

Respiratory tract infections –
antibiotic prescribing

Costing report

Implementing NICE guidance

July 2008

NICE clinical guideline 69



This costing report accompanies the clinical guideline: 'Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care' (available online at www.nice.org.uk/CG069).

Issue date: July 2008

This guidance is written in the following context

This report represents the view of the Institute, which was arrived at after careful consideration of the available data and through consulting healthcare professionals. It should be read in conjunction with the NICE guideline. The report and templates are implementation tools and focus on those areas that were considered to have significant impact on resource utilisation.

The cost and activity assessments in the reports are estimates based on a number of assumptions. They provide an indication of the likely impact of the principal recommendations and are not absolute figures. Assumptions used in the report are based on assessment of the national average. Local practice may be different from this, and the template can be amended to reflect local practice to estimate local impact.

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Executive summary

This costing report looks at the resource impact of implementing the NICE guideline 'Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care' in England.

The costing method adopted is outlined in appendix A; it uses the most accurate data available, was produced in conjunction with key clinicians, and reviewed by clinical and financial professionals.

Supporting implementation

The NICE clinical guideline on Respiratory tract infections – antibiotic prescribing is supported by a range of implementation tools available on our website (www.nice.org.uk/CG069) and detailed in the main body of this report.

Significant resource-impact recommendation

This report focuses on the recommendation that is considered to have the greatest resource impact and therefore require the most additional resources to implement or can potentially generate savings. This is:

- A no antibiotic prescribing strategy or a delayed antibiotic prescribing strategy should be agreed for patients with the following conditions:
 - acute otitis media
 - acute sore throat/acute pharyngitis/acute tonsillitis
 - common cold
 - acute rhinosinusitis
 - acute cough/acute bronchitis.

Total cost impact

The annual changes in revenue costs arising from fully implementing the guideline are summarised in the table below.

Movement in resources	Resource impact (£000s)
Current cost of antibiotics	24,316
Future cost of antibiotics	20,638
Total change in resources	-3,678

There are no organisational issues that could significantly delay implementing this guideline.

The prescribing of antibiotics within a primary care setting falls outside the scope of 'Payment by results'.

The prescribing of antibiotics for respiratory tract infections falls within programme budgeting category 01X 'Infectious diseases'.

Benefits and savings

Implementing the clinical guideline will bring the following benefits. The costs associated with these benefits are not considered due to insufficient availability of data.

- Compared with no prescribing, a delayed antibiotic prescribing strategy offers a 'safety net' for a small proportion of patients who develop a complication; there may be cost savings associated with fewer repeat visits to primary care practitioners.
- A possible reduction in the rate of C. Difficile or MRSA infections within an acute trust setting caused by overuse of the antibiotics in the community.
- A no antibiotic prescribing strategy or a delayed antibiotic prescribing strategy also results in a possible reduction in the occurrence of adverse effects of antibiotic use, notably the risk of increasing antibiotic resistance.
- Compliance with NICE guidance is one of the criteria indicating good risk reduction strategies and, in combination with meeting other criteria, could lead to a discount on contributions to the NHS Litigation Authority schemes, including Clinical Negligence Scheme for Trusts (CNST).

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Local costing template

The costing template produced to support this guideline enables organisations in England to estimate the impact locally and replace variables with ones that depict the current local position. A sample calculation using this template showed that additional savings of £7,300 could be made for a population of 100,000.

1 Introduction

1.1 *Supporting implementation*

1.1.1 The NICE clinical guideline on respiratory tract infections – antibiotic prescribing is supported by the following implementation tools available on our website (www.nice.org.uk/CG069):

- costing tools
 - a national costing report; this document
 - a local costing template; a simple spreadsheet that can be used to estimate the local cost of implementation
- a slide set; key messages for local discussion
- audit support.

1.1.2 A practical guide to implementation, 'How to put NICE guidance into practice: a guide to implementation for organisations' is also available to download from the NICE website. It includes advice on establishing organisational level implementation processes as well as detailed steps for people working to implement different types of guidance on the ground.

