A review of antimicrobial control strategies in hospitalized and ambulatory pediatric populations
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CRD summary
This review concluded that there are a limited number of diverse studies assessing the efficacy of antimicrobial stewardship in paediatric settings, and this makes it difficult to determine whether interventions are effective. Given the limitations of the data and despite poor reporting of the review methods, the authors’ conclusions appear appropriate.

Authors’ objectives
To review the literature on antimicrobial stewardship programmes in paediatric out-patient and hospital settings.

Searching
MEDLINE and the Cochrane CENTRAL Register were searched for studies published in English from 1 January 1996 to 1 May 2006 using the search terms detailed in the report. The references of identified articles were checked.

Study selection
Study designs of evaluations included in the review
The authors did not state which types of study were eligible for inclusion, but prospective and retrospective designs were included, along with randomised and non-randomised controlled trials, interrupted time series, retrospective studies and cohort studies.

Specific interventions included in the review
Multiple types of interventions principally aimed at antimicrobial control were eligible. Interventions used during outbreaks were excluded. The review included: ‘focused education’, which provided prescribers with education on specific clinical issues via lectures, brochures and/or focus groups, one or more times during the study; ‘dynamic education’, where clinicians received feedback on their specific prescribing practices or ‘real time’ guidance for a specific scenario; ‘parent education’ provided via pamphlets, posters or video presentations; ‘antibiotic restriction’, which limited antibiotic choices or availability; and ancillary tests such as serum inflammatory markers or rapid viral diagnostic assays intended to guide initiation or completion of antibiotic treatment.

Participants included in the review
To be eligible, studies needed to be limited to paediatric patients (age 18 years or younger) or, if a study had both adults and children, the outcomes had to be analysed separately and children had to represent 50% or more of the sample. In studies where the intervention was targeted at practitioners, only those treating paediatric populations were included. The majority of the included studies were of ambulatory care practices and were carried out in hospital settings, such as the paediatric intensive care unit (ICU), nursery or neonatal ICU, and the emergency department.

Outcomes assessed in the review
Multiple outcomes were included, but all were mainly related to either a change in antibiotic usage or resistance. Studies that measured antibiotic resistance, utilisation or management as a secondary outcome were excluded. Most of the studies assessed more than one outcome; the most frequent outcome was antibiotic, use as determined by prescribing rates, antibiotic consumption or antibiotic costs. Approximately half of the studies measured clinical outcomes.

How were decisions on the relevance of primary studies made?
The authors did not state how the studies were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The review team modified an existing quality assessment tool to evaluate potential biases and limitations of the included studies. To assess the clarity (reproducibility) of the studies, four factors were scored as ‘completely adequate’, ‘partially adequate’, ‘not specified or inadequate’ or ‘not applicable’. The studies were then classified as having sufficient or
insufficient clarity. Seven factors were used to relate study internal validity and studies were then classed as having ‘low’, ‘medium’ or ‘high’ risk of bias. Two reviewers piloted and then conducted the assessment of study quality. Any disagreements were resolved by discussion and consensus.

Data extraction
Two reviewers appear to have extracted the data.

Methods of synthesis
How were the studies combined?
The studies were combined in a narrative. They were categorised by the main intervention strategies used.

How were differences between studies investigated?
Differences between the studies were outlined in the text of the report.

Results of the review
Twenty-eight studies (number of participants not reported) met the inclusion criteria for the review: 26 prospective studies and 2 retrospective studies. Seven were clinical trials, nine used an interrupted time series design, nine were controlled before-and-after studies, two were cohort studies and one used a prospective crossover design.

Seven of the studies had a low risk of bias. Studies that used antibiotic restriction interventions had fewer potential biases than education-based studies, but baseline measurements were insufficient and contamination between groups was possible. Studies that used ancillary tests had the lowest risk of bias, mainly because the interventions were narrowly focused and compliance was easily monitored. Study clarity was generally good across the included studies.

All 8 studies that used focused education reported statistically significant improvements in antimicrobial prescribing. Studies with dynamic methods had mixed results, with some types of intervention reducing inappropriate antibiotic use and others finding no difference in prescribing rates or even an increase. Studies using parent education were also mixed. Antibiotic restriction policies tended to assess the impact of the intervention on antibiotic resistance and were not generally successful. Rapidly available ancillary tests were associated with the greatest reductions in antibiotic use.

Authors’ conclusions
There are only a limited number of heterogeneous studies assessing the efficacy of antimicrobial stewardship in paediatric settings, and this makes it difficult to determine whether interventions are effective.

CRD commentary
This review answered a clear but broadly defined research question. The literature searches were limited to English language studies and no specific attempts were made to locate unpublished material, so there is a risk of both language and publication bias. Study quality was assessed and the results used to interpret the evidence found. The review process and the number of reviewers involved at each stage of the review were not always clear, so it is difficult to assess the risk of reviewer error and bias. The narrative synthesis seems appropriate given the diversity of the studies. The authors’ cautious conclusions appear reliable given the limitations of the data, and the recommendations for further research seem appropriate.

Implications of the review for practice and research
Practice: The authors highlighted that physician education for specific therapeutic indications appears effective in the out-patient setting and rapid diagnostic or ancillary testing in the in-patient setting.

Research: The authors stated that future studies should be designed to find the optimum methods to educate clinicians and to evaluate the efficacy of specific interventions, and be designed without the biases found in the current literature.

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