

Infection Control of Tuberculosis: Approaches to a large problem & Strategies for improvement

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Objectives

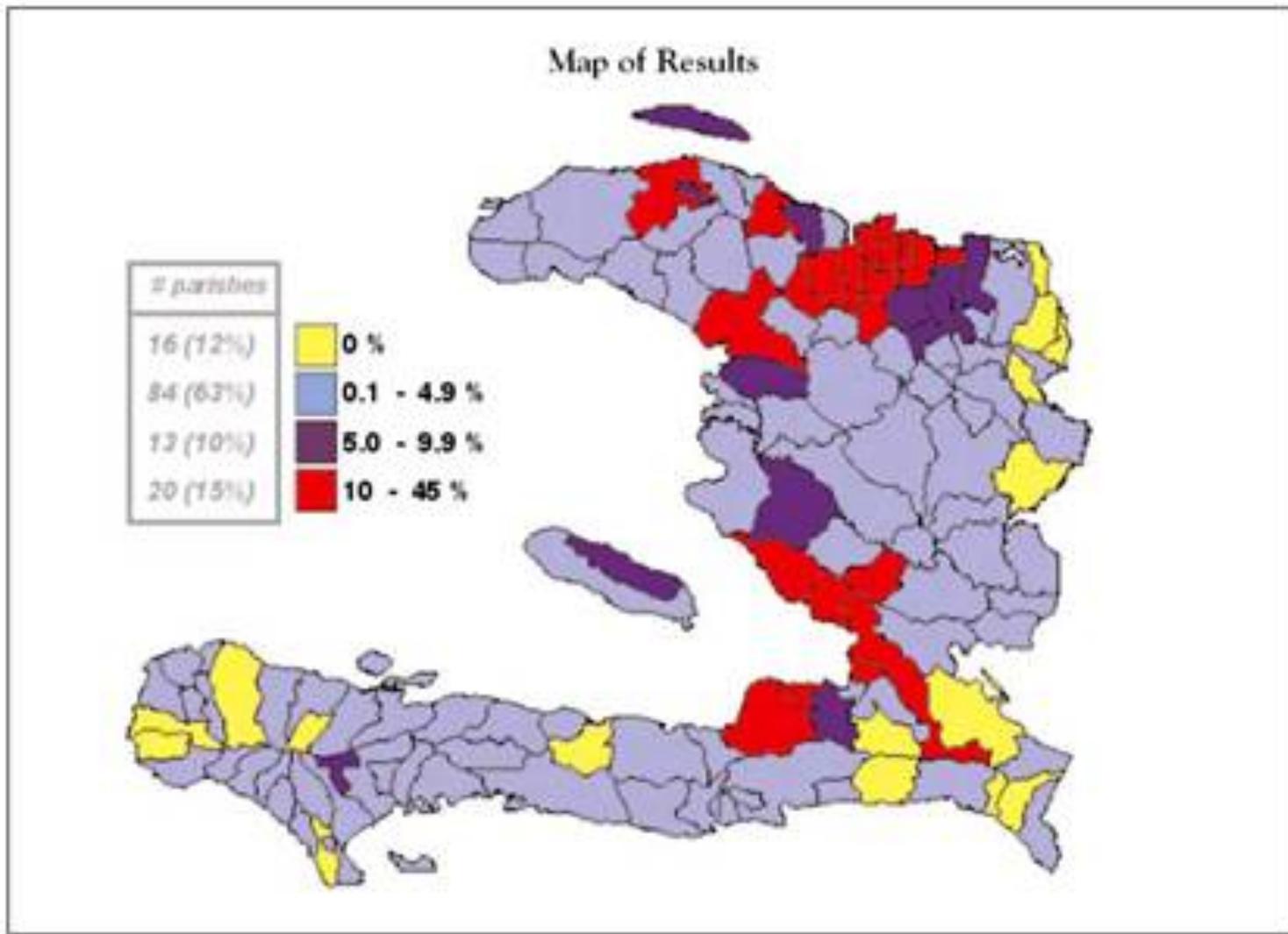
- To introduce TB infection control measures to health care workers at Sacre Coeur Hospital.
- To understand the impact such measures will have on the spread of TB.



Overview

- TB and MDR-TB, (XDR-TB), HIV trends in Haiti
- TB incidence among health care workers or returning health care workers/volunteers from Haiti
- Infection control measures
 - administrative
 - engineering
 - personal respiratory protection
- Health care worker protection

Prevalence of TB in Haiti



Facts

- The incidence of **tuberculosis** (TB) in Haiti is one of the highest in the Western hemisphere, at **306/100,000**
- By comparison, the U.S. rate is 4.2/100,000
 - *source: Global Tuberculosis Control: epidemiology, strategy, financing: WHO report 2009*
- Haiti was also the **7th leading** source country for foreign-born TB cases diagnosed in the United States during 2008
 - *CDC. Reported Tuberculosis in the United States, 2008. Atlanta, GA: U.S. Department of Health and Human Services, CDC, September 2009*

Epidemiology: Quick Refresher

- **Incidence** = rate of occurrence of new cases
 - conveys risk of contracting a disease
 - more useful than prevalence in understanding disease etiology
- **Prevalence** = measure of the total number of cases of disease in a population; is the ratio of the total number of cases in the total population
 - indicates how widespread a disease is
 - more a measure of disease burden to a society as a whole

Impact: the more infected, the more infected...

- Prevalence of nearly 50% in the most densely populated areas of Haiti!!!
- Post-earthquake created increased challenges:
 - more rapid spread of disease given:
 - displaced populations
 - living in even closer corners in tent cities
 - For prolonged periods
 - With reduced or delayed access to health care

Where on earth do we begin?

- Framework -> Big picture
 - Try to understand why Haiti has the highest incidence of TB in the Western Hemisphere.
 - develop a working understanding of each factor impacting TB incidence (next slide)
- Understanding risks → model to tackle infection control
- Need at the community level & in all health-care settings

Needs Assessment

- Requires knowledge of:
 - Haitian demographics –
 - Where people are living – pre & post earthquake living conditions
 - Type of home living in
 - number of people per home
 - number of rooms per home
 - Economy & Infrastructure
 - Urban vs. rural risk factors
 - Access to health care
 - Level of education & ways to effectively educate
 - Potential cultural & religious barriers
 - to accepting proposed plans for infection control, new ideas, and therapies

Economic Challenges

- By most economic measures, Haiti is the poorest country in the Americas.
 - It had a [nominal GDP](#) of 7.018 billion USD in 2009 & GDP per capita (PPP US\$) of 1,255
- It is an impoverished country, one of the world's poorest and least developed.
- Comparative social and economic indicators show Haiti falling behind other low-income developing countries (particularly in the hemisphere) since the 1980s.
- Haiti now ranks 149th of 182 countries in the United Nations [Human Development Index](#) (2006).
- About 80% of the population were estimated to be living in poverty in 2003.

More Economic Challenge

- About 66% of all Haitians work in the [agricultural](#) sector, which consists mainly of small-scale [subsistence farming](#)
- The country has experienced little formal job-creation over the past decade
- Loss of infrastructure from the Earthquake has halted the little growth that has occurred
- Several trained health care providers died or have been displaced themselves by the earthquake
- Reducing the number of permanent health care providers available to impact spread of disease and get out in the community to provide the necessary education.

