Screening migrants for infectious diseases at point of entry: a systematic review

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Screening: searching a definition

Screening in medicine is used:

- In clinical setting, a “set of screening tests” may be performed to a symptomatic patient to exclude or confirm diagnosis
- A toxicologic screening is a set of tests on environmental or clinical samples to identify a wide range of toxic substances
- Molecular screening is a phase in the selection of active molecules in pharmacology
- A surveillance screening is the testing of a sample of the population to survey the prevalence of a disease of an exposure, without any aim of prevention
- Screening as a preventive medicine intervention aimed at early diagnosis and improvement of prognosis.

From A. Federici

Definizioni di screening

1.“the screening programme is an organised public health intervention in which the health system actively contacts all the at risk population (target). The target subjects voluntarily participate. The health system takes care of the individuals in all the phases of testing, assessment and treatment and assures the disease management. All the process is monitored and the quality of the program is systematically promoted and evaluated” (Sacket)

2.“screening for a given disease is testing an asymptomatic population to classify individuals who are probably affected and individuals who probably are not affected by the disease” (Morrison)

Screening: searching a definition

Screening migrants for infectious diseases, in many cases, does not fit with any of these definitions:

- It should be systematic (not on a sample), but often is aimed at detecting conditions for which there is no interventionto be activated (to improve prognosis)
- It is often aimed at protecting the host population not the individuals who undergo screeing
- Often it is not voluntary

From A. Federici

Requirement for screening a disease

Wilson & Jungner , OMS 1968

1- the disease must be a relevant health problem

2 – the natural history of the disease must be well known

3 – we should be able to identify a well known pre-clinical stage

4 – early treatmet of the disease produce an advantage compared with treating the disease after symptoms onset

5 – a test for pre-clinical condition must be available

6 – the test must be acceptable by the target population

7 – there must be adequate structures for ascertainment and treatment of those who tested positive

8 – if required the test should be repeated at regular intervals according to the natural history of the disease

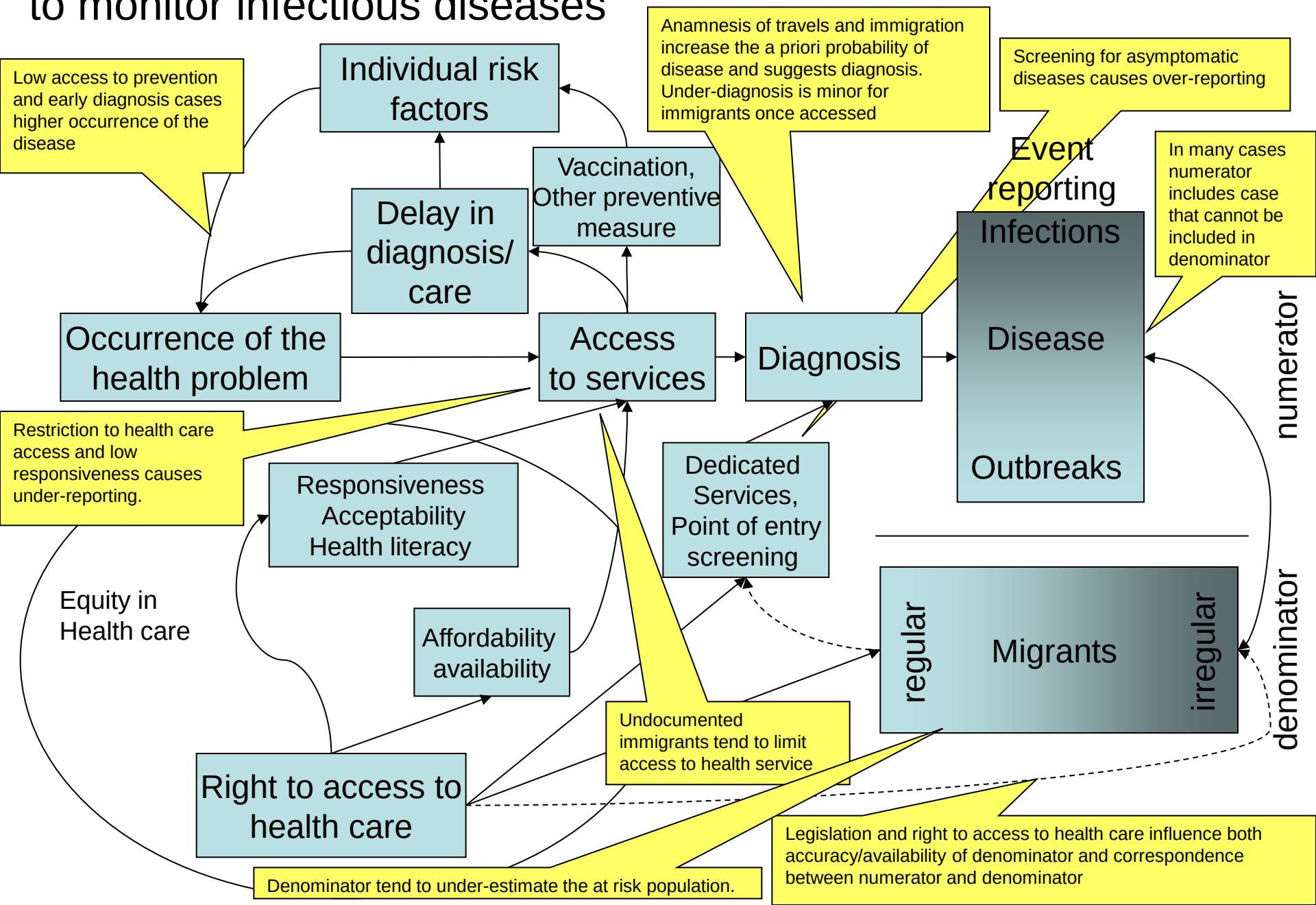
9 – the probablity of physical and psychological harms for the individual should be minor than the probability of benefits

