Implementing and evaluating a laboratory information system to optimize the treatment of tuberculosis patients in Peru

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Problem Statement (1)

- Peruvian National Tuberculosis Program
  - One of the largest MDR-TB programs in the world
- Laboratory data are essential for treatment
  - Drug Sensitivity Test (DST):
    - Determines appropriate drug regimen
  - Monthly bacteriology tests (smear & culture)
    - Clinical measure to monitor treatment response
- Timely and accurate data are essential through the 2 years of MDR-TB treatment

Problem Statement (2)

- Metropolitan Lima
  - 3 times land area of NYC
  - Population of 8.2 million
- Challenges
  - Among highest TB rates in the world
  - Poor Transportation
    - 3 hours to cross city
  - Lack of Public Health Funding
    - Require external support

Clinical TB System
PIH-EMR

- Secure web-based Electronic Medical Record (EMR)
- Open source software, open data standards
- Usable over low-speed dialup connections
- Bilingual: English/Spanish
- 13,000+ patients, 5,700+ received MDR-TB treatment
- Also used in Philippines (Tropical Disease Foundation)

- Developing Version 2 (OpenMRS) for wider use
  - Supports HIV and TB

Fraser et al. Proc AMIA Symp 2002

PIH-EMR

Handheld Data Collection

E-Chasqui System

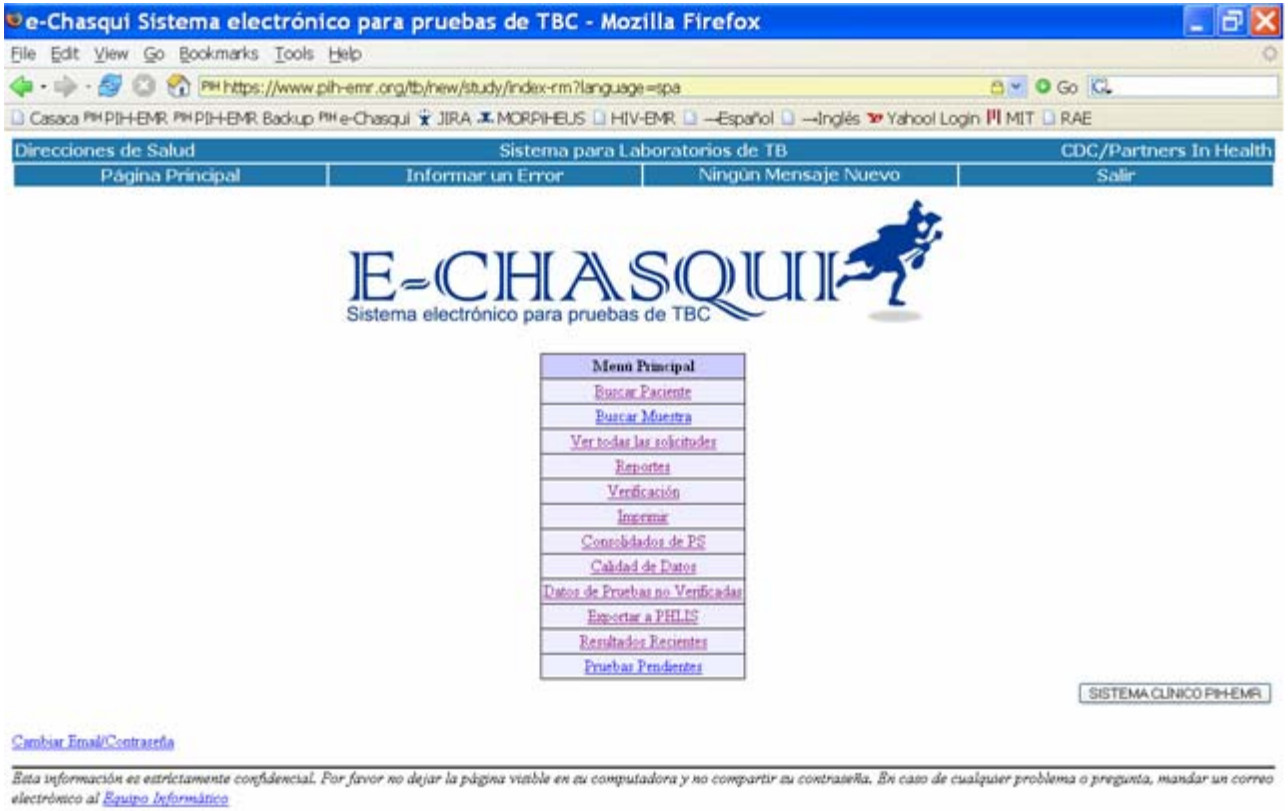
Smears
Cultures
DSTs

Biochem
Hematology

Registration form
History/exam
Previous Rx
Previous Dx
Contacts

Follow up
Chest X-ray

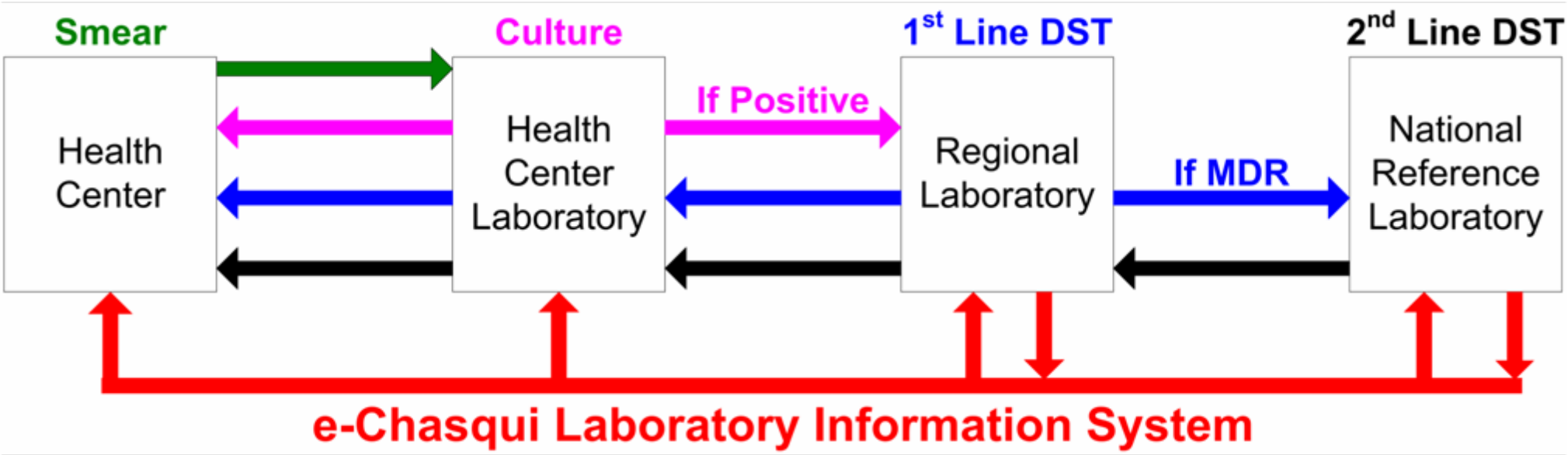
Drug regimens
Pharmacy



- Laboratory information system, e-Chasqui, extends the functionality of the PIH-EMR
- Web-based system to connect all TB treatment institutions

Lab Results Communication

Paper & e-Chasqui System Workflows



– 10% of results took > 60 days to arrive at clinic

– 16% of patients waited > 100 days to start treatment

Yagui et al. Int J Lung Dis 2006

Advantages of e-Chasqui

1. Automatically connects laboratories to health centers
   - Email notifications to health center personnel
   - Constant access to all information
2. Tools to improve data quality
3. Reporting functions for laboratory personnel
4. Alert clinicians & coordinators of high-risk patients
   - Patients with MDR-TB not on appropriate treatment

