NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Centre for Public Health

Cost impact analysis to support the development of tuberculosis service delivery recommendations

April 2015

Abbreviations

CPH	Centre for Public Health (at NICE)
DOT	Directly observed therapy
ED	Emergency department
GDG	Guideline Development Group
HRG	Healthcare resource Group
MDTB team	Multidisciplinary TB team
NICE	National Institute for Health and Care Excellence
SDG	Service Delivery Group
TB	Tuberculosis
Wte	Whole time equivalent

Declarations

There are no competing interests to declare.

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Contents

1 Executive Summary

Objectives and methods

- The aim of this analysis was to provide estimates of the cost impact of key service delivery and organisational factors arising during the update of CG117.
- A cost impact analysis was undertaken in line with the NICE methodology for developing costing tools and the NICE interim methods for developing service delivery guidance.
- Cost impact was undertaken for TB support workers, rapid radiology referral, direct emergency department (ED) referral, and TB co-ordinators.

TB support worker

- The cost impact was estimated to be -£13,400 to £36,200 per year depending on the band/salary of the support worker.
- It was estimated to be cost saving if 1wte band 3 support worker substitutes the time of a 0.5wte band 7 nurse.

Rapid radiology referral

- The cost impact was estimated to be -£37,300 to £37,700 depending on how many hospitalisations could be prevented through rapid radiology referral.
- Rapid radiology referral was estimated to be cost saving if 15 or more hospitalisations were avoided per year due to earlier diagnosis in radiology.
- In settings where the administrator time required to deal with the radiology referrals could be absorbed (no additional cost), then only 4 hospitalisations avoided per year would be required for the service to be cost saving.

Direct emergency department referral

- In a high incidence area (inner city), the cost impact was estimated to be -£38,800 to £5,900, depending on the number of repeated ED attendances that can be prevented by diagnosing at the first visit. The service was cost saving assuming two additional visits were required with at least a 29% re-attendance rate.

- In a low incidence area (rural), the cost impact was estimated to be -£13,800 to £8,500, depending on the number of ED attendances that can be prevented by diagnosing at the first visit. The service was cost saving assuming three additional visits were required with at least a 38% re-attendance rate.

TB co-ordinator

- The cost impact was estimated to be £44,000 to £75,000 per year for a TB co-ordinator, depending on the band of the co-ordinator and clinician time saved as a result of employing the TB co-ordinator.

Conclusions

- The cost impact analysis indicates that TB support workers, direct ED referral, and rapid radiology referral can, under certain circumstances, be a cost saving and thus potentially cost-effective use of resources. The TB co-ordinator post is associated with a cost impact of between £44,000 and £75,000 per year. However, all of these service configurations may be cost neutral or cost saving if they can be linked with preventing cases of active TB.

2 Background and context

The Department of Health has asked NICE: To prepare guidance for the NHS in England and Wales on the clinical management and diagnosis of, and measures to prevent and control tuberculosis (TB). This will replace the current guideline, 'Tuberculosis' NICE clinical guideline 117 (CG117). As part of this process, Public Health guidance 37 (PH37) 'Identifying and managing tuberculosis among hard-to-reach groups' will be incorporated, where appropriate.

Consultation on the draft scope highlighted the importance of service organisation and delivery to the effective identification, treatment and management of TB across all patient groups. As such, a key part of the update includes considering the most effective and efficient ways to organise and deliver TB services. The service delivery group (SDG), a subgroup of the guidance development group (GDG), were recruited to consider the evidence on service delivery, which would be later ratified by the GDG and incorporated into the full updated guideline.

3 Objectives

To provide estimates of the cost impact of key service delivery and organisational factors arising during the update of CG117 to enable the committee to more explicitly consider the costs in relation to the benefits.

4 Methods

A cost impact analysis was undertaken in line with the NICE methodology for developing costing tools and the NICE interim methods for developing service delivery guidance.

A cost impact approach was chosen due to the highly variable nature of TB service delivery and organisation across the UK, and the challenges in undertaking a cost-effectiveness analysis of such a fragmented and highly localised service.

Cost impact analysis considers the resources needed to implement an intervention or service, compared with current practice, and any resulting savings. The analysis takes a budget holder's perspective. It does not explicitly consider outcomes, but it

can take account of the potential benefits of an intervention or service, such as saved treatment costs.

Threshold analysis was undertaken to determine how many cases of active TB would need to be prevented to make a service change cost neutral. This approach was deemed necessary as none of the service models analysed provided direct evidence of reduced onward transmission which could result in active cases of TB being prevented. Threshold analysis was deemed a useful approach, as reducing active cases of TB is a key public health priority, and estimates of the costs of treating active TB are readily available.

4.1 Process for prioritising areas for analysis

Cost impact analysis was only undertaken for new service delivery recommendations (rather than existing recommendations relating to service delivery which were in the CG117 or PH37). The SDG had already heard evidence that the interventions behind these recommendations had the potential to be effective. The aim of this analysis was to provide some estimates of the costs in relation the benefits so that the committee could explicitly consider economic issues. Cost impact analysis was then prioritised on the basis of being:

- An area highlighted by the SDG as being of high relevance to the guideline
- A recommendation identified as having potential cost implications (either additional costs or savings)
- An area which was likely to have data readily available to populate a cost impact analysis (via expert input or SDG volunteers).

4.2 Areas chosen for cost impact analysis

The areas identified for cost impact analysis were:

- TB support workers
- Rapid radiology referral for suspected TB
- Direct emergency department (ED) referral
- TB co-ordinator.

Each area is described in more detail in the relevant section.

5 TB support workers

There was evidence of the costs and benefits of TB support workers in Manchester and London – see Appendix 1. This evidence enabled a cost impact analysis to be undertaken, together with a threshold analysis to determine how many cases of active TB would need to be prevented to off-set the costs of the TB support worker.

5.1 Patient numbers

The questionnaires completed in Appendix 1 indicate that TB support workers do not have a case load, but are instead employed at a service level. As such, estimates of patient numbers are not captured for this analysis.

5.2 Costs and savings

The questionnaires completed in Appendix 1 indicate that the TB support worker is employed at a band 3 to 4 in Manchester, and a band 3 to 6 in London. However, the higher band (band 5 and 6) workers in London may in fact be outreach workers which are a distinct part of the MDTB team, and separate from support workers.

In terms of savings, the post in Manchester replaced a 0.5wte TB nurse (assumed to be band 7). In London there is some indication that a support worker could replace upto a 0.8 wte TB nurse, although this may not always be the case and the post may be in addition to TB nurses.

5.3 Outcomes

The questionnaires completed in Appendix 1 indicate that the TB support worker provides a fundamental role in supporting patients, particularly with home visits, medication delivery, and DOT. This could not be captured directly in the cost impact analysis; although this has been indirectly captured via the cases of active TB prevented threshold analysis. The role also provides broader psychosocial support which could not be captured in the analysis.

5.4 Cost impact analysis

The cost impact analysis is shown in Table 1. In Manchester the cost impact varies from -£403 to £3,136 per year depending on the grade of the support worker. At a

band 3 post, the support worker is cost saving (£403 saved) and if outcomes are no worse or improved, then this would be considered a cost-effective use of resources. At a band 4 post the threshold analysis indicated that the TB support worker would need to prevent one case of active TB per year to be cost saving.

In London the cost impact varies from -£13,404 to £36,151 per year depending on the grade of the support worker and whether the support worker replaces or is in addition to TB nurses.

- At a band 3 post the support worker is cost saving (£13,404 saved) where the role substitutes the time of a 0.8wte TB nurse. If outcomes are no worse or improved, then this would be considered a cost-effective use of resources.
- At a band 6 post which is in addition to existing TB nurses the threshold analysis indicated that the TB support worker would need to prevent 8 cases of 'standard' active TB per year, or 3 cases of active TB in hard-to-reach people to be cost neutral. However, as previously mentioned, the higher band workers (band 5&6) may in fact be outreach workers which are a distinct part of the MDTB team, and separate from support workers.

Table 1 Cost impact analysis for TB support worker

Parameter	Manchester estimate	London estimate	Data source
Salary cost of TB support worker[a]	£21,266 to £24,804	£21,266 to £36,151	Manchester = band 3 to 4 London = band 3 to 6
Nurse post saved[a]	-£21,669	-£34,670 to £0	Manchester = 0.5wte band 7 nurse London = 0 to 0.8wte band 7 nurse[b]
Total cost impact (per year)	**-£403 to £3,136**	**-£13,404 to £36,151**	
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)[c]			
'Standard' active TB[d]	0 to 1 case	0 to 8 cases	Assumption that each case = £5,000[e]
Active TB in hard-to-reach people	0 to 1 case	0 to 3 cases	Assumption that each case = £15,000[f]

a Based on NHS salary scale. Estimates are mid-point of band and include on-costs. London weighting has not been applied as although the data was from London the estimate is applicable beyond that area.

b Based on London 2 example in Appendix 1 where when the TB support worker is on holiday a 0.8wte nurse is required to cover the role and London 3 example where the TB support worker is estimated to save the TB nurse around 2 hours per day and 1 TB support worker covers 4 TB nurses.

c The calculations of active TB are rounded up to the nearest whole number.

d Standard active TB is used to mean TB in people who are not hard-to-reach and not drug resistant.

e Taken from PH37. This estimate was based on 6 months treatment for TB.

f Taken from PH37 costing report. This estimate was originally based on expert opinion of the estimated costs of treating TB in hard-to-reach people.

6 Rapid radiology referral

There was evidence of the costs and benefits of rapid radiology referral in Leicestershire – see Appendix 2. This evidence enabled a cost impact analysis to be undertaken, together with a threshold analysis to determine how many cases of active TB would need to be prevented to off-set the costs of rapid radiology referral.

6.1 Patient numbers

The questionnaire completed in Appendix 2 provides some estimates of the patient volume in Leicestershire. These estimates are presented below in Table 2, together with some information on patient demographics. In terms of demographics, it is also worth noting that in Leicestershire less than 1% of patients are not registered with a GP, and that TB in homeless people and people in prison is rare in this area (see Appendix 2).

