastructural»
• What is «infrastructural»? We can see Infrastructure as:
  – underlying (invisible, enabling, supporting work)
  – having spatial extent (multiple sites, users, usage needs, conditions)
  – having temporal duration (sustainability, support)

• Work of infrastructuring:
  – the work associated with the building of an II

• Infrastructuring of work:
  – the effect of the II building on the ‘core’ work
  – example: …
Patient registration: more data captured

• Patient demographics
  – name, age, gender, address, phone number, next-of-kin

• Patient category
  – health insurance type/number, Below Poverty Line beneficiary, state govt. employee, central govt. employee, physically challenged

• Referral information:
  – referred from type of facility (primary health center, health post, community health center)
  – reason for referral (investigation, surgery, TB etc.)

• Instructions on which OPD room to visit.
..reflects multiple information needs…

• Hospital management
  – patient demographics and financial categories
• Public health officials
  – patient addresses and referral reasons
• State authorities
  – standardize patient registration across the state
  – overall picture of health system performance and health situation
Informating health management

- It is now possible to
  - examine referrals (where patients come from, for what service, demographic profiles),
  - disease profiles (diagnoses disaggregated by age and gender),
  - hospital management (billing, stocks, patient loads, bed utilization, etc.) and
  - epidemiology (disease incidence and prevalence, patterns in the spread of diseases).
«Informating» health management

• Such data can be used to
  – identify and strengthen weakly performing units
  – construct disease and mortality profile
  – strengthen administrative processes
  – improve resource optimization
  – conduct inter-hospital comparisons of performance, resource utilization and disease burdens.
  – strenghten epidemiological research and analysis at the state level
Shoshana Zuboff: «Automate/informate»

• Zuboff’s argument:
  – Automation of production (e.g. CNC) produced information. New skills required from workers to deal with data instead of physical processes.
  – Presence of information also opens new potentials
    – «informating» the work and the organization

• (Our paper aim to examine this in an II context)
HospIS, automating and informating:

• Some examples of «real automation» (understood as delegation of work to the system):
  – computerized inventory control, queue management, report generation

• Most: Intended redesign and change of work to achieve efficiency, transparency, quality
  – Disciplining patients, standardize documentation, simplify billing structures etc
Changes: not the same for all

- Work of lab technicians simplified
- Additional work for registration clerks and for OPD doctors (more data to be entered)
- New work tasks (support)
- Work of IPD nurses: simplified (patient management) and «complexified» (drug dispensing)
New linkages drive changes

• Within organization:
  – Better logistics with tighter couplings (info flow) between departments

• Between hospitals
  – Possibilities for new types of collaboration (ex. pharmacies, blood banks)

• At state level
  – Possibility for ‘informed’ decision making based on more immediate and richer data
• Automation of work (delegating to the ‘machine’) accompanied by additional work (to feed the ‘machine’)

• Informating not only a «by product» of automating, but can also emerge from a deliberate attempt to «informate» the organization

• Linkages/connections central
Dependencies between process strategy, architecture and governance approach

Architecture
(the structural characteristics of the II)

Process strategy
(temporal organization of activities, e.g. sequencing, phasing, prioritization)

Governance
(structures for regulating process, e.g. for participation in decisionmaking)
State-level architecture decisions

• Online installations communicating with one central db (store all data centrally)
  – or

• Distributed installations (local dbs) to communicate with central db (send reports to data warehouse)

• Debated in several rounds (workshop Jan 2012)
State-level architecture decisions

• Some factors:
  – Connectivity and uptime of state WAN?
  – Competency to support local installations?
  – Uncertainty about regulative requirements (new data protection legislation coming)
  – Relatively little movement of patient, little need to share patient data across facilities

• Decision: local servers for patient data, aggregated data to be exported to state’s data warehouse daily.
Localizing the data model

- Open MRS: ~ 2500 concepts (but oriented to ART)
- Millenium Village Project (considered global best practice and mapped to ICD10 and SNOMED CT) ~45 000 concepts
- INGO decided to develop own concept dictionary w/3500 concepts (from practice)
  - Generic/common and specific
- Curatorship: developers -> PH/clinical staff
- Appropriate model for governance of metadata? State? INGO (national/international)
Contracts, procurement etc.

• Need for a way to assign responsibility for e.g. HW procurement, LAN design and installation
• Budgeting routines
• Running support (long-term) – state vs. District:
  – Ex. Provision of stationery (preprinted paper)

• State, district, hospital, third party or INGO?
Institutionalizing support structures

• INGO -> Interested staff
  – Data entry staff from local IT company
  – E.g. clear paper jams, restart server, run backup
• Same model used in other hospitals
• 2014: new cadre of workers in state
  – defined skill sets and career paths
  – IT cells: support and training of clinical staff
• Professionalization also of INGO
  – tools, processes
• The work of infrastructuring

• The infrastructuring of work

• Co-occurring in a recursive relation, IIs ‘never complete’...