malaria consortium
disease control, better health

Devices such as a respiratory rate timer are used to diagnose pneumonia in children. Photo: Tine Frank

PROJECT BRIEF

Improved tools for the measurement of respiratory rate and oxygen saturation for diagnosis of pneumonia

This project aims to identify the most accurate, acceptable, scalable and user-friendly respiratory rate timers and pulse oximeters for diagnosis of pneumonia symptoms in children by community health workers and first-level health facility workers in four low-income countries

Project outline

Pneumonia is one of the leading causes of death in children under five in both Southeast Asia and sub-Saharan Africa. A large number of the children who die from pneumonia is a result of inappropriate treatment due to misdiagnosis of symptoms. In order to tackle the large number of childhood deaths from this preventable and treatable disease, Ministries of Health are investing in community health workers (CHWs) to deliver life-saving diagnosis and treatment with antibiotics.

CHWs and first-level health facility workers (FLHFWs) diagnose pneumonia, primarily through counting the respiratory rate of children who have cough or difficulty breathing. However, counting respiratory rates is often challenging, even for highly trained health workers, and misclassification is common. Pulse oximetry (POx) has been identified as a reliable and non-invasive tool to identify the levels of oxygen in children's blood. Low levels of oxygen in the blood (hypoxemia) is a symptom of severe pneumonia – a strong predictor for pneumonia-related death. But relevant devices are rarely available outside higher-level health facilities.

For this reason, a growing number of research groups are focusing on innovative approaches to improving pneumonia diagnostics through the

Country
Cambodia
Ethiopia
South Sudan
Uganda

Donor
Bill & Melinda Gates Foundation

Length of project
November 2013–June 2015, 18 months

Partners
Ministries of Health
Scientific Advisory Committee

A community health worker counts a child's respiratory rate using coloured beads

development of easy-to-use mobile phone applications and electronic devices. These tools focus on different approaches to diagnosing pneumonia such as measuring respiratory rate, heart rate, using automated accelerometers or cough/lung sound detectors. The clinical performance, usability and acceptability of these tools in endemic settings are still largely unknown.

This project aims to evaluate the use of various respiratory rate timing and classification devices, as well as pulse oximetry devices among CHWs and FLHFWs with different levels of training in Cambodia, Ethiopia, South Sudan and Uganda.

Malaria Consortium has selected these four countries due to the high proportion of under-five deaths caused by pneumonia in these countries. In addition, Ministries of Health in these countries are implementing programmes where pneumonia is diagnosed and treated at community level. Each CHW programme differs substantially across key areas, such as length of training, CHW literacy levels and devices used to count respiratory rates.

The project will systematically review the landscape for existing tools and devices which are appropriate for low-resource settings. It will identify the most promising and appropriate devices for field testing and establish their accuracy in supporting the diagnosis of pneumonia symptoms or measuring oxygen levels in the blood when used by CHWs and FLHFWs. Finally, the project will explore their acceptability and usability as perceived by CHWs, FLHFWs and caregivers.

The long-term success of this project will be measured according to the large-scale uptake of easy to use, low cost and acceptable devices that will be recommended for global use. For this reason, the project is committed to working together from the beginning with Ministries of Health, other national stakeholders, international stakeholders and a scientific advisory committee with appointed relevant experts.

Project objectives

- To systematically review the landscape of existing respiratory rate mobile phone applications, automated respiratory rate timing tools and POx devices appropriate for low-resource settings.
- To identify, using pre-defined criteria, the most promising and appropriate devices for field testing in sub-Saharan Africa and Southeast Asia.
- To establish the accuracy of respiratory rate timing/classification devices to diagnose symptoms of pneumonia and the POx devices to measure oxygen saturation, respectively, when used by CHWs and FLHFWs in sub-Saharan Africa and Southeast Asia.
- To explore the acceptability and usability of existing respiratory rate mobile phone applications, automated respiratory rate timing tools and POx devices as perceived by caregivers, CHWs and FLHFWs in Sub-saharan Africa and Southeast Asia.

This project supports efforts to deliver:

- ✓ *Control of childhood illnesses*
- ✓ *Health systems strengthening*
- ✓ *Capacity building / human resource development*
- ✓ *Operational research*
- ✓ *Monitoring and evaluation*
- ✓ *Policy change / advocacy*

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