Table 2 Patient numbers for radiology referral in Leicestershire

Patient flow	Number of patients	Data source
All rapid referrals per year	300	3072 cases over 10 years. 300 cases per year seen as a 'fair reflection' of clinical activity. (Appendix 2 - Q2)
Radiology referrals per year	177	59% of referrals were radiology coding from a recent audit (Appendix 2 - Q1d)
Cases of active TB found due to radiology referral	58	On average one third of referrals are active TB (Appendix 2 - Q2)
Patient demographics of radiology referral patients		
% male	60%	Based on an audit of 146 radiology referral patients (Appendix 2 – Q4)
% non-UK born	65%	Based on an audit of 146 radiology referral patients (Appendix 2 – Q4)

Patient flow	Number of patients	Data source
Patient demographics of active cases of TB		
% male	60%	Based on an audit of 40 active cases (Appendix 2 – Q4)
% non-UK born	80.6%	Based on an audit of 40 active cases (Appendix 2 – Q4)

6.2 Costs and savings

The questionnaire completed in Appendix 2 indicates that 80% of a wte (0.8 wte) grade 6 radiology administrator is required to manage the radiology coding and referrals. Lower grade posts were not deemed appropriate due to the clinical nature of the post. In addition to this, clinician time was required for making the triage decisions based on x-ray. Clarification was sought from the expert who estimated this time to be 30 minutes per referral.

In terms of savings, the questionnaire indicated that there are likely to be fewer hospitalised cases and reduced length of stay as a result of rapid radiology referral. No quantitative data was available for this, thus a range was used to estimate the possible number of hospitalisations avoided. This range was calculated by assuming between 0% and 50% of active cases would require hospitalisations per year if not diagnosed early due to rapid radiology referral – see Table 3.

The questionnaire also estimated that in 63% of cases the triage decision was for the consultant specialist to physically see the patient in clinic (question 1e). Savings may therefore be possible compared to other pathways due to the 37% of triage decisions not to physically see the patient in clinic. We have not been able to include this cost saving in the analysis, which is a conservative approach to the analysis and likely to over-estimate the cost-impact.

Table 3 Estimates of hospitalisations avoided due to radiology referral

Parameter	Estimates						Data source
Cases of active TB found due to radiology referral per year	58						See Table 2 above
% of active cases requiring hospitalisation if not detected in radiology per year	0%	10%	20%	30%	40%	50%	Assumption
Estimated number of patients per year	0	6	12	17	23	29	Above assumption - rounded to whole case

6.3 Outcomes

The questionnaire completed in Appendix 2 indicates that rapid referral was associated with 60.2 days mean symptom duration before treatment, compared with 95.9 days with other pathways. This reduction in diagnostic delay could not be directly linked with cases of active TB prevented; instead it was indirectly captured via the cases of active TB prevented threshold analysis.

6.4 Cost impact analysis

The cost impact analysis is shown in Table 4.

- The cost impact is between -£37,312 and £37,682 depending on the number of hospitalisations avoided per year.
- The analysis indicates that if 15 or more hospitalisations are avoided per year due to radiology referral, the service will be cost saving. If outcomes are no worse or improved then this would be considered a cost effective use of resources.
- In the worst case scenario, assuming that the number of hospitalisations avoided is 0 per year, then the service will have a cost impact of £37,682 per year. To off-set this cost the service would need to prevent 8 cases of standard active TB or 3 cases of active TB in hard-to-reach people per year.
- Although not shown in Table 4, in settings where the administrator time is absorbed (no additional cost), then the cost impact will simply be the clinician

time of £8,762. In this instance, the service will be cost saving if 4 or more hospitalisations are avoided per year due to radiology referral.

Table 4 Cost impact analysis for radiology referral

Parameter	Estimate						Data source
Radiology administrator time on TB referrals[a]	£28,921						Estimated to be 80% of a wte band 6
Clinician time spent on referrals[b]	£8,762						0.5 hours triage time for each of the 177 radiology referrals
Estimated hospitalisations avoided per year due to radiology referral	0	6	12	17	23	29	Based on estimates in Table 3 above
Estimated hospitalisation costs avoided per year[c]	0	-£15,516	-£31,032	-£43,962	-£59,478	-£74,994	HRG code DZ14B X number of patients hospitalised
Total cost impact (per year)	**£37,682**	**£22,166**	**£6,650**	**-£6,280**	**-£21,796**	**-£37,312**	Please note cost saving point is **15 hospitalisations** avoided per year
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)[c]							
'Standard' active TB[d]	8	5	2	0 cases			Assumption that each case = £5,000[e]
Active TB in hard-to-reach people	3	2	1	0 cases			Assumption that each case = £15,000[f]

a Based on NHS salary scale. Estimates are mid-point of band and include on-costs.

b Based on hourly clinician rates. Estimated as 0.5 hours x £99 per hour (PSSRU 2013/14) for all 177 referrals.

c Based on HRG code DZ14B (£2,586) for non-elective inpatient stay X the number of patients requiring hospitalisation.

d Standard active TB is used to mean TB in people who are not hard-to-reach and not drug resistant.

e Taken from PH37. This estimate was based on 6 months treatment for TB.

f Taken from PH37 costing report. This estimate was originally based on expert opinion of the estimated costs of treating TB in hard-to-reach people.

7 Direct emergency department referral

There is evidence of the costs and benefits of direct referral from an Emergency Department (ED) to a TB clinic in the inner London Region – see Appendix 3. The evidence enabled a cost impact analysis to be undertaken, together with threshold analysis to determine how many cases of active TB would need to be prevented to off-set the cost of the direct referral of people with suspected TB from an ED into a TB clinic.

7.1 Patient numbers

The questionnaire completed in Appendix 3 provides some estimates of the patient volume in inner London. The evidence gathered is from a retrospective cohort analysis of 154 patients diagnosed with TB over one year period, who attended ED at least once six months prior to the diagnosis. The proportion of those attended ED more than once prior to diagnosis is 27% in this setting, which equates to 41 people with a confirmed TB diagnoses.

The diagnosis rate in this setting is estimated to be 50%. Therefore it is estimated that approximately 308 patients with suspected TB were referred by an ED which led to 154 confirmed cases diagnosed in a 12-month period. Table 5 summarises these findings.

Table 5 Patient numbers for direct ED referral

Patient flow	Number of patients	Data source
Estimated total referrals for suspected TB per year	308	Based on 154 x 2 (50% detection rate) see appendix 1 Q2
Number of confirmed TB cases who attended ED in the last year	154	Based on audit in London – see appendix 1
Number of confirmed TB cases who attended ED more than once in the last year	41 (27%)	Based on audit in London – see Appendix 1

7.2 Costs and savings

The questionnaire completed in Appendix 3 indicates that 10% of a wte (0.1 wte) grade 6 administrator time would be sufficient to support approximately 308 direct referrals from ED to a TB clinic in a given year after their first ED visit. It also

revealed that approximately 15 minutes of clinician time will be required per direct referral. Based on this data, table 2 details the total annual cost incurred by the EDs in ensuring direct referral to the TB clinic following a first attendance.

In terms of savings, the questionnaire indicated the main quantifiable savings would arise from preventing additional ED visits. An average of £130 was considered as an appropriate average ED tariff cost for suspected TB patients (based on 2014/15 ED attendance HRG tariffs for HRGs VB03Z, VB07Z and VB08Z as informed by expert testimony). It is assumed a saving of £130 will be made for preventing each additional ED visit associated with suspected TB. The number of re-attendance visits varied from 2 to 5 ED visits before diagnosis among those patients who attended an ED multiple times.

7.3 Outcomes

Direct referral from an ED to a TB clinic at first visit is likely to result in many positive outcomes. These include reduced symptom duration before treatment, possible prevention of complex cases and multi-drug resistant (MDR) TB and reducing transmission of TB thereby preventing further cases. Direct referral from ED to a TB clinic could not be directly linked with a quantifiable reduction in transmission of TB or cases of active TB prevented; instead it was indirectly captured via the cases of active TB prevented threshold analysis. The main quantifiable positive outcome would be the prevention of additional ED visits before diagnosis, which is explored through cost impact analysis.

7.4 Cost impact analysis

The cost impact analysis is shown in Table 6 for a high incidence inner city, and in Table 7 for a lower incidence rural setting.

Inner city setting

The cost impact analysis assumes a minimum of 308 direct referrals of suspected cases over one year. The level of cost impact or savings made is dependent on the proportion of TB cases making multiple ED visits prior to diagnosis. A setting with a

higher proportion of multiple ED visits before diagnosis should achieve a higher saving by having the direct ED referral programme in place.

Table 6 explores the cost impact of a direct ED referral programme with varying levels of multiple ED visits.

- At the audited setting in London 27% of people with diagnosed TB attended ED more than once before diagnosis and therefore it is assumed a direct ED referral programme would have diagnosed 41 additional cases at first ED visit. This would only lead to a cost saving if all such cases required 3 or more additional visits prior to diagnosis. If all cases required only 1 additional visit, this would cost an additional £5,908 or would require the prevention of 2 standard active TB cases or 1 case of active TB in hard-to-reach people to offset these additional costs (see table 3).
- In a setting where 40% of people with diagnosed TB attended ED more than once before diagnosis, it is assumed there would be 62 additional cases diagnosed at the first ED visit on implementing the direct ED referral programme. This would lead to a cost impact of £3,230 if all such cases required one additional visit and a cost saving of up to £28,802 if all such cases required up to 5 additional visits prior to diagnosis (see table 3). The cost impact would require 1 case of standard active TB to be prevented to offset this additional cost.
- In a setting where 50% of people with diagnosed TB attended ED more than once before diagnosis, it is assumed there would be 77 additional cases diagnosed at the first ED visit on implementing the direct ED referral programme. This would lead to a cost impact of £1,228 if all such cases required one additional visit and a cost saving of up to £38,812 if all such cases required up to 5 additional visits prior to diagnosis (see table 3). The cost impact would require 1 case of standard active TB to be prevented to offset this additional cost.
- The questionnaire revealed most multiple visits prior to diagnosis ranged between 2 and 5 additional visits. This suggests cost savings can be achieved in ED settings where re-attendance rate is 27% or above with 3 or more additional visits made before diagnosis. Cost savings may be achieved

assuming two additional visits are required if the re-attendance rate is 29% or above.

Rural setting

Rural settings will have a considerably lower incidence of TB and therefore will have lower diagnostic rate. To reflect this lower incidence, the above cost impact analysis of direct ED referral programme is repeated at 25% diagnostic rate.

Table 7 explores the cost impact of a direct ED referral programme in settings with varying levels of multiple ED visits assuming 308 suspected TB cases and a 25% diagnostic rate to reflect rural settings.

