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Quality of care in childhood tuberculosis diagnosis at primary care clinics in Kampala, Uganda

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SUMMARY

OBJECTIVE: To assess the quality of routine childhood tuberculosis (TB) evaluation in Kampala, Uganda.

SETTING AND DESIGN: This was a cross-sectional study of children aged <15 years attending six government-run clinics from November 2015 to December 2016. Clinicians completed a standardized patient record form for all child visits. We assessed the following performance indicators of TB evaluation developed based on the Desk Guide of the International Union Against Tuberculosis and Lung Disease, an evidence-based decision aid on childhood TB diagnosis and management for clinicians: proportion screened for TB symptoms or contact history, proportion referred for laboratory evaluation if screen-positive, and proportion treated for TB if test-positive or meeting clinical criteria.

RESULTS: Of 24566 consecutive children enrolled, 11614 (47%) were fully screened for TB symptoms. Of 1747 (15%) children who screened positive, 360 (21%) had sputum examined, including 159 (44%) using smear microscopy, 244 (67%) using Xpert® MTB/RIF, and 52 (14%) using both techniques. Treatment was initiated in 18/20 (80%) children who tested positive. An additional 65 screen-positive children met the clinical criteria for TB; none were initiated on treatment.

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Conflicts of interest: none declared.

CONCLUSIONS: Large gaps exist along the pathway to diagnosis and treatment of childhood TB. There is an urgent need for enhanced implementation of evidence-based approaches to TB diagnosis to improve outcomes in childhood TB.

RÉSUMÉ

Evaluer la qualité de l'évaluation en routine de la tuberculose (TB) de l'enfant à Kampala, Ouganda.

Etude transversale d'enfants âgés de <15 ans fréquentant six centres de santé; gérés par l'état de novembre 2015 à décembre 2016. Les cliniciens ont rempli un dossier standardisé pour toutes les consultations des enfants. Nous avons évalué les indicateurs de performance suivants d'évaluation de la TB, élaborés à partir du Desk-Guide de l'Union, une aide à la décision fondée sur des preuves pour les cliniciens concernant le diagnostic et la prise en charge de la TB de l'enfant : proportion d'enfants dépistés à la recherche de symptômes de TB ou notion de contact, proportion référée pour des examens de laboratoire en cas de dépistage positif et proportion traitée pour TB en cas de tests positifs ou de réponse aux critères cliniques.

Sur 24566 enfants consécutifs enrôlés, 11614 (47%) ont eu un bilan complet à la recherche de symptômes de TB. Sur 1747 (15%) enfants qui ont eu un dépistage positif, 360 (21%) ont eu un examen de crachats, dont 159 (44%) par microscopie de frottis, 244 (67%) par Xpert® MTB/RIF et 52 (14%) par les deux techniques. Le traitement a été mis en route chez 18 enfants sur 20 (80%) qui ont eu un test positif. Un groupe supplémentaire de 65 enfants à dépistage positif ont répondu aux critères cliniques de TB; aucun n'a été mis sous traitement.

Il y a d'importantes lacunes tout au long du parcours de diagnostic et de traitement de la TB de l'enfant. Il y a un besoin urgent d'amélioration de la mise en œuvre d'approches basées sur des preuves du diagnostic de la TB afin d'améliorer les résultats de la TB de l'enfant.

RESUMEN

Evaluar la calidad de la investigación corriente de la tuberculosis (TB) en los niños de Kampala, en Uganda.

Fue este un estudio transversal de los nidos de edad <15 años que acudieron a seis consultorios gubernamentales de noviembre del 2015 a diciembre del 2016. Los médicos completaron un formulario normalizado con información clínica en todas las consultas de los niños. Los indicadores de desempeño de la evaluación de la TB utilizados en el presente estudio se escogieron a partir de la guía de La Unión, que es en una ayuda a la toma de decisiones basada en la evidencia científica en materia de diagnóstico y manejo de la TB y se dirige a los médicos. Se examinaron los siguientes indicadores: la proporción de niños en quienes se practicó la detección de síntomas indicativos de TB o los antecedentes de contacto, la proporción de casos derivados para evaluación de laboratorio cuando la detección fue positiva y la proporción de niños tratados por TB, cuando los resultados de las pruebas fueron positivos o cuando cumplían con los criterios clínicos.

De los 24566 niños consecutivos inscritos, en 11614 se practicó una detección completa de síntomas (47%). De los 1747 con una detección positiva (15%), en 360 niños se examinaron muestras de esputo (21%), de ellos 159 mediante baciloscopia (44%), 244 con la prueba Xpert® MTB/RIF (67%) y 52 con ambas técnicas (14%). Se inició el tratamiento en 18 de los 20 niños

con pruebas positivas (80%). Además de los niños con resultados positivos en las pruebas, otros 65 cumplieron con los criterios clínicos de TB, pero no se inició tratamiento en ninguno de ellos.

Existen aún importantes deficiencias en el seguimiento del algoritmo de diagnóstico y tratamiento de la TB en los niños. Es urgente reforzar la introducción de estrategias de diagnóstico de la TB fundamentadas en la evidencia científica, con el fin de mejorar los desenlaces clínicos de la TB durante la infancia.