1.2 *What is the aim of this report?*

1.2.1 This report provides estimates of the national cost impact arising from implementation of guidance on antibiotic prescribing for respiratory tract infections in primary care in England. These estimates are based on assumptions made about current practice and predictions of how current practice might change following implementation.

1.2.2 This report aims to help organisations plan for the financial implications of implementing NICE guidance.

1.2.3 This report does not reproduce the NICE guideline on antibiotic prescribing for respiratory tract infections and should be read in conjunction with it (see www.nice.org.uk/CG069).

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1.2.4 The costing template that accompanies this report is designed to help those assessing the resource impact at a local level in England, Wales or Northern Ireland. NICE clinical guidelines are developmental standards in the Department of Health's document '[Standards for better health](#)'. The costing template may help inform local action plans demonstrating how implementation of the guideline will be achieved.

1.3 *Epidemiology of respiratory tract infections*

1.3.1 Antibiotics are commonly prescribed in primary care for respiratory tract infections in both adults and children. General practice consultation rates in England and Wales show that a quarter of the population visit their GP because of a respiratory tract infection each year. Respiratory tract infections are the reason for 60% of all antibiotic prescribing in general practice. Patients with respiratory tract infections also present to NHS walk-in centres.

1.3.2 Patients with respiratory tract infection also present to NHS emergency departments in England and Wales, however, this is considered to be immaterial compared with the number of people visiting their GP.

1.3.3 The annual number of patients with respiratory tract infections receiving a consultation in a primary care setting is summarised below (table 1).

Table 1 Summary of GP and walk-in centre consultation rates for respiratory tract infections in England

Respiratory tract infection	Consultation rate* (per 1,000 population)	Number of patients (000s)
Acute otitis media	10.6	532
Acute sore throat/acute pharyngitis/acute tonsillitis	70.5	3,555
Common cold	7.0	354
Acute rhinosinusitis	15.2	767
Acute cough/acute bronchitis	18.1	911
Total		6,119

* Consultation rate for consultations in general practice and NHS walk-in centres in England.

1.3.4 The number of people receiving a GP consultation for respiratory tract infections including acute sore throat/acute pharyngitis/acute tonsillitis, common cold, acute rhinosinusitis and acute cough/acute bronchitis is based on General Practice Research Database (GPRD) data from 2000 (Ashworth et al. 2004).

1.3.5 Williamson et al. (2006) identified patients presenting with acute otitis media at a sample of general practices between 1991 and 2001. The reported consultation rates for acute otitis media in 2000 in England were 122.7 per 1000 registered patients for children under 2 years, 34.7 for children aged 2–10 years, 7.7 for children aged 11–16 years, 5.9 for children/adults aged 17–21 years and 4.9 for adults older than 21 years. The weighted average incidence of acute otitis media in England is 10.6 per 1000 GP registered patients.

1.3.6 Patient activity for NHS walk-in centres is based on activity data from a NHS walk-in centre for 2007/2008.

1.3.7 There are an estimated 90 walk-in centres operating in England, providing GP or nurse consultations for an estimated 2000 patients per month (Department of Health, 2007); (see table 2). It is assumed that this NHS walk-in centre is representative of NHS

walk-in centres across England. However the local template should be adjusted to reflect local walk-in centre activity.

Table 2 Summary of estimated walk-in centre consultation rates for respiratory tract infections in England

Respiratory tract infection	Consultation rate (per 1,000 consultations)	Number of patients (000s)
Acute otitis media	2.3	5
Acute sore throat/acute pharyngitis/acute tonsillitis	35.9	78
Common cold	0.5	1
Acute rhinosinusitis	4.9	11
Acute cough/acute bronchitis	1.8	3
Total		98

1.3.8 These assumptions have been discussed and agreed with the Guideline Development Group (GDG) and other clinical experts. If local information about the numbers of patients with respiratory tract infections exists, these numbers can be used in the local template.

1.4 Models of care

1.4.1 People with respiratory tract infections will usually be identified and managed within primary care. Primary care settings are general practices, walk-in centres and emergency departments.

2 Costing methodology

2.1 Process

2.1.1 We use a structured approach for costing clinical guidelines (see appendix A).

2.1.2 There is good information available about respiratory tract infections diagnosed in general practice settings, and this has been used in developing the costing model. There is little information

available about respiratory tract infections diagnosed in NHS walk-in centres or emergency departments.

