

UiO • **Department of Informatics**
University of Oslo

Margunn Aanestad

Building an statewide hospital information
infrastructure in India

Lecture Nov 3rd 2014



(NB. *some images removed..*)

Articles:

- Arunima S. Mukherjee, Margunn Aanestad, Sundeep Sahay: (2012): “Judicious design of electronic health records: Case from public health system in India”. *Health Policy and Technology*, 1(12–27), pp. 22-27
- Margunn Aanestad, Bob Joliffe, Arunima Mukherjee, Sundeep Sahay: «Infrastructuring Work: Building a state-wide hospital information infrastructure in India”. Accepted for publication in *Information Systems Research*, Special Issue on Information, Technology, and the Changing Nature of Work, 2014 (?)
- Plus:
 - Sahay and Walsham: “Building a Better World: Frugal Hospital Information Systems in an Indian State”, ICIS 2014.

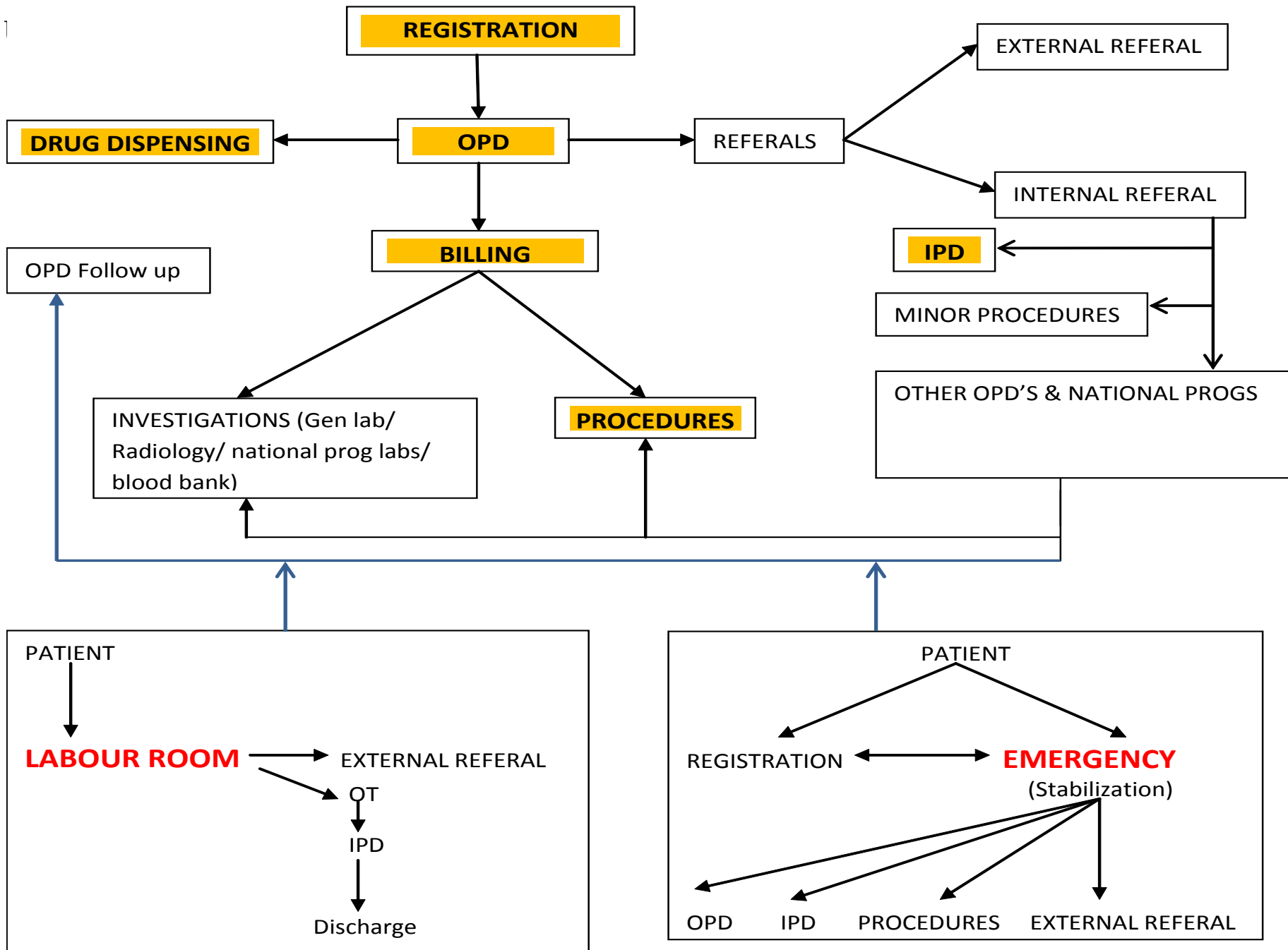
Storyline

- 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...

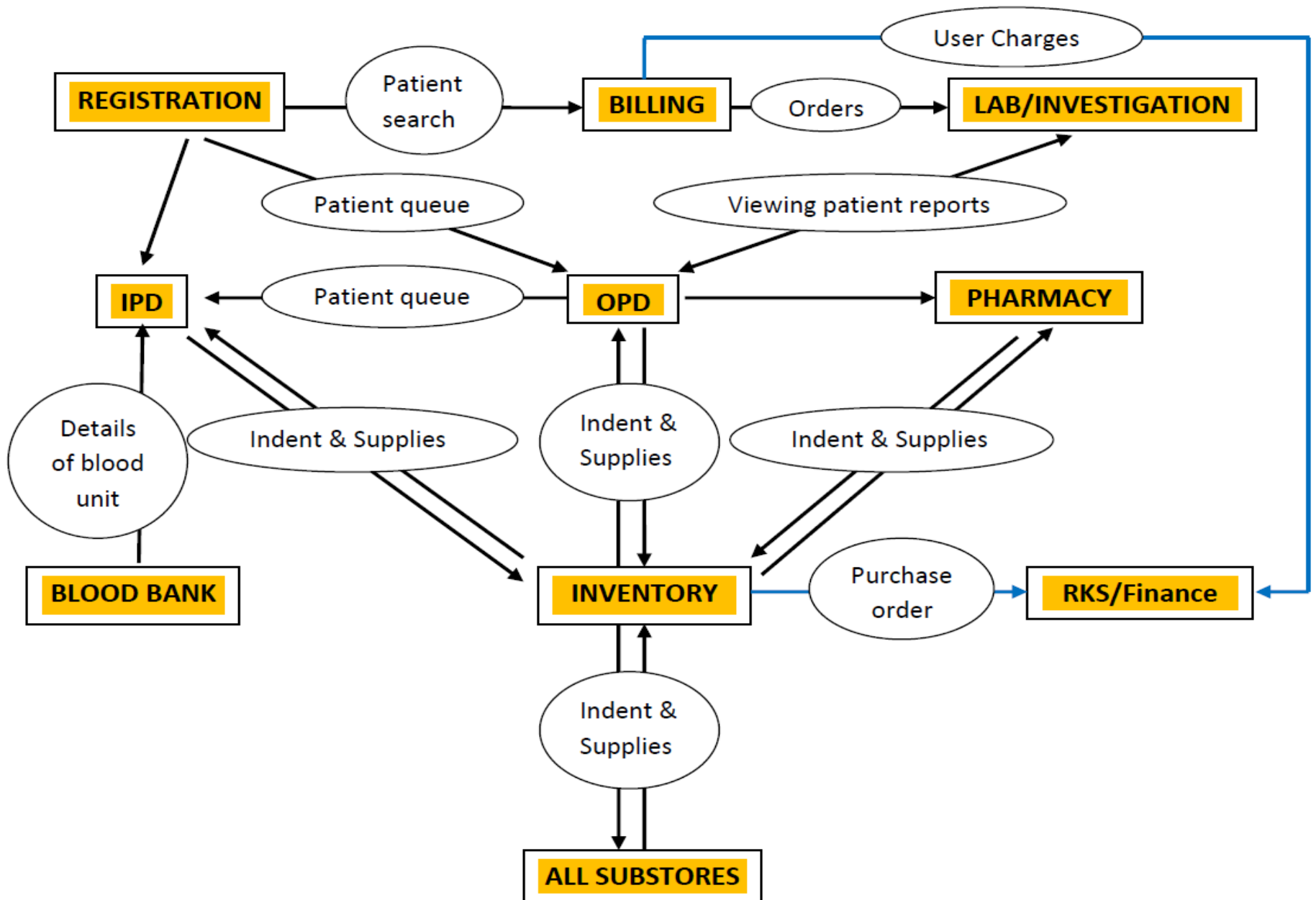
OpenMRS (Open Medical Record System)

