COVID-19 Critical Intelligence Unit

Evidence check

> Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Validated tools to diagnose respiratory illness via telehealth

Rapid review question

Which tools are validated to diagnose respiratory illness via telehealth?

In brief

- A Centre for Evidence Based Medicine (CEBM) review of methods to assess dyspnoea by telephone or video found no validated tools; and recommended against the use of the Roth score.(1)
- In this review, a rapid survey of 50 clinicians gave the following advice: ask the patient to describe their breathing in their own words, align with the NHS111 symptom checker which asks three questions, focus on change to identify if there has been deterioration and interpret the breathlessness in the context of the wider history and physical signs.
- A rapid review on the accuracy of self-monitoring of heart-rate, respiratory rate and oxygen saturation in patients with symptoms suggestive of COVID-19 infection found no studies on remote monitoring of respiratory rate and cautioned against use of smartphone apps for measuring oxygen saturation.(2)
- A rapid evidence synthesis from CEBM found it is not physically possible to measure blood oxygen saturation (SpO2) using current smartphone technology.(3)

Limitations

The use of telehealth in COVID-19 is a rapidly emerging field. Studies are often context specific.

Background

Respiratory illness can be acute or chronic, and include asthma, pneumonia, chronic obstructive pulmonary disease (COPD), pulmonary fibrosis. Telehealth has been applied in a 'forward triage' model to screen patients before they arrive at the ED, protecting patients, clinicians, and the community from exposure.(4)

Methods (Appendix 1)

Google and Pubmed were searched on 15 April 2020. Tools that aid self-management or compliance to a management plan in chronic respiratory conditions (such as chronic obstructive pulmonary disease) are out of scope for this review.

Results (Tables 1 and 2)

Table 1: Tools for monitoring respiratory illness

Source title	Findings	Source link
Telemedicine: A Reliable Tool to Assess the Severity of Respiratory Distress in Children, 2016 (5)	A prospective, cohort study in paediatric emergency department: simultaneous and independent face-to-face and telemedicine assessments were performed on 48 patients using respiratory score – a four-item, 12-point scale (respiratory rate [1–3], retractions [0–3], dyspnea [0–3], and wheezing [0–3]) to assesses the severity of a child's respiratory distress. The study concluded that telemedicine is a reliable tool to assess the severity of respiratory distress in children with intraclass correlation coefficient (ICC) of 0.95.	https://hospp eds.aappubli cations.org/c ontent/hospp eds/6/8/476.f ull.pdf
Reliability of Telemedicine in the Assessment of Seriously Ill Children, 2016 (6)	This prospective observational study was performed on 145 patients using the Respiratory Observation Checklist in a paediatric emergency department (PED) located in an urban tertiary care children's hospital. The components of the checklist were derived from previously published and validated respiratory scores, including the Paediatric Asthma Severity Score and the Pediatric Respiratory Assessment Measure. Excellent agreement between bedside and telemedicine observers was found for the impression of respiratory distress (κ = .85).	https://pediatr ics.aappublic ations.org/co ntent/pediatri cs/137/3/e20 150712.full.p df
The value of telehealth in the early detection of chronic obstructive pulmonary disease exacerbations: A prospective observational study, 2016 (7)	A total of 183 patients were followed up for mean 80.7 days accounting for 14,611 monitored days. A new tool, the EXAcerbations of Chronic pulmonary disease Tool for Patient-Reported Outcome (EXACT-PRO), a 14-item daily symptom diary, has recently been validated to quantify acute exacerbations of COPD. A daily questionnaire was developed locally to include questions about patients' general condition, breathlessness level, cough, sputum volume and colour changes and ankle swelling. Physical measurements include daily oxygen saturations and temperature.	https://journal s.sagepub.co m/doi/pdf/10. 1177/146045 8214564434
A telehealth system for automated diagnosis of asthma and chronic obstructive pulmonary disease, 2018 (8)	A prospective study describes the development and real-time testing of an automated expert diagnostic telehealth system for the diagnosis of two respiratory diseases, asthma and COPD. During six months, 780 patients across three remote primary healthcare institutions, and one hospital were assessed and diagnosed with an accuracy of 97%. A simple telehealth system was implemented consisting of a spirometer with a Bluetooth module, MATLAB-based expert system (ES) application, an Android-based mobile application for COPD and	https://acade mic.oup.com/ jamia/article/ 25/9/1213/49 99662