10 – the costs of the program must be sustainable and well balanced by the benefits

The systematic review

- The question was: “factors affecting the accuracy of infectious disease surveillance in migrants”

Interaction between migrant access to health care and indicators to monitor infectious diseases



Aims

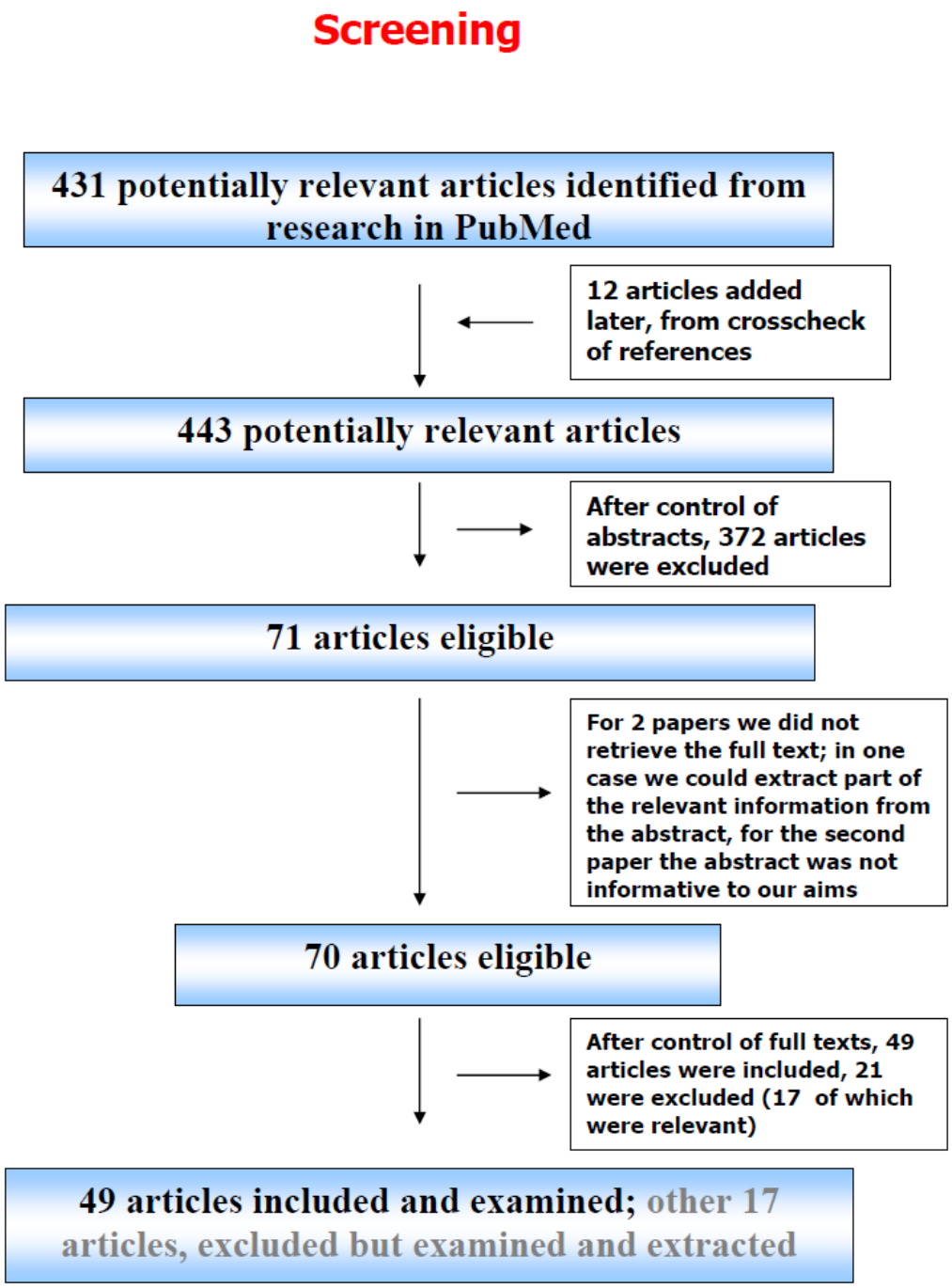
General aim

- A systematic review was conducted to identify all the relevant literature on the accuracy of infectious disease monitoring in migrants in the EU/EEA.

Specific objectives

- to identify possible mechanisms and barriers that can affect number of reported events (under-reporting, over-reporting, biases in reporting);
- to reveal characteristics and outcomes of screening programs for infections and infectious diseases that can introduce bias in occurrence reporting;
- to analyse problems about the definition of the denominator.

The results of the systematic review



The screened diseases

disease		papers
tuberculosis		40
HBV		3
HCV		3
HIV		1
Chagas		1
All IDs*		5

*mainly TB, HBV, diarrhoea and skin infestations and infections, meningitis and respiratory diseases

The countries

Country		papers
UK		9
Switzerland		7
The Netherlands		3
Italy		3
Other EU/EEA		14
Australia/New Zeland		2
USA		1
Canada		1
Guidelines not for specific Country		4

Phase of screening

		papers
Diagnosis		43
Prevention		20
Treatment		5
Follow up		2
Other		4

The topics

		papers
Disasters and emergencies		6
Border or post-entry routine		19
Outcomes of TB screening		5
Costs and CEA models		4
guidelines		8+1

Emergency and disaster reports: Mediterranean

- Pace-Asciak 2013 TB screening (mandatory) and subsequent surveillance of all migrants from 2002 to 2005 in Malta.
  - High prevalence at entry
  - cases with onset in the first months after entry.
  - Surveillance may overestimate incidence and prevalence because the denominator of undocumented is under-estimated.
  - Screening at entry does not limit the diagnostic delay for cases diagnosed after entry, suggesting that barriers to access of services exist also when care is free.

Emergency and disaster reports: Mediterranean

- Smith 2000: Kosovo refugee in Ireland.
  - TB, HBV, skin and diarrhoea were frequent.
  - Low immunization rates.
  - Recommend for vaccination.
  - Very high compliance to screening.