- 2.1.3 To overcome these limitations we had to make assumptions in the costing model. We developed these assumptions and tested them for reasonableness with members of the GDG and clinical practitioners in the NHS.

2.2 *Scope of the cost-impact analysis*

- 2.2.1 The guideline offers best practice advice on the care of adults and children (3 months and older, with a respiratory tract infection, for whom immediate antibiotic prescribing is not appropriate.
- 2.2.2 The guidance does not cover adults and children with respiratory tract infections, for who further investigation and/or immediate antibiotic prescribing is appropriate. However, the cost of immediate antibiotic prescribing is included in the costing model as this may change as a consequence of this guidance.
- 2.2.3 The costing work focuses only on the direct costs and savings arising from implementing this guidance.
- 2.2.4 We worked with the GDG and other professionals to identify the recommendations that would have the most significant resource impact; costing work has focused on these recommendations.
- 2.2.5 One of the recommendations (recommendation 1.1.3) in the guideline is considered to have a significant-cost resource impact. This recommendation concerns the agreement between a healthcare professional and a patient to adopt a no antibiotic prescribing strategy or a delayed antibiotic prescribing strategy for the following respiratory tract infections:
- acute otitis media
 - acute sore throat/acute pharyngitis/acute tonsillitis
 - common cold

- acute rhinosinusitis
- acute cough/acute bronchitis.

- 2.2.6 One recommendation (recommendation 1.1.1) is to offer a clinical assessment at the first face-to-face contact in a primary care setting. Another recommendation (recommendation 1.1.7) is to offer an immediate antibiotic prescription and/or further investigation to patients who are systemically very unwell or at risk of serious illness or developing complications. Both recommendations are considered to be current practice and are considered to have no resource implication.
- 2.2.7 Four recommendations (recommendations 1.1.2, 1.1.4, 1.1.5 and 1.1.6) concern offering patients advice, information and reassurance regarding their respiratory tract infection and antibiotic prescribing options. These recommendations are considered to have no resource implication because such advice and information should be routinely offered as part of a consultation.
- 2.2.8 We have limited the consideration of costs and savings to direct costs to the NHS that will arise from implementation. We have not included consequences for the individual, the private sector or the not-for-profit sector. Where applicable, any realisable cost savings arising from a change in practice have been offset against the cost of implementing the change.

3 Cost of significant resource-impact recommendations

3.1 *Antibiotic prescribing for self-limiting respiratory tract infections in adults and children*

Background

3.1.1 A no antibiotic prescribing strategy or a delayed antibiotic prescribing strategy should be agreed for patients with the following conditions:

- acute otitis media
- acute sore throat/acute pharyngitis/acute tonsillitis
- common cold
- acute rhinosinusitis
- acute cough/acute bronchitis (recommendation 1.1.3).

Assumptions made

3.1.2 The model is based on annual incidence and patient number estimates (see tables 1 and 2).

3.1.3 Clinical opinion has provided estimates for the proportion of patients currently receiving each of the three antibiotic management strategies outlined in the guidance (no antibiotic prescribing, delayed antibiotic prescribing and immediate antibiotic prescribing). These estimates have been used to inform the national costing assumptions. The proportion of patients receiving each of the three prescribing strategies may vary locally.

3.1.4 Based on clinical opinion, it is assumed that of those patients who receive a delayed antibiotic prescription, approximately 40% redeem their prescription and 60% do not collect their prescription.

3.1.5 The current and future prescribing level should be assessed locally.

Table 3 Proportion of patients adopting each antibiotic prescribing strategy

	Current treatment	Current treatment	Current treatment	Future treatment	Future treatment	Future treatment
	Immediate prescribing	No prescribing	Delayed prescribing	Immediate prescribing	No prescribing	Delayed prescribing
Acute otitis media	80%	10%	10%	70%	20%	10%
Acute sore throat/acute pharyngitis/acute tonsillitis	65%	20%	15%	50%	25%	25%
Common cold	30%	65%	5%	10%	80%	10%
Acute rhinosinusitis	95%	0%	5%	90%	4%	6%
Acute cough/acute bronchitis	80%	10%	10%	65%	15%	20%

3.1.6 Health Protection Agency guidance (2006) and clinical opinion have informed the assumptions concerning typical antibiotic prescribing strategies for the treatment of respiratory tract infections, the drug, dosage and duration of treatment (see appendix C). The typical drugs assumed to treat respiratory tract infections in primary care are: amoxicillin, clarithromycin, phenomethylpenicillin and erythromycin.

