**TB-screening in patients with HIV: an audit against UK national guidelines to assess current practice and the effectiveness of an electronic TB-screening prompt.**

**A Fox-Lewis MRCP1,2, N Brima MSc3, P Muniina PhD3, AD Grant FRCP1,2,4, SG Edwards FRCP1, RF Miller FRCP1,3,4,**

**SL Pett FRCP(E)1,3,5,6.**

**1***Mortimer Market Centre, Central and North West London NHS Foundation Trust, London, UK*

**2***Hospital for Tropical Diseases, University College London Hospitals NHS Foundation Trust, London, UK*

**3***Research Department of Infection and Population Health, University College London, London, UK*

**4***Clinical**Research Department, London School of Hygiene and Tropical Medicine, London, UK*

5*MRC Clinical Trials Unit at University College London, University College London, London, UK*

**6***Kirby Institute, University of New South Wales, Australia*

Corresponding author: A Fox-Lewis, Hospital for Tropical Diseases, Mortimer Market Centre, Capper Street (off Tottenham Court Road), London, WC1E 6JB. Email: a.fox-lewis@nhs.net

**Summary**

A retrospective clinical audit was performed to assess if the British HIV Association 2011 guidelines on routine screening for tuberculosis in HIV are being implemented in a large UK urban clinic, and if a tuberculosis-screening prompt on the electronic patient record for new attendees was effective. Of 4658 patients attending during the inclusion period, 385 were newly diagnosed first-time attendees and routine tuberculosis-screening was recommended in 165. Of these, only 6.1% of patients had a completed tuberculosis screening prompt, and 12.1% underwent routine tuberculosis-screening. This audit represents the first published UK data on routine screening rates for tuberculosis in HIV, and demonstrates low rates of tuberculosis-screening despite an electronic screening prompt designed to simplify adherence to the national guideline. Reasons why tuberculosis-screening rates were low, and the prompt ineffective, are unclear. A national audit is ongoing, and we await the results to see if our data reflect a lack of routine tuberculosis-screening in HIV-infected patients at a national level.

**Keywords:** tuberculosis, HIV, screening, audit

**Introduction**

As part of the End Tuberculosis (TB) Strategy, the WHO recommends systematic testing for and treatment of latent TB infection in all people living with HIV1. Both the British HIV Association (BHIVA) and the National Institute of Health and Clinical Excellence (NICE) have issued UK national guidelines for latent TB screening in HIV-patients. The BHIVA 2011 guidelines2,3 recommend screening with an interferon-gamma release assay (IGRA) in patients from:

* Sub-Saharan Africa (SSA) on antiretroviral therapy (ART) for <2 years;
* Medium-TB-incidence (MI) countries (Eastern Europe, Central Asia, North Africa, the Middle East, South Asia, East Asia, and the Caribbean) on ART for <2 years, with a CD4+ T-cell count <500 cells/µL;
* Low-TB-incidence (LI) countries (including the UK, Western Europe, Australia, USA, Canada and New Zealand) on ART for <6 months, with a CD4+ T-cell count <350 cells/µL.

The NICE 2011 guidelines4 recommend screening based on CD4+ T-cell count alone:

* <200 cells/µL, offer an IGRA and Mantoux test;
* 200–500 cells/µL, offer an IGRA +/- Mantoux test.

The clinic population of the Mortimer Market Centre (MMC) represents a large urban cohort of HIV-infected patients. Routine TB-screening as per the BHIVA guidelines was launched at this centre in October 2011, accompanied by an electronic TB-screening prompt appearing when new HIV-patients first attended the clinic. The user selected high, medium or low TB-incidence for the patient’s country of birth, upon which the prompt detailed the BHIVA guideline criteria necessitating an IGRA being requested for that patient (i.e. if from SSA the user would select ‘high incidence’ and the prompt would state ‘perform an IGRA if on ART for less than two years’).

The aims of this audit are threefold: to assess the demographics of a large urban HIV clinical population; to determine the extent to which the BHIVA 2011 guidelines on routine TB-screening are being implemented at this centre in newly diagnosed HIV-patients; and to evaluate the effectiveness of an electronic TB-screening prompt.

**Methods**

A retrospective audit of the electronic patient record (EPR) was used to identify all HIV-infected patients attending the clinic between 11 October 2011 and 31 December 2014 inclusive. For each patient, a computerised search was used to extract demographic data, CD4+ T-cell count at first attendance at MMC (baseline CD4+ T-cell count), IGRAs requested and their results, duration of follow up, and electronic records of transfers of care to or from MMC.

