The IMOGENE solution as a support to the surveillance of Tuberculosis in Georgia

Meeting on ERR for TB care and control
Geneva, 27-28 April 2011

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MEDES – An Economic Group of Interest, private, non-profit

- Mission:
  - Expertise in space medicine,
  - Applications of space for health and vice versa.

Promotion of the applications of satellites for health
- e-Health, disaster medicine, epidemiology

Common needs for data collection, isolated contexts, need for mobility and flexibility

An enabling project: SAFE, support of ESA - “On-demand” services for health early warning & epidemiological surveillance

Æ IMOGENE: a solution to generate data collection information systems
During SAFE project, expressed interest of the National Centre for TB (TBGEO), the Ministry of Health & the WHO local representative

Deployment co-funded by ESA

Objectives
- To support electronic surveillance of Tuberculosis in Georgia in view of setting up a sustainable service, for TB cases & MDR-TB cases
  - Information System to record TB and MDR-TB cases
  - Reporting module to generate WHO and NCDC report figures
  - GIS module

Requirements defined in close collaboration with:
- Dr. Archil Salakaia (TBGEO former Executive Director) and his team (Ucha Nanava and Medea Gegia)
- Dr. Olena Radziyevska. Medical officer, TB control in south Caucasus Post, WHO/EURO

Main steps
- System deployed in 12/2008
- Evaluation between 01/2009 and 01/2010
- Operational since 01/2010
All cases collected at district level on paper forms, sent to **central** level via regular mail and recorded there electronically by DB managers

**Previous system for TB: Epi Info**
- Desktop program
- Data stored in MS Access

**Tested system for MDR-TB**
- DOS program provided by MSF
All cases collected at district level on paper forms, sent to regional level via regular mail and recorded there electronically by DB managers.
System developed using the Imogene solution

Main steps
- Kickoff 01/04/2008
- First version delivery in 06/2008
- One week workshop in 08/2008
- System deployed in 12/2008
- Evaluation between 01/2009 and 01/2010
- Operational since 01/2010

Tasks
- Definition of the system
  - Forms, validation rules, security rules, reports
- Modeling of the defined forms
- Generation of the ERR system
- Customization of the ERR system
  - Field calculation
  - Report generation
  - GIS module
- Deployment of the system at TBGEO
- Tests, evaluation and updates
- Case based solution
- Web application that is accessible from all regional sites at anytime
- Centralized relational database for all TB related data and all periods
- Hardware and software owned and hosted by TBGEO (open source solution)
New system main functionalities

- **Modules**
  - Manages both TB and MDR-TB case recording
  - Generates TB report figures (WHO/ECDC/NCDC)
  - Provides GIS functionalities

- **Security**
  - Checks user login/password
  - Filters the data that a given user can view/edit depending on its privileges (e.g. MDR-TB, HIV)
  - Filters the data that a given user can access depending on the region he belongs to

- **Other**
  - Data validation
  - Internationalized user interface (Georgian and English)
Screenshots: Form for regular TB

TB Case

<table>
<thead>
<tr>
<th>Diagnosis date</th>
<th>Individual Code</th>
<th>Patient Gender</th>
<th>Patient Last Name</th>
<th>Patient First Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/04/2011</td>
<td>11-30-B-0135</td>
<td>Male</td>
<td>ნამდვილი</td>
<td>ჯილდო</td>
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<tr>
<td>05/04/2011</td>
<td>11-30-A-0985</td>
<td>Male</td>
<td>დამარცხებელი</td>
<td>ჯლის</td>
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<td>გამა</td>
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<td>11-45-A-0841</td>
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<td>გონიოსური</td>
<td>ღარიბი</td>
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<tr>
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<td>11-35-A-0007</td>
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<td>ლორდები</td>
<td>ღარიბი</td>
</tr>
<tr>
<td>05/04/2011</td>
<td>11-30-A-0232</td>
<td>Male</td>
<td>გვირიგი</td>
<td>ღარიბი</td>
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<td>11-06-A-0821</td>
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<td>ღარიბი</td>
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<td>ღარიბი</td>
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<td>ღარიბი</td>
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<td>05/04/2011</td>
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<td>ღარიბი</td>
</tr>
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<td>05/04/2011</td>
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<td>Female</td>
<td>ლადიჯი</td>
<td>ღარიბი</td>
</tr>
</tbody>
</table>

TB Form View (TBFORM_123be62)

Type of detection: Symptoms
Disease Location: Pulmonary Location
Sputum Microscopy: AFB
Treatment Category: II
Case Definition: Other
Treatment Start Date: 21/04/2011

Culture Analysis
- DST done: Positive
- R Drug Resistance: Resistant
- H Drug Resistance: Resistant
- M Drug Resistance: Resistant
- L Drug Resistance: Resistant
- E Drug Resistance: Resistant
- DST profile: SHRE
- Ks Drug Resistance: Susceptible
- Cm Drug Resistance: Susceptible
- DFX Drug Resistance: Susceptible
- Eto Drug Resistance: Susceptible
- PAR Drug Resistance: Susceptible
- DST profile second line drugs: DOR