- Rysstad 2003. Kosovar refugees in Norway.
  - High incidence of active tuberculosis (50/100,000).
  - A fifth of the BCG-vaccinated refugees needed careful follow-up to monitor possible progress from latent to active TB infection after immigration,
  - One in seven non-BCG-vaccinated refugees had tuberculin skin reactions compatible with latent TB infection.

Emergency and disaster reports: Asia

- Kelly 2002. East Timorese refugees in Australia:
  - Relatively high proportion of refugees was suspected of having TB (11.6%),
  - culture proven TB as a proportion of diagnoses was low (50%) and the smear positivity rate as a proportion of culture positive M. tuberculosis cases (and thus total diagnoses) was also low (28.9% of culture-positive patients).
- Denburg 2007. Karen refugees in Canada:
  - Identification of medical needs through the implementation of an effective screening protocol.

Routine border or post-entry screening for TB: the main system described

- UK border screening
- Switzerland asylum seeker (active)
- Switzerland routine (Passive)
- Norway
- The Netherland

Routine border or post-entry screening for TB: prevalence

Many authors point out that screening is worth only if prevalence is high enough. The following characteristics should be considered:

- Prevalence in the Country of origin
- Time trends (age and country)
- Socio-economic conditions
- Way of entry
- Risk factors pre-screening (questionnaires)

Systematic Review

- Arshad 2010: systematic review of screening yield for TB.
  - higher yield for refugee than for regular immigrants and for asylum seekers (probably because the refugees are not self-selected to be healthy, i.e. no healthy migrant effect)
  - higher yield for Asian and African immigrant than for European.
  - The prevalence in immigrants is higher than the prevalence in their origin countries, the authors suggest for problems of being high risk groups, but also an over-reporting in screening or an under-reporting in national statistics can be suggested.

Routine border or post-entry screening for TB: unsolved problems

- Low coverage of new arrivals (and decreasing in time)
- Low compliance to follow up practices
- Use of new tests (IGRA) in specific populations
- Biases in prevalence estimates due to selection (planned or incidental) of people to be screened
- Biases in comparisons wit non-screened populations