- At the audited setting in London 27% of people with diagnosed TB attended ED more than once before diagnosis. At a diagnostic rate of 25%, it is therefore assumed a direct ED referral programme would have diagnosed 21 additional cases at first ED visit. This would only lead to a cost saving if all such cases required 5 or more additional visits prior to diagnosis. If all cases required only 1 additional visit, this would cost an additional £8,535 or would require the prevention of 2 standard active TB cases or 1 case of active TB in hard-to-reach people to offset these costs.
- In a setting where 40% of people with diagnosed TB attended ED more than once before diagnosis, it is assumed there would be 31 additional cases diagnosed (at 25% diagnostic rate) at the first ED visit on implementing the direct ED referral programme. This would lead to a cost impact of £7,234 if all such cases required one additional visit and a cost saving of up to £8,782 if all such cases required up to 5 additional visits prior to diagnosis (see table 4). To offset the cost at 1 additional visit will require the prevention of 2 cases of standard active TB or 1 case of active TB in hard to reach people.
- In a setting where 50% of people with diagnosed TB attended ED more than once before diagnosis, it is assumed there would be 39 additional cases diagnosed (at 25% diagnostic rate) at the first ED visit on implementing the direct ED referral programme. This would lead to a cost impact of £6,233 if all such cases required one additional visit and a cost saving of up to £13,787 if all such cases required up to 5 additional visits prior to diagnosis (see table

4). To offset the cost at 1 additional visit will require the prevention of 2 cases of standard active TB or 1 case of active TB in hard to reach people.

- This indicates in rural setting with a lower diagnostic rate, the direct ED referral programme can be still cost savings provided the number additional visits are higher before diagnosis. This is likely to be case in a rural setting as TB is not often suspected in such settings. The analysis suggests that the direct ED referral programme can be cost saving in rural settings where re-attendance rate is 38% or higher and 3 or more visits are made on average before diagnosis.

Table 6 Cost impact analysis of direct ED referral in an inner city

Cost impact analysis - 27% re-attendance rate before diagnosis

Cases of additional active TB found due to rapid referral toTB clinic at first ED visit	41	41	41	41	41
Number of additional ED visits made per each active TB case not found due to non-referral	1	2	3	4	5
Total number of additional ED visits	41	82	123	164	205
Additional ED attendance cost saved	**5,330**	**£ 10,660**	**£ 15,990**	**£ 21,320**	**£ 26,650**
Total referral cost	£11,238	£11,238	£11,238	£11,238	£11,238
Total cost impact	**£5,908**	**£578**	**(£4,752)**	**(£10,082)**	**(£15,412)**
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)					
Standard active TB	2	1	0	0	0
Hard to reach active TB	1	1	0	0	0

Cost impact analysis - 40% re-attendance rate before diagnosis

Cases of additional active TB found due to rapid referral toTB clinic at first ED visit	62	62	62	62	62
Number of additional ED visits made per each active TB case not found due to non-referral	1	2	3	4	5
Total number of additional ED visits	62	123	185	246	308
Additional ED attendance cost saved	**£8,008**	**£ 16,016**	**£ 24,024**	**£ 32,032**	**£ 40,040**
Total referral cost	£11,238	£11,238	£11,238	£11,238	£11,238
Total cost impact	**£3,230**	**(£4,778)**	**(£12,786)**	**(£20,794)**	**(£28,802)**
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)					
Standard active TB	1	0	0	0	0
Hard to reach active TB	1	0	0	0	0

Cost impact analysis - 50% re-attendance rate before diagnosis

Cases of additional active TB found due to rapid referral toTB clinic at first ED visit	77	77	77	77	77
Number of additional ED visits made per each active TB case not found due to non-referral	1	2	3	4	5
Total number of additional ED visits	77	154	231	308	385
Additional ED attendance cost saved	**10,010**	**£ 20,020**	**£ 30,030**	**£ 40,040**	**£ 50,050**
Total referral cost	£11,238	£11,238	£11,238	£11,238	£11,238
Total cost impact	**£1,228**	**(£8,782)**	**(£18,792)**	**(£28,802)**	**(£38,812)**
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)					
Standard active TB	1	0	0	0	0
Hard to reach active TB	1	0	0	0	0

Table 7 Cost impact analysis of direct ED referral in a rural setting

Cost impact analysis - 27% re-attendance rate before diagnosis

Cases of additional active TB found due to rapid referral toTB clinic at first ED visit	21	21	21	21	21
Number of additional ED visits made per each active TB case not found due to non-referral	1	2	3	4	5
Total number of additional ED visits	21	42	62	83	104
Additional ED attendance cost saved	**2,703**	**£ 5,405**	**£ 8,108**	**£ 10,811**	**£ 13,514**
Total referral cost	£11,238	£11,238	£11,238	£11,238	£11,238
Total cost impact	**£8,535**	**£5,833**	**£3,130**	**£427**	**(£2,275)**
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)					
Standard active TB	2	2	0	0	0
Hard to reach active TB	1	1	0	0	0

Cost impact analysis - 40% re-attendance rate before diagnosis

Cases of additional active TB found due to rapid referral toTB clinic at first ED visit	31	31	31	31	31
Number of additional ED visits made per each active TB case not found due to non-referral	1	2	3	4	5
Total number of additional ED visits	31	62	92	123	154
Additional ED attendance cost saved	**£4,004**	**£ 8,008**	**£ 12,012**	**£ 16,016**	**£ 20,020**
Total referral cost	£11,238	£11,238	£11,238	£11,238	£11,238
Total cost impact	**£7,234**	**£3,230**	**(£774)**	**(£4,778)**	**(£8,782)**
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)					
Standard active TB	2	0	0	0	0
Hard to reach active TB	1	0	0	0	0

Cost impact analysis - 50% re-attendance rate before diagnosis

Cases of additional active TB found due to rapid referral toTB clinic at first ED visit	39	39	39	39	39
Number of additional ED visits made per each active TB case not found due to non-referral	1	2	3	4	5
Total number of additional ED visits	39	77	116	154	193
Additional ED attendance cost saved	**5,005**	**£ 10,010**	**£ 15,015**	**£ 20,020**	**£ 25,025**
Total referral cost	£11,238	£11,238	£11,238	£11,238	£11,238
Total cost impact	**£6,233**	**£1,228**	**(£3,777)**	**(£8,782)**	**(£13,787)**
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)					
Standard active TB	2	0	0	0	0
Hard to reach active TB	1	0	0	0	0

8 TB co-ordinator

There was evidence of the costs and benefits of a TB co-ordinator in both the North West and Birmingham area – see Appendix 4. This evidence enabled a cost impact analysis to be undertaken, together with a threshold analysis to determine how many cases of active TB would need to be prevented to off-set the costs of the TB co-ordinator.

8.1 Patient numbers

The questionnaires completed in Appendix 4 indicate that TB co-ordinators are employed at a service level. As such, estimates of patient numbers are not captured for this analysis.

8.2 Costs and savings

The expert testimony provided in Appendix 4 indicates that the TB co-ordinator is employed at a band 8a post in the North West and a band 8c post in Birmingham. In the North West the post was estimated to save 2 hours per week clinician time; whereas in Birmingham the post was not estimated to free up any clinician time. The post in the North West is not TB specific, but also covers HIV and other infectious diseases and allergies in children. It was not possible to only cost the TB portion of the post; hence, the post has been costed as a whole.

8.3 Outcomes

The expert testimony provided in Appendix 4 indicates that the TB co-ordinators provide a strong leadership role, particularly with regards to providing strategy and partnership working. This could not be captured in the cost impact analysis. However, estimates of how this improved leadership might translate into cases of active TB prevented have been estimated using the threshold analysis.

8.4 Cost impact analysis

As can be seen in Table 8 the cost impact varies from £44,020 to £74,958 per year, depending on the grade of the post and the amount of clinician time that can be freed up by the co-ordinator. To off-set this cost and achieve a cost neutral position the threshold analysis estimated that between 9 and 15 cases of ‘standard’ active TB

would need to be prevented per year, or between 3 and 5 cases of active TB in hard-to-reach people.

Table 8 Cost impact analysis for TB co-ordinator

Parameter	North West estimate	Birmingham estimate	Data source
Salary cost of TB co-ordinator[a]	£52,732	£74,958	North West = band 8a Birmingham = band 8c
Clinician time saved in monetary terms[b]	-£8,712	£0	North West = 2hours/week Birmingham = 0 hours
Total cost impact (per year)	**£44,020**	**£74,958**	
Threshold analysis – number of cases of active TB that need to be prevented to off-set costs (per year)[c]			
'Standard' active TB[d]	9 cases	15 cases	Assumption that each case = £5,000[e]
Active TB in hard-to-reach people	3 cases	5 cases	Assumption that each case = £15,000[f]

a Based on NHS salary scale. Estimates are mid-point of band and include on-costs.

b Based on hourly clinician rates. Estimated as 2hrs/week for 44 weeks at £99 per hour (PSSRU 2013/14).

c The calculations of active TB are rounded up to the nearest whole number.

d Standard active TB is used to mean TB in people who are not hard-to-reach and not drug resistant.

e Taken from PH37. This estimate was based on 6 months treatment for TB.

f Taken from PH37 costing report. This estimate was originally based on expert opinion of the estimated costs of treating TB in hard-to-reach people.

9 Conclusions

The cost impact analysis indicates that:

- TB support workers are associated with a cost impact of -£13,400 to £36,200 per year. The service is cost saving if a band 3 support worker substitutes the time of at least a 0.5 wte band 7 nurse. If outcomes are no worse or improved then this would be considered cost effective. However if the support workers do not substitute TB nurses' time, then the cost of this post could be off-set by preventing 8 standard cases of active TB or 3 cases of active TB in hard-to reach people per year.

- Rapid radiology referral is associated with a cost impact of -£37,300 to £37,700 per year. The service is cost saving if 15 or more hospitalisations are avoided per year due to earlier diagnosis. If outcomes are no worse or improved then this would be considered cost effective. However, if the service does not prevent hospitalisations, then the cost of the service could be off-set by preventing 8 standard cases of active TB or 3 cases of active TB in hard-to reach people per year.

- Direct ED referral in a high incidence area (inner City) is associated with a cost impact of -£38,800 to £5,900. The service is cost saving assuming direct referral saves two additional ED visits by earlier diagnosis with at least a 29% re-attendance rate. In a low incidence area (rural), the cost impact is -£13,800 to £8,500. The service is cost saving assuming three additional ED visits are saved with at least a 38% re-attendance rate.