3.1.7 It is assumed that 4% of patients are allergic to penicillin-based antibiotics, and therefore can be prescribed other forms of antibiotic, and the remaining 96% are not allergic to penicillin-based antibiotics (Salkind et al. 2001).

3.1.8 It is assumed that 78% of patients receiving a primary care consultation within either a general practice setting or a walk-in centre in England are older than 18 years, with the remaining 22% being 18 years and younger (Office of National Statistics, 2006).

3.1.9 All drug prices are taken from the PPA NHS electronic Drug Tariff: www.ppa.org.uk/edt/May_2008_version2/mindex.htm (accessed

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27/05/08), and do not include VAT, which is payable for drugs used in secondary care.

Cost summary

3.1.10 The change in cost of reducing antibiotic prescribing for adults and children following a GP- or nurse-led consultation in primary care is shown in table 4.

Table 4 Change in cost of reducing antibiotic prescribing

	Course cost (£)	Current		Proposed		Change	
		Numbers of patients (000s)	Cost (£000)	Numbers of patients (000s)	Cost (£000s)	Numbers of patients (000s)	Saving (£000s)
Acute otitis media	1.15	447	514	394	453	-53	-61
Acute sore throat/acute pharyngitis/acute tonsillitis	8.53	2,524	21,522	2,133	18,187	-391	-3,335
Common cold	1.23	113	139	50	61	-63	-78
Acute rhinosinusitis	1.23	743	911	708	868	-35	-43
Acute cough/acute bronchitis	1.61	765	1,230	665	1,069	-100	-161
Totals			24,316		20,638		-3,678

Other considerations

3.1.11 If the number of patients who receive a delayed antibiotic prescription strategy or a no antibiotic prescribing strategy is higher than assumed above, the savings associated with this recommendation are expected to increase. Conversely, if the number of patients who receive a delayed antibiotic prescribing strategy or no antibiotic prescribing strategy is lower, the savings outlined above will decrease.

3.1.12 Antibiotic prescribing for emergency departments is not included in the costing model because of a lack of data and the estimated small number of patients receiving treatment at an emergency National costing report: Respiratory tract infections – antibiotic prescribing

department; therefore savings may be higher than those outlined above.

- 3.1.13 Loss of income from prescription charges applicable to these medicines has not been estimated, this only applies to people who pay for their prescriptions.
- 3.1.14 The proportion of patients receiving each antibiotic prescribing management strategy should be assessed locally as they may differ from the estimates within the costing model where we have been conservative.

3.2 *Benefits and savings*

- 3.2.1 Compared with no prescribing, a delayed prescribing strategy offers a 'safety net' for a small proportion of patients who develop complications and require more resource-intensive treatment, which may include repeated primary care consultations or admission to hospital.
- 3.2.2 There may be a reduction in the risk of adverse effects of antibiotic use, notably the risk of antibiotic resistance in the general population and the cost associated with this complication.
- 3.2.3 There may be a reduction in the rate of C. Difficile or MRSA, caused by the overuse of antibiotics in the community. The cost of treating such infections, within an acute trust, setting may be significant.
- 3.2.4 Compliance with NICE guidance is one of the criteria indicating good risk reduction strategies, and in combination with meeting other criteria could lead to a discount on contributions to the NHS Litigation Authority schemes, including CNST.