Other Key Factors to Consider

- Most Haitians live on \$2 or less per day
 - Important to consider in cost assessment of infection control measures
- Haiti has 50% [illiteracy](#) & over 80% of college graduates from Haiti have emigrated, mostly to the United States
 - Key to thinking about why traditional US methods of infection control education & dissemination of information would fail in Haiti
- [Cité Soleil](#) is considered one of the worst [slums](#) in the Americas, most of its 500,000 residents live in extreme [poverty](#).
 - Not only do they live in substandard conditions, most families are restricted to 1 room homes (less than 3 feet from each other)
- Poverty has forced at least 225,000 Haitian children to work as [restavecs](#) (unpaid household servants); the United Nations considers this to be a modern-day form of slavery
 - These children are rarely given adequate medical attention and are often 'hidden' from community health workers providing door-to-door health care assessments and education.

How to Approach Infection Control of TB in Haiti

- Then can develop strategies to interrupt spread of disease in Haitian communities & health care facilities
 - Largely based on respiratory spread in crowded living conditions
 - Not realistic to change where people are living
 - Education & access to health care, especially in more rural settings, is limited
 - Need to know the most effective mode of educating people and health care providers
 - Need to educate communities & health care providers on:
 - What TB is
 - How it affects morbidity and mortality
 - How it can be spread between family members
 - How to prevent spread between each other
 - How to approach isolation precautions in health care settings

Access to TB Care in Haiti

- Until recently, PIH was the only organization treating MDR-TB in Haiti, serving as the national referral center for all cases.
- In 2008, GHESKIO began treating MDR-TB in collaboration with the Ministry of Health. They duplicated the PIH treatment model for MDR-TB in a public TB sanatorium in Leogane.
- When a patient was diagnosed with MDR-TB, they were initially treated with an empiric regimen, while awaiting the results of second-line DST testing, which was conducted at the Massachusetts State Laboratory (MA, USA).
- Each patient was changed to an individualized regimen when DST results were available.

Access to Care post-earthquake

- However, Leogane was the epicenter of the earthquake
- The MDR-TB hospital was destroyed along with most of the city's buildings
- The two government TB sanatoriums (one in Port-au-Prince and one in Leogane) were both destroyed.
- Plans are underway to build a new hospital for TB and for MDR-TB.
- In the meantime, all of GHESKIO's MDR-TB patients are receiving outpatient treatment, or else are hospitalized in isolation tents.
- The majority of GHESKIO patients with drug-susceptible TB were treated as outpatients; over 90% of these TB patients have been accounted for, and continue on treatment.

Infection Control

- Have to find a way to identify patients in the community who could have TB
- Can be especially challenging given several patients do not look very ill until they have severe disease AND
- Several people have other underlying chronic respiratory infections from environmental & tobacco exposure
- Differentiation between the 2 entities challenging for health care providers when patients are seen in health care settings & diagnosis is very difficult in resource limited settings (i.e. outside of large hospitals with lab facilities like Sacre Coeur)

Easy to Identify the 'Classic' TB Patient & Implement Infection Control Measures



What about more healthy appearing patients?



Unsuspecting woman with active pulmonary TB waiting in clinic line



How do we approach such a large problem?

Examples from the CDC & abroad

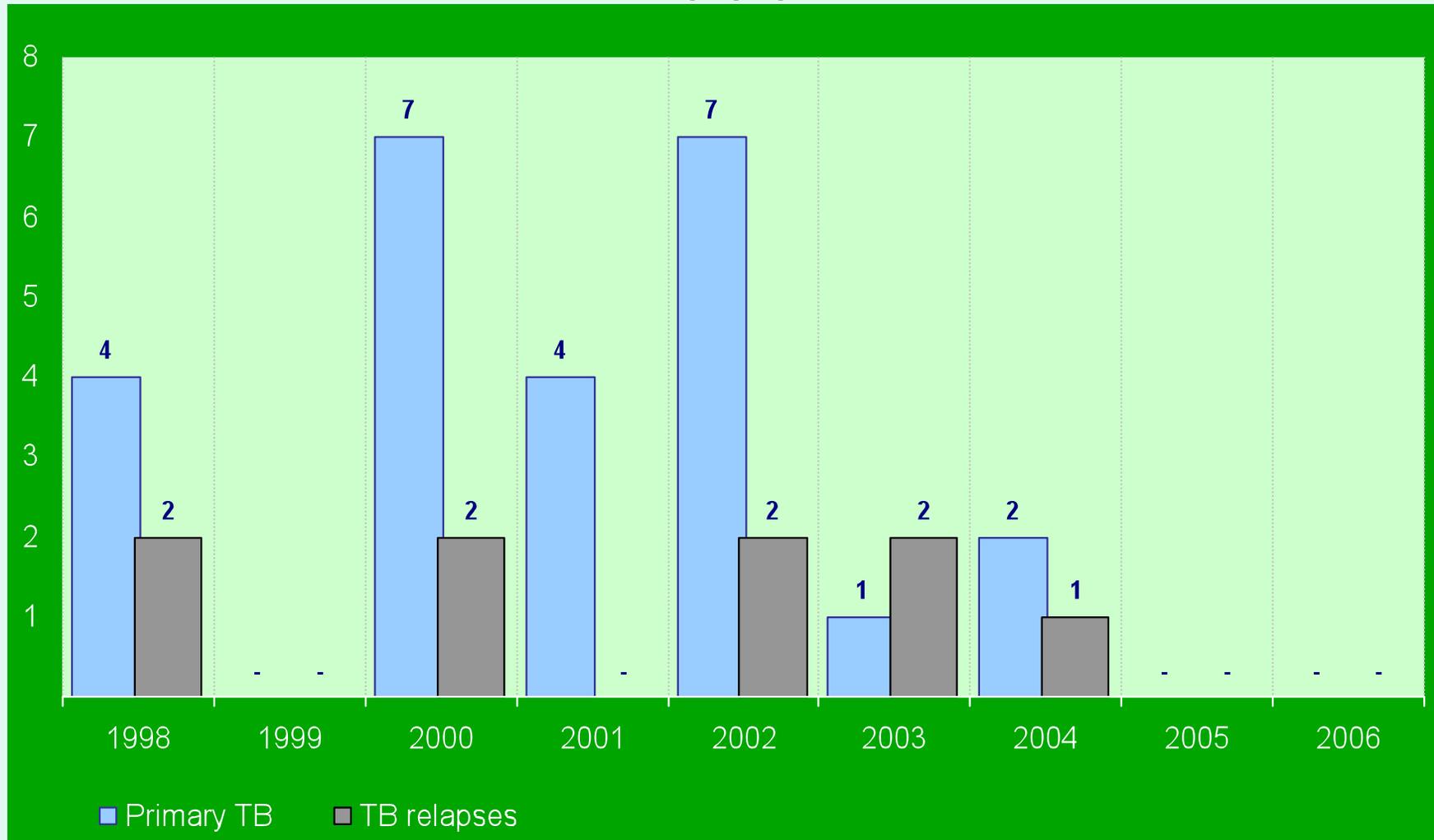
See how other resource-limited settings with high TB incidence & prevalence have approached infection control