- The TB co-ordinator post is associated with a cost impact of between £44,000 and £75,000 per year. This cost could be off-set by preventing 9 to 15 cases of 'standard' active TB, or 3 to 5 cases of active TB in hard-to-reach people per year.

9.1 Limitations

The configuration of TB services across the UK is highly variable, which is likely partially attributed to the different incidence rates of TB across the UK. As such, all estimates produced are aimed to be indicative of the cost impact, rather than exact.

It was not possible to do a detailed micro-costing exercise on any of the service changes analysed in this report. As such, there could be additional costs or savings that have not been accounted for. However, due to the different configurations of TB services around the UK, it is likely that these costs and savings will vary. Thus detailed micro-costing of one area would be unlikely to be generalisable to other areas.

The benefits of service changes in terms of cases of active TB prevented have not been directly estimated for any of the service configurations analysed. There is also

no simple way to link intermediate outcomes, such as improvements in diagnosis or treatment completion, with reductions in onward transmission and thus prevented cases of active TB. Given this limitation, sensitivity analysis in the form of threshold analysis had to be undertaken to determine how many cases of active TB would need to be prevented to make the service configuration cost neutral or cost saving. This then enabled the SDG to explicitly consider the costs and benefits in both a qualitative and quantitative format.

10 References

NICE methodology for developing costing tools.
NICE interim methods for developing service delivery guidance.

Appendix 1: TB support worker questionnaires

Support workers to assist TB nurses - Manchester

1. What is the usual grade and salary of the TB support workers employed by your organisation?

We do not have support workers in the TB Unit but another team in Respiratory Medicine uses them. They are employed at levels 3 and 4.

2. How long is the training programme for TB support workers to get the formal qualification required for this post? What is the cost of getting this qualification, who pays for this and who provides it?

There is not a specific training programme that I am aware of but NVQ level 2 or 3 would be required. The employer would normally pay for the course. There are numerous individual NVQ courses that result in a qualification. Some are in the Care category and there are some that would be suitable in the Health category. I do not really understand the funding structure but depending on which course is chosen, it seems to vary between £3000 and £5000.

3. Please complete the following table for the main 4/5 roles that the TB support workers in your organisation undertake.

Role (for example, contact tracing, admin, etc)	**Rough proportion of time spent on this role (%)**	**Is this role performed without supervision from a TB nurse? (y/n)**	**How has this role helped improve patient care, contact tracing, treatment completion or other clinical outcomes?**	**How has this benefit been measured?**
1. Collecting specimens from patient's home	5%	Y	Trained nurses do not always have time to collect specimens – specimens are important to confirm TB	N/A
2. Delivering medicines to patient's home	5%	Y	We must not have gaps in treatment but patients often need more tablets at short notice (they might have lost their tablets or failed to attend an appointment)	
3. Following up patients who have not attended (home visit)	15%	Y but discuss with a qualified member of staff	Patients who do not attend appointments need to be found quickly before they run out of tablets and non-attendance often signals poor adherence	

4. Contact tracing	5%	Without supervision but need to discuss with a qualified member of staff	Although the TB nurse usually does this at the beginning of treatment, there may be situations where further enquiries must be made or if we need to go back to the patient to get a list of contacts, this could be done by a support worker	
5. Home visits	50%	Without supervision but would need to discuss outcome with a qualified nurse	We would carry out many more home visits than we do at present if we had more time. Some require a TB nurse to visit but some patients just need more persistent contact with services.	

4. Have support workers improved other outcomes – such as patient satisfaction?

We do not have any surveys but the patients receive more attention and the trained nurses also gain satisfaction because they can concentrate on tasks requiring specialist skills.

5. What is the case load of support workers? For example, do they have a ratio of 1:40 patients like TB nurses? Or is it 1 support worker to 1 TB nurse? Or something else?

   Support workers would not have a case load – it would be a task based job. They would be supernumerary to the TB nurses in the same way as link workers or social workers are in a team. They would be able to carry out only some of the aspects currently undertaken routinely by the TB Nurse.

6. Has having support workers freed up nurse time? If so by how much and how was this measured? If it has never been measured could you estimate the time it might free up?

   My colleagues in Respiratory Medicine used the salary of a part-time qualified member of staff who left to fund a full-time health care support worker. Although they have not carried out any measurements of time saved, they feel that their service has benefitted from this arrangement as they now have much more flexibility and the trained nurses have more time to spend on the aspects requiring their specialist skills.

Support workers to assist TB nurses - London (1)

1. What is the usual grade and salary of the TB support workers employed by your organisation?

I was employed as a Band 5, then became a Band 6. However, male colleagues I know of have been on Band 7 (nursing grades), which has raised issues for me in terms of pay parity between men and women. They were not doing anything more than I do.

2. How long is the training programme for TB support workers to get the formal qualification required for this post? What is the cost of getting this qualification, who pays for this and who provides it?

There is no formal training or qualification for TB support workers, although I think that it would be very useful to devise one, as the skills needed are highly diverse. I would happily help to develop some sort of course or in-service training modules.

3. Please complete the following table for the main 4/5 roles that the TB support workers in your organisation undertake.

   It needs to be noted that my role within my multidisciplinary team focuses very much, though not exclusively, on complex, high risk patients with TB, so please have that in mind when you read the answers below.

Role (for example, contact tracing, admin, etc)	**Rough proportion of time spent on this role (%)**	**Is this role performed <u>without</u> supervision from a TB nurse? (y/n)**	**How has this role helped improve patient care, contact tracing, treatment completion or other clinical outcomes?**	**How has this benefit been measured?**
Contact tracing, letter writing, form filling, chasing ID documents, Home Office leave to remain applications, housing and benefits, home DOT, developing incentive strategies to encourage treatment adherence.	Needs driven	Yes	As TB case worker (my formal title within my organisation) I undertake a lot of tasks in terms of contact tracing relating to hard to reach patients. I support high risk TB patients to claim benefits, apply for asylum, obtain local authority housing, register with GPs. When these are granted, that is a good outcome for the patient, and for their adherence until treatment completion.	Housing in particular has had a direct impact on completion rates within our area. We have an arrangement to house all our NRPF patients, regardless of status. This has vastly improved completion rates and has been evaluated as highly effective and saved the Trust tens of thousands of pounds.
TB awareness. I do a lot of work with 3rd sector and local authority staff on raising TB awareness in their clients.		Yes	Higher awareness of TB signs and symptoms, especially amongst night shelter staff and volunteers. Less anxiety in statutory sector staff that they will catch TB from patients they are assessing.	This is an iterative process as there is a high turnover of staff within third sector organisations, so I have an annual cycle of awareness and training meetings.

Publishing work in peer-reviewed journals and other publications.		Yes	This helps to disseminate the work of the TB team and demonstrate how what we do in terms of our good practice can be replicated by other teams and services.	I am asked for support and advice by other TB teams, especially in relation to the work I have done on housing homeless patients.
Outreach work: late night outreach - meeting street sex workers. Regular attendance at day-time and evening drop-in centres for rough sleepers, street drinkers etc. Working collaboratively with other specialist teams.		Yes	Six years ago there was a large and very unwell population of homeless sex workers on the streets. Working closely with a sexual health team on late night outreach, this population of street sex workers is no longer out there; they are now housed, and have been treated for their chronic ill health problems, including HIV, TB, STDs and BBVs.	The UK born street sex working population within our catchment area has virtually disappeared. They are housed and their health status is hugely improved.
Mental health work		Yes	I have gained some effective, basic skills in order to support patients with mental distress.	Feedback from patients, adherence, treatment completion, but early days yet.

4. Have support workers improved other outcomes – such as patient satisfaction?

This is certainly reflected in our patient satisfaction surveys, and in feedback from the patients themselves, families and friends. We also have incentives to encourage adherence, which includes bus passes to facilitate attending for daily DOT, and food for patients with NRPF. Since 2008 we have housed every homeless patient for the duration of their treatment. This has saved our acute Trust a significant sum of money in terms of eliminating the problem of bed-blocking homeless TB patients, as well as significantly improving the quality of life of these patients. Completion rates among this cohort is currently 98%, and we have not had a patient lost to follow up for at least 4 years, so no nursing or case worker time is spent in chasing lost patients, and patients are not in danger of developing drug resistant Tb because of too many treatment stop-starts.

5. What is the case load of support workers? For example, do they have a ratio of 1:40 patients like TB nurses? Or is it 1 support worker to 1 TB nurse? Or something else?

This also is needs driven, as I work almost exclusively with patients with multiple problems and chaotic lifestyles. I am the only support worker (case worker) in the team, and get referrals from the 5 nurses and the consultant physician. Our ratio of one case worker to 6 clinicians seems about right for our particular demographic context.
Furthermore, this document refers to support workers, whereas my designation is case worker, and I work very independently much of the time. I have much more autonomy than a support worker, and feel that this should be reflected in job titles. Perhaps there is a case for having either a support worker, with fewer skills, or a case worker with a higher operational level, depending on local needs and circumstances.

6. Has having support workers freed up nurse time? If so by how much and how was this measured? If it has never been measured could you estimate the time it might free up?

This is difficult to measure, but on reflection I think it is the wrong question. The work that I do with complex patients was simply not being done before I joined the team, partly because it lay way outside the nursing remit, and also because it required both time and skills that I had, and that they didn't. I have the freedom to work at times when the nurses could not e.g. evening and late night outreach, and I can spend lengthy periods of time with patients whose needs are really complex and challenging. I can go with them to Home Office appointments, solicitors offices, Atos assessments and appeal hearings, and to the local authority housing department.

I also work collaboratively with other specialist health and social teams such as the sexual health and specialist addictions teams within the Trust, and community drug and alcohol recovery services. Having created these links, the nurses are also now involved in multidisciplinary patient care with these services.

There is no career progression or specific CPD for TB case/support workers. I have had to identify training courses that would be helpful for me to attend, as well as enhance the skills I bring to the team. These have included courses on immigration law, housing and benefits. There is a high prevalence of mental distress among our complex, high risk patients. I am currently doing a p/t post graduate course on counselling psychology, in order to be able to support these patients with mental health problems, especially when adherence is being affected. However, we lack a clear and definable career pathway.

