



AUDIT, RESEARCH AND GUIDELINE UPDATE

## Raising standards in UK TB control: introducing cohort review

Charlotte Anderson,<sup>1</sup> Jacqueline White,<sup>2</sup> Ibrahim Abubakar,<sup>3,4</sup> Marc Lipman,<sup>2</sup> Surinder Tamne,<sup>4</sup> Sarah R Anderson,<sup>1</sup> Jennifer deKoningh,<sup>2</sup> Susan Dart<sup>2</sup>

<sup>1</sup>Field Epidemiology Services—Victoria, Public Health England, London, UK

<sup>2</sup>North Central London TB Service, Royal Free Hospital NHS Foundation Trust, University College London, London, UK

<sup>3</sup>Department of Infection and Population Health, Centre for Infectious Disease

Epidemiology, University College London, London, UK

<sup>4</sup>Respiratory Diseases Department, Centre for Infectious Disease Surveillance and Control, Public Health England, London, UK

### Correspondence to

Charlotte Anderson, Field Epidemiology Services—Victoria, Public Health England, 151 Buckingham Palace Road, London SW1W 9SZ, UK; Charlotte.anderson@phe.gov.uk

Received 23 April 2013

Revised 21 May 2013

Accepted 22 June 2013

Published Online First

18 July 2013

### ABSTRACT

Cohort review has been used internationally to support tuberculosis (TB) control. We describe its first use in the UK by a London TB service. Improvements were noted in case management and contact tracing, weaknesses identified and important service changes put in place. Key areas of impact were directly observed therapy (DOT) provision (a greater proportion of cases offered DOT, and in response to low uptake resources diverted to create posts responsible for patient-centred DOT delivery), and contact tracing (more contacts per case screened and assessed). Cohort review enables whole system review and improvement. It has subsequently been adopted across the UK.

### INTRODUCTION

Tuberculosis (TB) is an on-going problem in the UK.<sup>1</sup> Unlike most other countries, rates are not falling. It is concentrated in urban areas with the greatest number in London where, in 2011, there were approximately 3500 new notifications.<sup>2</sup> The five clinics that comprise North Central London (NCL) TB Service notify approximately 500 new cases per year.<sup>2</sup> This is more than most UK cities and many European capitals.<sup>1</sup>

TB cases are socially complex, with one in 10 known to have associated issues of homelessness, problem drug or alcohol use, or imprisonment.<sup>2</sup> Management is further complicated by increasing TB drug resistance.<sup>2</sup> Having systems that are in place which routinely and effectively enable TB services to detect, treat and prevent TB are, therefore, of paramount importance.

In 2010, NCL TB Service introduced cohort review with the aim of improving clinical and public health TB management. Cohort review is the multidisciplinary, systematic, quarterly appraisal of the case management and contact investigation of every case of TB. It focusses on specific outcomes, measured against local and national targets, and provides a framework for service evaluation. The process was adapted from US Centers for Disease Control and Prevention guidance,<sup>3</sup> and drew upon the success of cohort review in a number of TB control programmes, including New York City, where since its adoption in 1993, there has been a steep and progressive decline in TB rates.<sup>4</sup>

As its first UK adopter, we describe our experience, the impact of its methodology on our TB service, and implications for others.

### METHODS

All patients notified as having TB disease by the five NCL TB clinics between 1 July 2009 and the implementation of cohort review in June 2010 were compared with those diagnosed in the first 18 months of its use (1 July 2010 to 31 December 2011). A standard set of information was obtained on each patient, including: treatment outcome at 12 months; offer and uptake of HIV testing; identification of the need for, and use of, directly observed therapy (DOT); and the number of contacts identified and assessed (excluding larger incident screening exercises). Data were analysed using Stata 12. The proportion of cases with the outcome of interest in each cohort were compared using  $\chi^2$  tests (or Fisher's exact test where warranted by small cell sizes), with Bonferroni correction to control for the number of comparisons. As this was a service evaluation, ethical approval was not required.

### RESULTS

Five hundred and fifty-seven TB cases were notified by NCL clinics in the year before cohort review was introduced (table 1). Over the next 18 months, 752 cases were notified. Both groups were similar in terms of sex, age, place of birth and drug resistance. Postcohort review, more of the non-UK-born cases were recent migrants (15% vs 10%), although nearly half had still been in the UK for 10 or more years before diagnosis. Fewer cases had pulmonary disease in the post-cohort review group, while the proportion confirmed by culture increased. Fewer cases were reported as having one or more social risk factor in the postcohort review group (22% vs 16%,  $p=0.005$ ) (table 1).

We considered the impact of cohort review on two areas: (1) TB case management outcomes, including anti-TB treatment effect, uptake of HIV testing, and the use of DOT; and (2) contact tracing outcomes, including the number of contacts identified and assessed.

### TB case management

Over 90% of cases were offered a HIV test, and were tested, in both groups. Excluding those with known rifampicin resistance, there was no change in the proportion of cases completing treatment following the implementation of cohort review (table 1).