Case in point: Latvia

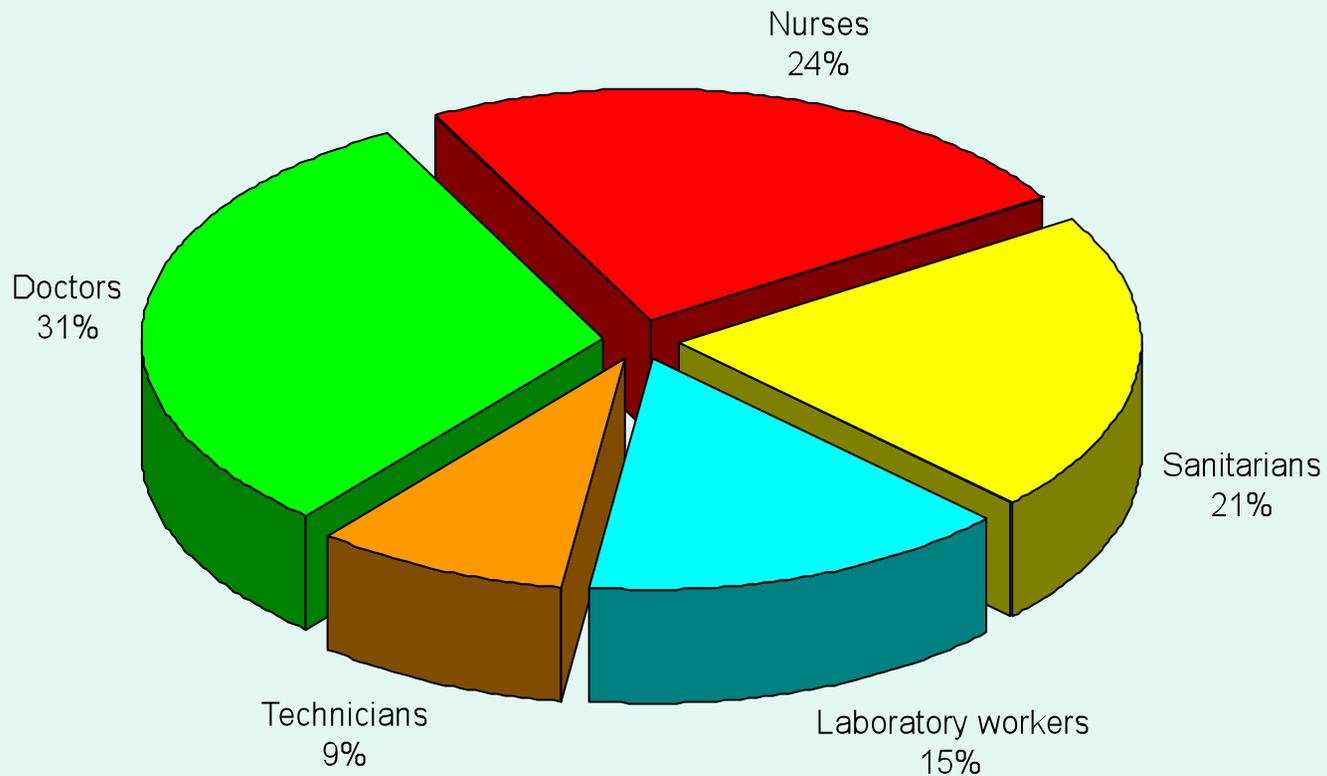
Number of patients with MDR-TB and XDR-TB in Latvia 2001 - 2006



TB among Health Care Workers(HCW) in the SATLD central hospital 1998 - 2006

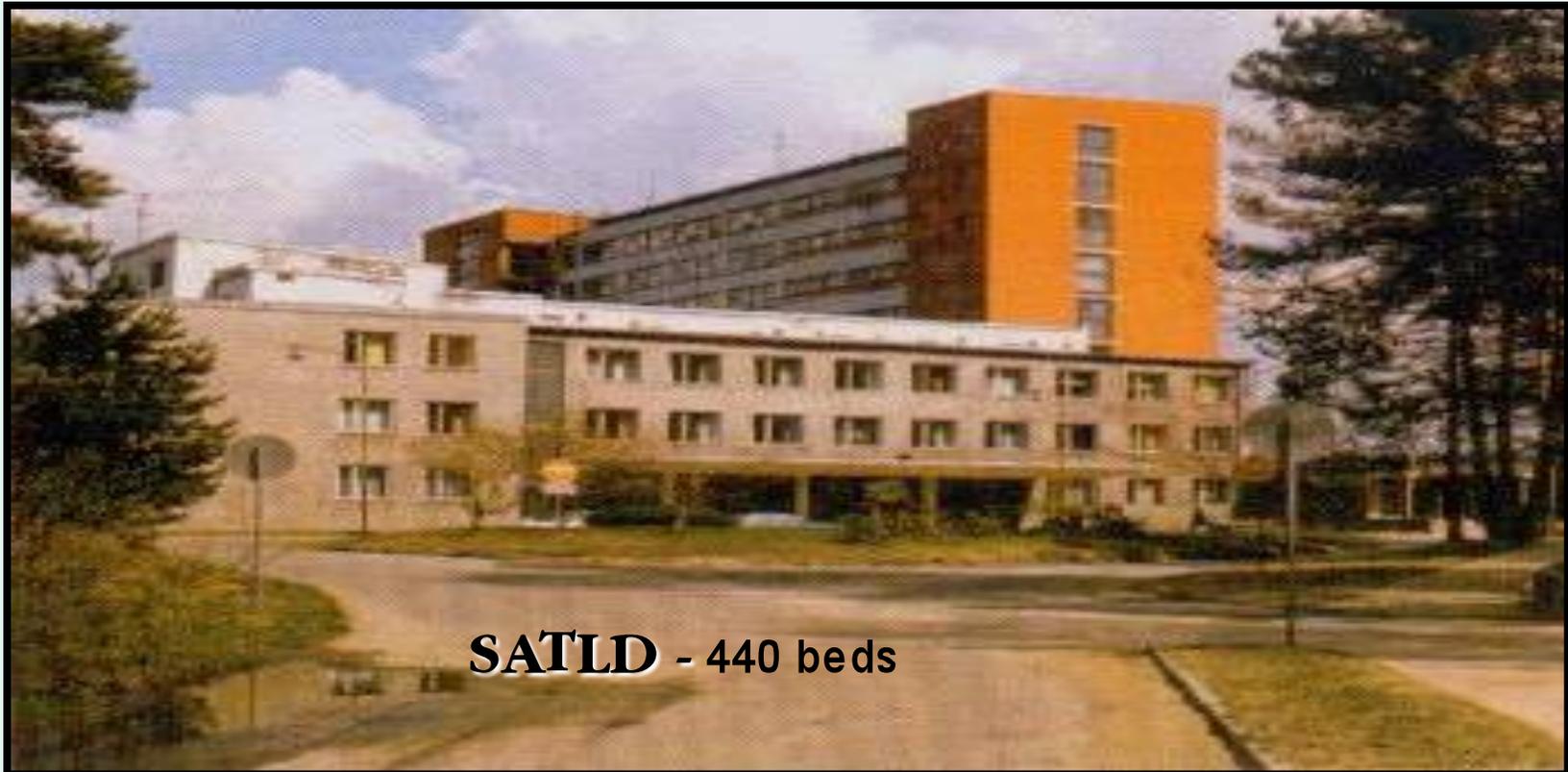


TB among HCW in the SATLD central hospital 1998 - 2004



Collaborative project with CDC to develop comprehensive infection control plan at SATLD