Support workers to assist TB nurses – London (2)

1. What is the usual grade and salary of the TB support workers employed by your organisation?

Band 3, however across London the bands vary from B3-B6 depending on their experience and role. In our organisation, a summary of the role is:

- Provide outreach DOT and weekly supervision of treatment
- Home visits to TB contacts, and those with suspected and confirmed TB to discuss reason for nonattendance and any support required
- Accompany patients to appointments at the clinic, and other appointments related to the patients' health and social wellbeing e.g. welfare benefits
- Support in-patients in respiratory isolation for long periods (e.g. patients with multi drug resistant TB), those that struggle with confinement (patients with a prison history or homelessness). The support includes visiting the patient, bringing newspapers, and accompanying patients to go for a walk / short period of leave that are at risk of absconding.

2. How long is the training programme for TB support workers to get the formal qualification required for this post? What is the cost of getting this qualification, who pays for this and who provides it?

There is no formal qualification for a TB support worker, rather training and qualifications in a variety of areas depending on the scope of the role:

Minimum for a B3: Health & safety; TB diagnosis, treatment & side effects (provide as part of local competency based training by the TB nurses); Advocacy; Mental health awareness, Equality & diversity
Most of the training can be provided by the learning and development departments of the organisation.

A senior support worker (B5/B6) may attend training and gain qualifications in substance misuse, welfare benefits advice, immigration advice.

A qualified (TB) social worker is likely to be a B7

I would expect most clinics would benefit from a B3/B4 skill level, and having those with more specialist skills covering a number of clinics for the most complex cases.

3. Please complete the following table for the main 4/5 roles that the TB support workers in your organisation undertake.

Role (for example, contact tracing, admin, etc)	**Rough proportion of time spent on this role (%)**	**Is this role performed <u>without</u> supervision from a TB nurse? (y/n)**	**How has this role helped improve patient care, contact tracing, treatment completion or other clinical outcomes?**	**How has this benefit been measured?**
Providing outreach DOT and weekly supervision of treatment	60%	Y	The role helps ensure the most complex patients, with the least motivation complete treatment. The care is more patient centred; the TB SW can be more flexible in relation to the time and the venue the patient would prefer DOT. The nurses are restricted by clinic commitments and capacity. Without a TB SW, patients are required to attend clinic for DOT which requires much greater commitment and effort by the patient who is at most at risk of non-adherence and loss to follow up.	None of the patients identified for DOT over the last 4 years were lost to follow up. Treatment completion rates are 88-95% over the last 4 years.
Home visits to TB contacts, and those with suspected and confirmed TB to discuss reason for nonattendance and any support required	20%	y	Increased yield of contacts and suspected TB cases attending clinic	Data available for the last 6 months <u>Contacts that did not attend screening</u>: 44% of those visited by TB SW attended <u>Suspected cases that did not attend</u> 80% of those visited by TB SW attended
Accompany patients to appointments at the clinic, and other appointments related to the patients' health and social wellbeing e.g. welfare benefits	10%	y	Enhanced patient experience, addressing social aspects that increased the patient's risk of TB initially, and improved engagement with the service	Anecdotal feedback is positive. High treatment completion rates and low loss to follow up.

Support in-patients in respiratory isolation for long periods	5%	y	Enhanced patient experience, improved engagement with the service, very low incidence of patients absconding	As above
Admin	5%	y	More efficient, cost effective use of nurse time	Minimal time spent by nurse doing non clinical admin

4. Have support workers improved other outcomes – such as patient satisfaction?

Anecdotal feedback is very positive

5. What is the case load of support workers? For example, do they have a ratio of 1:40 patients like TB nurses? Or is it 1 support worker to 1 TB nurse? Or something else?

   The TB SW doesn't have a specific caseload as such, other that the number of patients on outreach DOT. Based on local transportation, 1 TB SW can provide DOT to approx. 7-8 patients per day (three times a week regimen). Other activities take place on non DOT days.

   The number of TB SWs would be depend on the overall clinic caseload taking into account number of cases, social risk factors and number requiring enhanced case management (ECM).
   We have 1 TB SW for an average 110 notifications /annum, 30% have social risk factors, and around 50% require ECM.

6. Has having support workers freed up nurse time? If so by how much and how was this measured? If it has never been measured could you estimate the time it might free up?

   This is difficult because in practice what happens is that without a TB SW clinics do not have the capacity to do home visits for non attendees and DOT.

   When our TB SW is on AL, it is necessary to identify 0.8 WTE nurse to maintain the care plans in place. This involves cancelling clinics and staff working extra hours.

Support workers to assist TB nurses London (3)

1. What is the usual grade and salary of the TB support workers employed by your organisation?

My outreach worker is a Band 4 It is a band 4 post because she had translation skills.

2. How long is the training programme for TB support workers to get the formal qualification required for this post? What is the cost of getting this qualification, who pays for this and who provides it?

No training programme as such, it is a an ongoing learning experience, but she has been on an internal Phlebotomy course which was provided by the trust

3. Please complete the following table for the main 4/5 roles that the TB support workers in your organisation undertake.

Role (for example, contact tracing, admin, etc)	**Rough proportion of time spent on this role (%)**	**Is this role performed <u>without</u> supervision from a TB nurse? (y/n)**	**How has this role helped improve patient care, contact tracing, treatment completion or other clinical outcomes?**	**How has this benefit been measured?**
Translation service	15%	Yes for phone calls No for clinic visits	This has helped immensely. She will go to homes, ward visits as required with or without dr's or tb nurses, and will often get information that we were unable to get	Patient satisfaction questionnaires
Arranging Contact tracing	30%	yes	The staff member will contact them to arrange or discuss why they have not attended. This has improved our levels of contact tracing	
DOT/ home visits	25%	Yes	This allows the TB nurses more time for other work and has helped our completion rates and compliance	
Phlebotomy	20%	yes	Our patients no longer wait for hours in the Phlebotomy department. This has been a huge improvement for the patients, especially those for those who have twice weekly bloods.	
General duties which include chase the DNA's patients. Liaise with Rheumatology, Collect samples, etc	10%	yes	This has improved the overall service. It has freed up nursing time and improved the quality of the service.	

4. Have support workers improved other outcomes – such as patient satisfaction?

Yes.

5. What is the case load of support workers? For example, do they have a ratio of 1:40 patients like TB nurses? Or is it 1 support worker to 1 TB nurse? Or something else?

No case load- the post holder is an asset for all the TB team and occasionally will work with the Dr's for clinic translations.

6. Has having support workers freed up nurse time? If so by how much and how was this measured? If it has never been measured could you estimate the time it might free up?

As above - it has never been measured but on a DOT's day it can free me up by half a day depending on how many we have . over all, for me personally, she must free up 2hours a day. but there is four of us!

Support workers to assist TB nurses - London (4)

In my response I will refer TB support worker as Outreach Worker as this is the title of my role at St. George's Hospital.

Assessing cost impact will be complex in the case of TB support workers or outreach workers (OW) as they are of different bands, varied roles and functions. Any emphasis on outreach role as freeing up nurses time or as a secondary role in assisting clinicians undermines the specific expertise and knowledge that the OW bring to TB case management and this might push OW to take on unimportant role to satisfy the expectation of freeing up time. OW with background of Social, Psychological, Advocacy and Social Work studies or experience could add value to the role.

To my opinion, outreach role needs to be standardised and offer equal importance to the clinical staff in TB Team. TB being a social disease, OW's role in offering patients with social, financial, psychological and other relevant support aids and improves treatment adherence and completion. Hence, OW role is vital in managing TB patients.

1. What is the usual grade and salary of the TB support workers employed by your organisation?

   Band 6

2. How long is the training programme for TB support workers to get the formal qualification required for this post? What is the cost of getting this qualification, who pays for this and who provides it?

   No formal training involved for TB support workers. The job is based on previous outreach, networking and advocacy experience and knowledge of TB.

3. Please complete the following table for the main 4/5 roles that the TB support workers in your organisation undertake.

Role (for example, contact tracing, admin, etc)	**Rough proportion of time spent on this role (%)**	**Is this role performed <u>without</u> supervision from a TB nurse? (y/n)**	**How has this role helped improve patient care, contact tracing, treatment completion or other clinical outcomes?**	**How has this benefit been measured?**
Addressing and supporting patients to manage barriers to treatment with particular focus on MDR and XRD patients	70% (direct one to one work with patients)	Jointly working with the nurses in addressing the barriers and then working independently or in consultation with nurses towards solutions	This role helps in improving treatment completion The work involved include: - Supporting patients to find appropriate housing - Support with travel cost - Offering food vouchers - Helping patients to access benefits	Number of MDR/XDR patients adhering to treatment and completing treatment

Monitoring DOT and VOT adherence		Taking independent responsibility in monitoring and supporting treatment adherence and reporting the outcome to relevant case managers.	Improving treatment completion Involves: - Visiting homes for DOT - Assessing and introducing patients to VOT. - Working with Find and Treat to ensure compliance of VOT - Weekly and monthly reporting of the adherence - Close follow up with patients who fail to adhere to DOT/VOT	Number of patients adhering to treatment and completing treatment
Establishing and sustaining network and partnership relationship with statutory and voluntary organisations to facilitate help for the patients		Working in consultation with the Team	Improving treatment completion Involves establishing referral pathways with agencies for example: IAPT services for Psychological services, Food Bank for food vouchers, Health Trainers for one to one support, Chaplaincy for spiritual support	The level of support established for the patients Evidence: Service leaflet
Increasing awareness of TB among high risk communities	25% (awareness raising and development role)	Working independently	Contributes to early intervention The role involves: Awareness raising events for voluntary organisations, and participating in larger community events	Increasing referrals from voluntary organisations
Increasing awareness of TB among service providers, work force and front line workers		Working independently	Contributes to early intervention Talks, presentations and conferences on TB and early intervention measures	Increasing referrals Number of events held or attended
Monitoring and reporting the TB team's performance against KPI	5% (Strategic)	Working independently	Improving patient experience Reporting KPI to the commissioners and contribute in service improvement which	Commissioners' decision to increase TB workforce as the result of the reporting

			has an effect on patient experience	

4. Have support workers improved other outcomes – such as patient satisfaction?

   Outcomes that the support worker helped to improve are:
   a) Treatment completion through close one-to-one support and addressing barriers to treatment
   b) Improved contact tracing by visiting patient's house and inviting contacts for screening.
   c) Early intervention through various educational and training activities
   d) Improved patient experience by offering dedicated time and support

5. What is the case load of support workers? For example, do they have a ratio of 1:40 patients like TB nurses? Or is it 1 support worker to 1 TB nurse? Or something else?

