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Radiology services for children in HIV- and TB-endemic regions: scope for greater collaboration between radiologists and clinicians caring for children

Angela Dramowski,

Department of Paediatrics and Child Health, Tygerberg Children's Hospital, P.O. Box 19063, Tygerberg 7505, South Africa

Megan M. Morsheimer,

Department of Paediatrics and Child Health, Tygerberg Children's Hospital, P.O. Box 19063, Tygerberg 7505, South Africa

Lisa Frigati,

Department of Paediatrics and Child Health, Red Cross Children's Hospital and University of Cape Town, Cape Town, South Africa

H. Simon Schaaf,

Department of Paediatrics and Child Health, Tygerberg Children's Hospital, P.O. Box 19063, Tygerberg 7505, South Africa

Helena Rabie,

Department of Paediatrics and Child Health, Tygerberg Children's Hospital, P.O. Box 19063, Tygerberg 7505, South Africa

Gillian Sorour, and

Department of Paediatrics and Child Health, Tygerberg Children's Hospital, P.O. Box 19063, Tygerberg 7505, South Africa

Mark F. Cotton

Department of Paediatrics and Child Health, Tygerberg Children's Hospital, P.O. Box 19063, Tygerberg 7505, South Africa

Abstract

There is limited literature documenting the interaction between radiologists and clinicians caring for children, especially in regions where HIV and tuberculosis (TB) are endemic. The dual burden of these diseases in resource-limited settings creates unique challenges for radiographic interpretation and utilization. This review aims to heighten awareness of issues confronting radiologists and clinicians caring for children and to encourage greater collaboration between these two disciplines in HIV-and TB-endemic regions. The Child-Friendly Healthcare Initiative is discussed, emphasizing opportunities to promote child friendliness in radiology services.

Correspondence to: Angela Dramowski.

A.D., M.M.M. and L.F. contributed equally to this report.

Keywords

Chest; HIV; Tuberculosis

Introduction

Health-care services in sub-Saharan Africa are burdened by the overwhelming magnitude of the HIV and tuberculosis (TB) epidemics. Most patients accessing HIV and TB care are treated at public sector primary health-care clinics. Although radiography services may be accessible to clinicians in this setting, interpretation of studies by radiologists is only available in private facilities, and secondary and tertiary public hospitals. Even in settings where radiologists are available for consultation, clinicians and radiologists rarely collaborate. This lack of communication leads to dissatisfaction among both parties and impacts on the quality of care for mutual patients. Little attention has been given to exploring the role for increased interaction between these groups [1, 2]. This paper aims to advocate on behalf of children utilizing radiology services, highlight issues encountered by radiologists and clinicians caring for children, and facilitate collaboration between these disciplines in HIV- and TB-endemic regions.

The scope of the HIV and TB epidemic

Global estimates suggest that one-third of the world's population is infected with *Mycobacterium tuberculosis* and that almost 1.6 million children have active TB disease [3]. Of the two million children worldwide infected with HIV [4], 90% live in sub-Saharan Africa. The effect of the dual HIV and TB epidemics is felt most acutely in South Africa, with recent estimates of paediatric HIV cases numbering 360,000 [5]. Similarly, children in the Western Cape province of South Africa experience a high incidence of childhood TB (600 per 100,000) [6]. Dual infection is common; HIV-infected children are at a 20-fold increased risk of contracting TB when compared with HIV-noninfected peers [7].

Issues confronting radiologists and clinicians caring for children with HIV

HIV is a multisystem, multipathogen disease that challenges diagnostic skills. The wide spectrum of disease afflicting this immunocompromised population makes special investigations, especially radiological studies, essential in confirming a clinical diagnosis. In view of the difficulties in the differential diagnosis in HIV-infected children with multiple comorbidities, radiologists play an important role in contributing evidence that corroborates clinical impressions.

It is well recognized that chest radiographs in HIV-infected children can be difficult to interpret due to the frequent simultaneous presence of multiple pathological processes. Comorbid diagnoses such as bacterial pneumonia, viral pneumonitis, lymphocytic interstitial pneumonitis, atypical pulmonary TB and even pulmonary Kaposi sarcoma may severely limit the interpretability and value of a single chest radiograph [8]. Chronic lung disease, bronchiectasis and gastroesophageal reflux are further pathologies to be considered when interpreting chest radiographs in this population.