- Johnsen 2005 examines the effectiveness of TB screening in asylum seekers in Norway, and describes TB incidence rates after arrival. Authors conclude that screening on entry should continue, but follow-up of abnormal mass miniature X-rays must be improved. There should be more emphasis on treatment of latent infection.
- Erkens 2008 describes the routine TB screening in the Netherlands for newly arrived immigrants, about 70000 individuals followed for 29 months after arrival. The screening has five rounds of follow up for up to 29 months after arrival. The coverage decreases after the first round. The yield of screening is related to the prevalence of disease in their origin countries. Follow-up screening for individuals from countries with a low or medium incidence and with no abnormalities on their chest radiographs at entry has been abolished as a result of the study.
- Monney 2005, Sarivalasis 2012, in Swiss asylum seeker. In the first study they compared the results of screening at borders for asylum seekers with passive screening for other migrants, cases found at active screening were less frequently asymptomatic, all groups had a very high compliance to therapy. They studied the predictors of LTBI with multiple regression. The screening was voluntary.
- Farah 2005, (Norway) The results indicate the need for health personnel to be aware that immigrants remain at high risk of TB many years post-migration. Screening for TB on arrival should be strengthened, and preventive therapy for those with recent TB infection should be considered.
- Olivani 2012 (Italy) presents the use of a screening questionnaire for TB to identify high risk individuals to be referred to second level tests. Compliance to referral was low.
- Van den Brande 1997 reports on the results of active screening in a group of asylum seekers in Belgium.The conclusion is that asylum seekers constitute an important risk group for TB; the recommendations are, therefore, that in all asylum seekers screening for tuberculosis should be mandatory.
- Codecasa 1999 describes epidemiology and clinical patterns of tuberculosis among immigrants from developing countries in the Province of Milan (Italy). In conclusion, the incidence of TB is higher among more recent immigrants. Preventive measures for early diagnosis of disease orchemoprophylaxis of dormant infection are not regularly performed, but should be implemented for those immigrants at high risk.
- Fernández Sanfrancisco 2001 describes the prevalence of tuberculosis infection in the immigrants from different African countries at the Calamocarro refugee camp in Ceuta, Spain. The immigrant population from central African countries shows a higher prevalence of tuberculosis infection, comprising a group at risk of contracting this disease. Therefore, it is of fundamental importance to implement specific programs to actively detect tuberculosis infection during their stay in the host city.
- Van Burg 2003 has the aim of identify low-risk groups among asylum seekers in the Netherlands that may be excluded from tuberculosis screening at entry or during follow-up. Authors conclude that 1) those with abnormal X-ray at entry should receive preventive therapy after exclusion of active TB, or undergo intensive follow-up, 2) periodic screening is not indicated for immigrants from countries whose asylum seekers have a low prevalence of pulmonary TB at entry, and 3) children <12 years can be excluded from screening.
- Harling 2007. Tuberculosis screening of asylum seekers: 1 years'experience at the Dover Induction Centres. Induction centre tuberculosis screening services for asylum seekers can achieve a high uptake, but their cost-effectiveness is questionable, particularly where the yield of active disease is low. Tuberculin skin testing is not an ideal screening procedure in this setting because it may be uncompleted and the benefit of detecting latent infections is uncertain.
- Callister 2002.Pulmonary tuberculosis among political asylum seekers screened at Heathrow Airport, London, 1995–9. The prevalence rate of TB in political asylum seekers entering the UK through Heathrow Airport is high and more Mycobacterium tuberculosis isolates from asylum seekers are drug resistant than in the UK population.
- Ormerod 1998. Is new immigrant screening for tuberculosis still worthwhile? A comparison between new immigrant screening data in the 1980s and the in the 1990s was done. Between 1990 and 1994 the official Port of Arrival system continued to perform poorly, identifying only 40% of total new immigrants compared with 55% in 1983-88.
- Mathez 2007. TB at Swiss borders. They explore how many cases would be missed if x-chest would be used only in symptomatic subjects (gold standard culture positive).
- Pareek 2011. Tuberculosis screening of migrants to low tuberculosis burden nations: insights from evaluation of UK practice. Considerable heterogeneity and deviation from national guidance exist throughout the UK new entrant screening process, with high-burden regions undertaking the least screening. Forming an accurate picture of current front-line practice will help to inform future development of European new entrant screening policy.
- Laifer 2004. Polymerase chain reaction for Mycobacterium tuberculosis: impact on clinical management of refugees with pulmonary infiltrates.Repeated PCR testing for Mycobacterium tuberculosis complex (MTB) in a population of asymptomatic war refugees with pulmonary infiltrates highly suggestive of TB is significantly more sensitive than acid-fast smear (AFS).

Routine border or postentry screening.

- Valerio 2008. Spain. High prevalence of HBV and HCV stress the need for screening and vaccination for HBV. Immigrants from Latin America are at relatively low risk and should be not screened.
- Aparicio 2012, in France piloted a post-entry screening for HIV, HBV and HCV and found moderate compliance, and quite high prevalence.

- Hobbs 2002. The health status of asylum seekers screened in Auckland in 1999 and 2000. Immigrant communities in New Zealand have special healthcare needs, as well as experiencing language barriers, cultural differences and economic difficulties.

Cost effectiveness studies and models: general evaluation

- Dasgupta 2004. “Despite the high proportion of active cases in low-incidence countries attributable to foreign-born residents, the public health impact is relatively low. Current chest radiograph screening programmes have little impact and are not cost-effective. (…) In contrast, contact tracing, particularly within ethnic communities, appears to be more cost-efficient and less intrusive”.
- Choudhury 2013 analyses incidence of tuberculosis in new entrants aged 16–34 with positive tuberculin skin tests but normal chest X-rays after initial entry. Need to confirm or revise the assumptions behind the 2011 NICE economic appraisal.
- Kruijshaar et al 2013 propose a model to calculate the Number Need to Screen in order to prevent one TB disease according to the risk to develop a TB in the first 5 years since entry for each country of origin. Migrants at higher risk are not necessarily those coming from countries with higher prevalence of TB: NNS were the lowest in Somalian and the highest in South African and Filipino migrants, which contrasts with TB rates in these countries.