- 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



MODULES INTERCONNECTING



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

Patient ID: SHDDUXXXXXX Location: <loc>

Name: Age: Gender: Date:

Patient category: Age category: Referral information:

OPD Entry Form Clinical summary Investigation Reports Inpatient Record

Provisional Diagnosis*: Ac

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

>> Acid Peptic Disease with <#if any,diagnosis 2>

<<

Add note:

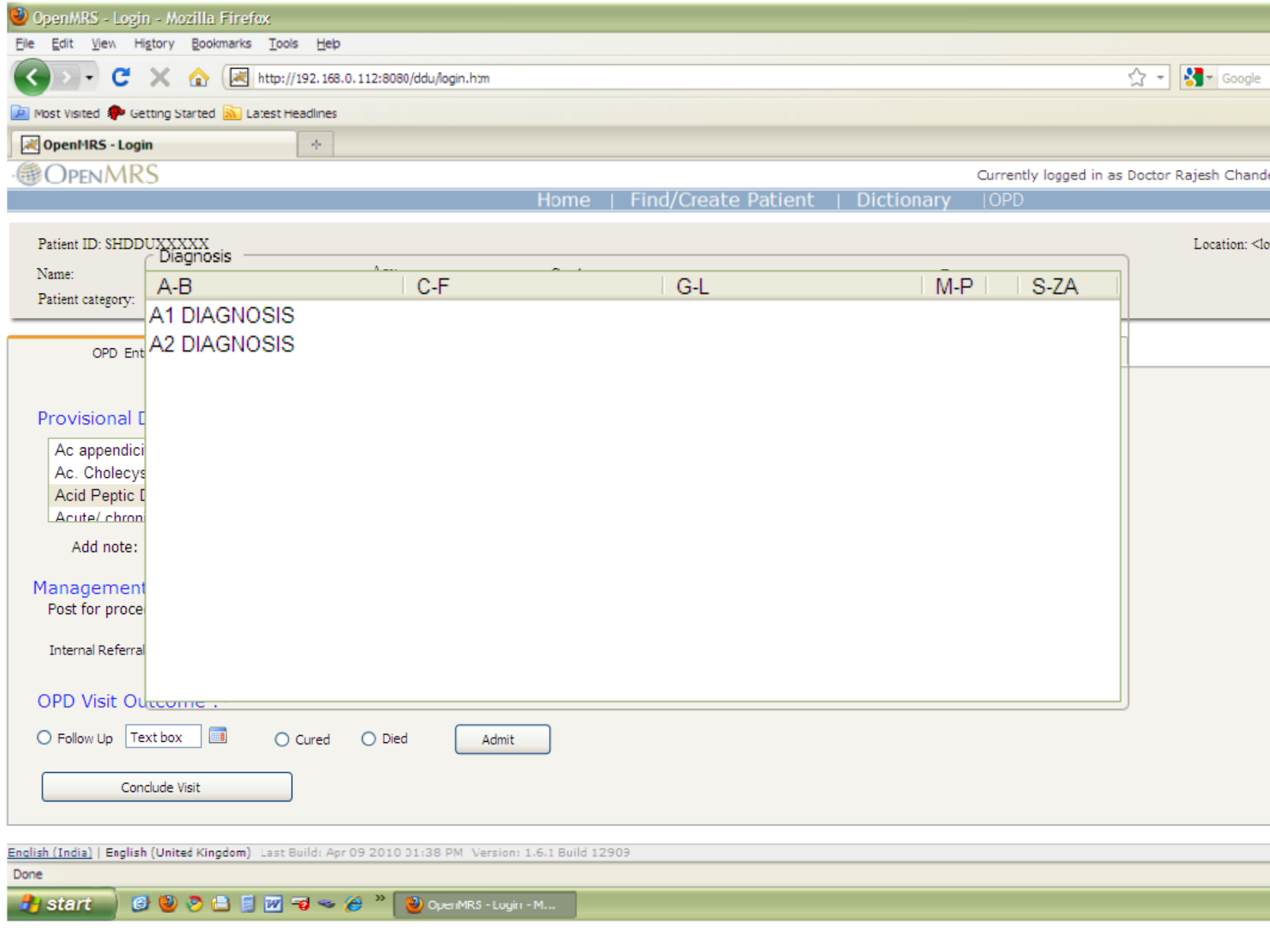
Management Plan :

