Bronchoscopy in children: A review of services in sub-Saharan Africa

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Flexible bronchoscopy is a versatile, efficacious and indispensable diagnostic and treatment tool for the evaluation of upper and lower airway anatomy and assessment of airway function in respiratory diseases in children.[1]Bronchoscopy was first used in adult patients in 1968 with the use in paediatric patients only 10 years later.[2,3] A survey on practices in paediatric bronchoscopy in Europe published by Barbato *et al.*[4] in 1997 found that across 51 centres, a total of 7 446 bronchoscopies had been performed over a period of a year. These results suggested that bronchoscopy use had become well established in some European centers. The European Paediatric Bronchoscopy survey 2015 was initiated by the European Respiratory Society (ERS) Paediatric Bronchoscopy Group members with the aim to assess the state of diagnostic and therapeutic procedures in the field of respiratory medicine.[5] A total of 56 145 bronchoscopies were reported by 198 participating centers, with an average of 74 flexible and 20 rigid bronchoscopies per year performed in each. This demonstrated the increasing availability of diagnostic bronchoscopy, with a wide uptake of interventional procedures in children.

Flexible bronchoscopy is widely used to investigate and manage neonates and children with complex respiratory disease in high-income countries (HIC).[10] In contrast, the availability of bronchoscopy services in low-and-middle-income countries (LMIC) is limited, and available in a few select centres, where it is almost exclusively used for diagnostic purposes.[10,11] The National Indian bronchoscopy survey in 2016 evaluated bronchoscopy practices on a national scale. They found bronchoscopy services were available in tertiary healthcare facilities in major metropolitan cities, with nearly 70% of bronchoscopists working in multispecialty hospitals or teaching faculty at medical schools.[9] Flexible bronchoscopy in children is a generally-safe and well-tolerated procedure that should be used for airway evaluation, bronchoalveolar lavage, foreign body removal, diagnosis of infectious and non-infectious disease, as well as advanced therapeutics.[11, 12] Bronchoscopy is an important tool that can be used peri-operatively in the management of patients with congenital heart disease (CHD) who present with respiratory symptoms.[13] Perioperative bronchoscopic evaluations in an Israeli study revealed abnormalities in 75% of patients, including external airway compression, bronchomalacia and mucus secretions. This prompted changes in the clinical management in 53% of children.[13] Despite the increased use of flexible bronchoscopy and published guidelines on the procedure, a study in Western China found that there was variation in the personnel performing the procedures, with nearly half of centres not using an anesthesiologist.[6]In Brazil, most bronchoscopies are performed under sedation in an examination room without significant complications[7,8]. The Paediatric Intervention Pulmonology of Collaborative groups was established in western China to improve the skills and standardise the procedure of paediatric flexible bronchoscopy (PFB).

LMIC have a high burden of infectious disease in a context of poor diagnostic services. Specific to this setting is the high prevalence of tuberculosis (TB). TB is the leading cause of death from a single infectious agent globally and childhood and TB accounts for 11 % of all TB cases and 14% of the overall TB mortality burden worldwide.[14] According to WHO, Africa has one-third (320 000 children) of all TB cases among children between 0 and 15 years of age worldwide. The high mortality in children is assumed to be partly due to diagnostic challenges which may delay the initiation of treatment. Enlarging lymph nodes can cause external airway compression (incidence of airway compression varies from 8% to 38% in children <15 years) and caseating lymph nodes can herniate into the airways, resulting in bronchogenic and hematogenous spread. Flexible bronchoscopy is a useful tool in the diagnosis and management of TB complicated by airway disease.[10] Bronchoscopy is the gold standard for assessing the degree of airway compression and obstruction in paediatric pulmonary TB. However, due to limited resources, it is not frequently performed.[14] The indications for bronchoscopy in childhood pulmonary TB can be diagnostic, including determining any complications (airway compression, endobronchial involvement and broncho-oesophageal fistula), collecting of samples for bacterial confirmation (bronchoalveolar lavage, endobronchial or transbronchial biopsy, endobronchial ultrasound guided sampling) for interventions including endobronchial enucleation, debulking airway lymph nodes, dilatation of bronchial stenosis, closure of broncho-oesophageal fistula and management of haemoptysis[14,15] and finally, to monitor treatment response.

In sub-Saharan Africa there is limited infrastructure and few paediatric pulmonologists and cardiothoracic surgeons.[16] In Ghana, only 33 flexible bronchoscopies were performed in the Tamale Teaching Hospital (TTH) between 2017 and 2019, all in adult patients.[16] In a Tanzanian study, there was a 3-fold increase in the number of patients who underwent flexible bronchoscopy, from 57 cases in 2013 to 180 cases in 2017. However, no paediatric cases were included.[17] Similarly, a Kenyan study found that in a total of 290 bronchoscopies conducted between January 2016 and December 2020, bronchoscopy was useful and diagnostic with an overall diagnostic yield of 81.9%. The findings are similar to those of an Egyptian study, where the overall yield was 78.6%.[18] However, in t latter study, less than 4% of participants were children with only 8 cases were under the age of 18 years old.[18] Locally, a study at Chris Hani Baragwanath Academic Hospital, between 2011 – 2018 of 830 bronchoscopies revealed

that the majority were inpatient procedures (n=484).[19] A study on neonates, conducted at Inkosi Albert Luthuli Hospital over a 6-year period (2010 - 2016) including 599 bronchoscopies found that the main indications for bronchoscopy were nosocomial pneumonia, ventilator dependence and unilateral lung disease.[20]

Training mentorships have been pioneered in tertiary centres in Uganda, Tanzania and other LMIC, in partnership with international institutions, to develop bronchoscopic services in Africa, which has improved respiratory care and stimulated local research. However, there is still a great need for the training of paediatric bronchoscopists.[10, 17, 21] Up to October 2017, there was only one paediatric pulmonologist in Ethiopia, and a new collaboration was established between Germany Senior Experts Service (SES) and St. Paul's Hospital Millennium Medical College in Addis Ababa, to train the second generation of fellows in paediatric pulmonology in the country.[22]

There are multiple barriers to implementing bronchoscopic services in LMIC, including limited financial resources, lack of access to formal training programmes and narrow perceived value or scope of bronchoscopic practices.[10,11,23] A study in Nigeria identified that challenges facing bronchoscopic practice were limited training (77.6%), availability of bronchoscopes (23.2%), level of awareness and knowledge of procedure by medical doctors (15.6%) and cost of procedure (10.8%).[23] In addition understanding equipment limitations, cleaning or storage protocols, local capacity and having uniformed structure for bronchoscopy and checklists reduces complications and is required for success of the programme.[11]

There needs to be a multimodal approach to bronchoscopic training in LMIC to ensure paediatric bronchoscopist competence, patient safety and improved respiratory care for children who access these services and the surrounding communities and regions.[10,11 21 23] In addition to conventional supervision using real patients, simulators and web-based lectures could be utilised.[23] Establishing bronchoscopic services in LMIC requires adequate financial resources to access equipment, maintaining facilities with modern technology and sustainable multimodal training curriculums.[10,11,21] Through the collaboration of pulmonologists, institutes, foundations and manufacturers, paediatric bronchoscopy services can be developed in LMIC to improve the quality of respiratory care in children by training competent paediatric bronchoscopists and establishing areas of excellence throughout the African continent.[10,11,22] Collaborations like the African Paediatric Fellowship Training Programs have improved capacity and training in paediatric pulmonology in Africa, but coupled to this is the need to improve access to equipment, facilities, maintenance and manufacturer support in country.[24]

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