The audit inclusion criteria were: age >18 years, newly attending the clinic after the launch of TB-screening on 11 October 2011 (patients were not screened retrospectively), have had the entirety of their HIV care at MMC (i.e. newly diagnosed at first attendance), have been followed-up for ≥180 days, have a recorded CD4+ T-cell count and have a country of birth within a region for which the guidelines make explicit TB-screening recommendations. Thus only newly diagnosed patients who were only followed up at MMC and who fell into SSA, MI or LI regions met the audit inclusion criteria.

Patients were stratified by their country of birth into SSA, MI, and LI screening groups. The specific countries composing world regions were taken from the UN regional classifications5. Given only newly diagnosed patients were included, all patients were considered to be on ART for <6 months. Each patient’s baseline CD4+ T-cell count and screening group were used to determine if TB-screening would be recommended for that patient by the BHIVA guidelines, and if recommended whether an IGRA had been done. Only an IGRA that was not requested in the context of TB symptoms was considered to have been done for routine screening.

Demographic analysis was only undertaken for HIV patients meeting the audit inclusion criteria.

**Results**

During the inclusion period 4658 HIV-patients were followed-up at the centre, of which 385 met the audit inclusion criteria. Salient demographic data is summarised in Table 1.

**Table 1.** Demographic profile of HIV-infected patients meeting the audit inclusion criteria.

Total number of HIV-infected patients attending MMC during inclusion period……………. 4658

Country of birth in region for which the BHIVA guidelines make explicit

TB-screening recommendations………………………………………………………………………… 3580 (76.9%)

Country of birth in region for which the BHIVA guidelines *do not* make

explicit TB-screening recommendations\*………………………………………………………….. 347 (7.4%)

Country of birth not specified……………………………………………………………………………. 731 (15.7%)

Number of patients meeting audit inclusion criteria……………………………………………………….. 385 (8.3%)

CD4+ T-cell count of patients meeting audit inclusion criteria; median (IQR)…….. 450 (310-630)

Age; median (range), years………………………………………………………………………………… 37 (18–79)

Gender

Men…………………………………………………………………………………………………….. 331 (86.0%)

Women……………………………………………………………………………………………….. 54 (14.0%)

Sexual orientation

 Heterosexual……………………………………………………………………………………….. 97 (25.2%)

 Homosexual…………………………………………………………………………………………. 270 (70.1%)

 Bisexual……………………………………………………………………………………………….. 18 (4.7%)

 Ethnicity

White (British, Irish, other)………………………………………………………………….. 263 (68.3%)

Black African………………………………………………………………………………………... 61 (15.8%)

Black Caribbean…………………………………………………………………………………… 11 (2.9%)

Black other…………………………………………………………………………………………… 7 (1.8%)

Mixed…………………………………………………………………………………………………… 15 (3.9%)

Asian (Indian, Pakistani, Bangladeshi)………………………………………………….. 16 (4.2%)

Chinese………………………………………………………………………………………………… 6 (1.6%)

Unknown…………………………………………………………………………………………….. 6 (1.6%)

Screening group

 SSA………………………………………………………………………………………………………. 63 (16.4%)

 MI………………………………………………………………………………………………………… 63 (16.4%)

LI………………………………………………………………………………………………………….. 259 (67.3%)

 Clinician seen at first attendance

 Consultant…………………………………………………………………………………………… 211 (54.8%)

 Registrar………………………………………………………………………………………………. 153 (39.7%)

 Clinical Nurse Specialist……………………………………………………………………….. 21 (5.5%)

Prompt completed…………………………………………………………………………………………….. 23 (8.1%)

 Consultant…………………………………………………………………………………………... 7 (30.4%)

Registrar………………………………………………………………………………………………. 16 (69.6%)

Clinical Nurse Specialist……………………………………………………………………….. 0 (0.0%)

Patients in whom TB screening was recommended who underwent

TB screening with an IGRA…………………………………………………………………………………. 20 (12.1%)

 Screened by Consultant……………………………………………………………………….. 13 (65.0%)

 Screened by Registrar………………………………………………………………………….. 7 (35.0%)

\*Regions for which the BHIVA guidelines do not make explicit TB-screening recommendations include 77 of the 196 (39%) world countries (detailed below):

Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama);

South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela);

Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan);

South-Eastern Asia (Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Viet Nam);

Northern Europe (Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden);

Southern Europe (Albania, Andorra, Bosnia and Herzegovina, Croatia, Gibraltar, Greece, Holy See, Italy, Malta, Montenegro, Portugal, San Marino, Serbia, Slovenia, Spain, The former Yugoslav Republic of Macedonia);

Melanesia (Fiji, Papua New Guinea, Solomon Islands, Vanuatu);

Micronesia (Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, Palau);

Polynesia (Cook Islands, Niue, Samoa, Tonga, Tuvalu).

