A simple intervention to improve hospital antibiotic prescribing

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ABSTRACT

Objective: To evaluate changes in prescribing behaviour after distribution of antibiotic guidelines printed on a 9 × 6 cm laminated card suitable for clipping to a hospital identification badge.

Intervention: Guidelines for appropriate antibiotic prescribing for 20 common and important paediatric infections were printed on a laminated 9 × 6 cm card suitable to clip to a hospital identification badge and distributed to all medical staff.

Design: We collected data from medical records for three marker conditions (tonsillitis, pneumonia, and orbital/periorbital cellulitis) on samples of patients from the six-month periods either side of the month in which the cards were distributed. Prescribers were unaware of the study and investigators analysed the prescriptions without knowledge of the period in which they were written. Prescriptions were rated for appropriate choice of antibiotic and appropriate dose. Data were also collected on antibiotic costs.

Main outcome measures: Proportion of cases in which antibiotic choice was appropriate; proportion of cases in which antibiotic dose was appropriate; annualised costs of third-generation cephalosporins.

Results: For tonsillitis there was little change in prescribing practice after the cards were introduced. For pneumonia, cases with appropriate choice increased from 77% to 92% ($P = 0.028$) and cases with appropriate dose increased from 48% to 81% ($P = 0.001$). For orbital/periorbital cellulitis, cases with appropriate choice increased from 19% to 78% ($P < 0.001$) and cases with appropriate dose increased from 30% to 51% ($P = 0.11$). Annualised costs of third-generation cephalosporins were $193 245 pre-cards and $89 814 post-cards.

Conclusion: The cards appeared to have a beneficial effect on prescribing practice for the three marker conditions. This simple intervention is likely to be cost-effective and useful in reducing inappropriate use of antibiotics.

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FOR MANY YEARS, clinicians have been warned of the dire consequences of overuse of antibiotics. These predictions are now a reality, with antibiotic-resistant organisms an increasing clinical problem. Current examples include methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococcus and penicillin-non-susceptible strains of *Streptococcus pneumoniae*. These resistant organisms are associated with morbidity and mortality and have greatly increased the costs of treatment.[1-3]

The four main factors that encourage emergence of antibiotic-resistant pathogens are the use of

- antibiotics when bacterial infection is unlikely (eg, for the common cold, coughs and bronchitis);
- antibiotics for bacterial infection that is likely to resolve without this therapy (eg, most children with acute otitis media);
- broad-spectrum agents when a narrow-spectrum drug would suffice (eg, use of third-generation cephalosporins for community-acquired pneumonia); and
- antibiotics in animal farming.

Australia has one of the highest per-capita rates of antibiotic use among major developed countries,[4] and hospital prescribing practices contribute to this problem. A 1997 audit of prescribing practices at the Royal Children's Hospital, Melbourne, found excessive use of broad-spectrum agents, despite the existence of written guidelines and protocols encouraging use of narrow-spectrum antibiotics.

We attempted to improve appropriate choice and dosing in antibiotic prescribing in our hospital using a simple and inexpensive intervention — a laminated guidelines card that could be attached to an identification badge.

METHODS

Intervention

Guidelines for appropriate antibiotic prescribing for 20 common and important paediatric infections were produced on a laminated 9 × 6 cm card suitable to clip to a hospital identification badge (Box 1). The guideline contents were not new, but condensed material from existing hospital protocols into a readily accessible format that could easily be carried. Our guidelines are mostly consistent with the recommendations of the *Therapeutic guidelines — antibiotic*.[5]

Laminated antibiotic cards were sent to junior and senior medical staff in our hospital. An accompanying letter stated that they might find it useful in their daily practice. Staff were not told that they must follow the recommendations on the card, nor that we were conducting the study.

Evaluation

We conducted six-month pre- and post-intervention audits of prescribing prac-

For editorial comment, see page 196. See also pages 203 and 210.

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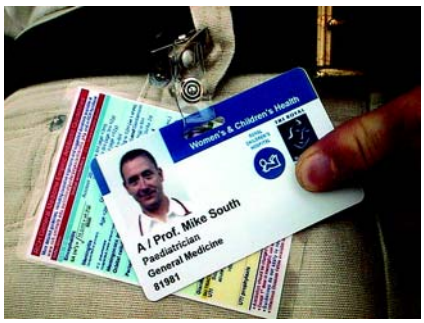
1: The guidelines card



tice for three marker conditions (tonsillitis, pneumonia, and orbital/periorbital cellulitis). These conditions were chosen because they are relatively common paediatric infections and the recommended choice and dosage of antibiotic did not change over the 12-month study period. The recommendations on the card for the three conditions are listed in Box 2.

From the hospital's computer database, we randomly selected up to 100 cases of each of the three marker conditions in each of two six-month periods (pre-card and post-card). The pre-card period was the six months to the day the cards were sent, and the post-card period was six months starting one month after the cards were sent, to allow time for all staff to receive the cards.

The appropriate parts of each case medical record, including the prescription if available, were photocopied with the names and dates obscured. The investigators assessed the copied records without knowledge of the six-month period in which they had been written. The copied records were first assessed to see if they could be included in the study. Cases were excluded if no antibiotics were prescribed or documented. All exclusion decisions were made without knowledge of the six-month period in which the patients had been treated.

The investigators then determined which antibiotics had been prescribed, if the recommended appropriate antibiotic had been chosen, and if the dose was correct. A dose was classified as correct if it was within 15% of the recommended dose based on the child's weight.

For the same two six-month periods, we determined the cost of broad-spectrum third-generation cephalosporin antibiotics supplied by the pharmacy department to the general medical wards and the emergency department. These were overall costs, and we were unable to categorise them by diagnosis. There were no changes to the unit pricing of these agents during the study period.