   Outreach worker jointly case manage complex patients. There is no fixed ratio.
   The worker is attached to the team and works as part of the time in improving the outcome for the patients. Though the case load is much lower than the fellow clinical team members, the OW takes on predominantly complex patients and in my case it's all the MDR and XDR patients who have complex social issues. Managing these patients takes lot of efforts and time.

6. Has having support workers freed up nurse time? If so by how much and how was this measured? If it has never been measured could you estimate the time it might free up?

   I disagree with this question. The role of OW is more joint and complimentary rather than one of assisting role. As TB being social disease having social and economic factors as contributory factors, OW comes with specific expertise to compliment the clinical aspect of the disease. The OW worker plays an equal role along with clinicians in walking the patients to the road of recovery.

   The contribution of OW worker has to be measured on the basis of how they are able to support patients to adhere to treatment to complete treatment. The role is very specific. The existing tools such as SROI (Social Returns on Investment) can be used to assess the impact of OW's work to assess the economic benefit the OW brings to the services.

Appendix 2: Radiology referral questionnaire

1. In your presentation, you mention that rapid access was associated with 60.2 days mean symptom duration before treatment, compared with 95.9 days with other pathways.

a. Can we have the range on these two estimates?

I have attached the original abstract which is in the public domain following BTS presentation 2011. The ranges were not reported in the abstract but I did request re-analysis from the raw data. I am awaiting the researcher's answer which I will send on if available by 11/11/2014.

b. Has anyone done any subgroup analysis to determine if some types of patients would have much longer delays without radiology referral? (for example, those not registered with a GP?)

Significant delay of referral associates with failure to refer through rapid access. In our audit based on 126 pulmonary cases, GP practices with low notification rates (those practices NOT in the top 10 for notification rates) associated with failure to refer through rapid access (59% vs 81% referred through rapid access. Two thirds of all pulmonary cases in this audit were identified via rapid access. Patients referred by GPs not seeing many TB patients had longer symptom duration by a mean of 5.4 weeks ($p < 0.04$) compared to those referred by one of the top 10 practices for TB incidence . We also found that UK born subjects were significantly less likely to be referred through rapid access ($p = 0.001$).

c. Has anyone estimated how many cases of active TB might be prevented by diagnosing earlier? For modelling, could it be assumed to be in the ratio 60.2 to 95.9 ?

This analysis is not available yet. There is some evidence when looking at the whole group of rapid access cases that LTBI numbers in contacts are not affected. However, this previous analysis was very limited in terms of numbers and the important analysis of the culture positive pulmonary subgroup (rapid access identified versus others) is currently underway. For this group we have audit data for the years 2007-14 with associated contacts and their outcomes (subsequent LTBI and/ or progression to active disease).

d. What are the other pathways? Are these pathways still in use or has radiology referral replaced any?

TB coding of radiological images is the main pathway but we also accept direct referrals from primary and/or secondary care, referrals based on microbiology results and histology reporting. In a recent audit radiology coding accounted for 59% of referrals, and direct GP 29% (20% without CXR). The remainder accounts for the other 12% of referrals. The overall aim of the rapid access service is to see patients with a probable active TB as soon as possible to fast track investigation and treatment.

e. Has anyone compared the costs of the rapid access with other pathways?

We have not performed a formal cost effectiveness analysis on this service. The additional cost involved relates to staffing costs for the administrator / nurse and consultant time spent with triage decisions. In many cases the triage decision is not to see the patient and overall we found that 63% of referrals were physically seen in clinic by the consultant specialist. 40 of 145 referrals were found to have active TB – overall rate one third. In some cases coded x-rays refer to patients already admitted to hospital. In this situation immediate advice on isolation procedures and information about TB referral pathways is offered to the clinical team in charge of the case.

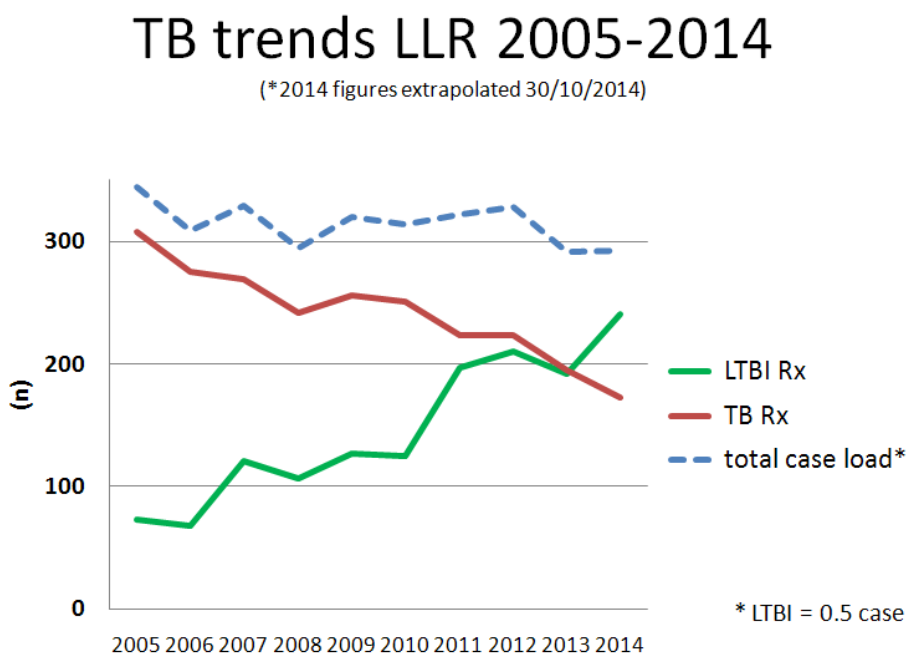
Further cost savings are likely through fewer hospitalised cases and reduced length of stay. In addition there is a likely impact on cost due to reduced transmission by prevention of Latent TB infection (LTBI) in contacts.

f. Is any additional resource required to provide immediate triage by the TB service?

As stated in answer to the previous question the additional resource required involves an administrative or nursing post (band 6 suggested) as well as the required clinician time involved in making the triage decisions based on x-ray and sampling review and symptom questionnaire . Most other elements of the rapid access service are part of what the TB service is meant to do anyway just in a more focussed fashion and at an earlier time point during the clinical pathway.

2. In your testimony you mention that there are about 400 referrals per year – currently about 200 active and 200 latent (which count as ½ active in terms of active equivalents) – giving a caseload of 300 active-TB-equivalents . Does this seem about right?

In my testimony I quoted 3000 rapid access referrals in 10 years (3072 since 2005 to date). 300 referrals per year is therefore a fair reflection of this clinic activity which aims to identify active cases early. Not all diagnosed TB cases are identified through rapid access. On average one third of referrals are active TB and slightly over 50% of all active cases in the region come through rapid access. Total active case notifications during the same time period (2005-2014) have steadily fallen from 309 to 172 cases per year. There will be close to 250 treated LTBI cases this year. LTBI cases are not generally identified through the rapid access service but via other routes (contact clinics and limited migrant screening mainly). I agree that one LTBI case on 3RH treatment should be regarded as 1 active TB case x 0.5 for required nurse number calculations (BTS recommendation is 1WTE TB nurse per 40 active TB cases). This activity is plotted as the blue curve on the following updated graph:



3. Of the ~200 patients diagnosed with active TB through radiology referral – do we know what proportion are not registered with a GP?

In our cohorts patients streamed through rapid access only rarely are not registered with primary care. This would only happen in patients attending A&E in desperation – less than 1 % I would estimate. This may well be different in other urban areas.

4. What other demographic information do you have on these ~200 active patients that you think might be useful?

Based on the most recent audit of all 146 referrals:

Based on the most recent audit of *all 146* referrals:

male 88/146 (60%)
non-UK born 70/146 (65%)
median time of stay 10 years
mean age 44.4 (median 40)

country of origin :

		Frequency	Percent
Valid	unknown	38	26.0
	ALBANIA	1	.7
	BENGAL	1	.7
	CHINA	1	.7
	HUNGARY	1	.7
	INDIA	45	31
	KENYA	3	2.1
	MONTSERRAT	1	.7
	MOZAMBIQUE	2	1.4
	NEPAL	1	.7
	PORTUGAL	1	.7
	SAUDI ARABIA	1	.7
	SLOVAKIA	1	.7
	SOMALIA	4	2.7
	SOUTH AFRICA	1	.7
	SUDAN	1	.7
	TANZANIA	1	.7
	TURKEY	2	1.4
	UK	38	26.0
	ZIMBABWE	2	1.4
	Total	146	100.0

In the same audit of the 40 active cases we found:

male 60%
non-UK born 80.6% (56.9% for not-TB outcome)
time to UK arrival 7 years (13 years for not-TB outcome)
mean age 37.4 (47 for not-TB outcome)
country of origin data were not significantly different for the active case group.

In essence active TB in rapid access referrals in LLR is found in young recent arrivals from high prevalence countries (mainly ISC and sub-Saharan Africa) of predominantly male sex. UK born individuals with TB are more likely to be identified via other referral routes, particularly when seen by GPs with limited TB experience (see answer 1b). TB rapid access system implementation therefore needs to be coupled and will benefit from promotional events and regular public awareness campaigns in primary care, radiology and in the community.

5. Of the ~200 active patients diagnosed as above, have you (or anyone else) estimated how many cases of onward infection might have been prevented by rapid diagnosis (or is this the same question as in 1(c)?

This was answered in question 1c.

6. Within these ~200 patients, about how many are there within subgroups who might be the most infectious and likely to transmit to others? For example, homeless people, prisoners and ex-prisoners, people recently infected, those infected with certain TB strains, etc?

As per BTS abstract (attached) 58% of all pulmonary cases are seen through rapid access.1/3rd of rapid access identified cases are smear positive. A radiology based TB coding system favours identification of pulmonary cases where early intervention prevents progression to a more advanced and more infectious phenotype. The shortest symptom duration at time of referral is seen in those identified through the contact screening system (3.8 weeks), from where planned chest x-rays are also channelled into the rapid access TB clinic, if appearances suggest active TB.

TB in homeless people and prisoners are rare events in LLR.

7. Does your genotyping recognise MDR TB? If so, how does knowledge of MDR TB change what you do? What proportion of patients have drug resistant TB, MDR-TB, XDR-TB?

