Pediatric tuberculosis consultations across 5 CDC regional tuberculosis training and medical consultation Centers

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ARTICLE INFO

Keywords:
Tuberculosis
Pediatric Consultation

ABSTRACT

Background: The U.S. Centers for Disease Control and Prevention (CDC) funds five Regional Tuberculosis Training and Medical Consultation Centers (RTMCCs) that provide training and consultation for tuberculosis (TB) control and management. RTMCC utilization for assistance with diagnosis and management of TB in children has not been described. We analyzed pediatric TB consultations performed across all RTMCCs in terms of question type, provider type, and setting.

Methods: The CDC medical consultation database was queried for consultations regarding patients ≤ 18 years provided between 1/1/13–4/22/15 by all RTMCCs (Curry International TB Center, Heartland National Tuberculosis Center, Mayo Clinic Center for TB, New Jersey Medical School Global TB Institute, Southeastern National TB Center). Each query was categorized into multiple subject areas based on provider type, setting, consultation topic, and patient age.

Results: The 5 RTMCCs received 1164 pediatric consultation requests, representing approximately 20% of all consultations performed by the centers during the study period. Providers requesting consults were primarily physicians (46.3%) or nurses (45.0%). The majority of pediatric consult requests were from state and local public health departments (679, 58.3%) followed by hospital providers (199, 17.1%); fewer requests came from clinicians in private practice (84, 7.2%) or academic institutions (40, 3.4%). Consults addressed 14 different topics, most commonly management of children with TB disease (19.1%), latent TB infection (LTBI) (18.2%), diagnosis or laboratory testing (18.7%), and pharmacology (9.2%).

Discussion: Pediatric consultations accounted for approximately 20% of all consultations performed by RTMCCs during the study period. RTMCCs were utilized primarily by public health departments regarding management of TB disease, LTBI, and diagnosis or laboratory testing. The relative underutilization of the RTMCCs by clinicians in non-public health settings, who often manage children with TB exposure or infection, warrants further study. As US TB case rates decline and providers become less experienced with childhood TB, medical consultation support may become increasingly important.

Introduction

There are five Regional Training and Medical Consultation Centers (RTMCCs) funded by the Centers for Disease Control and Prevention (CDC) in the United States: Curry International Tuberculosis Center, Mayo Clinic Center for Tuberculosis, Heartland National Tuberculosis Center, Southeastern National Tuberculosis Center, and the Global Tuberculosis Center at Rutgers, State University of New Jersey. These

https://doi.org/10.1016/j.jctube.2018.04.004
Received 9 December 2017; Received in revised form 7 March 2018; Accepted 9 April 2018
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centers develop educational materials about tuberculosis (TB), support regional TB programs through educational activities including case management training, and provide electronic and telephone medical consultation regarding all aspects of TB control, including TB diagnosis and management, to providers in the US and abroad. All consultations provided by the RTMCCs are captured in the CDC's Medical Consultation Database (MCD), which was created in September 2006. To date, no study has evaluated RTMCC utilization for pediatric cases. Similar evaluations of a variety of consultation modalities, including teleconsultation, internet, and video-assisted methods, in diverse fields of medicine, have led to improvements in quality of care [1–6]. Knowledge about how consultation services are being used would allow RTMCCs to adapt TB training programs and materials to better fit the needs of medical providers and their patients. We suspect that medical consultation for pediatric TB diagnosis and management of both latent and active TB may be increasingly important as TB rates in the United States decline. Despite decreases in TB incidence, TB in young children remains a concerning health problem. In the United States in 2015, 440 of 9,557 TB cases (4.7%) were in children aged 0–14 years old [7]. Many aspects of pediatric TB have not been well studied, and the diagnosis and management of pediatric TB is often based on “expert opinion,” or is extrapolated from adult studies. As case rates of pediatric TB decline in the United States, providers have less experience managing children with TB, who pose diagnostic challenges because they often present with nonspecific symptoms and do not produce adequate sputum samples for diagnostic purposes, and frequently have paucibacillary and culture-negative TB disease [8,9]. Furthermore, there are few TB drug formulations for children, and administration of TB medications and monitoring for medication toxicities can be difficult in children and quite variable depending upon age [9]. Pediatric TB is also a marker for recent TB transmission, making contact investigations critical for optimizing TB prevention and control efforts [10]. Identifying clinical and demographic factors associated with pediatric TB consultation would help RTMCCs better understand the needs of their stakeholders in order to impact TB prevention and control. This knowledge can help public health programs prevent transmission, latent TB infection (LTBI), and progression to disease in young children [11]. The objective of this study was to assess how RTMCCs are being utilized for pediatric TB consultations by describing requesting provider type and practice setting, patient age, and consultation topic. We also compared utilization among all five RTMCCs.