Challenge of paediatric TB diagnosis

TB is challenging to diagnose in children, even in the absence of HIV. Children often have paucibacillary disease and cannot always cough on demand for sputum sampling. Therefore, clinicians usually rely on symptom screening, contact tracing, tuberculin skin tests and chest radiography for diagnosis. Immunosuppression and atypical clinical presentation in HIV-infected children makes confirmation of TB even more difficult [8]. Symptom-based approaches are of limited diagnostic value in HIV-infected children, and have a positive predictive value of only 62% [9]. Similarly, the tuberculin skin test, the most common immune-based diagnostic technique, is positive in only 20–40% of those with confirmed pulmonary TB [9]. For these reasons, paediatricians rely heavily on chest radiography to identify active TB disease, but interpretation is problematic when other HIV-related acute and chronic lung diseases coexist. Furthermore, TB in these children may be recurrent [10]. Ambiguities in a clinician's interpretation of radiological findings may, therefore, lead to under- or overdiagnosis of TB. This results in either a missed opportunity to treat and prevent lung damage, or unnecessary treatment with risk for drug side effects. Thus the input of radiologists in this context can be invaluable in guiding decisions about clinical management.

Interpretation of paediatric chest radiographs in HIV- and TB-endemic settings

It is uncommon for clinicians to provide comprehensive medical histories, relevant physical examination findings, differential diagnoses, or direct questions on the request form for radiological services. Likewise, radiology reports do not always address the crucial, clinically relevant findings that impact on patient management. By providing relevant clinical histories and highlighting diagnostic queries, clinicians can enhance the radiologists' ability to produce a detailed differential diagnosis and radiological investigation plan. Improved communication between clinicians and radiologists is therefore essential to maximize the ability of an imaging study to direct treatment.

Communication channels and technological advances in radiology services

Clear channels of communication are essential to ensure that both clinicians and radiologists have the requisite clinical information upon which to base important diagnostic and management decisions. Provision of the telephone numbers of both clinician and radiologist is vital to facilitating greater interaction. Easy telephonic access would encourage clinicians to seek advice on appropriate radiological investigations and urgent cases, and would allow radiologists to provide timely, personal communication of urgent results back to clinicians. Each radiological report could serve as an opportunity to inform, alert and teach clinicians. Building closer working relationships between radiologists and clinicians will contribute to improved clinical management of children in HIV- and TB-endemic regions.

Radiographers also play an important role as they determine the quality of the study and may influence the type of studies carried out (PA and lateral chest films, or PA alone).

Feedback regarding quality control of radiographs must freely flow between clinicians, radiologists and radiographers in order to assure optimized studies.

Radiologists and clinicians in resource-limited settings should collaborate to identify, acquire and effectively utilize new technologies that improve paediatric services. For example, electronic storage of radiological images may simplify record keeping and allow access to previous studies. In HIV- and TB-endemic areas where acute pathology is frequently superimposed on chronic disease, historical comparisons can be the key to an accurate diagnosis. Another advantage of filmless technology of benefit to children is the ability to adjust image exposure levels, thus avoiding the need to retake under- or overexposed radiographs.

Primary health-care settings that do not have an on-site radiologist could also benefit from technological advances in the field of telemedicine. Even with limited equipment, a clinician with a digital camera in a resource-limited, HIV- and TB-endemic region could approach a radiologist via the internet for an opinion on the interpretation of an investigation.

Global initiatives to improve care for children

In HIV- and TB-endemic settings overwhelmed by the substantial service burden, children's needs are likely to be neglected. Internationally, many health-care providers are improving services for children by adopting the Child-Friendly Healthcare Initiative (CFHI). Inspired by the United Nations Convention on the Rights of the Child, the CFHI provides a standards-based approach to improving children's health-care experience [11]. Several of these standards could be easily integrated into existing services if championed by both radiologists and clinicians caring for children. In the discussion below, the CFHI standards relevant to paediatric radiology services in HIV- and TB-endemic regions are explored.

Child-friendly environment

Most children are fearful of new environments, particularly when they are inherently more vulnerable due to illness and separation from their family. This distress is often compounded by the failure of hospital personnel to explain procedures without the use of medical jargon. Even in busy resource-limited settings, radiologists and clinicians caring for children should remain cognizant of a child's need for emotional and psychological support during medical procedures and investigations. Allowing a parent to be present during radiological studies and to assist with positioning for procedures, provides reassurance to a child in an unfamiliar environment. A well-informed and relaxed parent is a helpful ally who may be able to significantly reduce the child's anxiety, allowing rapid acquisition of high-quality images.

Privacy and confidentiality

Respect for a child's right to privacy and dignity is fundamental to the CFHI programme. Confidentiality of medical records and spoken information is vitally important, particularly in HIV- and TB-endemic regions, as stigmatization can be socially devastating. Disclosure of HIV status to a child is often a slow process, and best managed by the child's primary caregiver and the multidisciplinary medical team. Clinicians and radiology department staff

must remain sensitive to variable disclosure status when interacting with children and their accompanying extended family.

Risks of procedural sedation

Sedation is required for some types of paediatric radiological investigations and is not without risk: hypoventilation, airway obstruction and apnoea are significant dangers. Most radiology facilities in resource-limited settings are ill-equipped for paediatric monitoring, anaesthesia and resuscitation. Radiologists and clinicians in this context need to create a collaborative plan for the safety of mutual patients undergoing procedures.