Cost effectiveness studies and models: improvements

- Dasgupta 2004.
  - Screening with sputum culture would improve cost-effectiveness marginally.
  - Treatment of latent infection detected through screening with tuberculin skin testing or chest radiographs may require coercive measures to maximise impact and cost-effectiveness.
- Bothamley 2002 compares the yield and costs of screening new entrants in a hospital based new entrants' clinic (referrals from the port of arrival), general practice (new registrations), and centres for the homeless.
  - Screening for tuberculosis in primary care is feasible and could replace hospital screening of new arrivals for those registered with a GP.
- Harling 2007. Tuberculosis screening at the Dover Induction Centres.
  - Screening services for asylum seekers can achieve a high uptake, but their cost-effectiveness is questionable, particularly where the yield of active disease is low.
  - Tuberculin skin testing is not an ideal screening procedure in this setting because it may be uncompleted and the benefit of detecting latent infections is uncertain.
- Johnsen 2005. Effectiveness of TB screening in asylum seekers in Norway.
  - screening on entry should continue, but follow-up of abnormal mass miniature X-rays must be improved.
  - There should be more emphasis on treatment of latent infection.

Systematic Review

- Klinkenberg 2009. systematic review to assess effectiveness of tuberculosis (TB) screening methods and strategies in migrants in European Union/European Economic Area (including Switzerland) countries.
  - Recommendations include the need for improved data for guiding the optimal frequency and duration of screening;
  - assessment and improvement of cost-effectiveness;
  - access to healthcare for migrants, including illegal migrants;
  - ensuring a continuum of care for those screened;
  - and consideration of screening for latent TB infection with caution.
  - screening should be a component of a wider approach, rather than a stand-alone intervention.

Guidelines

- 8 documents producing recommendation about screening for infectious diseases were found:
  - 3 from governmental agencies (UK NHS; USA CDC, EU ECDC);
  - 1 consensus conference of scientific societies;
  - 4 by individual researchers.

- 1 paper (Coker 2004) makes an overview of the screening policies for TB in new entries in EU member states. The screening policies, where presented, are different; all are based on x-chest.

Table 1 Legal requirements, national guidance and location of screening location

Country	Legal requirement	National guidance	Screening location
Switzerland	Y	Y	Refugees and asylum seekers at port of entry Foreign workers in community
Malta	Y	Y	Refugees, asylum seekers, illegal immigrants, students, prisoners and adopted children at chest unit
Iceland	Y	Y	Refugees and asylum seekers in the community
Belgium	N	Y	Asylum seekers at port of entry Refugees and asylum seekers at reception/holding centres or in the community
Latvia	Y	Y	Refugees and asylum seekers in the community
The Netherlands	Y	Y	Refugees and asylum seekers at camps or community centres Immigrants in the community from high-risk countries
England, Northern Ireland*	N	Y	Refugees and asylum seekers in the community or port of entry (on UK mainland). Other new entrants also screened
Norway	Y	Y	Refugees and asylum seekers at reception/holding centres (small numbers screened in the community) All other entrants and those coming to be reunited with family at community centres
Denmark	N	Y	Refugees and asylum seekers at reception/holding centres
Greece	N	N	Refugees in hospitals Asylum seekers in reception/holding centres
France	Y	N	Refugees, asylum seekers and workers at reception/holding centres
Portugal	N	N	Refugees at reception/holding centre
Czech Republic	Y	Y	Refugees and asylum seekers at reception/holding centres

* Reported here together as one of the 51 countries sampled. Respondents from each region were sent questionnaires.
Y = Yes; N = No.