Methods

We queried the MCD for medical consultations regarding patients ≤18 years that occurred between Jan 1, 2013 and April 22, 2015 at all 5 RTMCCs. All data provided were de-identified. Each query was categorized by requesting provider profession and setting, age of the patient, and the consultation topic. Nineteen consultations concerning subjects >18 years of age were excluded from all analyzes except tabulation of consultation topics, as data about topic areas were not broken down by subject age. For the analysis of consultation topics, a query that addressed multiple topics was counted multiple times. In all other analyzes, a query was counted only once. This study was determined to be exempt from IRB review by the Mayo Clinic Institutional Review Board.

Results

Across all 5 RTMCCs there were 1,164 pediatric consultation requests during the study period, representing 20% of all adult and pediatric consultations. The majority of these consultation requests were from physicians (46.3%), followed by nurses (45.0%) (Fig. 1). Providers requesting consultation most commonly worked at local or state public health departments (58.3%), followed by hospitals (17.1%), private practices (7.2%), or other settings (14.1%) including community health centers, correctional facilities, and regional health offices (Fig. 2). Consultations were categorized into 10 different topic areas, which were not mutually exclusive (Fig. 3). The top three topic areas for which consultation was provided were TB disease (19.1%), diagnostic testing (18.7%) for TB disease or LTBI through tuberculin skin test (TST), interferon-gamma release assay (IGRA), or other methods, and LTBI (18.2%). Queries about contact investigation/transmission (11.4%), pharmacology (9.2%), drug resistance (6.9%), case management (5.3%), adverse effects (3.3%), and, program/policy (2.2%) were less common (Fig. 3). The top age category for consultations was children aged 1–3 years (19.0%), followed by ≤1 year (17.0%), 3–5 years (12.0%), and 13–18 years (11.0%) (Fig. 4). Consultations were less commonly about school age children 5 to < 10 years (7.0%) and 10–13 years (6.0%). Consultations regarding children of multiple ages comprised 7.0% of all queries. Approximately 21.0% of the consultations did not specify age of the patient(s).

There were no differences across all 5 RTMCCs in terms of provider setting, consultation topics, or patient age group. However, the proportion of all consultations that were pediatric varied across centers, ranging from 14% to nearly 40% (Table 1). In addition, there were differences among the five centers in distribution of requesting provider type: Heartland and Mayo received consultation requests primarily from nurses, while Curry, Southeastern, and Global TB Institute received consultation requests primarily from physicians.

Discussion

Our findings demonstrate that pediatric consultations represent a significant proportion of consultations provided by the five RTMCCs. Public health departments are the main users of RTMCC pediatric consultation, primarily regarding TB disease, diagnostics, and LTBI. We observed fewer consultations from non-public health entities than from public health providers. As children with LTBI may be treated by private providers, academic institutions, and hospitals, RTMCC consultation services might be better marketed to these non-public health entities in order to achieve the best outcomes for these pediatric patients [12]. Consultations for pediatric TB, including TB disease, LTBI, infection control, contact investigation and programmatic policy issues, represented 20% of overall consultations provided by RTMCCs during the study period. Although the definition of pediatric patients is ≤14 years in the National TB Surveillance System compared with ≤18 years in the RTMCC MCD, the proportion of pediatric RTMCC TB consultations (20%) is 4 times higher than the proportion of pediatric TB cases in 2015 (4.7%) [7], suggesting that RTMCCs are being utilized disproportionately for pediatric patients. In young children, both LTBI and active TB can be more difficult to diagnose, LTBI is more likely to progress to active TB, and TB is likely to manifest in more extreme forms such as meningitis or disseminated disease, thereby creating a need for consultation [13].

Our data suggest that the 5 RTMCCs have the potential to impact the care of the youngest children (1–3 years), who are at highest risk for progression to TB disease. The fact that providers frequently ask questions about the diagnosis and management of pediatric TB and LTBI suggests that there is both a paucity of providers with experience in pediatric TB management and a need for further training and education for providers caring for children with TB, many of whom may not be pediatricians.

TB diagnosis in pediatric patients is challenging for many reasons, including the high frequency of culture-negative disease in children. Additionally, infants with active TB often will present with extra-pulmonary disease, young children with pulmonary TB may not cough or produce high quality sputum samples, and pediatric TB tends to be paucibacillary, often resulting in negative acid fast bacilli (AFB) smears on respiratory and gastric acid samples. Furthermore, there is much
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