

Diagnostic utility of biomarkers in diagnosing serious bacterial infections in older adults in the ambulatory care setting: a systematic review and meta-analysis

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Review question

What is the utility of biomarkers (blood, urinary and salivary) in diagnosing serious bacterial infections in older adults in the ambulatory care setting?

Searches

We will search the following databases: MEDLINE and MEDLINE in process, Embase and Web of Science, from inception to date. No time restrictions will be imposed. We will also search Google Scholar for relevant internet proceedings, and hand search the bibliography of located articles. Two reviewers will independently determine the eligibility of articles with disagreements resolved by discussion.

Types of study to be included

Inclusion criteria:

- 1) Cross-sectional or cohort studies assessing serious bacterial infections. We have defined serious bacterial infections as sepsis (including bacteraemia), pneumonia, urinary tract infection, skin and soft tissue infection (including cellulitis), intra-abdominal infection (cholecystitis, appendicitis, diverticulitis and abscesses), bacterial meningitis, bacterial infective endocarditis and active tuberculosis. These bacterial infections have been shown to have a predilection for older adults (Yoshikawa, 2000).
- 2) Studies that provide sufficient information to enable extraction of data into two by two tables.
- 3) Studies conducted in ambulatory care units; this includes general practice, out of hours facilities, nursing homes, emergency departments and outpatient clinics.

Exclusion criteria:

- 1) Studies conducted in immunosuppressed participants (e.g. active cancer or receiving chemotherapy).
- 2) Studies conducted in developing countries, as there is likely to be considerable variation in the type and mode of presentation of bacterial infections.
- 3) Studies in which the index test (biomarker) and reference standard are not performed during the illness episode of the participant.
- 4) Studies in which patients' co-morbidities are used to select participants.
- 4) Studies not published in English language.
- 5) Non-human studies.
- 6) Systematic review, case reports, case series, case control studies and conference abstracts. Systematic review may be used as a point of reference.

Condition or domain being studied

Serious bacterial infections often present in an atypical fashion in older adults, creating a diagnostic conundrum for clinicians. Clinicians may therefore turn to diagnostic tests to facilitate their decision making, but these biomarkers may be less informative in older adults compared to their younger counterparts. The goal of this review is to establish which biomarkers (blood, urinary and salivary) are useful in diagnosing serious bacterial infections in older adults in the ambulatory care setting.

Participants/population

Studies conducted in adults aged 65 years and above who at the time of study inclusion are symptomatic with undifferentiated illness. Studies that include younger participants will only be included if age-stratified analyses can be performed, enabling data for those over the age of 65 years to be extracted.

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Intervention(s), exposure(s)

Biomarkers (blood, urinary or salivary) used alone or in combination.

Comparator(s)/control

Observational studies that provide a reference standard for confirming the diagnosis of the serious bacterial infection. The reference standard may include a combination of elements (e.g. an imaging modality combined with symptoms and signs).

Context

Main outcome(s)

Calculation of statistical measures such as the sensitivity, specificity, positive and negative likelihood ratios with their 95% confidence intervals, and the pre- and post-test probabilities for each biomarker or combination of biomarkers in diagnosing a particular bacterial infection.

Additional outcome(s)

None.

Data extraction (selection and coding)

Risk of bias (quality) assessment

The quality of included studies will be assessed according to the Quality Assessment of Diagnostic Accuracy Studies -2 (QUADAS-2) tool (Whiting et al, 2011). A judgement of high risk, unclear risk or low risk will be made for each study against each of the four domains.

Strategy for data synthesis

Data will be extracted from the individual studies into two by two tables. We will calculate the sensitivity, specificity, positive and negative likelihood ratios with their 95% confidence intervals, and the pre- and post-test probabilities for each biomarker in diagnosing a bacterial infection.

Where the measures of a biomarker or group of biomarkers are similar across four or more studies in diagnosing a particular serious bacterial infection, we will plot the result in receiver operating characteristic space (Van den bruel et al, 2010).

Where it is not possible to perform meta-analysis, results will be presented in narrative format and on dumbbell plots.

Analysis of subgroups or subsets

If substantial heterogeneity is observed, given sufficient data, we will perform subgroup analysis to further investigate this. If possible, we will assess the effect of variation in age (such as 65-74, 75-84 years and >84 years), study setting (emergency department versus other ambulatory care settings), study design (cohort versus cross-sectional) and co-morbidities on the effect size. Sensitivity analyses on the basis of study quality, and also according to the time interval between the index test and reference standard (<24 hours versus 24 hours or more) will also be performed.

Contact details for further information

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Conflicts of interest

None known

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English

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England

Stage of review

Review_Ongoing

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Subject indexing assigned by CRD

Subject index terms

Adult; Ambulatory Care; Bacterial Infections; Biomarkers; Humans

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Details of any existing review of the same topic by the same authors

Stage of review at time of this submission

Stage	Started	Completed
Preliminary searches	Yes	Yes
Piloting of the study selection process	Yes	No
Formal screening of search results against eligibility criteria	No	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

Versions

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