Keywords

pediatric tuberculosis; quality; lowincome countries

UP TO TWO THIRDS OF CHILDREN with tuberculosis (TB) are never reported and are likely never diagnosed.[1–4] In most high-burden settings, children can only receive a full diagnostic evaluation, including microbiologic testing, in referral settings that are inaccessible to most families.[5–11] Given the many challenges, the use of algorithms applying the clinical criteria for diagnosis and empiric treatment of TB in children has been suggested.[12]

The World Health Organization (WHO), together with the International Union Against Tuberculosis and Lung Disease (The Union), has developed several tools, including the WHO/Union childhood TB training toolkit,[13] the Union childhood TB online training course,[14] and the Desk Guide for the Diagnosis and Management of Tuberculosis in Children (the Desk Guide).[15] The latter, an evidence-based decision aid for clinicians, was last updated in 2016. The Desk Guide lays out a simple clinical algorithm that incorporates both laboratory-based and syndromic approaches to the evaluation of children for TB.

We wished to assess the quality of routine evaluation of children for TB at primary care clinics in Kampala, Uganda. We determined the proportion of children completing key steps in the pathway to diagnosis and treatment of childhood TB using metrics adapted from the diagnostic algorithms described in the Desk Guide.

METHODS

Study participants and setting

We conducted a cross-sectional study of all sick children (age <15 years) who presented for clinical evaluation to six government-run primary care clinics in Kampala from November 2015 to December 2016. Kampala accounts for 20% of all TB cases reported to the Ugandan National TB and Leprosy Programme (NTLP).[16] The clinics provide free general out-patient services and in-patient maternity care to over 3 million residents of the city and surrounding districts. Each facility has an average number of 60 staff members, and each has a dedicated TB unit with designated health personnel supervised by the NTLP and a laboratory that offers sputum examination via light-emitting diode fluorescence microscopy. On-site Xpert® MTB/RIF (Cepheid, Sunnyvale, CA, USA) molecular testing is available at four clinics, and the other two clinics refer specimens to nearby clinics for Xpert testing. NTLP guidelines recommend Xpert as the first-line test in all children aged <15 years.[17] Sputum

induction, gastric aspiration, the tuberculin skin test, and chest radiography are not routinely available at these sites; patients requiring these services are referred to Mulago National Referral Hospital, Kampala. On-site counseling and testing for human immunodeficiency virus (HIV) are available, and NTLP guidelines recommend routine HIV testing in all patients with presumed TB. At the time of our study, clinicians at the facilities had received training in the management of childhood TB based on NTLP guidelines.[17] This training took place starting from April 2015. These guidelines are in line with Desk Guide recommendations.[15]

Study measurements

In November 2015, we introduced a modified version of a patient record form (PRF) approved by the Uganda Health Ministry Information Services and the Kampala Capital City Authority (KCCA) Directorate of Public Health. The form included questions to prompt screening of all children for the symptoms, risk factors, and signs of TB, and to facilitate recording of TB-related testing, diagnosis, treatment, and referrals to outside facilities (Figure 1).[18] We conducted training in each clinic to orient staff to the PRF before its introduction, and follow-up audit checks to confirm that the PRF was being filled out correctly.

We employed two full-time research assistants to extract data from the PRFs into a Research Electronic Data Capture database (REDCap, Nashville, TN, USA). In addition, research personnel reviewed the presumptive TB, TB laboratory, and anti-tuberculosis treatment registers at each site, and updated the database with any information missing from PRFs.

Using the Desk Guide algorithms, we defined performance indicators that reflect each step of the care pathway for childhood TB diagnosis, including:

1. The proportion of children fully screened for TB (documented presence or absence of all of the following):
    - **i.** Fever lasting >14 days;
    - **ii.** Persistent, non-remitting cough or wheeze lasting ⩾2 weeks;
    - **iii.** Contact with an adult TB patient;
    - **iv.** Failure to thrive or weight loss within 1 month;
    - **v.** Drenching night sweats; and
    - **vi.** Reduced playfulness or fatigue.
2. The proportion of children with presumed TB (having ⩾1 symptom suggestive of TB or contact history, as listed above);
3. The proportion of children with microbiologic (⩾1 positive sputum smear or Xpert result) or clinically diagnosed TB (as set out in the Desk Guide[15]); and
4. The proportion of children meeting the criteria for TB diagnosis initiated on anti-tuberculosis treatment.

Finally, we assessed the key steps in evaluating all children with presumptive TB for HIV, including the proportion of: 1) children referred for HIV counselling and testing (HCT) and 2) HIV testing completed if referred.

Analysis

We summarized clinical and demographic characteristics using appropriate measures of central tendency for continuous variables, and proportions for categorical variables. For selected quality indicators, we used logistic regression models with robust standard errors to account for clustering within health centers and to obtain point estimates and 95% confidence intervals (CIs) after adjusting for age. All analyses were performed using STATA 14.1 (Stata Corporation, College Station, TX, USA).

Ethical considerations

The Makerere University School of Medicine Research and Ethics Committee, Kampala, and the Uganda National Council for Science and Technology, Kampala, approved the study protocol and waived the requirement for informed consent.