- diagnostics and treatment of patients with TB (MDR-TB) and nonspecific pulmonary diseases
- ~5000 patients are examined and treated every year
- ~1000 bacillary TB patients are examined and treated every year (160 MDR-TB patients)
- 600 employees



SATLD - 440 beds

Hôpital Sacré Coeur

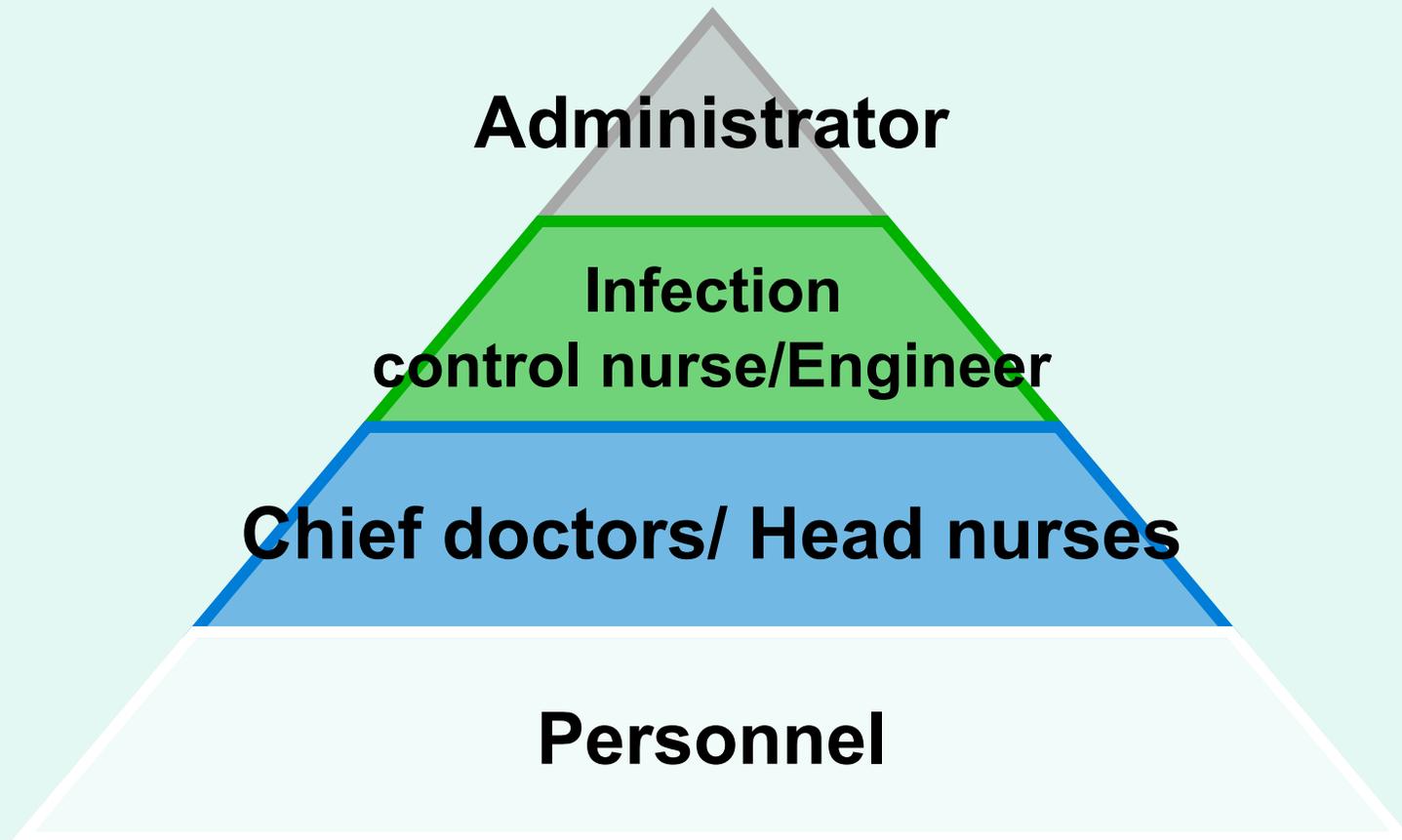
Hospital Statistics – 2010

44,693 Outpatient Visits
4,987 Hospital Admissions
2,351 Surgeries
141,987 Prescriptions
121,000 Laboratory Tests
5,466 Diagnostic Tests
1,036 Newborn Deliveries
4,999 Counseled & tested for HIV
2,149 of those were pregnant mothers
12,406 Antiretroviral Clinic Visits
41 kids/day on average seen by Nutrition
1,700+ Medical Professional Volunteers
in 19 Specialties spent an average of one
week working and teaching at HSC