Data were analysed using the χ^2 test for proportions.

RESULTS

One hundred cases each of tonsillitis and pneumonia were randomly selected from each of the six-month pre- and post-card periods. Seventy-five of the tonsillitis cases were excluded because no antibiotic was prescribed or there was no record of the prescription — all had been managed without admission to hospital. There were almost no data available for dosage in tonsillitis, as all of these patients had been given a prescription for a retail pharmacy without the dose being recorded in the hospital record. Fifty-seven cases of pneumonia were excluded, as no antibiotic was prescribed because the aetiology had been thought to be viral. There were no changes in the proportions of patients who received antibiotics for either condition when the two periods were compared.

For orbital/periorbital cellulitis, there were 65 cases over the two six-month periods. None were excluded from analysis.

There were significant increases in the proportions for both appropriate choice of antibiotic, and for appropriate dose in the six-month post-card period (Box 3).

2: Recommendations on the card for the marker conditions

Condition	Recommendation (maximum doses in parentheses)
Tonsillitis	Penicillin V 30 mg/kg (1 g) oral 12 hourly for 10 days
Pneumonia	
Mild	Amoxycillin 15 mg/kg (500 mg) oral 8 hourly (consider procaine penicillin 50 mg/kg (1.5 g) IM first) (if > 5 years consider erythromycin)
Moderate	Benzylpenicillin 50 mg/kg (3 g) IV 6 hourly (if > 5 years consider erythromycin)
Severe pneumonia or large pleural effusion	Flucloxacillin 50 mg/kg (2 g) IV 4 hourly *and* gentamicin 7.5 mg/kg (240 mg) IV daily
Orbital cellulitis	Cefotaxime 50 mg/kg (2 g) IV 6 hourly *and* flucloxacillin 50 mg/kg (2 g) IV 6 hourly
Periorbital cellulitis	Benzylpenicillin 50 mg/kg (3 g) IV 6 hourly *or* flucloxacillin 50 mg/kg (2 g) IV 6 hourly if bite/injury (if severe use flucloxacillin and gentamicin)

IM = intramuscularly. IV = intravenously. The full content of the current version of the guidelines card, along with more information, is available at www.rch.unimelb.edu.au/genmed/antibiotic-cards.html

3: Proportion of cases in which appropriate antibiotic was chosen, and appropriate dosage prescribed, for six months before (pre-card) and six months after (post-card) distribution of the antibiotic guidelines card

	Number of cases		Appropriate choice of antibiotic			Appropriate dose of antibiotic*		
	Pre-card	Post-card	Pre-card	Post-card	$P^\dagger$	Pre-card	Post-card	$P^\dagger$
Tonsillitis	74	51	49 (66%)	36 (71%)	0.7	—	—	—
Pneumonia	66	77	51 (77%)	71 (92%)	0.028	32 (48%)	62 (81%)	0.001
Orbital/periorbital cellulitis	43	22	8 (19%)	17 (78%)	< 0.001	13 (30%)	11 (50%)	0.11

*Includes only those cases in which the appropriate antibiotic was chosen. — = insufficient data available. †*P* values by χ^2 test for proportions.

More detailed analysis showed prescribing practice favouring narrow-spectrum antibiotics in the six-month post-card period. Inappropriate dosing in the six-month pre-card period was mostly in the form of underdosing.

Annualised costs of third-generation cephalosporins were $193 245 (pre-cards) and $89 814 (post-cards).

DISCUSSION

Our study suggests that the distribution of laminated antibiotic guideline cards modified doctors' behaviour, leading to improvements in prescribing practice. This was reflected in a substantial reduction in expenditure on broad-spectrum third-generation cephalosporin antibiotics.

There was no significant change detected in prescribing for tonsillitis. All these patients were managed on an ambulatory basis, and in many cases the doctors recommended that the patient remain on antibiotics already prescribed by a general practitioner. Overall prescribing practice was appropriate, and this may reflect the simple nature of the antibiotic guidelines for this condition.

For pneumonia and orbital/periorbital cellulitis, there were improvements in antibiotic choice and dosage. This may reflect the more complex nature of the antibiotic management for these conditions.

The cards were effective in changing prescribing behaviour among our doctors, even though the content printed on the card already existed in various hospital protocols and handbooks. Therefore, it appears that the readily accessible format was responsible for the change.

We have no direct data to indicate that our intervention was the cause, or the only cause, of the changes in prescribing behaviour. However, no other specific interventions or education programs were in place at the time. The cards have become very popular with our staff, those rotating from other institutions, medical students, and general practitioners.

Antibiotic policies aimed at encouraging the use of narrow-spectrum antibiotics have been shown to reduce colonisation with resistant organisms in controlled-trial circumstances.[6] The challenge is to translate the benefits into everyday practice. The approach to this will need multiple components, including doctor and patient education and the development of a view in which overall community benefit must be weighed against the issues for an individual patient. Some interventions will be complex, such as the use of expert computer systems to guide prescribing;[7] others, such as these guideline cards, will be simple.

We plan to conduct further audit of antibiotic use to determine if the apparent benefits to prescribing behaviour will be sustained. Certainly, the cards are now routinely carried and used by our junior medical staff. Each year we produce an updated version.

We conducted no formal cost–benefit study. However, each card costs less than $2 to produce. At present costs, if four or five patients per year are prescribed penicillin rather than a third-generation cephalosporin antibiotic for moderate pneumonia, the savings would be sufficient to defray the costs for distributing updated cards annually to all our junior and senior staff.

CONCLUSION

The distribution of laminated antibiotic guideline cards suitable to clip to a hospital identification badge appears to be a simple, low-cost intervention to reduce inappropriate antibiotic prescribing.

COMPETING INTERESTS

None identified.

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