Post for procedure: Search for Procedure <Procedure 1 >

Internal Referral : -- Select OPD -- External Referral : -- Reffer to --

OPD Visit Outcome : *

Follow Up Cured Died



Patient ID: SHDDUXXXXX

Location: <lo

Name:

Patient category:

Diagnosis

A-B	C-F	G-L	M-P	S-ZA
-----	-----	-----	-----	------

A1 DIAGNOSIS
A2 DIAGNOSIS

Provisional D

- Ac appendici
- Ac. Cholecys
- Acid Peptic D
- Acute/chron

Add note:

Management

- Post for proce
- Internal Referral

OPD Visit Outcome

Follow Up
 Cured Died

- 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

ROGI KALYAN SAMITI
DEEN DAYAL UPADHYAY ZONAL HOSPITAL SHIMLA (H.P.)
DEPARTMENT OF RADIO-DIAGNOSIS & IMAGING
X-RAY/ULTRA SOUND REPORT
(Not for Medico Legal Purpose)

Name.....Age.....F/M.....OPD No /Indoor No.....
REPORT X-Ray/USG No..... Date.....

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

Radology Tests	Parameters	Result Options
Pancreas	Size	Actual Size
	Outline	Regular / Irregular
	Echotexture	Isoechoic/Hypoechoic/Hyperechoic
	Mass Lesion	Present / Absent
	Size of Mass Lesion	Actual
	Echotexture of Mass Lesion	Isoechoic/Hypoechoic/Hyperechoic

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 HosplS

- 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.
 - strengthen 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 informing:

- 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

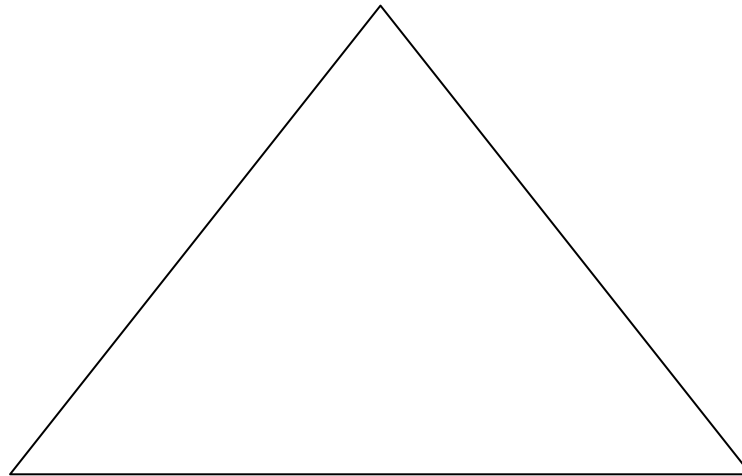
- Within organization:
 - Better logistics with tighter couplings (info flow) between departments
- Between hospitals
 - Possibilities for new types of collaboration (ex. pharmacies, blood banks)
- At state level
 - Possibility for ‘informed’ decision making based on more immediate and richer data

- 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 processes 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, Its 'never complete' ...