RESULTS

Between November 2015 and December 2016, 24 566 sick children presented to the out-patient department at the six health clinics (Figure 2). The numbers attending each clinic ranged from 2268 to 8228. The majority (n=15942, 65%) of the children were aged <5 years; most were girls (n = 12253, 53%) (Table 1).

Screening for the cardinal symptoms suggestive of tuberculosis

The proportion of children screened for individual TB symptoms ranged from 55% (95%CI 54–56) for history of reduced playfulness to 65% (95%CI 64–66) for cough lasting ⩾2 weeks (Table 1). Among those screened, persistent cough lasting ⩾2 weeks was the most common symptom (5.5%, 95%CI 5.1–5.8). The prevalence of other symptoms or history of contact with an adult with TB ranged from 0.7% (95%CI 0.6–0.8) for history of contact to 4.5% (95%CI 0.1–5.0) for persistent fever. Overall, 1747 of 24566 (7.1%, 95%CI 6.9–7.3) children had contact history or a symptom suggestive of TB.

Clinical and laboratory diagnosis of tuberculosis

Of the 1747 children with symptoms suggestive of TB, 360 (20.6%, 95%CI 18.6–22.5) were referred to the on-site laboratory for sputum evaluation, 351 (97.5%, 95%CI 95.1–99.3) of whom underwent sputum testing (Figure 3). Clinicians referred children aged <5 years much less often than those aged ⩾5 years (19% vs. 81%, $P < 0.001$). Of those referred, 192 (53.3%, 95%CI 50.7–57.5) were tested initially using Xpert, 11 (5.7%, 95%CI 2.4–7.8) of whom had a positive result (including one with rifampicin resistance). One hundred and fifty-nine (44%, 95%CI 41.6–47.3) children were tested initially using sputum smear microscopy, and nine (5.7%, 95%CI 2.2–8.0) had a positive result on the first smear. At these two clinics, only 11/36 (30.6%) children who underwent smear examination also had Xpert testing performed. Moreover, the majority (68.5%, 95%CI 63.1–72.7) of children who underwent smear examination presented to one of the four clinics that did have on-site

GeneXpert devices, which reflects the poor adoption of guidelines even when Xpert testing was readily available. A second smear examination was performed in 47 (29.6%, 95%CI 27.1–31.4) children tested using smear microscopy; however, this provided no additional yield. Xpert testing was performed following a negative first or second smear in 52 (32.7%, 95%CI 30.5–34.6) children referred for sputum smear microscopy, and none had a positive result. Thus, 298/360 (82.8%, 95%CI 79.3–85.1) children completed sputum testing if referred. Of the 62 who did not complete sputum testing, nine had no tests performed, and 53 had only one smear examination.

In addition to the 20 children with smear- or Xpert-positive TB, 65 children met the clinical criteria for TB diagnosis. Thus, 85/1747 (4.8%, 95%CI 3.9–5.9) children with symptoms or risk factors suggestive of TB met the microbiologic or clinical criteria for TB diagnosis. None of the 20 children with confirmed TB, but 49/65 (75.4%) children with clinical TB had a history of contact with an adult with TB. Of note, none of the 65 children meeting the clinical criteria were given a TB diagnosis by clinicians.

Referral for human immunodeficiency virus testing

Among the 1747 children with a positive contact history or symptoms suggestive of TB, 352 (20.1%, 95%CI 18.0–22.1) were referred for HIV testing, including 315/1241 (25.4%, 95%CI 19.9–31.2%) children aged ⩾18 months and 37/506 (7.3%, 95%CI 4.8–10.9%) children aged <18 months. Of those referred, 288 (82.1%, 95%CI 79.9–84.9) completed testing, including 19/20 (95%, 95%CI 67.7–99.4) children with microbiologically confirmed TB, but only 2/65 (3.1%, 95%CI 0.8–12.1) children who met the clinical criteria for TB diagnosis. Of those who completed testing, 69 (23.9%, 95%CI 21.2–27.2) had positive results, including 6/19 (31.6%) with microbiologically confirmed TB and 3/37 (8.1%) children aged <18 months. Among children with a newly positive HIV test, nine (13%) were aged 0–4 years, 22 (32%) were aged 5–9 years and 38 (55%) were aged 10–14 years. Children who were referred for HIV testing were comparable with those who were not referred for HIV testing with respect to sex. However, they were more likely to be older (14% vs. 86%, $P < 0.001$), and more likely to have symptoms suggestive of TB than those not referred for HIV testing ($P < 0.001$ for all symptoms).

Treatment initiation

Of the 85 children who met the microbiologic or clinical criteria for TB diagnosis, only 18 (21.1%, 95%CI 13.6–31.4) were initiated on anti-tuberculosis treatment, all of whom had microbiologically confirmed TB. Thus, 18/20 (90%, 95%CI 64.5–97.8) children with microbiologically confirmed TB and none of the 65 children with clinical TB were initiated on anti-tuberculosis treatment. No child without the microbiologic or clinical criteria for TB diagnosis was started on anti-tuberculosis treatment. Isoniazid preventive therapy was not offered to any child at the study clinics.