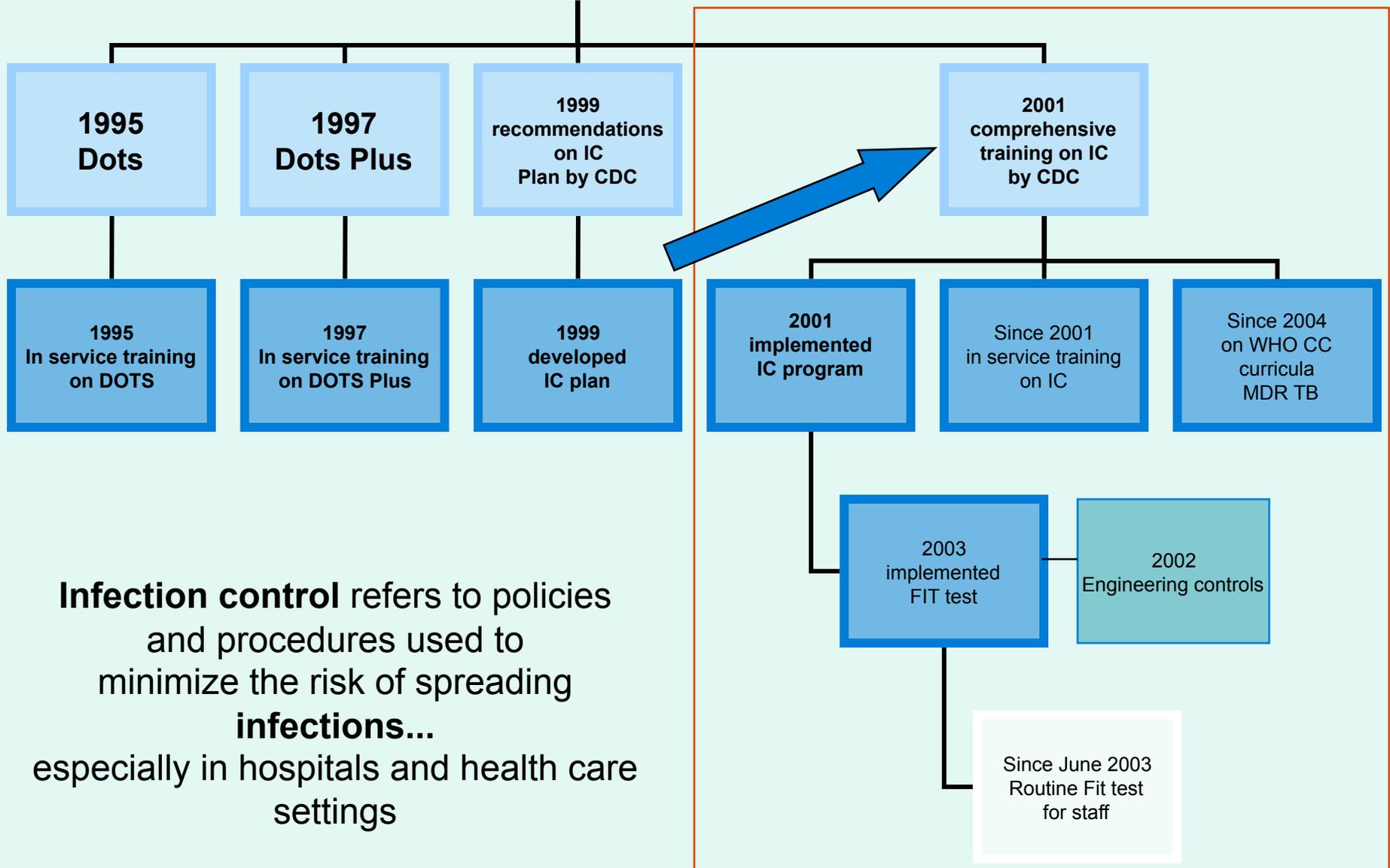
Interventions

Assignment of responsibilities



Responsibility on implementing, monitoring, enforcing, evaluating, and revising infection control programs on a routine basis including linkage to TB diagnostics

Interventions



Infection control refers to policies and procedures used to minimize the risk of spreading **infections...** especially in hospitals and health care settings

Administrative controls at SATLD

Includes

- assignment of responsibilities
- risk assessment
- written infection control plan
 - Isolation procedures
 - Patient flow within facility
 - Reducing cough inducing procedures
- staff and client education
- screening program for HCW
- implementation, supervision of IC

Assignment of responsibilities

Supervisory responsibility should be delegated to a **specific person** or infection control team with a leader

Should include experts in:

- infection control
- hospital epidemiology
- clinician/ nurse
- engineering

IC team **responsible** for all aspects of the IC program

3. Risk assessment within SATLD

Very high risk – TB patients treatment

TB wards (MDR-TB)
Bacteriology laboratory
Bronchoscopy; X-ray;
admission departments
administrative controls
engineering controls
personal respiratory protection

High risk – infectious TB patients not encountered

Wards (thoracic surgery, pediatric, extrapulmonary, nonspecific pulmonary)
Surgery, Intensive care ward,
Consultation and other diagnostic procedures; Physical therapy
administrative controls
engineering controls

Medium risk – no TB patients attended

Clinical laboratory; pharmacy;
Administration department
Maintenance department
•administrative controls

2001 developed and implemented IC program

Contents-

Specify responsibilities

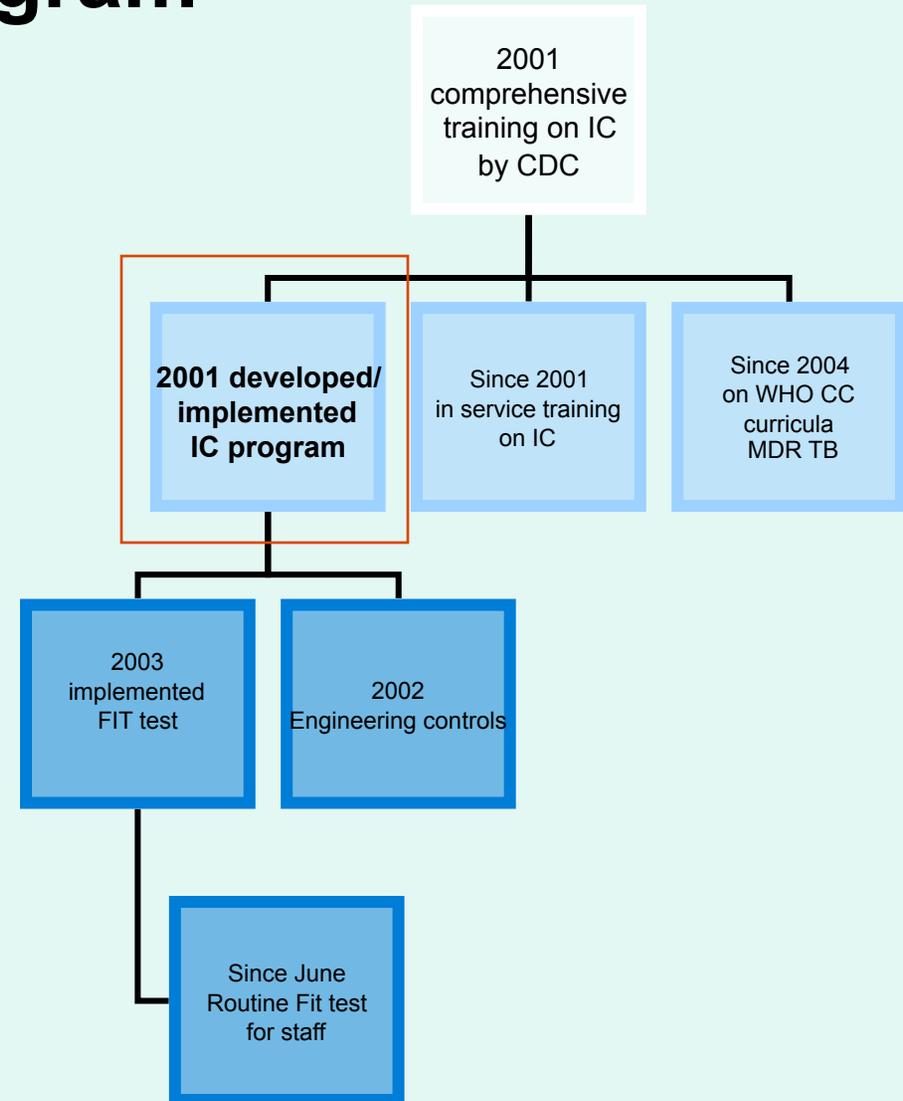
Supervisory responsibility delegate to a **specific person** or infection control team with a leader including experts in: infection control, hospital epidemiology, clinics, engineering

Written policies for

1. patients hospitalization/ flow/ transfer/ discharge
2. monitoring of infectiousness
3. special precautions for high risk procedures and locations
4. monitoring of engineering controls
5. personal respiratory protection program
6. staff and client education

Screening and management of health care workers

Ongoing monitoring/ annual evaluation of the program



Administrative control measures

Isolation in ward (general requirements)

- Nonspecific pulmonary diseases
- TB suspects, primary TB patient
- MDR-TB suspects (TB relapses, failures, contact persons of MDR-TB patients, treatment interruptions)
- MDR-TB patients (infectious XDR-TB patients are sent to other hospital)

Administrative control measures

Isolation in TB ward

- Isolation departments - infectious TB cases (smear positive) placed in the separate part of the ward (locked doors; see next slide))
- Rules and regulations of isolation
 - Patients have to stay in the isolation rooms (nutrition, examination, treatment etc.)
 - Infectious patients must wear surgical masks during leaving isolator
 - Make only high priority examinations
 - Relatives visits restricted

Isolation department



Example picture of isolation room door.

