# ResApp Announces Further Positive Results from Adult Clinical Study

- **Achieved high levels of accuracy (91%-100%) for distinguishing adult patients with URTI, COPD, asthma or pneumonia from subjects with no discernible respiratory disease**
- **Demonstrated differential diagnosis of asthma versus COPD, pneumonia versus asthma and pneumonia versus COPD at 88%-94% accuracy**
- **Correctly detected lower respiratory tract disease in 84% of adult patients initially diagnosed as clear by experienced clinicians using stethoscopes**
- **Finalised clinical protocol and confirmed three leading US hospitals for US paediatric study, SMARTCOUGH-C**

**Perth, Western Australia, 3 October 2016** -- ResApp Health Limited (ASX: RAP) today announced further positive results from its adult clinical study underway at Joondalup Health Campus (JHC) and the Wesley Hospital. This additional set of preliminary results, prepared by the team led by Associate Professor Udantha Abeyratne at The University of Queensland, again demonstrates high levels of sensitivity, specificity and accuracy on an expanded adult dataset.

ResApp's cough sound-based algorithms achieved between 91% and 100% accuracy for distinguishing adult patients with chronic obstructive pulmonary disease (COPD), asthma or pneumonia from subjects with no discernible respiratory disease. In addition, the new analysis demonstrated accuracy of 100% for distinguishing patients with an upper respiratory tract infection (URTI) from the no respiratory disease group (not previously reported). The differential diagnosis of asthma versus COPD, pneumonia versus asthma and pneumonia versus COPD (not previously reported) was achieved at an accuracy in the range of 88% and 94%. The complete set of results, including sensitivity and specificity are given in the table below.

As was found in the paediatric study, the algorithms were able to correctly detect lower respiratory tract disease in 84% of adult patients who were initially diagnosed as clear by experienced clinicians using stethoscopes but were finally diagnosed as having a lower respiratory tract disease after additional clinical testing.

"We are pleased to again report high levels of accuracy in a significantly larger dataset, which continues to build our clinical evidence base as we progress towards FDA submission," said Tony Keating, CEO and Managing Director of ResApp. "It is also excellent to note that once again our algorithms outperformed experienced clinicians

by correctly detecting lower respiratory tract infection in patients initially diagnosed as clear."

As with previous analyses, the performance of the algorithm was evaluated using the method of leave-one-out cross-validation against the final clinical diagnosis. ResApp notes that these results are preliminary and may change as the clinical study progresses. Recruitment of adult patients continues at JHC and the Wesley Hospital.

ResApp's US paediatric clinical study is also progressing well. SMARTCOUGH-C is a prospective, multi-site, double-blind study that will evaluate the efficacy of the ResAppDx software application in the diagnosis of childhood pneumonia and other respiratory conditions from cough sounds. Three leading US hospitals are now confirmed as study sites, with enrolment to take place at multiple locations within each hospital. The SMARTCOUGH-C clinical study protocol has been finalised and the study will begin following approval by each site's institutional review board, which is expected within two to six weeks.

**Table of respiratory disease groups used in this preliminary analysis**

| | |
|---|---|
| Normal Group: Smokers (27 subjects, increased from 26) | Subjects with no discernible respiratory disease at the time of measurement with a history of smoking. |
| Normal Group: Non-smokers (57 subjects, increased from 52) | Subjects with no discernible respiratory disease at the time of measurement with no history of smoking. |
| COPD Group (25 subjects, increased from 22) | Patients with a diagnostic classification of one or more of the following: COPD, COPD with non-infective exacerbation, emphysema. The diagnostic standard is the overall clinical assessment supported by either lung function tests, CT scans or both. |
| Asthma Group (43 subjects, increased from 25) | Patients with a diagnostic classification of either acute or chronic asthma. Some subjects have concomitant upper respiratory tract infection (URTI) and allergic nasal obstructions. Chronic asthma was diagnosed using lung function tests and acute asthma on history and examination. |
| Pneumonia Group (71subjects, increased from 17) | Patients with a diagnostic classification of pneumonia with or without URTI. Only X-ray or CT confirmed pneumonias are considered. |

| | |
|---|---|
| URTI Group<br>(20 subjects) | Patients with a diagnostic classification of upper respiratory tract infection (URTI) and no clinically discernible lower respiratory tract involvement. |

*In addition to these groups, the available dataset includes patients diagnosed with other respiratory diseases and comorbidities that were not considered in this preliminary analysis.

**Table of preliminary results**

| Target Group(s) | Control Group | Sensitivity | Specificity | Accuracy |
|---|---|---|---|---|
| COPD | Normal: Non-smokers | | | |
| *(cough alone)* | | 92% | 91% | 91% |
| *(with age)* | | 100% | 96% | 98% |
| COPD | Normal: Smokers | | | |
| *(cough alone)* | | 88% | 96% | 92% |
| *(with age)* | | 100% | 100% | 100% |
| Asthma | Normal: Non-smokers | | | |
| *(cough alone)* | | 91% | 88% | 89% |
| *(with age)* | | 91% | 91% | 91% |
| Asthma | Normal: Smokers | | | |
| *(cough alone)* | | 91% | 93% | 92% |
| *(with age and presence of runny nose)* | | 91% | 93% | 92% |
| Pneumonia | Normal: Non-smokers | | | |
| *(cough alone)* | | 87% | 93% | 90% |
| *(with age, presence of runny nose and fever)* | | 97% | 100% | 98% |
| Pneumonia | Normal: Smokers | | | |
| *(cough alone)* | | 94% | 96% | 95% |
| *(with age, presence of runny nose and fever)* | | 100% | 100% | 100% |
| Asthma and COPD | Normal: Non-smokers | | | |
| *(cough alone)* | | 93% | 88% | 90% |
| *(with age, presence of runny nose and fever)* | | 91% | 91% | 91% |
| Asthma and COPD | Normal: Smokers | | | |
| *(cough alone)* | | 96% | 96% | 96% |
| *(with age and presence of runny nose)* | | 93% | 93% | 93% |
| URTI | Normal: Non-smokers and Smokers | | | |
| *(cough alone)* | | 100% | 94% | 95% |
| *(with age, presence of runny nose and fever)* | | 100% | 100% | 100% |
| Asthma | COPD | | | |

| | | | | |
|---|---|---|---|---|
| *(cough alone)* | | 84% | 88% | 85% |
| *(with history of smoking)* | | 93% | 96% | 94% |
| Pneumonia | Asthma | | | |
| *(cough alone)* | | 77% | 70% | 75% |
| *(with presence of fever)* | | 92% | 81% | 88% |
| Pneumonia | COPD | | | |
| *(cough alone)* | | 77% | 76% | 77% |
| *(with presence of fever)* | | 92% | 92% | 92% |

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**About ResApp Health Limited**

ResApp Health Limited (ASX: RAP) is a digital health company developing smartphone applications for the diagnosis and management of respiratory disease. The technology is based on machine learning algorithms that use sound alone to diagnose and measure the severity of respiratory conditions without the need for additional hardware. The algorithms were initially developed by The University of Queensland with funding from the Bill and Melinda Gates Foundation. ResApp has both adult and paediatric clinical studies underway with preliminary results demonstrating accurate diagnosis of pneumonia, asthma/viral wheeze, bronchiolitis, croup, chronic obstructive pulmonary disease and upper respiratory tract infections. Markets for ResApp's technology include telehealth use through partnerships with telehealth service providers, emergency department and regular clinic use by healthcare providers, at-home use by consumers and working with global aid and humanitarian organisations to deliver tools for the developing world.

For more information on ResApp, visit www.resapphealth.com.au