Implementation of e-Chasqui

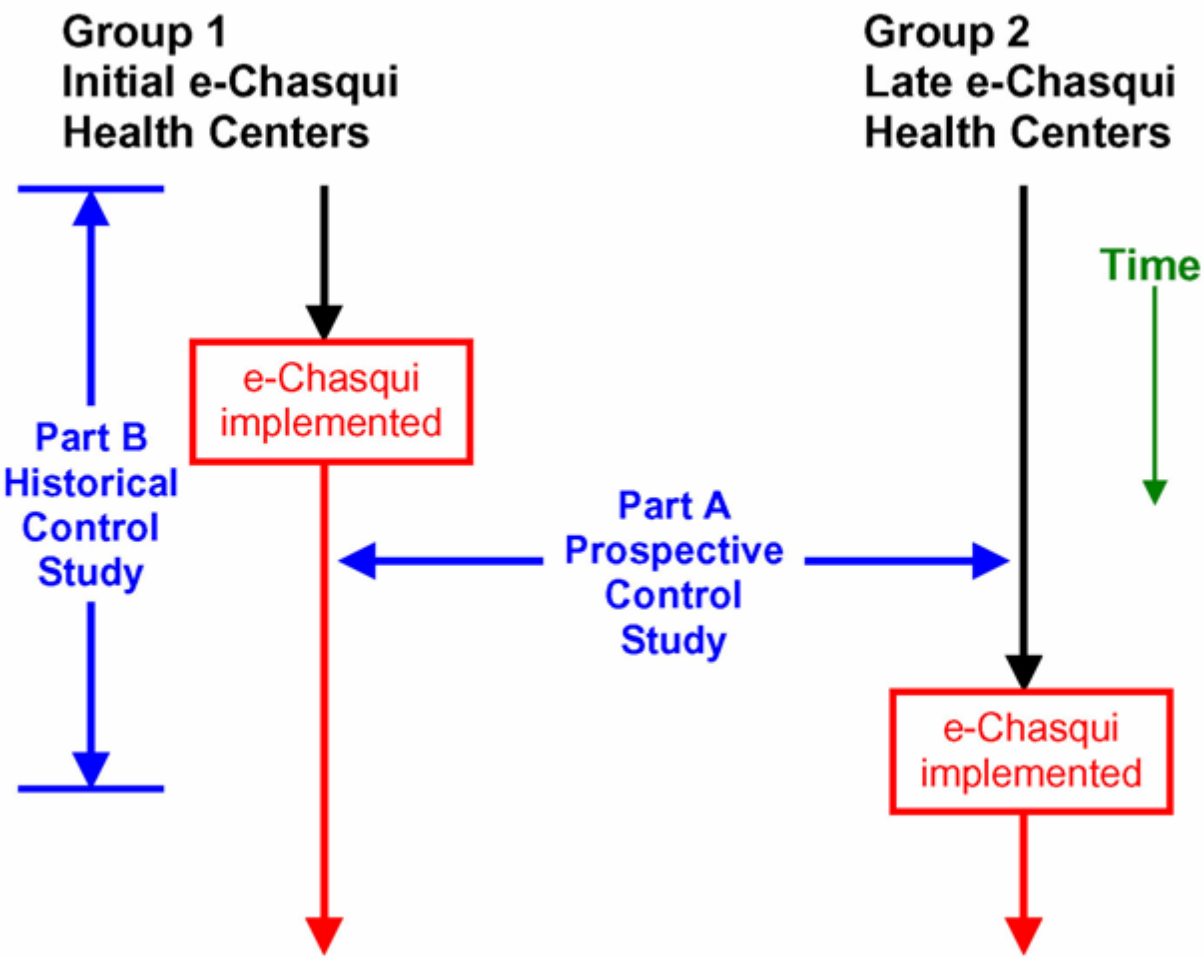
- Data Entry
  - National Reference Laboratory (INS)
  - 2 of 5 Regional Laboratories
    - Smears (28,000+), Cultures (30,000+)
    - 1st Line (7,000+) and 2nd Line (350+) DSTs

- Data Viewing
  - 20 health centers in 2 health districts
  - ~100 users including clinicians, nurses and lab staff
  - Connect centers providing care for 3.2 million people

Evaluation of e-Chasqui

- Prospective **(A)** & historical **(B)** controlled study

- Controls
  - **A.** Later access establishments
  - **B.** Self Controls



Evaluation of e-Chasqui

- Outcomes of Interest:
  1. Average communication delays
  2. Frequency of "Lost Results"
  3. Quantity of laboratory errors
  4. Approximate cost of the intervention
  5. Users' perception of e-Chasqui and nation-wide EMR
  6. Reduction of duplicate DSTs performed

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