Referrals and non-tuberculosis diagnoses

Only 22/1747 (1.3%, 95%CI 1.2–1.4) children with a positive contact history or symptoms suggestive of TB were referred for further evaluation at other facilities, including 6 (27%) to the pediatric TB clinic and 5 (23%) to the Nutrition Unit at Mulago National Referral

Hospital, 5 (23%) to another KCCA clinic with on-site Xpert testing, 4 (18%) to a private health facility for sputum induction, and 2 (9.1%) to the HIV clinic at the same facility. Only one child referred (4.5%) completed sputum testing on arrival, and results were negative. None of those referred met the clinical criteria for TB diagnosis.

All 65 children who met the clinical criteria for TB diagnosis were diagnosed with a condition other than TB. Six children were diagnosed with a notifiable infection, 36 children were diagnosed with non-notifiable infections, and six had miscellaneous diagnoses (Table 2). Table 3 shows the diagnosis made by the clinician for the remainder of the 1747 children with symptoms or risk factors suggestive of TB.

Quality of tuberculosis evaluation by age

Compared with children aged <5 years, children aged 5–9 years were more likely to be referred for HIV testing (odds ratio [OR] 3.9, 95%CI 3.0–5.0, $P < 0.001$) and sputum testing (OR 9.6, 95%CI 6.8–13.7, $P < 0.001$), and to complete sputum testing (OR 4.4, 95%CI 2.1–7.1, $P < 0.001$), after adjusting for sex and study site. Children aged 10–15 years were even more likely than those aged <5 years to be referred for HIV testing (OR 6.9, 95%CI 5.2–8.5, $P < 0.001$) and sputum testing (OR 19.9, 95%CI 13.8–28.6, $P < 0.001$), and to complete sputum testing (OR 7.4, 95%CI 3.6–10.2, $P< 0.001$). Children aged 10–15 years were also more likely to be diagnosed with TB (OR 1.9, 95%CI 1.2–3.1, $P=0.049$), and to initiate anti-tuberculosis treatment (OR 8.3, 95%CI 4.8–13.5, $P = 0.011$) than those aged <5 years.

DISCUSSION

We characterized the quality of care for childhood TB diagnosis at urban primary care clinics in Uganda using clinical algorithms adapted from the Union Desk Guide,[15] which are aligned with WHO guidelines on childhood TB.[12] We found that the quality of care was poor, particularly for children aged <5 years. Only half of all children were fully screened for symptoms and TB contact history; only one fifth of children who screened positive for TB symptoms or risk factors were referred for sputum examination; and none of the children who met the clinical criteria for TB diagnosis started treatment. These data highlight many opportunities for quality improvement in the diagnostic evaluation of children for TB in routine primary care settings.

Very few studies have examined the quality of childhood TB diagnosis in low-income settings using standardized indicators.[19,20] We evaluated screening not only for cough but also for other symptoms in accordance with Desk Guide guidelines.[21] Systematic screening of children for TB at health facilities can improve the number of TB cases identified.[22] We have previously shown that universal screening of children is achievable through the use of standardized forms and task shifting to registration staff.[18,20,23]

Clinical diagnosis is critical, yet under-emphasized, in childhood TB diagnosis. Our findings are consistent with those from a study from Cambodia, which found that clinicians do not commonly use clinical judgment alone to make a diagnosis of TB in children.[19] Only 19% of children aged <5years with presumed TB were referred for sputum testing (compared with 81% of children aged >5 years). The TB diagnostic algorithm suggests referral of

children with productive cough for sputum examination. Older children are more likely to produce sputum, and this can partly explain the higher referral rates for older children for sputum examination. Anti-tuberculosis treatment was not initiated in any child without a positive sputum result. These findings highlight the need for improving clinicians' confidence in making a clinical diagnosis of TB in children, while also facilitating referrals to higher-level facilities, particularly those for young children. Furthermore, recommended diagnostics were underused, with only half of children referred for sputum examination evaluated using Xpert. NTLP guidelines recommend that if Xpert is not available on site, smear microscopy should be performed, and another sample should be referred for Xpert testing using the sample transport system. At the two study clinics that lacked GeneXpert devices on site, only 11/36 (30.6%) children who underwent smear examination also had Xpert testing performed. Moreover, the majority (68.5%, 95%CI 63.1–72.7) of children who underwent smear examination presented to one of the four clinics that had an on-site GeneXpert device, reflecting the poor adoption of guidelines even when Xpert testing was readily available. Enhancing the ability of clinicians in primary care settings to make clinical and laboratory TB diagnoses is essential to improving care among children with TB.[3,5,10,24,25]

Our study had limitations. We could not follow up children who met the clinical criteria for TB to assess outcomes. Relying on routine health facility data could have underestimated the quality of care by clinicians as a result of under-recording. However, we reviewed TB laboratory and treatment registers to ensure complete capture of all TB diagnostic and treatment data.

In conclusion, the quality of routine evaluation of children for TB in primary health care facilities in Uganda was poor. Major gaps were identified at all stages of the TB evaluation process, particularly among younger children. Better adherence to clinical algorithms is likely needed to reduce childhood TB burden in low-income, high TB burden countries.