Prevention of nosocomial disease transmission and contact tracing

Crowded and poorly ventilated radiology waiting rooms with both adults and children may further accelerate transmission of TB to vulnerable hosts, including immunocompromised health-care workers [12, 13]. In HIV- and TB-endemic regions every effort should be made to provide separate paediatric and adult radiology waiting room facilities. Infection control measures such as cough etiquette and provision of masks to adults with suspected TB should also be instituted.

Missed opportunities for provision of chemoprophylaxis occur in more than half of children with culture-confirmed TB and a known adult TB source case [14]. Radiologists play an important role in assisting the contact tracing process by facilitating routine chest radiography in the primary caregivers accompanying children with TB to the radiology department.

Adherence to infection control policies is vitally important for both radiologists and clinicians since poor hand washing may result in transmission of virulent hospital-acquired bacterial pathogens to staff and patients. In HIV-endemic regions, neglect of this practice may have disastrous consequences, particularly for immunocompromised children.

Conclusion

A clear line of communication must exist between radiologists and clinicians caring for children, particularly in HIV- and TB-endemic regions where clinical management is so closely guided by radiological assessment. Although the scope for increased collaboration between radiologists and clinicians is vast, the radiological report remains the simplest and most effective communication and teaching tool. It is, therefore, primarily through these reports that colleagues will build a partnership that benefits children in HIV- and TB-endemic regions.

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References

1. Gunderman R, Ambrosius WT, Cohen M. Radiology reporting in an academic children's hospital: what referring physicians think. *Pediatr Radiol*. 2000; 30:307–314. [PubMed: 10836592]
2. Schreiber MH. Communicating with the referring physician: the standard of care. *AJR*. 1997; 169:343–345. [PubMed: 9242734]
3. Nelson LJ, Wells CD. Global epidemiology of childhood tuberculosis. *Int J Tuberc Lung Dis*. 2004; 8:636–647. [PubMed: 15137548]
4. UNAIDS. 2008 Report on the global AIDS epidemic. 2008. http://www.unaids.org/en/KnowledgeCentre/HIVData/GlobalReport/2008/2008_Global_report.asp. Accessed 17 Feb 2009
5. ASSA. ASSA 2003 AIDS and demographic model. 2005. <http://www.actuarialsociety.org.za/Models-274.aspx>. Accessed 17 Feb 2009
6. Mahomed H, Kibel M, Hawkridge T, et al. The impact of a change in bacille Calmette-Guérin vaccine policy on tuberculosis incidence in children in Cape Town, South Africa. *Pediatr Infect Dis J*. 2006; 25:1167–1172. [PubMed: 17133164]
7. Chintu C. Tuberculosis and human immunodeficiency virus co-infection in children: management challenges. *Paediatr Respir Rev*. 2007; 8:142–147. [PubMed: 17574158]
8. Marais BJ, Graham SM, Cotton MF, et al. Diagnostic and management challenges for childhood tuberculosis in the era of HIV. *J Infect Dis*. 2007; 196(Suppl 1):S76–S85. [PubMed: 17624829]
9. Marais BJ, Gie RP, Hesselink AC, et al. A refined symptom-based approach to diagnose pulmonary tuberculosis in children. *Pediatrics*. 2006; 118:1350–1359. [PubMed: 17015523]
10. Schaaf HS, Krook S, Hollemans DW, et al. Recurrent culture-confirmed tuberculosis in human immunodeficiency virus-infected children. *Pediatr Infect Dis J*. 2005; 24:685–691. [PubMed: 16094221]
11. Southall DP, Burr S, Smith RD, et al. The Child-Friendly Healthcare Initiative (CFHI): Healthcare provision in accordance with the UN Convention on the Rights of the Child. Child Advocacy International. Department of Child and Adolescent Health and Development of the World Health Organization (WHO). Royal College of Nursing (UK). Royal College of Paediatrics and Child Health (UK). United Nations Children's Fund (UNICEF). *Pediatrics*. 2000; 106:1054–1064. [PubMed: 11061775]
12. Escombe AR, Moore DA, Gilman RH, et al. The infectiousness of tuberculosis patients coinfecting with HIV. *PLoS Med*. 2008; 5:e188. [PubMed: 18798687]
13. Behr MA, Warren SA, Salamon H, et al. Transmission of *Mycobacterium tuberculosis* from patients smear-negative for acid-fast bacilli. *Lancet*. 1999; 353:444–449. [PubMed: 9989714]
14. Schaaf HS, Marais BJ, Whitelaw A, et al. Culture-confirmed childhood tuberculosis in Cape Town, South Africa: a review of 596 cases. *BMC Infect Dis*. 2007; 7:140. [PubMed: 18047651]