TB-screening was recommended in 165 (42.9%) of the 385 patients meeting the audit inclusion criteria. Of these only 10 (6.1%) had a completed TB screening prompt, and only 20 (12.1%) underwent routine TB-screening with an IGRA (Figure 1).

**Figure 1**. Flowchart detailing use of the screening prompt and IGRAs performed for patients at MMC meeting the audit inclusion criteria and in whom TB screening was recommended.

**Discussion**

This audit demonstrates low TB-screening rates in HIV-patients, despite an electronic prompt to facilitate screening. The prompt was under-utilised: it was completed in only 6.1% of patients in whom screening would have been recommended. The majority (54.8%) of patients were seen at first attendance by a consultant. Consultants only completed 30.4% of the completed prompts, but requested 65% of the screening IGRAs, indicating that the decision to perform an IGRA was generally made independent of the screening prompt.

The under-use of the prompt may be related to the complexity of the BHIVA 2011 guidelines, which risk stratify by three variables (country or birth, ART duration and CD4+ T-cell count). The strategy advocated by NICE, using only CD4+ T-cell count, may be easier to implement and increase screening rates. A recent economic analysis of TB-screening in HIV found that both the NICE and BHIVA strategies were cost-effective compared with no screening6. During the more recent study period (2005-2010) this analysis found the NICE guidelines to be less cost effective than the BHIVA guidelines, but noted that the NICE strategy is simpler and less likely to miss cases. Given the difficulty in implementing the BHIVA guidelines at this centre, which may be partially attributable to their added complexity and significant omissions in screening recommendations for many regions, it may well be that the NICE guidelines would be an overall more effective strategy. A real-life comparison of the two strategies is needed.

The findings of this audit represent the first published data on routine TB-screening rates in a UK HIV clinic setting, and may reflect under-screening at a national level. A national audit is currently underway, and we await the results to compare our performance relative to other similarly sized and ethnically/geographically diverse clinic cohorts. If the screening rates observed here are comparable to those at other centres, then the results of this audit have vital implications at both patient and public health level, and would demonstrate a need for an improved and systematic strategy for TB-screening in HIV-infected individuals, nationwide.

**References**

1. World Health Organization. Guidelines on the management of latent tuberculosis infection 2015., Geneva, World Health Organization, 2015, <http://www.who.int/tb/publications/ltbi_document_page/en/> (15/12/2015).
2. Asboe D, Aitken C, Boffito M et al; BHIVA Guidelines Subcommittee. British HIV Association guidelines for the routine investigation and monitoring of adult HIV-1-infected individuals 2011. HIV Medicine (2012), 13, 1–44. DOI: 10.1111/j.1468-1293.2011.00971.x
3. [Pozniak AL](http://www.ncbi.nlm.nih.gov/pubmed/?term=Pozniak%20AL%5BAuthor%5D&cauthor=true&cauthor_uid=21951595), [Coyne KM](http://www.ncbi.nlm.nih.gov/pubmed/?term=Coyne%20KM%5BAuthor%5D&cauthor=true&cauthor_uid=21951595), [Miller RF](http://www.ncbi.nlm.nih.gov/pubmed/?term=Miller%20RF%5BAuthor%5D&cauthor=true&cauthor_uid=21951595) et al; British HIV Association guidelines for the treatment of TB/HIV coinfection 2011. [HIV Med.](http://www.ncbi.nlm.nih.gov/pubmed/21951595) 2011 Oct;12(9):517-24. doi: 10.1111/j.1468-1293.2011.00954.x.
4. NICE National Institute for Health and Care Excellence clinical guideline 117. Tuberculosis: Clinical diagnosis and management of tuberculosis, and measures for its prevention and control. March 2011. <https://www.nice.org.uk/guidance/cg117> (15/12/2015).
5. United Nations Statistics Division, Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings. <http://unstats.un.org/unsd/methods/m49/m49regin.htm> (15/12/2015).
6. Capocci S, Smith C, Morris S et al; Decreasing cost effectiveness of testing for latent TB in HIV in a low TB incidence area. Eur Respir J. 2015 Jul;46(1):165-74. doi: 10.1183/09031936.00067114. Epub 2015 Apr 16.