Cocker 2004

Table 2 Screening tools used

Country	Clinical screening tools used
Switzerland	TST CXR
Malta	TST CXR >10 years Clinical history and examination of those with abnormal CXR BCG checked for those TST positive
Iceland	TST (Mantoux) <35 years CXR >34 years
Belgium	TST <5 years and pregnant women CXR >5 years Clinical history and physical examination in those with abnormal CXR or positive TST BCG checked in weakly positive TST
Latvia	TST (Mantoux) age 0–14 years CXR ⩾15
The Netherlands	CXR >12 years <12 years if BCG scar then CXR If no BCG scar, then TST
England	CXR at port of entry In community, TST (Heaf). If strongly positive TST (Heaf 2–4 in <16 years, 3–4 >16), then CXR
Northern Ireland	CXR if suspicious symptoms and/or positive TST Physical examination if suspicious symptoms and/or positive TST
Norway	TST (Pirquet) CXR Clinical examination for those with history of TB or symptoms BCG checked
Denmark	CXR if clinical suspicion Clinical history Physical examination offered BCG checked for if examined
Greece	TST in those with symptoms and signs in reception centres or positives CXR in hospitals CXR for all in hospital >18 years Clinical history and physical examination
France	CXR Clinical history Physical examination BCG scar checked for
Portugal	TST for <15 years CXR Clinical history Physical examination
Czech Republic	TST for <15 years CXR for those >1 year Clinical history

TST = tuberculin skin test; CXR = chest X-ray; BCG = bacille Calmette-Guérin immunisation.