4 Sensitivity analysis

4.1 Methodology

- 4.1.1 There are a number of assumptions in the model for which no empirical evidence exists. Because of the limited data, the model developed is based mainly on discussions of typical values and predictions of how things might change as a result of implementing the guidance and is therefore subject to a degree of uncertainty.
- 4.1.2 As part of discussions with practitioners, we discussed possible minimum and maximum values of variables, and calculated their impact on costs across this range.
- 4.1.3 Wherever possible we have used the national tariff plus market forces factor to determine cost. We used the variation of costs for the 25th and 75th percentiles from reference costs compared with the reference cost national average as a guide to inform the maximum and minimum range of costs.
- 4.1.4 It is not possible to arrive at an overall range for total cost because the minimum or maximum of individual lines would not occur simultaneously. We undertook one-way simple sensitivity analysis, altering each variable independently to identify those that have greatest impact on the calculated total cost.
- 4.1.5 Appendix B contains a table detailing all variables modified and the key conclusions drawn are discussed below.

4.2 Impact of sensitivity analysis on costs

Change in proportion of patients using a delayed antibiotic prescribing strategy for acute sore throat/acute pharyngitis/acute tonsillitis

- 4.2.1 Varying the change in the proportion of patients adopting a delayed antibiotic prescribing strategy for acute sore throat/acute pharyngitis/acute tonsillitis between 0% and 15% results in a cost saving varying from £3.0 million to £4.6 million.

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Change in proportion of patients using an immediate antibiotic prescribing strategy for acute sore throat/acute pharyngitis/acute tonsillitis

4.2.2 Varying the change in the proportion of patients adopting an immediate antibiotic prescribing strategy for acute sore throat/acute pharyngitis/acute tonsillitis between 3% and 15% results in a cost saving varying from £1.5 million to 3.7.million.

5 Impact of guidance for commissioners

5.1.1 The costs associated with implementing this guideline will be within primary care, and hence do not fall within the scope of 'Payment by Results'. Potential cost saving may accrue in an acute trust setting with fewer patients receiving treatment for infections including C. Difficile and MRSA.

5.1.2 The prescribing of antibiotics for respiratory tract infections falls into programme budgeting category 01X 'Infectious diseases'.

6 Conclusion

6.1 Total national cost for England

6.1.1 Using the significant resource-impact recommendation shown in table 5 and assumptions specified in section 3 we have estimated the annual realisable savings of fully implementing the guideline in England to be £3.7 million. Table 5 shows the breakdown of costs resulting from changes in antibiotic prescribing strategies.