ISOLATION PROCEDURES

- Patient education, signed informed consent
- Examinations
 - 3 consecutive sputum samples
 - Chest X-ray examination
 - Sputum examination with BACTEC, MIGIT for smear positive TB patients, MDR TB suspects
- Ideal: separate rooms
- Isolation together, according patient infectiousness, and risk for MDR-TB

ADHERANCE TO ISOLATION PROCEDURES

Books;

- Newspapers, magazines
- Hygiene kits delivery;
- radio, televizors;
- phone

Discontinuation of isolation

- Sputum smear positive TB patients –
 - after 3 negative sputum smear microscopy,
 - who have received treatment more than 2 weeks
 - clinical improvement;
- MDR-TB patients –
 - after 2 negative sputum smear analysis 2 consecutive month,
 - who received treatment more than 8 weeks
 - clinical improvement

Administrative control measures

Reducing cough induction procedures

- Bronchoscopy (with substantial reason)
- Inhalations (only sputum induction aerosols)
- Examination of respiratory functions (surgery)



PATIENTS FLOW

- From admission department to isolation room
- From isolation room to examination rooms, Flow of patients in X-ray ward
- Special time of examination for patients from different groups
 - Patients with non specific pulmonary diseases and TB patients TM negative
 - Bacillary TB patients
 - Bacillary MDR – TB patients

2002 implemented engineering controls

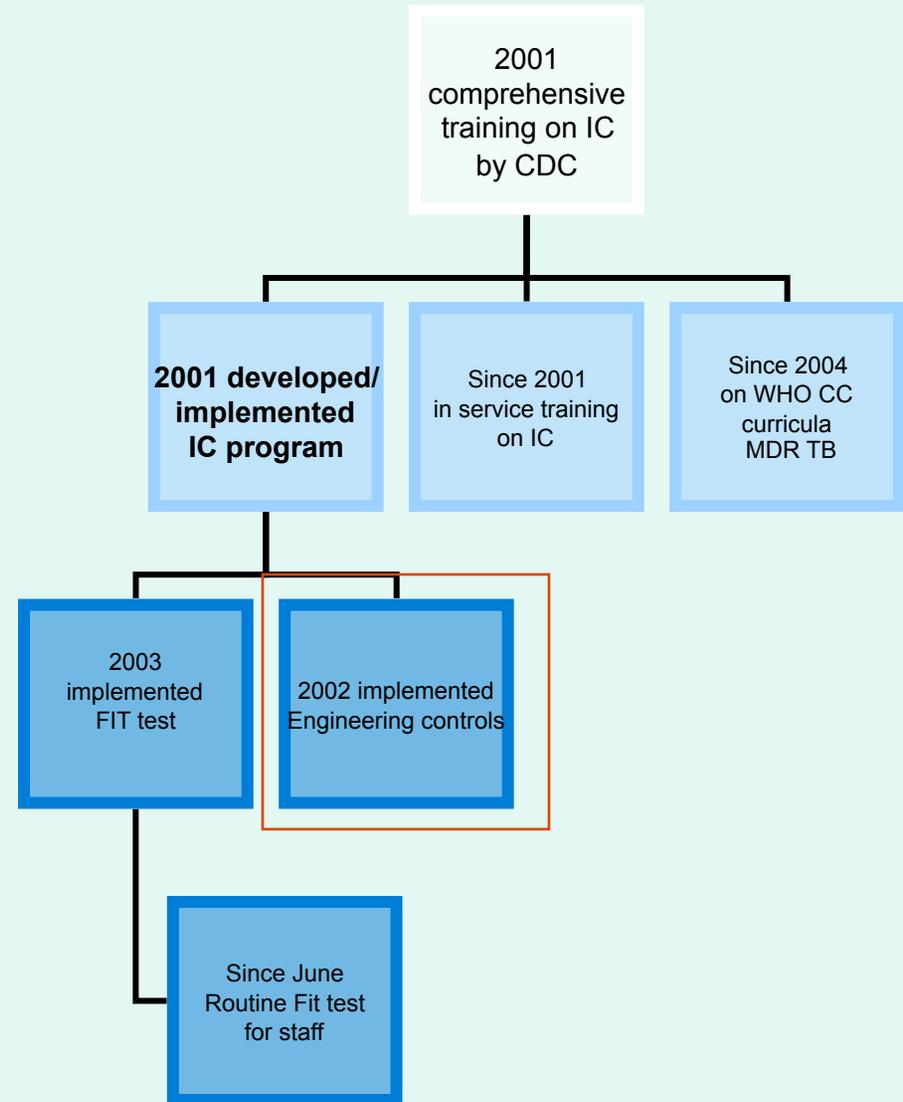
Aim- decrease concentration of infectious droplets nuclei in the air

UV lamps

HEPA Filters

~~Ventilation system~~

Natural airflow



Engineering control measures

Ventilation

- General ventilation system (old)
- Ventilation through open windows
- Controlled airflow
- Local ventilation system with negative pressure in bacteriological laboratory

HEPA filters

- In laminar boxes
- Ventilators (fans) with HEPA filters
 - 15 big HEPA filters (surgery; consultation ward; ward of functional diagnostics; intensive care)
 - 6 small HEPA filters (sputum induction room)



UV lamps

- Closed type of UV lamps
 - 72 W – 154 UV lamps
 - 36 W – 69 UV lamps
- UV lamps are working 24 hours
- Cleaning with 96° of alcohol 1 time per 3 months
- Measuring of UV irradiance after cleaning