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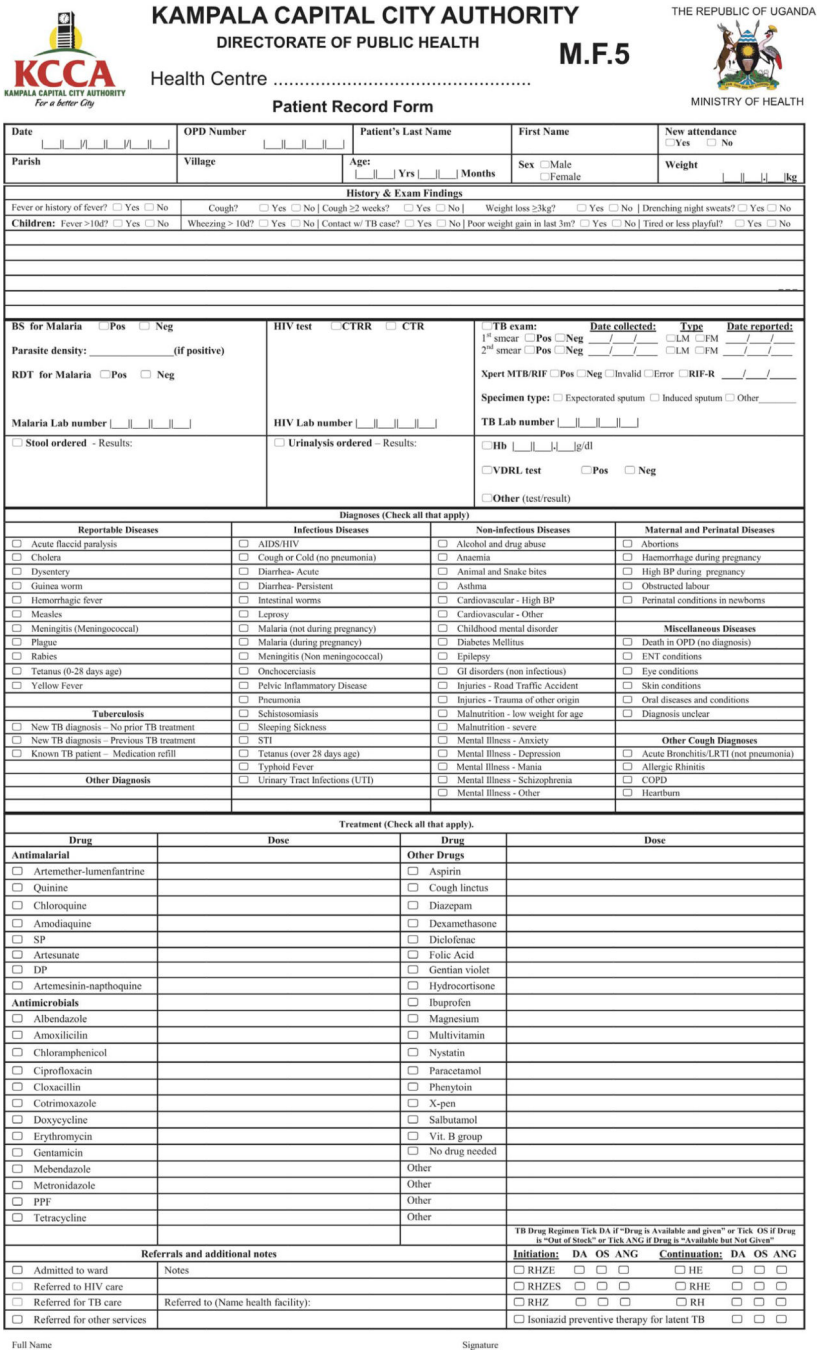

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Health Centre .....

Patient Record Form

Date	OPD Number	Patient's Last Name	First Name	New attendance ☐Yes ☐ No
Parish	Village	Age: |__|__| Yrs |__|__| Months	Sex ☐Male ☐Female	Weight |__|__|.|__|kg

History & Exam Findings

Fever or history of fever? ☐ Yes ☐ No | Cough? ☐ Yes ☐ No | Cough ≥2 weeks? ☐ Yes ☐ No | Weight loss ≥3kg? ☐ Yes ☐ No | Drenching night sweats? ☐ Yes ☐ No

Children: Fever >10d? ☐ Yes ☐ No | Wheezing > 10d? ☐ Yes ☐ No | Contact w/ TB case? ☐ Yes ☐ No | Poor weight gain in last 3m? ☐ Yes ☐ No | Tired or less playful? ☐ Yes ☐ No

BS for Malaria ☐Pos ☐ Neg Parasite density: _____(if positive) RDT for Malaria ☐Pos ☐ Neg Malaria Lab number |__|__|__|__|	HIV test ☐CTRR ☐ CTR HIV Lab number |__|__|__|__|	☐TB exam: Date collected: Type Date reported: 1st smear ☐Pos ☐Neg __/__/__ ☐LM ☐FM __/__/__ 2nd smear ☐Pos ☐Neg __/__/__ ☐LM ☐FM __/__/__ Xpert MTB/RIF ☐Pos ☐Neg ☐Invalid ☐Error ☐RIF-R __/__/__ Specimen type: ☐ Expectorated sputum ☐ Induced sputum ☐ Other_____ TB Lab number |__|__|__|__|
☐ Stool ordered - Results:	☐ Urinalysis ordered – Results:	☐Hb |__|__|.|__|g/dl ☐VDRL test ☐Pos ☐ Neg ☐Other (test/result)