Table 5 Summary of resource impact

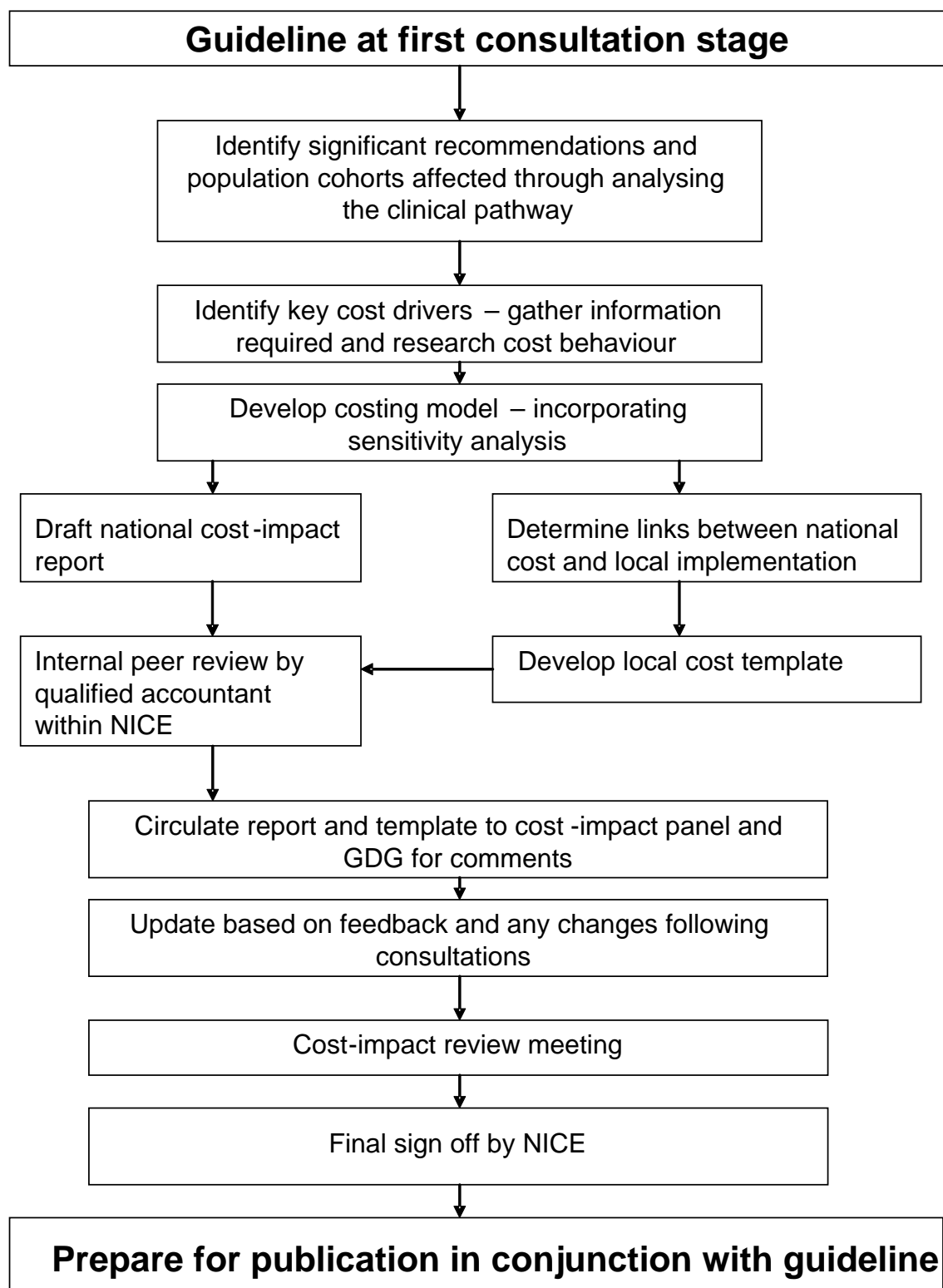
Movement in resources	Resource impact (£000s)
Current cost of antibiotics	24,316
Future cost of antibiotics	20,638
Total change in resources	-3,678

- 6.1.2 There may be other unquantifiable savings from a reduction of C. Difficile and MRSA.
- 6.1.3 We applied reality tests against existing data wherever possible, but this was limited by the availability of detailed data. We consider this assessment to be reasonable, given the availability of data regarding diagnosis and treatment paths and the time available. However, the savings presented are estimates and should not be taken as the full saving of implementing the guideline.

6.2 Next steps

- 6.2.1 The local costing template produced to support this guideline enables organisations such as primary care trusts (PCTs) or health boards in Wales and Northern Ireland to estimate the impact locally and replace variables with ones that depict the current local position. A sample calculation using this template showed that a population of 100,000 could expect to incur additional savings of £7,300. Use this template to calculate the cost of implementing this guidance in your area.