The genotype is generally not known at the point of diagnosis and does not frequently affect the rapid access clinic triage process. Where risk factors exist for MDR-TB, infection prevention precautions will be taken and where the suspicion is strong the outcome will be negative pressure room accommodation for further investigation / treatment.
All smear positive cases will have the GeneXpert probe done (24hr turnaround) to inform on likely mutations conferring Rifampicin resistance. Cases flagged up via contact screening, where the index case is known to have MDR are managed as probable MDR TB until proven otherwise. MDR case rates are static around 1% of all mycobacterial isolates. Primary Isoniazid resistance occurs with a frequency of 5% of isolates per year.

8. What tariff is used for the radiology referral? Is it routine OPD tariff for specialty 350 (infectious diseases) i.e. £263 for first attendance and £209 for follow-up attendance?

Standard Respiratory clinic tariffs (new / follow-up) apply to those patients physically seen in RA clinic, as the lead clinicians for this service are Respiratory physicians. In keeping with the pioneering approach to early diagnosis, there is currently no service agreement in place for those patients who are not physically seen in the rapid access clinics. An enhanced clinic tariff would seem justified and desirable to properly reflect the comprehensive service on offer.

9. If patients are not registered with a GP, who picks up the cost of referral (whether rapid or not)?

Assistance with primary care registration is offered. Overseas patients / visitors etc are managed as per NHS standard charging policy. A dedicated primary care service for homeless people and other disadvantaged groups including asylum seekers exists in the City of Leicester (ASSIST service).

TB treatment is free of charge and treatment is never withheld due to unresolved funding queries. I suspect the tax payer picks up that cost but these cases are rare in LLR.

10. How much administrator time is spent dealing with the radiology referrals?

80 % of one WTE is spent with sorting out the rapid access referrals. This role requires one band 6 nurse WTE. Our locally employed admin staff member is extremely committed to her role and operates in close liaison with the other TB nurses. However, a band 4 admin staff member is not generally suitable for this very clinical role, where not only sputum sample collection and symptom questionnaires are required, but also almost daily liaison with multiple other agencies and clinical specialist services .

11. Are there any data around people being admitted earlier as a result of rapid referral and improved outcomes, shorter length of stay etc?

Admission avoidance and early discharge of patients with suspected TB are both key aims of the rapid access service. There is indirect evidence (see table below) that these aims are achieved from symptom duration data comparing cases identified through rapid access services with those identified from other referral sources:

	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
RA TB services	64	12.3438	10.77065	9.6533	15.0342
Primary care not RA	10	24.0000	14.14214	13.8833	34.1167
Secondary care	23	14.7391	17.68208	7.0928	22.3854
Total	97	14.1134	13.37510	11.4177	16.8091

P=0.035 across all groups with ANOVA

P=0.027 comparing RA with non RA for cases referred through O/P pathways

It is likely that shorter symptom duration as a surrogate marker of less extensive / advanced disease favours outpatient management and/or early discharge for clinic follow-up (see table below):

Hospital Admissions:

	Pulmonary extended	Pulmonary limited	Total
Not admitted to hospital	8	63	71
%	33.3%	61.8%	56.3%
Admitted to hospital	16	39	55
%	66.7%	38.2%	43.7%

- Extended pulmonary TB was more likely to be associated with hospital admission.
- This is in keeping with the nature of the disease i.e. more severe (disseminated) and more complex

Appendix 3: Direct ED referral questionnaire

A retrospective cohort analysis identified 154 patients diagnosed with TB over a one year period within the inner London region. All patients attended ED at least once within 6 months prior to diagnosis. This retrospective analysis specifically looked at ED attendance at St-Mary's and Charing Cross hospitals which formed part of the Imperial College NHS Trust.

The following questionnaire was submitted to the ED Consultant responsible for St-Mary's (SMH) and Charing Cross hospital (CXH) and undertaking the analysis. The questionnaire was completed through a telephone interview.

1. **What is the total number of patients diagnosed with TB over a one year period and seen within one of the EDs at the two sites at least once 6 months before diagnosis?**

154 patients presented to either CXH or SMH over a one year period who were subsequently diagnosed with TB. These patients presented to ED at least once six month prior to the diagnosis date. This included 75 pulmonary and 79 non-pulmonary cases.

2. **What is the diagnosis conversion rate?**

Based on Imperial audit data we believe the diagnostic conversion rate is approximately 50%. As far as I'm aware there is no published data on this in the literature for the UK.

3. **Based on this can you suggest the total number of suspected cases referred from the EDs to a TB clinic within a year?**

In my experience roughly 3 suspected cases are seen over a week at each site. Therefore it is reasonable to assume 308 suspected cases will be referred through the Direct ED Referral Programme to a TB clinic to diagnose 154 TB patients.

4. **What proportion of those diagnosed with TB attended ED multiple times prior to diagnosis?**

Total = 41 re-attending (27% of diagnosed cases).

20 pulmonary and 21 non-pulmonary patients presented to the ED more than once before being referred to TB services. The average number of re-attendances by these patients was between 2-5 attendances.

5. **What is the cost incurred to the emergency department in ensuring direct referral from ED of all suspected cases (308) to a TB clinic after their first visit to ED?**

I have spoken with our business manager who agrees the figure of band 6 Administrator salary (if it includes London Weighting). However, it will not take more than 10% (0.1 wte) of their time to ensure direct referral.

Also 15 minutes is an appropriate additional time for a clinician to make a referral to TB services.

6. **What is the low, medium and high ED attendance tariff cost and which one is most relevant for an average suspected TB case?**

For the 'potential TB patients' the majority will either be Category 3 with 1-3 Tx = £151 or Category 2 with 1-2 Tx = £112.

7. **Finally are there any other quantifiable cost savings from diagnosing TB earlier through direct ED referral to TB clinic (other than preventing additional ED visits)**

I'm not sure if the data exists - but of the patients with pulmonary TB - not picked up in ED - did any of them go on the infect others that were picked up in contact tracing? - this would help to think of the cost of onward infection. I can ask our audit team to look into this. It will probably take some time to get this data.

Appendix 4: TB co-ordinator testimony

North West

1) How are paediatric TB services set up and managed in your area? Why are they set up in this way? Is there evidence to support the way that they are configured?

2) What are the advantages and challenges of the way that your service is configured? Is there evidence on whether your model can help to reduce diagnostic delay, improve contact tracing or improve treatment completion in the community that you serve?

We would be keen for you to have discussions with your network (if possible/practicable) in preparing your response to gain as broad an insight as conceivable regarding your model.

Elements of particular relevance such as: inequalities, demographics, geography, variations due to differences in active TB rates, MDR and LTBI, and accountability arrangements are sought specifically evidence or opinion on:

- The effectiveness of different service models (in relation to the outcomes above), and where possible the factors that contribute to this
- The cost and/or cost effectiveness of different approaches
- Implementation issues relevant to different approaches

Section B: Expert to complete	
Summary testimony:	[Please use the space below to summarise your testimony in 250 – 1000 words – continue over page if necessary]

The North West is a large geographical region comprising both low and high incidence TB areas (mean incidence 11.3/100,000; Manchester and Blackburn 40/100,000). It has the 4th highest incidence of TB in the UK with 769 cases per year of whom 60-70 are children < 16 years. Incidence in children tripled from 2003-11 but is now starting to fall again.

There are 2 regional centres (AlderHey and Royal Manchester Children's Hospitals) and 25 District General Hospitals seeing children. The maximum distance between a DGH and a regional centre is 60 miles. The paediatric TB service at RMCH sees 60% of all paediatric TB cases in the area. From January 2009-11 RMCH received 949 referrals of whom 725 were screened and 251 underwent consultant assessment. Of these 77 had latent Tb and 107 had Tb disease. We were also involved in the management of 2-6 Tb incidents involving children / year. With this increasing workload we recognised that standards of care were quite variable around the region with some children experiencing incomplete initial assessment leading to difficulties in their later care. There were delays in both diagnosis and treatment and some children were receiving non-standard treatments. We had 2 paediatric deaths and 5 cases of TB meningitis in 3 years and many children were travelling long distances to receive care.

Under the umbrella of the North West TB summit (a group of interested clinicians, Tb nurses, public health and health protection teams) we undertook a detailed review of paediatric TB services in the North West. In most cases care was being delivered by a paediatrician with specific expertise or an adult physician with paediatric input but many of these would only see a paediatric case once every few years. Services were generally poorly resourced, supported by solo clinicians and nurses and had difficulty in providing timely surge capacity.

We defined the best model of care to be one with consistently high standards, multidisciplinary expertise, access to specialist investigations and support, rapidly and readily accessible with surge capacity and regular review of performance and outcome. The delivery of such a model was discussed at a stakeholder meeting with Tb nurses, paediatricians, health protection and public health teams and commissioners from around the region. It was agreed that a hub and spoke model would best meet the needs of the children and this was further developed and shared with the district paediatricians for comment.

The hub and spoke model comprises 3 levels of care:

Level 3 (tertiary centre) – leads the network and leads the care in all children with non-pulmonary, non-lymph node disease.

Level 2 (DGH provides the majority of the care) is divided into 2 subgroups

Level 2a – DGH **leading** the care – where there is a critical mass of patient and clinician expertise

Level 2b – DGH **provides** the care – where the DGH is a long way from the centre but there is little clinician expertise and few patients. The regional centre will lead the assessment and treatment and work in close liaison with the DGH

Level 3 – DGH does not provide care - DGHs where there is little expertise and DGH is close to a regional centre

All hospitals work to a common evidence based pathway including quality measures (such as wait times) and an assessment proforma for those with suspected TB disease. There are defined points of integration between primary and secondary care and clear roles and responsibilities for all staff.

This model has been piloted at RMCH and 3 DGHs in Greater Manchester over the last 12 months. It has generally worked well with feedback from DGH clinicians that they and their patients prefer straightforward cases to be cared for locally but they require more support with atypical, non-pulmonary, complex, young (<2 years), co-infected or MDR cases. They appreciate email and telephone communication and prompt access to advice when needed. They require help with specialist investigation such as bronchoscopy, biopsy or induced sputum and need access to specialist tertiary services such as neurology, spinal teams and PICU. They recognise the importance of TB nurses and cohort review although they struggle to attend due to other service pressures.