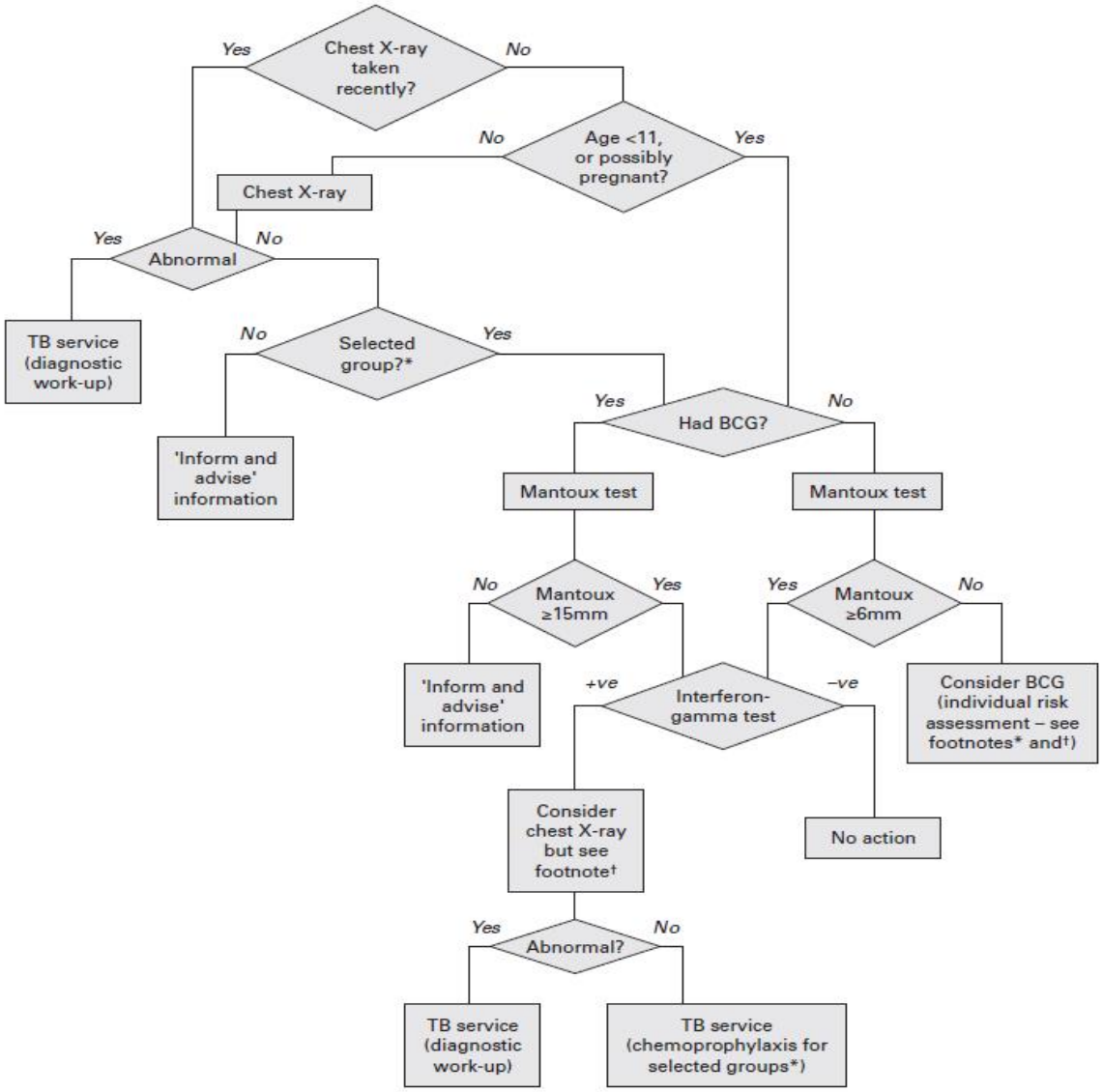
Cocker 2004

Table 3 Action following determination of latent tuberculosis

Country	If latent TB identified, course of action	BCG offered?
Switzerland	Preventive treatment offered Clinical and CXR follow-up	BCG offered
Malta	Preventive treatment given	BCG offered if <45 years and not vaccinated before
Iceland	Preventive treatment offered occasionally CXR follow-up 3 to 5 years	No action
Belgium	Preventive treatment offered Clinical and CXR follow-up Patient given advice	No action except asylum seekers staying in reception/ accommodation centres given health education sessions on TB
Latvia	Preventive treatment offered <15 years	No action
The Netherlands	<12 years, if positive TST and CXR normal, preventive treatment offered Others followed up	BCG offered if positive TST
England	Preventive treatment offered To under 16 if grade 2 or greater Considered in 16–34 years if grade 3 or 4	BCG offered if <16 years with negative TST
Northern Ireland	Preventive treatment offered if <34 years and positive TST	BCG offered if negative TST and <16 years old Patient given advice
Norway	Preventive treatment offered If not, then follow-up for 3 years with CXR	BCG not generally offered to those over 40 years Patient given advice
Denmark	Patient given advice	No action
Greece	Preventive treatment offered	No action
France	No action <15 years sent to hospital for preventive treatment	Given advice
Portugal	Preventive treatment offered Follow-up with CXR Patient given advice	BCG offered and patient given advice
Czech Republic	Clinical follow-up Given advice	Given advice No action

