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Expanded blood borne virus testing in a tuberculosis clinic. A cost and yield analysis

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Summary *Objectives:* Testing for HIV is a standard of care for people with active tuberculosis (TB). People investigated for TB in the UK often originate from areas with a high prevalence of HIV and other blood borne viruses (BBV). However, assessment for these infections is patchy. We determined the yield and costs of different testing strategies for BBV in a UK TB clinic.
Methods: Since 2009, it has been routine to test all TB clinic attendees. Demographic, clinical and virological data were retrospectively extracted from patient notes and hospital databases.
Results: Over 3 years, 1036 people were assessed in the TB service. 410 had a final diagnosis of active TB. HIV testing of the latter population diagnosed 27 new HIV cases at a cost of £3017. When BBV testing was offered to all clinic attendees, a further 6 (total 33) new HIV, 5 Hepatitis B (HBV) and 2 Hepatitis C (HCV) diagnoses were made at a total cost of £22,170.
Conclusions: We have identified previously undiagnosed HIV, HBV and HCV in a TB clinic population. Our data suggest that despite increasing upfront expense, the associated yield argues

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strongly for BBV testing to be offered to all patients being investigated for possible TB, irrespective of their final diagnosis.

Background

Earlier diagnosis of HIV infection offers considerable personal and public health advantages. Testing people with HIV indicator conditions is strongly advocated by numerous medical advisory bodies[1]; such that it is now a UK standard of care for people receiving treatment for active tuberculosis (TB).[2] It is also routinely recommended in all men and women who originate from a country of high HIV prevalence (>1%).[3]

The health benefits of early diagnosis of other blood borne viruses (BBV) such as Hepatitis B & C are similar.[4–6] These are likely to be present in UK populations at risk of TB.[7,8] Given the greater chance of TB reactivation in those with latent TB and HIV infection,[9] and the risk of drug induced hepatotoxicity in people with viral hepatitis infection,[10] screening for other blood borne viruses seems sensible when testing for latent TB.

The most pragmatic approach to testing for BBV in people attending TB clinics would be to test everyone, irrespective of perceived risk. However, there are few data on: (1) the yield of testing for BBV in persons referred in a metropolitan, resource-rich environment with reported low overall HIV prevalence, (2) whether those with latent TB infection (LTBI), or who are being assessed for suspected TB disease, are offered any BBV testing routinely, and (3) the cost associated with testing for BBV in this setting. Here, we report our experience of testing for HIV, Hepatitis B & C in adult TB clinic attendees and the costs associated with screening at first presentation to a TB service compared to the currently recommended, though later, point i.e. when starting treatment for a diagnosis of active TB.

Methods

Comprehensive clinical and laboratory data were extracted from hospital clinical and pathology systems for all persons age ≥17 years attending the Royal Free Hospital TB medical outpatient service between 01 January 2009 and 01 July 2012. From January 2009, a policy was introduced where patients attending the TB clinic were routinely offered BBV testing. Verbal consent was obtained when testing was offered. Those with a preliminary positive BBV test result were informed, confirmatory tests performed and patients referred on to a relevant clinic as necessary.

Initial screening blood tests included at least HIV1 and 2 antibody, Hepatitis B (HBV) surface antigen and Hepatitis C virus (HCV) IgG antibody (and if positive, Hepatitis C RNA testing).

A case of Active TB was defined as someone with a clinical or laboratory diagnosis of symptomatic or culture positive TB and receiving treatment. Latent TB was defined as evidence of TB infection in an asymptomatic individual, whether or not they were on preventive treatment. Subjects seen in the TB clinic who did not fall into either Active or Latent TB categories were given a collective designation of Other diagnoses (referred to as 'Others' in the subsequent text).

A subject who had a new positive BBV result was defined as someone with a positive BBV result within 3 months of being seen in TB clinic or starting on TB treatment, and hence was diagnosed during their investigation for TB.

BBV testing strategies and costs

Four models for testing were constructed and compared for yield and cost of testing for BBV (see Fig. 1):

1. All subjects attending clinic, on treatment for active tuberculosis are tested for BBV
2. All subjects *taking anti-tuberculosis treatment* for active or latent tuberculosis infection are tested
3. All subjects diagnosed with active or latent tuberculosis are tested (*whether or not on anti-tuberculosis treatment*)
4. All subjects attending the TB service.

The number of patients needed to test (NNT) in order to diagnose one new case of BBV was calculated for each strategy by dividing the number of patients that had a test by the number of new positive cases.

Costs were estimated using local charges (2013). An initial HIV test was £8.09; and if reactive, a confirmatory test a further £8.09. An HBsAg screening assay cost £8.09, and if positive, a neutralisation assay £12.13. An HCV IgG antibody was £12.13, and if a low positive, a second test cost a further £5.65. Confirmatory HCV RNA cost £40.45. The analysis used a health service perspective and did not include costs for e.g. phlebotomy that would have been performed as part of routine care within clinical management.

Statistical analysis was performed in Excel 2010. Comparisons of proportions were analysed using the Chi-squared test.

As this was a service evaluation, formal ethical approval was not required.

Results

Over three and a half years, 1036 adult subjects attended the clinic, of which 410 (40%) had active TB disease (with mean age 42, standard deviation, SD 15.84 years), 242 (23%) had latent TB infection (mean age 38, SD 15.85 years) and 384 (37%) a final diagnosis other than TB (mean age 48, SD 15.83 years) (Fig. 1 and Table 1). Seven hundred and forty six (72%) were born outside the UK, 248 (24%) were black African, 190 (18%) of South Asian ethnicity (referred to as