27/04/2011
### Screenshots: Main form for MDR-TB

#### Hospital Admission View (HOSPFORM_12fb0ed)

<table>
<thead>
<tr>
<th>Admission</th>
<th>Patient</th>
<th>Risk Factors</th>
<th>TB History</th>
<th>Current Episode</th>
<th>Co-Morbidities</th>
<th>HIV</th>
<th>Lab Results</th>
<th>X-Ray</th>
<th>Treatment</th>
<th>Info</th>
</tr>
</thead>
</table>

**How was this patient diagnosed?**
- New

**Disease Site**
- Pulmonary TB Only

**Diagnosis in case of pulmonary location**
- Disseminated TB

**Symptoms**
- Fever
- Night Sweats
- Dry Cough
- Productive Cough
- Haemoptysis
- Chest Pain
- Nausea
- Vomiting
- Diarrhoea
- Loss of Appetite
- Weight Loss
- Visual Problems
- Cystitis
- Headache
- Hearing Loss
- Numbness
- Other

<table>
<thead>
<tr>
<th>Height (m)</th>
<th>Weight (kg)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.78</td>
<td>67</td>
<td>20.02</td>
</tr>
</tbody>
</table>

**Patient Type**
- New case (never treated)

#### Hospital Admission View (HOSPFORM_12fb0ed)

**Prescribed Treatment Regimen Type (TB drugs)**
- ETR

**Drug Dosage**
- 10-49-6-0580 31147393 30049 10/04/2011 ETR

**Treatment Regimen Drugs**
- R Hm LPX Ca PAS

**Total number of anti-TB drugs prescribed**
- 6

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27/04/2011

MEDES - IMOGENE
Data quality and validation

- Through typed fields and their specific validation rules
- Through required fields
- Through user defined validation rules (e.g. code format)
- Through field conditional access (e.g. specific fields appear if user selects pulmonary case)
- Through hierarchical lists
- Through calculated fields
- Through the generation of data check reports (e.g. double entry list)
A system to push Laboratory results from the Laboratory Information System to the TB ERR system is currently being developed by a Georgian company.

A system to manage drug stocks at national level is planned to be deployed (MSH) and an interface with this system will have to be developed.
Maintenance and updates

- **Maintenance**
  - Infrastructure maintenance (hardware and network) done by TBGEO
  - Software maintenance (e.g. changes in forms and in reports) done by Medes but possibility to transfer it to a Georgian company

- **System updates**
  - Done by Medes but possibility to transfer it to a Georgian company
  - Possible updates
    - Smartphone application for data collection at district level
    - Additional reports
    - New functionalities
    - Interoperability
System Use

- **Utilization of the system**
  - 11 regional DB managers trained and using the system on a daily basis
  - + 1 DB manager for jails
  - Historical data of 2006-2008 entered in the system (more than 18000 entries)
  - 13900 new entries entered by users since 1/1/2009
    - *About 31900 entries in total*

- **Report generation**
  - WHO and NCDC report figures generated with the system

⇒ Presently the only system for TB case recording and reporting, fully operational, used daily, nationwide
Issues encountered

- **Technical**
  - Import of historical data from Access files with different data models into the new system
  - Server hosted by TBGEO at the beginning: Service interruption from time to time because of power breakdowns and server shutdowns. In September 2009, the server was moved and is now hosted by TBGEO’s Internet Service Provider
  - Internet access at some places not ensured
  - Small changes in the forms are asked and can be managed thanks to the Imogene modelling/generation principle
  - Yearly changes in the reports have to be made manually

- **Functional**
  - GIS module not useful for the moment
  - Data collection at district level not useful for the moment

- **Financial**
  - System maintenance and updates are needed (interoperability, forms, reports) but not funded
Keys to success

- ESA co-funding of the investment required for the development of the solution
- Specifications of the Information System made in parallel of the specifications of the new organisation of the surveillance network
- Involvement of TBGEO with support of national ministry of health and WHO/Euro TB
- Users very involved in the whole process from specifications to deployment and evaluation
- Users were looking for a sustainable solution right from the beginning, not for a pilot one
Thank you for your attention, any questions?
Annex: IMogene

- A development studio to generate and easily deploy integrated Data Collection Information Systems
  - Generation of an independent and dedicated IS
  - Multi-platform
  - Generated applications: Web, Android and Desktop
IMOGENE: benefits for end-users

- Designed to be transferred to end-users

- To enable end-users
  - To **easily generate and deploy** their own data collection information system
    - **Flexible and adapted** to their specific needs, to the specific context
    - **Easily accessible** (mobility, web...)
  - To be the **owner** of the information system
  - To be **fully autonomous**
    - For the deployment
    - For updates, further evolutions
    - For hosting their data
    - For interoperability, exchanges with other existing information systems.

Æ February 2011 – publication of IMOGENE as open source – LGPL licence

http://code.google.com/p/imogene/