CXR = chest X-ray; TST = tuberculin skin test; BCG = bacille Calmette-Guérin immunisation.

Cocker 2004



This algorithm sets out the actions for screening new entrants (or people returning after a prolonged stay) to England or Wales from a country with a high incidence of TB (as defined by the HPA; go to **www.hpa.org.uk** and search for 'WHO country data TB'). It does **not** apply to people who are known to be HIV-positive, who should be referred to an HIV team. People coming to the UK to work in healthcare with either patient or clinical material contact should be screened in line with the 'new NHS employees' algorithm. It applies to dedicated new entrant screening services, and therefore does not detail the systems for detecting new entrants, nor the clinic activities that follow. Service providers with a different service model may need to adapt this to their individual processes.

* Select new entrants for further screening/action if they are any one of the following:
  - age <16
  - age 16–35 from sub-Saharan Africa or a country with incidence >500/100,000

† Timing of chest X-ray and/or BCG may be dependent on pregnancy status. Interpret existing chest X-ray if one has been taken recently.

Figure 10: Algorithm for new entrant screening

England and Wales
Algorithm new entrant
Screening for TB

Conclusions

- Few reports on real emergencies
- Agreement only on TB screening
- Focus on treatment and follow up
- No agreement on standard screening algorithms and tools
- Contrasting results about cost effectiveness
- Need for a Health Technology Assessment.