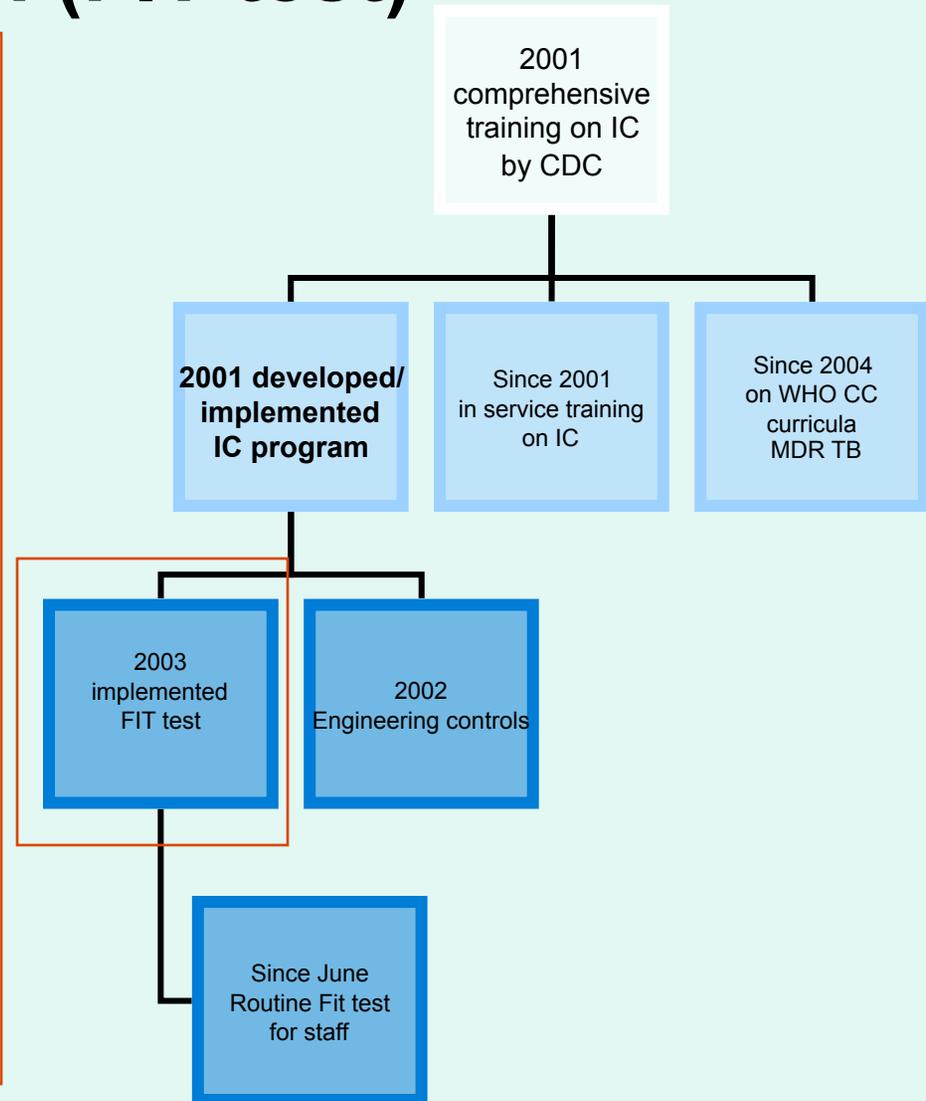


2003 implemented personal respiratory program (FIT test)

Employees should pass an qualitative fit test test:

- prior to initial use
- whenever a different respirator face piece (size, style, model or make) is used, and
- at least annually thereafter

Additional fit test whenever changes in physical condition or job description that could affect respirator fit are noticed or reported

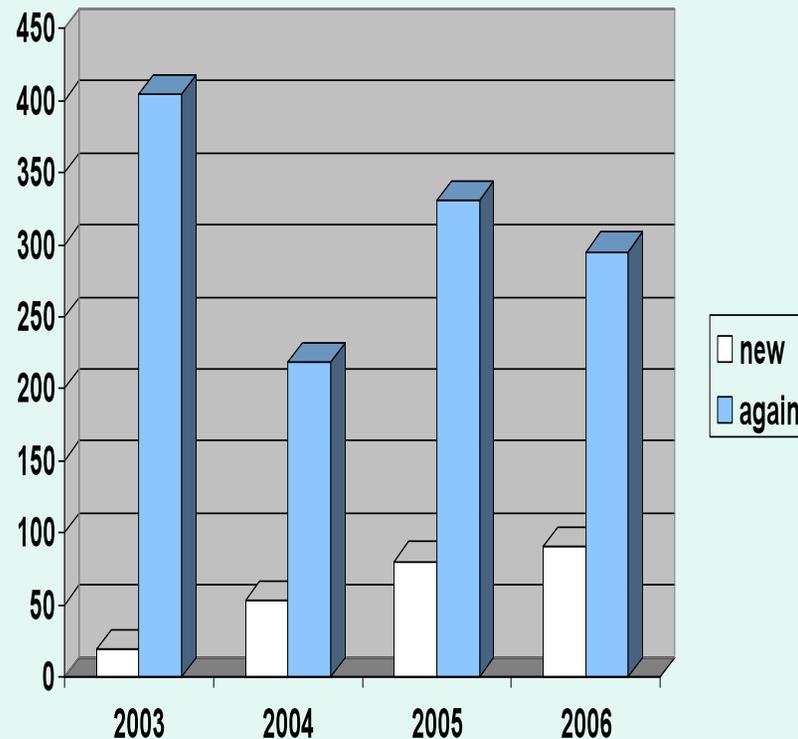


Respirators

- Respirator FFP₃ (CEN standards)
- Qualitative fit test with Bitrex
 - prior to initial use
 - when change respirator (size, style, model)
 - one time per year
- Surgical masks for patients



Fit test done at SATLD



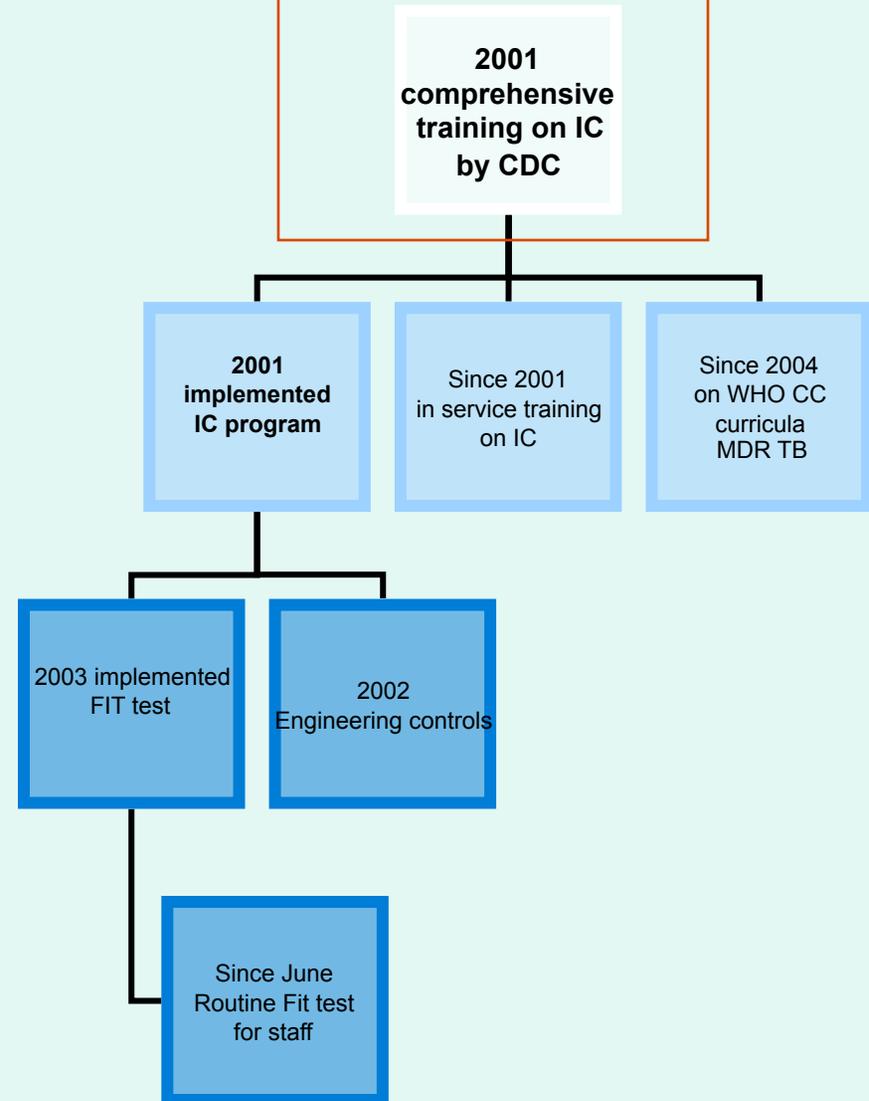
Physical factors contributing to poor fitting respirators

- Weight loss/gain
- Facial scarring
- Changes in dental configuration (dentures)
- Facial hair
- Cosmetic surgery
- Excessive makeup
- Mood of worker (smiling/frowning)
- Body movements

