

Innovations in pneumonia diagnosis and treatment: a call to action on World Pneumonia Day, 2013



In recognition of the 5th annual World Pneumonia Day on November 12, 2013, a call to action is being issued for innovations to defeat childhood pneumonia. Innovations to transform pneumonia diagnosis and treatment are urgently needed to tackle the leading cause of death in children younger than 5 years of age. Pneumonia causes more childhood deaths than do AIDS, malaria, and tuberculosis combined.¹ Nearly all childhood pneumonia deaths are preventable through proper diagnosis and treatment. Yet less than a third of young children with symptoms of pneumonia receive treatment in low-resource settings,² where instruments to diagnose and treat pneumonia accurately are out of reach or unsuited to the needs of low-resource communities. The present rollout of *Haemophilus influenzae* type b and *Streptococcus pneumoniae* conjugate vaccines shows promise to reduce childhood pneumonia mortality, while increased attention to maternal immunisation can potentially decrease neonatal mortality from influenza, respiratory syncytial virus infection, group B streptococcal disease, and pertussis. Now is the time for a comprehensive approach to reduce pneumonia mortality that also includes promising diagnostic and treatment solutions. We should mobilise the resources, partnerships, and political will necessary to scale up existing instruments and accelerate the development of new innovations to revolutionise pneumonia diagnosis and treatment and save lives.

Pulse oximetry is the accepted standard for detection of hypoxaemia, an often fatal complication of pneumonia.³ Pulse oximetry is highly cost effective and can accurately and reliably measure hypoxaemia, identifying 20–30% more cases than do clinical signs alone.^{4,5} Yet pulse oximetry is frequently unavailable in low-resource settings because of perceived cost, insufficient supply, and absence of policies, guidelines, and training.⁶ Pulse oximetry could transform the diagnosis of hypoxaemia in low-resource settings, ensuring that oxygen is used efficiently and rationally, easing timely referral decisions, reducing treatment failure rates, and decreasing health-care costs.⁷ Low-cost pulse oximetry devices tailored for low-resource

settings are in development, including mobile phone applications and alternatively-powered pulse oximeters.

Other diagnostic innovations in the pipeline include automated respiratory rate counters with a variety of technologies (accelerometers, small motion amplification programmes, and bioimpedance, among others), tracheal and chest auscultation with digital processing and analysis of respiratory sounds, and host response biomarkers such as inflammatory biomarkers (eg, C-reactive protein and procalcitonin), cardiovascular biomarkers (eg, arginine vasopressin and natriuretic peptides), and exhaled biomarkers (eg, volatile organic compounds). Combination of several diagnostic and prognostic innovations into an integrated instrument could improve identification of pneumonia and its severity.

With training and appropriate support, community health workers can effectively diagnose and treat childhood pneumonia in the community and increase access to high-quality care.⁸ Most pneumonia deaths are due to severe (chest indrawing) pneumonia,⁹ and in many low-resource settings, referral to facilities is difficult and frequently does not occur.^{10,11} Therefore, case management of severe pneumonia at the community level is required. In two Pakistani studies, treatment failure rates were significantly reduced when community health workers treated severe pneumonia with oral amoxicillin for 5 days in the community compared with one dose of antibiotic and referral to the nearest health facility, the present standard of care.^{12,13}

Ensuring that amoxicillin—WHO's recommended first-line treatment for childhood pneumonia—is available in child-friendly formulations is crucial to increasing its use.¹⁴ The availability of child-friendly 250 mg amoxicillin dispersible tablets should be improved to save lives, money, and health-care resources. Packaged in blister packs that are easy to dispense, manage, and withstand sunlight, heat, and rain, amoxicillin tablets quickly disperse in a small amount of clean water or breastmilk. Amoxicillin dispersible tablets have a longer shelf-life, do not need refrigeration, are more

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cost effective, and are easier to administer than other amoxicillin formulations.

Other innovations in childhood pneumonia treatment are also in development, including a child-friendly product presentation of amoxicillin dispersible tablets to enable appropriate dispensing, administration, and adherence in the community. Discussion regarding the optimum duration of treatment with amoxicillin is under way, which could result in fewer days of treatment. Low-cost, electricity-free oxygen concentrators are also in development, as is oxygen-in-a-box, which relies on chemical oxygen generation.

A comprehensive strategy to address childhood pneumonia should include the development and delivery of solutions designed for low-resource settings that are reliable, accurate, automatic, and appropriate for use in infants and young children. These innovations must be culturally acceptable, portable, resistant to water and dust, durable, and simple to use in the community. Through strategic partnerships, targeted investments, and our collective commitment, we can scale up existing instruments and prioritise the development of promising new innovations to protect the most vulnerable and save lives.

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