A higher proportion of adult cases in the cohort review group was assessed as requiring DOT, particularly those with identified risk factors (38% and

**To cite:** Anderson C, White J, Abubakar I, *et al.* *Thorax* 2014;**69**:187–189.

**Table 1** Characteristics, management and contact tracing outcomes of TB cases notified before and after cohort review implementation

	Precohort review		Postcohort review		p Value*
	n/N	%	n/N	%	
<i>Description of cases</i>					
<i>Patient demographics</i>					
Male	307/557	55.1	407/752	54.1	0.721
Aged 20–39 years	248/557	44.5	365/752	48.5	0.150
Non-UK born	409/541	75.6	586/742	79.0	0.152
Recent migrant (<2 years)	44/425	10.4	88/596	14.8	0.038
Long-term resident (≥10 years)	243/425	57.2	274/596	46.0	<0.001
Reported risk factor on LTBR†	120/547	21.9	116/735	15.8	0.005
<i>Clinical characteristics</i>					
Pulmonary	328/557	58.9	394/752	52.4	0.020
Sputum	111/328	52.3	139/394	52.1	0.975
Culture confirmed	278/557	49.9	418/752	55.6	0.042
Any drug resistance	39/278	14	54/418	12.9	0.673
MDR	7/274	2.6	9/417	2.2	0.735
<i>HIV test</i>					
Offered	511/557	91.7	694/752	92.3	0.718
Performed	510/557	91.6	687/752	91.4	0.895
<i>Case management and contact tracing outcomes</i>					
<i>Treatment outcome at 12 months‡</i>					
Completed	480/549	87.4	637/737	86.4	0.599
Still on treatment	23/549	4.2	44/737	6.0	0.155
Died	24/549	4.4	20/737	2.7	0.106
Lost to follow-up	12/549	2.2	25/737	3.4	0.201
lost to follow-up overseas	4/549	0.7	16/737	2.2	0.039
excluding those lost to follow-up overseas	8/549	1.5	9/737	1.2	0.714
Treatment stopped	10/549	1.8	11/737	1.5	0.645
<i>DOT§</i>					
Required DOT	62/380	16.3	145/680	21.3	0.049
Required DOT (with identified risk factor)	42/110	38.2	79/134	59.0	0.001
Offered DOT	58/62	93.6	135/145	93.1	0.907
Offered DOT (with identified risk factor)	41/42	97.6	73/79	92.4	0.242
Received DOT	52/62	83.9	91/145	62.8	0.003
Received DOT (with identified risk factor)	38/42	90.5	56/79	70.9	0.014
Refused DOT	6/62	9.7	44/145	30.3	0.001
Refused DOT (with identified risk factor)	3/42	7.1	17/79	21.5	0.043
<i>One or more contacts identified</i>					
All cases	430/557	77.2	646/752	85.9	<0.001
Pulmonary	257/328	78.4	345/394	87.6	0.001
Sputum smear positive	102/111	91.9	132/139	95.0	0.324
<i>Three or more contacts identified</i>					
All cases	282/557	50.6	428/752	56.9	0.024
Pulmonary	179/328	54.6	252/394	64.0	0.010
Sputum smear positive	82/111	73.9	115/139	82.7	0.089
<i>Five or more contacts identified</i>					
All cases	160/557	28.7	233/752	30.1	0.378
Pulmonary	107/328	32.6	144/394	36.6	0.270
Sputum smear positive	61/111	55.0	75/139	54.0	0.875
<i>Contacts assessed</i>					
All cases	1312/1777	73.8	2134/2644	80.7	<0.001
Pulmonary	856/1162	73.7	1301/1594	81.6	<0.001
Sputum smear positive	433/559	77.5	621/735	84.5	0.001

\* **Bold** denotes significant after using Bonferroni correction ( $p < 0.00125$ ).

† Reported history of homelessness, imprisonment, drug or alcohol misuse, or mental health issues.

‡ Excluding cases with known rifampicin resistance.

§ Excluding children aged 15 years or younger.

DOT, directly observed therapy; TB, tuberculosis.

59% preintroduction and postintroduction, respectively,  $p = 0.001$ ). However, although the proportion offered DOT by the clinic remained high (>90%), the proportion that actually

received DOT fell. This largely resulted from an increased refusal by patients to be treated using DOT (10–30%,  $p = 0.001$ ) (table 1).

### Contact tracing outcomes

Following the introduction of cohort review, the proportion of cases with at least one contact identified among all cases rose ( $p < 0.001$ ), in particular for pulmonary cases ( $p = 0.001$ ). The proportion of cases with three or more contacts identified also increased (55–64%,  $p = 0.010$  for pulmonary cases). There was, however, no evidence of a change in the proportion of TB cases with five or more contacts identified which remained at 30% of all cases, and a third of pulmonary cases and half of sputum smear positive cases.

