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Proof-of-concept study to determine the feasibility of measuring bacterial load in exhaled breath of children with pneumonia and empyema using a novel point-of-care test

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Background: Pneumonia is a leading cause of death in children. Approximately 75% of patients with acute respiratory tract infections (ARTI) receive antibiotics despite most of these infections having viral origin. Early diagnosis and appropriate treatment is essential. There is no point-of-care (POC) test, available to diagnose bacterial pneumonia. This study aims to investigate the feasibility of developing a POC device that will measure bacterial load in breath from children with pneumonia and empyema. The purpose is to find a diagnostic POC test capable of isolating bacterial pneumonia.

Methods: This study is designed to show that a POC breath test can detect the difference in bacterial load (through assay of lipopolysaccharide (LPS) and peptidoglycan) in exhaled breath of children with pneumonia/empyema and those without a chest infection (controls). It comprises of development of a breath sampler, laboratory and clinical testing. Three prototypes of the breath sampler were produced in phases with refinement. Each prototype underwent laboratory testing using a known concentration of endotoxin which was nebulized thorough the prototype incorporating a sampling surface (SS). Subsequently, a sample of endotoxin impinged on the SS was extracted and tested using limulus amebocyte lysate (LAL) assay. Clinical testing involves collecting breath samples from 48 children between 5 to 15 years with pneumonia/empyema and well matched controls. Semi-structured qualitative interviews will be conducted with participants, parents and clinicians to examine the acceptability of the test.

Results: A breath sampler, suitable for clinical testing has been developed. Results from laboratory testing show that it is possible to detect nebulized endotoxins (comparable to levels detectable in breath) using the LAL assay.

Discussion & Conclusion: The study will demonstrate the potential of using a POC test to identify children with pneumonia or empyema who may benefit from antibiotics.

References

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Biography

Gladys Makuta completed her MSc in International Health and Management and BA in Health Sciences and Social Services. She is currently a PhD student in the Division of Population Medicine at Cardiff University, United Kingdom, working on the balloon study. She has strong research interest in infection detection, prevention and management in a global health context. She has significant experience in commercial and non-commercial clinical research and teaching gained from both developed and resource limited areas, prior to her current role.

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