Diagnoses (Check all that apply)

Reportable Diseases	Infectious Diseases	Non-infectious Diseases	Maternal and Perinatal Diseases
☐ Acute flaccid paralysis	☐ AIDS/HIV	☐ Alcohol and drug abuse	☐ Abortions
☐ Cholera	☐ Cough or Cold (no pneumonia)	☐ Anaemia	☐ Haemorrhage during pregnancy
☐ Dysentery	☐ Diarrhea- Acute	☐ Animal and Snake bites	☐ High BP during pregnancy
☐ Guinea worm	☐ Diarrhea- Persistent	☐ Asthma	☐ Obstructed labour
☐ Hemorrhagic fever	☐ Intestinal worms	☐ Cardiovascular - High BP	☐ Perinatal conditions in newborns
☐ Measles	☐ Leprosy	☐ Cardiovascular - Other	
☐ Meningitis (Meningococcal)	☐ Malaria (not during pregnancy)	☐ Childhood mental disorder	**Miscellaneous Diseases**
☐ Plague	☐ Malaria (during pregnancy)	☐ Diabetes Mellitus	☐ Death in OPD (no diagnosis)
☐ Rabies	☐ Meningitis (Non meningococcal)	☐ Epilepsy	☐ ENT conditions
☐ Tetanus (0-28 days age)	☐ Onchocerciasis	☐ GI disorders (non infectious)	☐ Eye conditions
☐ Yellow Fever	☐ Pelvic Inflammatory Disease	☐ Injuries - Road Traffic Accident	☐ Skin conditions
	☐ Pneumonia	☐ Injuries - Trauma of other origin	☐ Oral diseases and conditions
Tuberculosis	☐ Schistosomiasis	☐ Malnutrition - low weight for age	☐ Diagnosis unclear
☐ New TB diagnosis – No prior TB treatment	☐ Sleeping Sickness	☐ Malnutrition - severe	
☐ New TB diagnosis – Previous TB treatment	☐ STI	☐ Mental Illness - Anxiety	**Other Cough Diagnoses**
☐ Known TB patient – Medication refill	☐ Tetanus (over 28 days age)	☐ Mental Illness - Depression	☐ Acute Bronchitis/LRTI (not pneumonia)
	☐ Typhoid Fever	☐ Mental Illness - Mania	☐ Allergic Rhinitis
Other Diagnosis	☐ Urinary Tract Infections (UTI)	☐ Mental Illness - Schizophrenia	☐ COPD
		☐ Mental Illness - Other	☐ Heartburn

Treatment (Check all that apply).

Drug	Dose	Drug	Dose
Antimalarial		**Other Drugs**	
☐ Artemether-lumenfantrine		☐ Aspirin	
☐ Quinine		☐ Cough linctus	
☐ Chloroquine		☐ Diazepam	
☐ Amodiaquine		☐ Dexamethasone	
☐ SP		☐ Diclofenac	
☐ Artesunate		☐ Folic Acid	
☐ DP		☐ Gentian violet	
☐ Artemesinin-napthoquine		☐ Hydrocortisone	
Antimicrobials		☐ Ibuprofen	
☐ Albendazole		☐ Magnesium	
☐ Amoxilicilin		☐ Multivitamin	
☐ Chloramphenicol		☐ Nystatin	
☐ Ciprofloxacin		☐ Paracetamol	
☐ Cloxacillin		☐ Phenytoin	
☐ Cotrimoxazole		☐ X-pen	
☐ Doxycycline		☐ Salbutamol	
☐ Erythromycin		☐ Vit. B group	
☐ Gentamicin		☐ No drug needed	
☐ Mebendazole		Other	
☐ Metronidazole		Other	
☐ PPF		Other	
☐ Tetracycline		Other	
			TB Drug Regimen Tick DA if "Drug is Available and given" or Tick OS if Drug is "Out of Stock" or Tick ANG if Drug is "Available but Not Given"

Referrals and additional notes		Initiation:	DA	OS	ANG	Continuation:	DA	OS	ANG
☐ Admitted to ward	Notes	☐ RHZE	☐	☐	☐	☐ HE	☐	☐	☐
☐ Referred to HIV care		☐ RHZES	☐	☐	☐	☐ RHE	☐	☐	☐
☐ Referred for TB care	Referred to (Name health facility):	☐ RHZ	☐	☐	☐	☐ RH	☐	☐	☐
☐ Referred for other services		☐ Isoniazid preventive therapy for latent TB					☐	☐	☐

Full Name Signature

Figure 1.

Patient Record Form. The form was approved by the Uganda Health Ministry Information Services, Kampala, and the Directorate of Public Health, Kampala Capital City Authority, Kampala, Uganda, to be used as one of the medical forms at the out-patient department. The form has been used previously in rural areas of Uganda.[18] OPD = Out-Patient Department; TB = tuberculosis; BS = blood smear; Pos = positive; Neg = negative; RDT = rapid diagnostic test; HIV = human immunodeficiency virus; CTRR = counseled, tested, resulted, and reactive; CTR = counseling, testing and referral; LM = light microscope; FM =

fluorescence microscopy; RIF-R = rifampicin-resistant; Hb = hemoglobin; VDRL = venereal disease research laboratory; AIDS = acquired immune-deficiency syndrome; STI = sexually transmitted infection; ENT =ear, nose, throat; LRTI = lower respiratory tract infection; COPD = chronic obstructive pulmonary disease; SP = sulfadoxine-pyrimethamine; DP = dihydroartemisinin-piperaquine; DA = drug available and given; OS = out of stock; ANG = available but not given; R = rifampicin; H = isoniazid; Z = pyrazinamide; E = ethambutol.

