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Extended Research Article

Rapid tests to inform triage and antibiotic prescribing decisions for adults presenting with suspected acute respiratory infection: a rapid evidence synthesis of clinical effectiveness and cost–utility studies

Katie Scandrett,[1,2] Jill Colquitt,[3] Rachel Court,[4,7] Fiona Whiter,[5] Bethany Shinkins,[4] Yemisi Takwoingi,[1,2] Emma Loveman,[3] Daniel Todkill,[4] Paramjit Gill,[6] Daniel Lasserson,[6] Lena Al-Khudairy,[4,7] Amy Grove[4,7] and Yen-Fu Chen[4,7*]

[1]Institute of Applied Health Research, University of Birmingham, Birmingham, UK
[2]National Institute for Health and Care Research (NIHR) Birmingham Biomedical Research Centre, University of Birmingham, Birmingham, UK
[3]Effective Evidence LLP, Waterlooville, UK
[4]Warwick Evidence, Warwick Medical School, University of Warwick, Coventry, UK
[5]Freelance reviewer for Effectiveness Evidence LLP, Waterlooville, UK
[6]Warwick Applied Health, Warwick Medical School, University of Warwick, Coventry, UK
[7]Birmingham Centre for Evidence and Implementation Science, School of Social Policy and Society, University of Birmingham, Birmingham, UK

*Corresponding author y.chen.25@bham.ac.uk

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Scientific summary

Rapid tests to inform triage and antibiotic prescribing decisions for adults presenting with suspected acute respiratory infection: a rapid evidence synthesis of clinical effectiveness and cost–utility studies

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Scientific summary

Background

Acute respiratory infection (ARI) is a group of diseases caused by viruses or bacteria that affect the respiratory tract, such as the common cold and influenza. Rapid testing of biomarkers and microbial pathogens that can return results quickly at the point of care has emerged as potentially useful tools to aid the initial assessment of patients with suspected ARI. The primary objective of this rapid evidence synthesis was to evaluate the clinical effectiveness and cost-effectiveness of different near-patient, rapid point-of-care tests (POCTs) alone or in combination to guide initial assessment and management in people aged 16 and over with suspected ARI. This evidence review was conducted to help inform whether rapid tests should be made available for use at initial patient consultations in various settings to help inform referral of patients to NHS ARI hubs, virtual wards or hospitals.

Methods

This rapid synthesis consists of a review of clinical effectiveness studies with meta-analysis and a review of cost–utility studies. The reviews followed published methods, were registered on PROSPERO (CRD42023429515) and are reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidance.

Search strategies

Searches were conducted in May 2023. MEDLINE and Epistemonikos databases were searched for systematic reviews with no date limit. Searches for randomised controlled trials (RCTs) were conducted in EMBASE, MEDLINE and Cochrane Central Register of Controlled Trials. Searches for cost–utility studies were conducted in EMBASE, MEDLINE and the Cost-effectiveness Analysis Registry with no date limit. Relevant study design filters were used. Searches combined the concepts of ARI with near-patient, rapid POCTs. For the RCT searches, terms for specific biomarkers and tests in combination with terms for guide or inform were added to capture the concept of biomarker test-guided management. All searches were restricted to English language and humans, and excluded grey literature and non-research articles. References of included studies and relevant reviews were checked.

Eligibility criteria

Systematic reviews of RCTs or economic evaluations, RCTs and cost–utility studies that evaluated near-patient, rapid POCTs (with a turnaround time of 45 minutes or shorter) licensed for use in the UK in people aged 16 years or over with suspected ARI were eligible. In an amendment to the protocol, POCTs no longer available in the UK were also included. The following outcomes were eligible for the review of clinical effectiveness: hospital admission, escalation of care, length of hospital stay, follow-up consultation/ongoing monitoring, antibiotic/antiviral use, time to clinical cure or resolution of symptoms, mortality and health-related quality of life; and for the review of cost-effectiveness: incremental cost, life-years gained, incremental quality-adjusted life-years, incremental disability-adjusted life-years, incremental cost-effectiveness ratio and incremental net health/monetary benefit. Studies concerning patients with confirmed COVID-19, hospital inpatients and children under 16 years were excluded.

Study selection

For the clinical effectiveness review, titles and abstracts were screened by one reviewer with the initial 20% of records screened by two reviewers. At least 90% agreement was achieved before proceeding to single reviewer screening. Relevant full texts were obtained and screened following the same process. For the cost-effectiveness review, both phases of screening were conducted by two independent reviewers. In both reviews, any disagreements were resolved through discussion and with a third reviewer if needed.