Administrative control measures

Staff Education on IC since 2001

- **2001 comprehensive training on IC by CDC**
- **Aim** to get comprehensive knowledge on IC control issues about measures, job descriptions, responsibilities
- **Target audience**
Representatives from **MoH, MoJ, Public Health Agency, administration** and **all level** medical staff of SATLD
- **Curricula-** transmission, administrative/ engineering and personal respiratory protection controls



Staff Education

- Introduce with responsibilities, inform of the risk of TB transmission
- Inform about risk for immunosuppressive persons
- Training course about TB epidemiology, diagnosis and treatment
- Introduce with TB infectious control program

Staff Education on IC since 2001

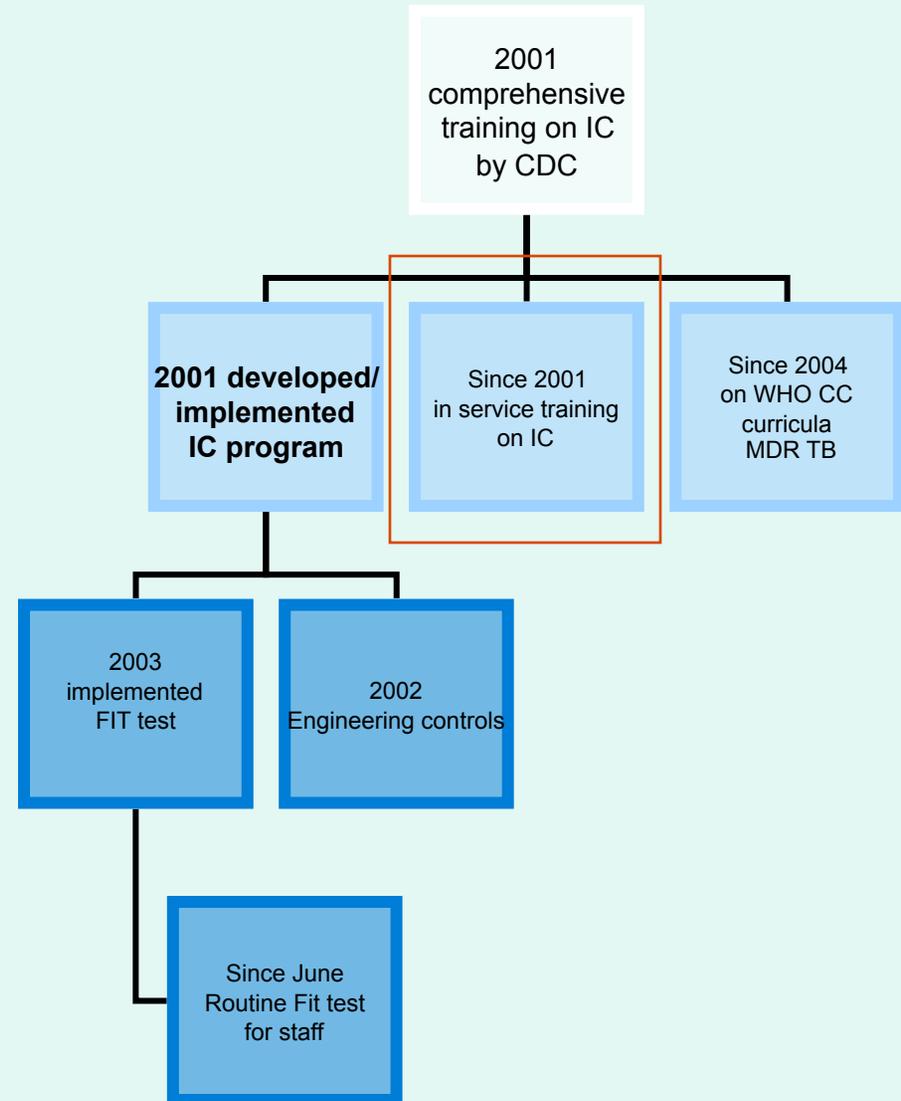
Training and education for HCW to ensure good work practices

- IC plan - organization, rationale, and what is expected of them
- Personal respiratory protection program

Target audience: all level administrative and medical staff

Contents:

- Inform about risk of transmission,
- immunosuppressive persons
- about TB epidemiology, diagnosis and treatment
- personal protection
- cough hygiene
- administrative/engineering controls
- disinfection aids/ usage
- hand hygiene



Administrative control measures

TB screening program for HCW (1)

- Prophylactic examination
 - Chest X-ray examination once a year
 - Sputum examination and chest X-ray for HCW with TB symptoms or if they have any complains

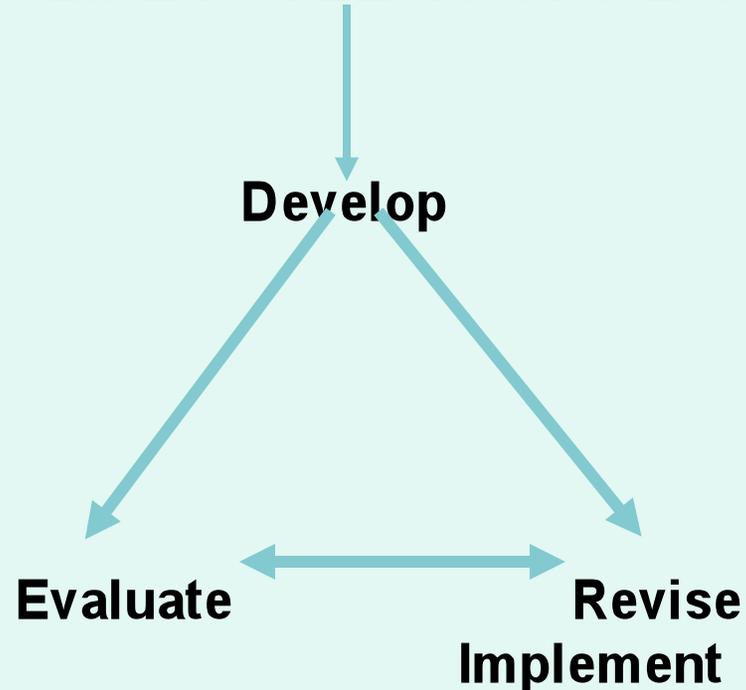
Administrative control measures

TB screening program for HCW(2)

- Regulations of Ministry of Health of Latvia
- HCW for working in harmful conditions receive
 - Additional vacation (3 – 10 days)
 - Additional payment (10 % - 15% from salary every month)
- Insurance
- HCW are insured for accidents in work place and for risk to get TB/MDR-TB (1000 \$ / 2000\$ respectively)

Prevention of hospital infection

LIFECYCLE OF IC PLAN



- Implemented, monitored and enforced IC plan
- Educated and trained HCW to ensure good work practices
- Counselling and screening HCW periodically
- Evaluated and revised plan 4 times

CONCLUSIONS

- Administrative IC are the most important component of IC plan in setting with limited resources and high incidence of TB and MDR-TB
- Administrative IC Program can ensure
 - Early detection
 - Early isolation
 - Early treatment
- TB infection control can effectively prevent nosocomial transmission of TB and MDR-TB to HCW

Application of the model

- Open for discussion
- Thoughts on limitations to implementation in the hospital setting?
- Concerns with community based education?

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