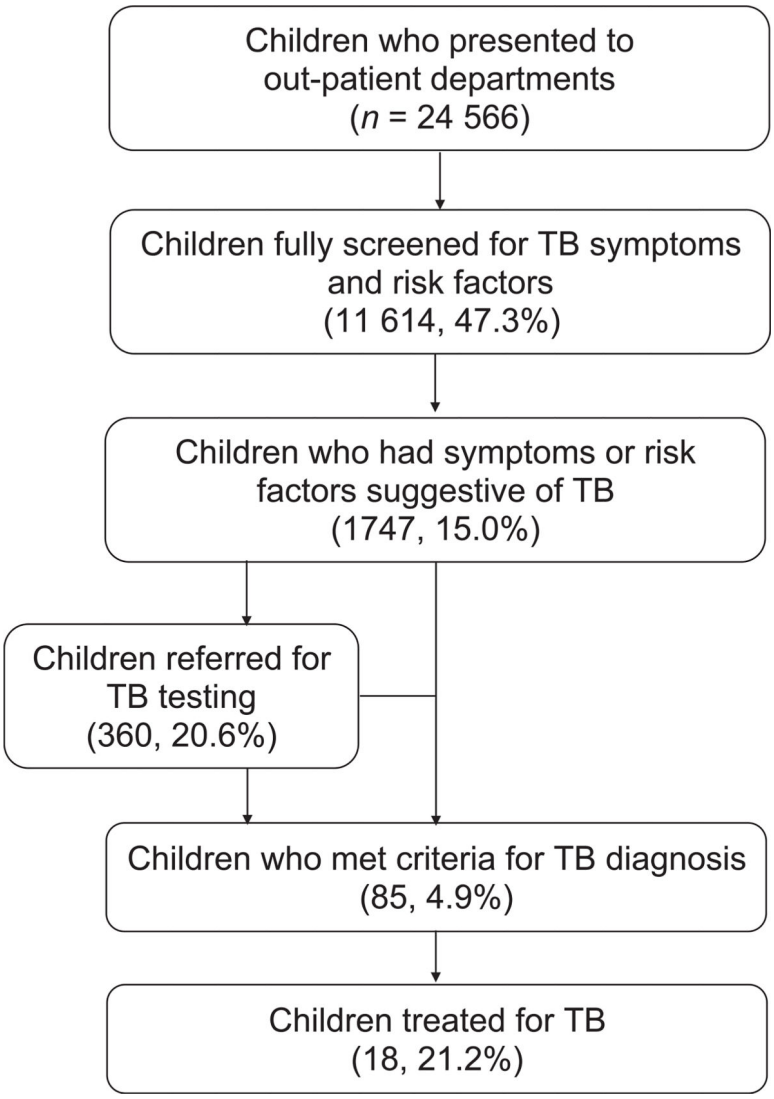

Figure 2.

Flow chart for the quality of assessment of sick children for TB who present at health facilities in Kampala. Children who were fully screened for TB are those who had all the following symptoms assessed: history of fever lasting >14 days; persistent, non-remitting cough or wheeze lasting >2 weeks; contact with an adult TB patient; failure to thrive or weight loss in the last 3 months; and reduced playfulness or fatigue. Children who met the microbiologic criteria for TB diagnosis included those with positive laboratory tests for TB (n = 20, 23.5%), as well as those children who met the clinical criteria for diagnosis of TB (n= 65, 76.5%). The latter included children who had ⩾2 of the symptoms suggestive of TB and had a history of contact with a TB patient. TB = tuberculosis.