The proportion of contacts that were clinically assessed by the TB team increased from 74% to 81% ( $p < 0.001$ ). Importantly, this was found in contacts of pulmonary (74–82%,  $p < 0.001$ ) and sputum smear positive cases (78–85%,  $p = 0.001$ ), who are at greatest risk of infection.

### DISCUSSION

It is widely recognised that early identification of TB cases and improving treatment completion are key to TB control.<sup>1</sup> Identification is largely through self-presentation to health services, contact tracing around known cases, and active case finding in high-risk populations. Ensuring that cases successfully complete treatment relies on the implementation of standardised case management practices, with extra support for vulnerable patients. Insufficient evidence has been available to determine the extent and success of contact tracing practices in London, and in the identification and enhanced care of patients at risk of default. This paper reviews the first use of cohort review in the UK, and its impact on a TB service.

The basic premise of cohort review is a framework of peer appraisal to ensure standardisation of case management. The systematic process highlights strengths and weaknesses of the service as a whole that may not be identified in other case review or team meetings.

We found some measures of successful case management, in particular, treatment completion and HIV testing, remained high but unchanged. As these were very high to begin with, a larger sample size would be needed to show a statistically significant effect.

After cohort review was implemented, a higher proportion of adults were assessed as requiring DOT though less received it—mainly due to patient refusal. This often arises because individuals feel they do not need supervised therapy, or that DOT interferes with their schedule.<sup>5</sup> Education, support and ensuring arrangements for DOT are person-centred, and may overcome these concerns. However, cohort review also highlighted staff concerns regarding the service's ability to provide DOT, in particular, out-of-hours, at weekends and public holidays, and across geographic service boundaries. Our solution was to identify funds to employ four non-clinical staff with the specific remit to deliver community-based DOT. We believe this will resolve many of the issues over DOT provision, and the DOT team's impact will be monitored through cohort review.

We found some evidence that a greater number of contacts were screened and assessed once cohort review was initiated. Importantly, this was performed in cases where the index was likely to be most infectious. The whole system approach,

inherent in cohort review, highlighted several deficiencies in our current contact tracing practice, informed the development of new national guidance, enhanced staff development and emphasised the importance of timely and accurate data collection. Further plans include routine community visits (particularly for smear positive pulmonary patients) to identify high-risk contacts, and a new standard to visit all contacts of pulmonary TB cases who fail to attend two appointments for screening. A further service objective is to provide an out-of-hours contact tracing clinic to offer patients increased choice of appointment times.

A limitation of our evaluation is that we cannot account for subjective changes in the way staff assessed and managed patients that may have occurred as a result of increased focus on process and outcome. For example, while the pre-cohort review group was reported as having a greater proportion of cases with one or more social risk factors, the proportion assessed as requiring DOT was higher in the post-cohort review group—which may result from more stringent assessments by case managers.

Following our implementation, it has been adopted across London and the UK. We urge TB services to ensure it is used appropriately, and its impact closely monitored. For example, increasing the number of contacts screened could be a significant burden to TB services unless the focus remains on those at highest risk. A fuller evaluation of the impact of cohort review across the UK is planned.

We have described the first use of cohort review in the UK: it has proved to be an effective, practical tool to monitor patient and public health outcomes for a local TB Service. We observed an improvement in a number of case management and contact tracing outcomes, but more importantly it has allowed the service to better identify its weaknesses and find solutions to these collectively. Its use in both high and low incidence areas indicates that cohort review is an adaptable tool applicable to a variety of settings.

**Contributors** All authors substantially contributed to this manuscript. CA, JW and SD had the idea for the study; CA, JW, SD and IA contributed to the study design; CA and JD contributed to acquisition of data; CA and IA contributed to analysis of data; CA drafted the article; All authors revised it critically for interpretation and important intellectual content. All authors gave final approval to the version to be published. CA and SD are the guarantors.

**Competing interests** None.

**Provenance and peer review** Not commissioned; externally peer reviewed.

### REFERENCES

- 1 Abubakar I, Lipman M, Anderson C, *et al.* Tuberculosis in the UK—time to regain control. *BMJ* 2011;343:d4281.
- 2 Tuberculosis in London: Annual review (2011 data). Health Protection Agency London Regional Epidemiology Unit. September 2012. [http://www.hpa.org.uk/webc/HPAwebFile/HPAweb\\_C/1317136048986](http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317136048986)
- 3 Centers for Disease Control and Prevention, Division of Tuberculosis Elimination. *Understanding the TB cohort review process: instruction guide*. Atlanta, GA: CDC, 2006. <http://www.cdc.gov/nchstp/tb/pubs/cohort/cohort.pdf> (accessed Apr 2011).
- 4 Munsiff SS, Ahuja SD, King L, *et al.* Ensuring accountability: the contribution of the cohort review method to tuberculosis control in New York City. *Int J Tuberc Lung Dis* 2006;10:1133–9.
- 5 Gupta S, Berg D, de Lott F, *et al.* Directly observed therapy for tuberculosis in New York City: factors associated with refusal. *Int J Tuberc Lung Dis* 2004;8:480–5.