Appendix A. Approach to costing guidelines



Appendix B. Results of sensitivity analysis

Assessment of sensitivity costs to a range of variables							
Parameter varied	Baseline value	Minimum value	Maximum value	Baseline costs £000s	Minimum costs £000s	Maximum costs £000s	Change £000s
Unit cost of amoxicillin antibiotic (250 mg)	0.04	0.03	0.05	-3,678	-3,620	-3,736	-116
Unit cost of clarithromycin antibiotic (250 mg)	0.28	0.26	0.3	-3,678	-3,677	-3,680	-3
Unit cost of phenoxymethylpenicillin antibiotic (250 mg)	0.12	0.1	0.14	-3,678	-3,642	-3,733	-91
Unit cost of erythromycin antibiotic (250 mg)	0.18	0.16	0.2	-3,678	-3,676	-3,681	-5
Change in proportion of patients receiving a delayed antibiotic prescribing strategy for acute otitis media	0%	0%	10%	-3,678	-3,678	-3,715	-37
Change in proportion of patients receiving a delayed antibiotic prescribing strategy for acute sore throat/acute pharyngitis/acute tonsillitis	10%	0%	15%	-3,678	-3,072	-4,588	-1,516
Change in proportion of patients receiving a delayed antibiotic prescribing strategy for common cold	5%	0%	5%	-3,678	-3,678	-3,687	-9
Change in proportion of patients receiving a delayed antibiotic prescribing strategy for acute rhinosinusitis	1%	0%	13%	-3,678	-3,673	-3,729	-56
Change in proportion of patients receiving a delayed antibiotic prescribing strategy for acute cough/acute bronchitis	10%	0%	15%	-3,678	-3,649	-3,766	-117
Change in proportion of patients receiving an immediate antibiotic prescribing strategy for acute otitis media	10%	5%	19%	-3,678	-3,648	-3,734	-86
Change in proportion of patients receiving an immediate antibiotic prescribing strategy for acute sore throat/acute pharyngitis/acute tonsillitis	15%	3%	15%	-3,678	-1,496	-3,678	-2,182
Change in proportion of patients receiving an immediate antibiotic prescribing strategy for common cold	20%	10%	21%	-3,678	-3,652	-3,681	-29
Change in proportion of patients receiving an immediate antibiotic prescribing strategy for acute rhinosinusitis	5%	5%	9%	-3,678	-3,678	-3,701	-23
Change in proportion of patients receiving an immediate antibiotic prescribing strategy for acute cough/acute bronchitis	10%	10%	15%	-3,678	-3,678	-3,721	-43

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Appendix C. Antibiotic dose, frequency and duration

Antibiotics for respiratory tract infections (adult dosage – aged 18 years and over)

Respiratory tract infection	Antibiotic	Dose and frequency	Duration (days)	Treatment cost £
Acute otitis media	Amoxicillin	500 mg every 8 hours	5	1.20
	Clarithromycin	250 mg every 12 hours	5	2.80
Acute sore throat/acute pharyngitis/acute tonsillitis	Phenoxymethylpenicillin	500 mg every 6 hours	10	9.60
	Erythromycin	500 mg every 6 hours	10	14.40
Common cold	Amoxicillin	500 mg every 6 hours	5	1.60
	Erythromycin	500 mg every 6 hours	5	7.20
Acute rhinosinusitis	Amoxicillin	500 mg every 8 hours	5	1.20
	Clarithromycin	500 mg every 12 hours	5	5.60
Acute cough/acute bronchitis	Amoxicillin	500 mg every 8 hours	7	1.68
	Clarithromycin	250 mg every 12 hours	7	3.92

Antibiotics for respiratory tract infection (Child dosage – 3 months to 18 years)

Respiratory tract infection	Antibiotic	Dose and frequency	Duration (days)	Treatment cost £
Acute otitis media	Amoxicillin	250 mg every 8 hours	5	0.60
	Clarithromycin	125 mg every 12 hours	5	4.00
Acute sore throat/acute pharyngitis/acute tonsillitis	Phenoxymethylpenicillin 3 months–1 year	62.5 mg every 6 hours	10	1.20
	Phenoxymethylpenicillin 1–6 years	125 mg every 6 hours	10	2.40
	Phenoxymethylpenicillin 6–18 years	250 mg every 6 hours	10	4.64
	Erythromycin 3 months–2 years	125 mg every 6 hours	10	3.60
	Erythromycin 2–18 years	250 mg every 6 hours	10	7.20
Common cold	Amoxicillin	250 mg every 6 hours	5	0.80
	Erythromycin	250 mg every 6 hours	5	7.20
Acute rhinosinusitis	Amoxicillin	500 mg every 8 hours	5	0.60
	Clarithromycin	500 mg every 12 hours	5	2.80
Acute cough/acute bronchitis	Amoxicillin	250 mg every 12 hours	7	0.84
	Clarithromycin	125 mg every 12 hours	7	5.60

Health Protection Agency guidance (2006) and clinical opinion has informed the assumptions concerning the drug, duration, dose and frequency of antibiotic prescribed in a primary care setting.

All drug prices are taken from the PPA NHS electronic drug tariff (accessed 27/05/08).

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