We are now in the process of formally commissioning the service for roll out across the region. We

need to identify a level 2 spoke in the North of the region and identify methods to ensure effective review of paediatric outcomes across the whole region. This is only partially addressed by cohort review in its current form.

Answers to additional questions:

a. Paediatric numbers have fallen significantly since 2011(by 49% across North West, by 36% attending RMCH). This cannot fairly be attributed to the paediatric network as this is reactive rather than proactive. There has been an associated reduction (although less marked) in all Tb cases across the region and the country. The Tb summit has done some work on raising awareness in local communities and with health professionals which may have resulted in earlier diagnosis in adults with consequently less transmission. It is likely that patterns of migration play the biggest role

b. Although 60% paediatric TB cases are treated at RMCH we do not treat 60% of all latent disease. The latent TB treated at RMCH is from our local catchment area in central Manchester. Most DGHs are happy to treat latent TB without reference to us.

c. Diagnostic delay is a significant problem. Despite 3rd sector work, a combination of stigma and a lack of awareness of the potential for poor outcomes in children mean that some families present late. More often we see children who have presented repeatedly to primary and secondary care with suggestive symptoms that have not been identified and referred promptly. This is particularly common in children with non- pulmonary forms of TB (including Tb meningitis) but also occurs in children with classical symptoms and signs when paediatricians have simply not considered the diagnosis. We have seen teenagers with classical TB who have been unwell for 9-12 months prior to diagnosis. Diagnostic delay occurs more frequently in low incidence areas far from a regional centre. This may be because of a lack of clinician expertise or awareness or an unwillingness / inability of families to travel a long way to the regional centre.

d. See c

e. See c

f. See c

g. We agree the process is complex. Tertiary children's services have long been commissioned on a region wide footprint and children's hospitals have systems and staff in place to liaise with commissioners used to developing networks. The PDG may find it helpful to approach such an individual to discuss this further. Nicola Adamason (Associate Director for Strategy at RMCH) Nicola.Adamson@cmft.nhs.uk would be happy to assist with this if necessary.

h. The demographic footprint in Cheshire is very different to that in Manchester and the TB incidence is much lower. Tb staffing is also significantly better in Cheshire and Merseyside than the rest of the region

i. Clinical teams are fundamental to the development of high quality clinical services and it is important that those involved in service provision have a full understanding of local services and challenges before developing a service model for paediatric TB. These will clearly vary around the country and it is unlikely one model will fit all. There is a considerable workload associated with this and we have been fortunate to have the TB summit to help us collect data. Perhaps TB control boards will help with this in the future.

j. Children with MDR are rare and difficult to manage and advice and support should be sought from a centre of expertise. Currently this would be Great Ormond Street Hospital +/- the British Thoracic Society MDR group. These children will also need local paediatric care to manage medication, side effects and treatment. Thorough initial assessment will be very important and should be done in a regional paediatric centre with Tb expertise. In our region we would see and assess the child in the regional centre even if this meant they had to travel 60 miles. We would liaise with GOS and our local adult colleagues and develop a management plan. The ongoing care may then be administered locally by the TB nursing team but we would see the child regularly (at least monthly) and personally review all imaging etc.

k. We have not submitted a business case or economic data yet. To date we have been piloting a new model and have only rolled this out to 3 DGHs. The next step of formal commissioning will require such data to be collected and we are in the process of collecting 10 year outcome data for all Tb cases at RMCH to facilitate this.

l. IGRAs in children are possible and we do them in every case. We screened >100 neonates exposed to TB in a neonatal unit and managed to get sufficient samples from all. We do not currently use them instead of mantoux testing as we find subgroups of children who have positive mantoux and negative IGRA and vice versa.

m. Developing and running a network is time consuming and has impacted on our ability to provide other services. A lot of the development work has been done in our own time. The main time pressures are: development of a regional pathway and assessment proforma, holding stakeholder meetings (probably need about 2-3 ½ day meetings), general organisation, attending cohort review and steering group meetings (3 hours / month) and then running the network and auditing outcomes. Clinical questions from other clinicians can be time consuming (maybe 0.5hrs/week) but are less time consuming than sorting out a sick child who has been suboptimally assessed or managed. Once the network is fully running there will be additional time pressures of reviewing distant radiology / clinic letters etc for children who are no longer needing to travel to RMCH. This will need to be explicitly commissioned. In our region we are looking at commissioning through an operational delivery network. This is a network hosted by a provider (usually the tertiary centre) which is formally monitored in terms of delivery.

n. I believe Tb control boards will have some funding which could be used for cohort review. I am not sure if this will be sufficient to fund a paediatric network although it might cover some of the administration. Regional commissioning has previously be used effectively to support other paediatric networks in the North West

o. We are used to commissioning across the North West Region for specialist children's services so this seems a sensible footprint

Costing questions

See 'm' above. Much of the set up was done in our own time. It has probably taken consultant time of 2 hours/week over a period of 12 months to develop / organise our service to the current level. In addition, we have introduced an extra 9 hours of clinic time/month to manage newly referred patients. **Apart from seeing the patients most of the network organisation and planning would be more effectively and efficiently done by a network coordinator. In our region (covering a population of 1 million children) we think it would be reasonable to have 1 coordinator (band 8a) to cover TB / HIV / infectious diseases and allergy. There is an additional requirement for band 4 admin support.**

References (if applicable):

Birmingham

a) Birmingham, sounds like the early part of the NY story. Had some jolts, and move to coordinators. NY has a whole team though not just a coordinator. Have they discussed whether they need to have more resource?

The Coordinator role in Birmingham has a system oversight and coordination role rather than a care coordination role. Additional resource was negotiated with the PCT just before CCGs were formed to increase the number of TB nurses for incident management as the number of incidents had increased three fold, and to fund the TB clinical leads (3 PAs for the Adult Lead and 1 PA for the Paediatric lead – both appointed in 2014. Further resource would be required to further enhance case finding for latent disease and for active disease in underserved groups.

b) a lot of what you are talking about is partnerships and relationships... what makes for a successful one? Clear service agreements?

For partnerships to be successful there needs to be clear system leadership and a shared vision across all partners for TB prevention and control. This should be supported by a single responsible body who is expected to chair the TB Board and part of this is to ensure time is allocated to develop relationships with the wide variety of stakeholders and create a focus of attention for what is otherwise perceived to be a public health protection issue that does not affect large numbers in the population ie 4-500 in Birmingham ham per annum – not everyone's biggest priority.

Structure, strategy, partnership, agreements and clear governance arrangements are all important but insufficient. We cannot underestimate the importance of great relationships, and leadership behaviours that transcend the concerns of individual organisations and interests, create a shared narrative and ambition for improvement of outcomes for people and communities, and a momentum for change across the partnership - particularly between clinicians with an interest in TB in each acute trust. Similarly for microbiologists. The Lead clinician, both current and his immediate predecessor, for TB in the host trust for the TB nursing service is very well respected locally, and has worked well with Public Health colleagues and is collaborative and modest. The lead provided by the DPH in chairing the TB Board , and his support and challenge is also absolutely key to recent progress.

c) In London – no one seems responsible. Have you solved the problem of who is responsible if there is no improvement in local TB?

In Birmingham there is one TB Service that manages case load across the whole of Birmingham and Solihull. Acute services are delivered through 4 acute trusts, there are 4 CCGs and 3 LAs (which does create complexity) but is significantly less complex than London who have circa 31 LAs and about the same number of CCGs. The partnership is clear that there is a shared responsibility for improvement – and that no one organisation can "do it" on its own – in addition we have increasing clarity about the ambition for improvement (and are moving to quantify that in local standards), and clear workstreams and deliverables based on the best evidence we have, or that will improve the evidence base, with clear delivery mechanisms, leadership and resources from across the partnership against the deliverables.

In governance terms, the TB Board has a line to the Birmingham Health and Wellbeing Board through the DPH, and the interest previously shown by Birmingham City Council through its Oversight and Scrutiny Committee also provides clarity that there is an accountability to the population through the Council's democratic mandate.

d) what works best - quality standards – locally or nationally set?
We need both. Nationally set standards are important as it allows comparability. National support should also allow sharing good practice and support the less well performing areas to drive for excellence. At the same time locally set quality indicators are important to engender ownership and allow progress to be monitored according to the population and service need. We are about to launch our local standards –set out in the annexe.

e) ownership of contact tracing, and governance of this process. Where does it sit? Especially if it crosses geographic boundaries….

Contact tracing as part of case management rests with the TB Community Nursing service commissioned by CCGs, and the TB Community nursing service is also responsible for contact tracing in TB incidents. Statutory responsibility for managing incidents rests with Public Health England Centres through their health protection teams, the PHE Centre's geographical footprint in the West Midlands crosses local areas and yet is coherent both in terms of social geography and cross boundary NHS patient flows, and the Centre is networked nationwide with other Centres (with PHE's Case and Incident Management IT system also supporting good quality practice). Good working relationships and handover between neighbouring community nursing services is also crucial. In Birmingham TB Nursing numbers were increased to support contact tracing for incident management and both Clinical Leads have responsibility for giving clinical advice in incidents.

e) who funds your co-ordinator ?

The first 18 months was funded with short term pump priming by HPA/PHE West Midlands – for the next period of funding will come from 2 of our LAs with high incidence of TB and the individual is employed by PHE.

Costing questions – TB co-ordinator:

- What grade is the TB co-ordinator on?
  8C Grade AfC

- We are assuming the co-ordinator is full-time and they don't have additional responsibilities beyond TB – is this correct?
  Yes

- Does the co-ordinator free up anybody else's time – such as clinicians (if so, what band and how much time per week/month)?
  No, it does not, as there is no overlap between her role and any other staff. This is a critical role for engaging with CCGs and other key people in Birmingham and for managing the partnership programme. No other person has this remit or time in their job.

- How will the co-ordinator's success be measured in the short, medium and longer term?
  This post has a clear job planning process with specific objectives and it is reviewed regularly as well as during the appraisal process. There is an ongoing national project led by the PHE with the support of UCL to evaluate this position.

o Do we have any success to report (i.e. securing funding – if so how much) and/or any measures of success yet (quantitative or qualitative)?
If no specific outcomes for the co-ordinator, how might you justify maintaining the role in the longer term once the network is fully functioning?
It is not purely the establishment of the network that is important - the role supports system leadership and multiagency programme management by acting as the "glue of the system" and having an oversight of the TB service and facilitating and coordinating the improvement programme.