Data extraction

Data were extracted by one reviewer using a pre-piloted and standardised form and checked by a second reviewer, with disagreements resolved by discussion.

Risk-of-bias assessment

Systematic reviews were assessed using the JBI Critical Appraisal Checklist. RCTs and cost–utility studies (if not assessed by existing reviews) were assessed using the Cochrane risk-of-bias tool and the Drummond checklist respectively.

Data synthesis

All included studies were tabulated and summarised narratively. Meta-analyses of clinical effectiveness outcomes were conducted to estimate summary risk ratios with 95% confidence intervals (CIs). Meta-analysis using a random-effects model using the DerSimonian and Laird method was undertaken. A sample size adjustment was made to cluster randomised trials. Inconsistency across studies was measured using I^2 statistic and chi-squared test and by assessing study characteristics. Subgroup analyses were planned and sensitivity analyses undertaken.

Assessment of certainty of evidence

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework was used to evaluate the certainty of evidence for the key outcomes of 7- or 28-day mortality, escalation of care and hospital admission.

Results

Clinical effectiveness

Eligible trials were identified for C-reactive protein (CRP) POCTs, procalcitonin POCTs, group A streptococcus (GAS) POCTs and influenza POCTs only. No evidence was identified for other types of near-patient rapid POCTs. Outcomes assessed by the included studies varied.

One recent systematic review was included as a source of data for eligible studies. Fourteen RCTs were included; all had a high risk of bias. The setting was mainly primary care; two studies involved outpatient clinics, and one study involved nursing homes. Ten RCTs analysed POCTs for CRP. In five of these studies, the test assessed is currently unavailable in the UK. The effects of CRP tests compared with usual care on hospital admissions, mortality and health-related quality of life were highly uncertain due to sparse data. Three RCTs had heterogeneous findings on resolution of symptoms/time to full recovery. The risk of re-consultations increased in patients receiving CRP POCTs (risk ratio 1.61, 95% CI 1.07 to 2.41; I^2 56.6%; four studies). There was a reduction in antibiotics initially prescribed (CRP POCT vs. usual care: risk ratio 0.75, 95% CI 0.68 to 0.84; I^2 54.7%; nine studies). Subgroup analysis of people with chronic obstructive pulmonary disease and sensitivity analyses excluding studies in a nursing home setting or tests unavailable in the UK did not change the conclusions inferred from the main analyses.

The effects of procalcitonin POCTs compared with usual care on hospital admission, re-consultations, duration of symptoms and mortality were very uncertain as evidence was available from only one RCT with a high risk of bias. The study found a large reduction in initial antibiotic prescriptions within 7 days.

Two RCTs found a large reduction in initial antibiotic prescriptions for GAS POCTs versus usual care. Only one RCT compared an influenza POCT with usual care. The effect on antibiotics prescribed was very uncertain. No deaths occurred in either treatment group. These trials had a high risk of bias.

Cost-effectiveness

Six of the included cost–utility studies were judged to be directly applicable to our review question, four of which focused on CRP POCT. The results suggested that CRP POCT is potentially cost-effective; these studies were generally limited to capturing only short-term costs and consequences.

One study evaluated 14 different POCTs for GAS; none were cost-effective compared with usual care.

A further study evaluated two rapid tests (Quidel for influenza, and BinaxNOW for the pneumococcal antigen) compared to culture/serology and found that they were not cost-effective.

Conclusion

The rapid review of clinical effectiveness identified only a small number of eligible trials covering few relevant POCTs. There was limited evidence of the effectiveness of near-patient rapid POCTs in adults with suspected ARI. CRP POCT may reduce the number of patients given an antibiotic prescription at initial consultation but could increase the rate of re-consultations. The overall certainty of the evidence was very low according to the GRADE assessment. CRP POCT may potentially be cost-effective, but existing estimates were based on very small and uncertain gains in quality-adjusted life-years and only accounted for short-term costs and consequences. There was very limited or an absence of evidence for other POCTs.

Further research is needed to explore the impact of POCTs, used alone or in combination, on triaging decisions across different clinical settings and to quantify the longer-term health and cost consequences of reducing antibiotic prescribing.

Study registration

This study is registered as PROSPERO CRD42023429515.

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