Source title	Findings	Source link
	asthma diagnosis based on previously developed and validated system. The study highlighted reliable and precise data collection and synchronised and secured data exchange for accurate decision-making.	
Measuring respiratory symptoms of COPD: performance of the EXACT-Respiratory Symptoms Tool (E-RS) in three clinical trials, 2014 (9)	The E-RS utilises 11 respiratory symptom items from the existing and validated 14-item EXACT, which measures symptoms of exacerbation. The E-RS total score quantifies respiratory symptom severity, and three domains assess breathlessness, cough and sputum, and chest symptoms. Study examined the performance of the E-RS in each of three controlled trials with common and unique validation variables: one six-month (N = 235, US) and two three-month (N = 749; N = 597; international). Results suggest the E-RS is a reliable, valid and responsive measure of respiratory symptoms of COPD suitable for use in natural history studies and clinical trials.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4203869/pdf/12931_2014_Article_124.pdf
Development and Evaluation of an Automated, Home-Based, Electronic Questionnaire for Detecting COPD Exacerbations, 2015 (10)	A small prospective follow-up study on 19 patients. An automated questionnaire for the early detection of COPD exacerbations (AQCE) was developed in collaboration with 52 patients. The questionnaire consisted of 14 questions and was implemented on a computer system for use by patients at home in an unsupervised environment. Psychometric evaluation was conducted after a six-month field trial. The results suggest that AQCE is a valid and reliable questionnaire, showing that an automated home-based electronic questionnaire may enable early detection of exacerbations of COPD.	https://www.hindawi.com/journals/jhe/2015/627464/
An Expert Diagnostic System to Automatically Identify Asthma and Chronic Obstructive Pulmonary Disease in Clinical Settings, 2018 (11)	An Expert Diagnostic System (EDS) based on machine learning methods, such as artificial neural networks (ANNs) and fuzzy logic (FL) were used for the detection of respiratory diseases for automated identification of COPD and asthma.

EDS was validated using new data acquired in a prospective study conducted at a local healthcare institution. To develop accurate classification algorithms, data from 3,657 patients were used and then independently verified using data from 1,650 patients collected over a period of two years. Our results demonstrate that the expert diagnostic system can correctly identify patients with asthma and COPD with sensitivity of 96.45% and specificity of 98.71%. Additionally, 98.71% of the patients with a normal lung function were correctly classified, which contributed to a 49.23% decrease in demand for conducting additional tests, therefore decreasing financial cost. | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6076307/pdf/41598_2018_Article_30116.pdf |

Table 2: Tools to assess COVID-19 patients, but not validated for telehealth

Source title	Findings	Source link
COVID-19: a remote assessment in primary care, 2020 (1, 12)	• Although such consultations can be done by telephone in many cases, video provides additional visual cues and therapeutic presence. • Breathlessness is a concerning symptom, though there is currently no validated tool for assessing it remotely. • Recommends questions developed through user testing to include subjective reporting of breathing difficulties by patients with focus on tracking change and interpreting the breathlessness in the context of the wider history and physical signs.	https://www.bmj.com/content/bmj/368/bmj.m1182.full.pdf
NEWS (or NEWS2) score when assessing possible COVID-19 patients in primary care? 2020 (13)	NEWS and its updated version, NEWS2, are early warning scores which were originally developed for monitoring hospital inpatients over time using repeated measurements. Enthusiasm for NEWS2 in the primary care management of COVID-19 may be premature. If used at all, this score should be used alongside a wider clinical assessment of the patient and in the context of changes over time. There is no research on the value of these tools for COVID-19 outside hospital. NEWS2 includes blood pressure and oxygen saturation measurements that are difficult or impossible to take remotely. It does not include age or comorbidities, which are known to be strong independent predictors of survival in COVID-19.	https://www.cebm.net/covid-19/should-we-use-the-news-or-news2-score-when-assessing-patients-with-possible-covid-19-in-primary-care
ResApp and Coviu team up to provide remote respiratory tests through telehealth platform	Digital health company ResApp Health (ASX: RAP) has inked a binding deal to integrate its ResAppDx-EU – a smartphone-based acute respiratory disease diagnostic test – into Coviu's telehealth platform to enable clinicians to perform respiratory assessments remotely. ResAppDx-EU uses machine learning algorithms to analyse a patient's cough sounds to diagnose lower respiratory tract diseases such as pneumonia and asthma. The app is CE Marked in the European Union and is approved by the Therapeutics Goods Administration in Australia.	https://smallcaps.com.au/resapp-coviu-provide-remote-respiratory-tests-telehealth-platform

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Appendix 1

PubMed: ((((((("Respiratory illness"[All Fields] OR (("lung"[MeSH Terms] OR "lung"[All Fields]) OR "pulmonary"[All Fields])) (("dyspnoea"[All Fields]) OR "breathlessness"[All Fields])) OR "respiratory"[Title/Abstract]) AND ("review"[Publication Type] OR "systematic"[Filter])) AND ((("telehealth"[All Fields] OR "telemedicine"[MeSH Terms]) OR "telemedicine"[All Fields]) OR "telehealth"[All Fields])) AND ("review"[Publication Type] OR "systematic"[Filter])) AND (((("assess*"[All Fields] OR "remote assessment"[All Fields]) OR "assessment"[All Fields]) OR "examin*"[All Fields]) AND ("review"[Publication Type] OR "systematic"[Filter]))

PubMed: ("Respiratory illness"[All Fields] OR "dyspnoea"[MeSH Terms] OR "dyspnoea"[All Fields]) OR ("breathlessness"[All Fields] OR "respiratory"[Title/Abstract]) AND ((("telehealth"[All Fields] OR "telemedicine"[MeSH Terms]) OR "telemedicine"[All Fields]) OR "telehealth"[All Fields])) AND ("assess*"[All Fields] OR "remote assessment" [All Fields] OR "assessment"[All Fields] OR Examin*[All Fields])