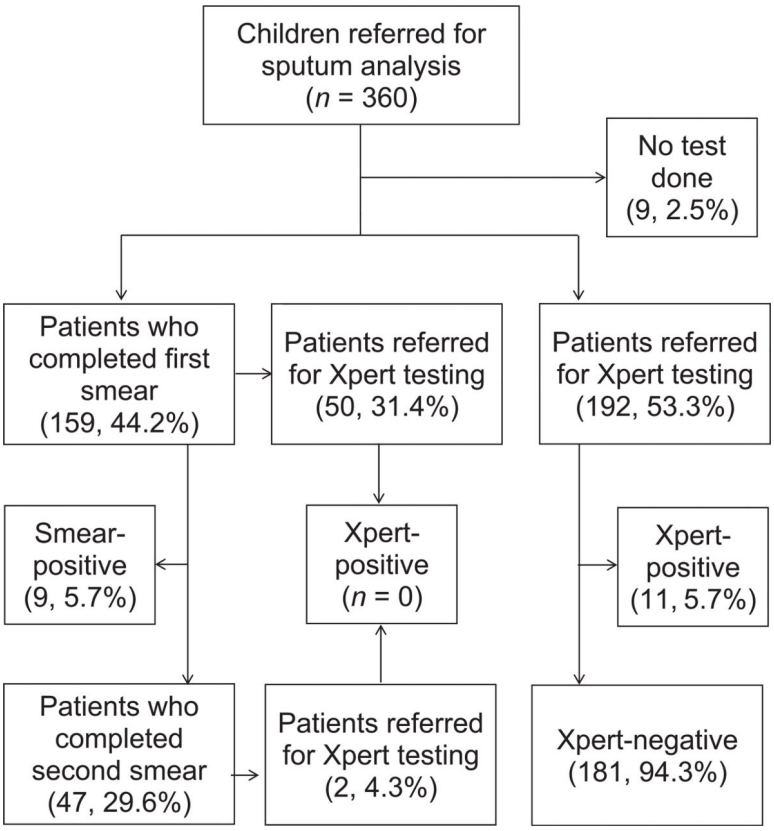

Figure 3.

Results of sputum examination among 360 children with presumed TB referred for TB testing. Slightly more than 50% of the children were evaluated using Xpert; the remainder were evaluated using smear microscopy. The completion rate of microscopy was only about one third. TB = tuberculosis.

Table 1

Demographic and clinical characteristics of sick children attending the out-patient department, Kampala, Uganda

Characteristics	Assessed *n*(%)	Present *n*(%) (95%CI)
Age, years	24 566 (100)	—
<5	—	15 942 (65) (64–66)
5–9	—	4 809 (20) (19–21)
10–14	—	3 815 (16) (15–17)
Female	23 207 (94)	12 253 (53) (52–54)
Persistent non-remitting cough for ≥72 weeks	15 974 (65)	872 (5.5) (5.1–5.8)
History of fever >14 days	15 029 (61)	419 (2.8) (2.6–3.1)
Failure to thrive or weight loss in last 1 month	13 563 (55)	239 (1.8) (1.5–2.0)
Drenching night sweats	13 498 (55)	189 (1.4) (1.2–1.6)
Fatigue or reduced playfulness	13 262 (54)	315 (2.4) (2.1–2.6)
Contact of an adult with TB	13 439 (55)	92 (0.7) (0.6–0.8)
≥1 symptom or risk factor	24 566 (—)	1 747 (7.1) (6.9–7.5)

CI=confidence interval; TB=tuberculosis.

Table 2

Final diagnosis of 65 children who met the clinical criteria for TB*

Category	*n/N* (%)
Notifiable diseases	6/65 (9)
Dysentery	5/6 (83)
Measles	1/6 (17)
Infectious diseases	36/65 (55)
Respiratory tract infection	27/36 (75)
Cough or cold but no pneumonia	26/27 (96)
Acute bronchitis/LRTI (non-pneumonia)	1/27 (4)
Diarrheal disease	9/36 (25)
Pneumonia	4/36 (11)
Malaria	15/36 (17)
Septicemia	2/36 (6)
Worm infestations	4/36 (11)
Miscellaneous conditions	6/65 (9)
Eye conditions	2/6 (33)
Skin conditions	4/6 (67)
Other†	17/65 (5)
Treatment initiation	
Child was initiated on other treatment	63/65 (97)
Antimalarial medication	14/63 (22)
Antibacterial medication	57/63 (91)
Other medication	48/63 (76)

*None of the 65 children who met the criteria for clinical TB were referred out of the facility.

†Including parotitis, urinary tract infection and burns.

TB=tuberculosis; LRTI=lower respiratory tract infection.

Table 3

Diagnoses given to and follow-up of 1662 children not diagnosed with TB

Category	*n/N* (%)
Notifiable diseases	17/1662 (1.0)
Cholera	2/17 (11.8)
Dysentery	4/17 (23.5)
Measles	11/17 (64.7)
Respiratory tract infection	457/721 (63.4)
Cough or cold, but no pneumonia	378/457 (82.7)
Acute bronchitis/LRTI (non-pneumonia)	51/457 (11.2)
Allergic rhinitis	24/457 (5.3)
COPD	4/457 (8.8)
Diarrheal disease	246/721 (34.1)
Pneumonia	142/721 (19.7)
Malaria	129/721 (17.9)
Septicemia	54/721 (7.5)
Worm infestation	42/721 (5.8)
Other*	112/721 (15.5)
Non-communicable diseases	41/1662 (2.5)
Asthma	10/41 (24.4)
Other gastrointestinal disorders	5/41 (12.2)
Acute malnutrition	11/41 (26.8)
Other†	15/41 (36.6)
Miscellaneous conditions	90/1662 (5.4)
ENT disorders	5/90 (5.6)
Eye conditions	11/90 (12.2)
Skin conditions	64/90 (71.1)
Oral conditions	10/90 (11.1)
Patient referred out of the facility	20/1662 (1.2)
Child on treatment	1270/1662 (76.4)

*Includes meningitis, onchocerciasis, schistosomiasis, STI, tetanus, typhoid, UTI.

†Includes trauma (n=2), diabetes mellitus (n=1), anemia (n=1), and animal bite (n=1).

LRTI=lower respiratory tract infection; COPD=chronic obstructive pulmonary disease; ENT=ear, nose, throat; STI=sexually transmitted infection; UTI=urinary tract infection.