The natural history of acute cough in children aged 0 to 4 years in primary care: a systematic review

Alastair D Hay and Andrew D Wilson

SUMMARY

Professional and parental uncertainty regarding the natural history of cough and respiratory tract infection (RTI) in pre-school children may in part be responsible for the high consultation, reconsultation, and antibiotic prescribing rates in this age group. The aim of the study was to review the evidence about the natural history of acute cough in children aged between 0 and 4 years presenting to primary care in terms of illness duration and complications. The study was a systematic review, with qualitative and quantitative data synthesis, of control and placebo arms of systematic reviews, randomised controlled trials (RCTs), and cohort studies set in primary care. Searches were done of MEDLINE (between 1966 and June 1998), EMBASE (between 1988 and September 1998), and the Cochrane Library databases, using the MeSH terms 'respiratory tract infection', 'cough', and 'bronchitis', and the textwords 'cough', 'bronchitis', and 'chest infection', limited to children aged between 0 and 4 years, and English language articles. Eight RCTs and two cohort studies met the review criteria. At one week, 75% of children may have improved but 50% may be still coughing and/or have a nasal discharge. At two weeks up to 24% of children may be no better. Within two weeks of presentation, 12% of children may experience one or more complication, such as rash, painful ears, diarrhoea, vomiting, or progression to bronchitis/pneumonia.

This review offers parents and clinicians more prognostic information about acute cough in pre-school children. Illness duration may be longer and complications higher than many parents and clinicians expect. This may help to set more realistic expectations of the illness and help parents to decide when and if to reconsult. This information may be useful to those designing patient information and self-help resources.

Keywords: *cough; respiratory tract infections; children, pre-school; meta-analysis; natural history.*

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Introduction

COUGH is the most common problem managed by general practitioners (GPs) in the United Kingdom (UK), and it is more common in pre-school children than in any other age group.[1] Two out of three children aged between 0 and 4 years visit their GP at least once a year with an acute respiratory infection[2] and up to three-quarters of these will have a cough.[3] Given that the UK population of children aged between 0 and 4 years is four million, this accounts for at least two million face-to-face consultations for new episodes of cough annually, with up to half a million reconsultations[4] and many more episodes of respiratory illness not currently seen by GPs.[5] Estimating the cost of GP time at £7.30 per consultation and antibiotics at £3 per prescription[6] (assuming a 40% prescribing rate),[4] the crude annual National Health Service (NHS) cost of treating cough in pre-school children is at least £20 million. Consultation rates for all problems in pre-school children have risen,[7] and this rise may accelerate with the increasing accessibility of 'walk in'[8] primary care clinics and NHS Direct services.[9] In a recent evaluation of NHS Direct services in three regions, 22% of all calls concerned pre-school children.[10]

Most coughs in pre-school children are caused by respiratory tract infections (RTIs), with around 7% caused by asthma.[11] One study found that the most common diagnostic labels given to pre-school children with RTI and cough were: 'cold or sinusitis' (33%), 'bronchitis' (15%), 'tracheitis' (12%), 'pneumonia or bronchiolitis' (12%), 'pharyngitis' (10%), 'influenza' (9%), 'laryngitis or croup' (7%), and otitis media (2%).[3] However, Howie *et al*[12] demonstrated large variations between doctors in the frequency of diagnostic labels and treatments offered to adults presenting to primary care with respiratory tract illness. The variation may be more marked in pre-school children because they present with fewer symptoms than older children and adults, they rarely expectorate sputum with their cough,[13] and it is not possible to establish the presence or absence of subjective symptoms such as chest pain and sore throat. Because precise diagnoses can often only be made in retrospect, it has been recommended that research of acute problems in primary care be based on presenting symptoms and disease categories.[14]

Despite the lack of evidence of effectiveness in improving outcome or reducing complications of RTI in children,[15] concerns regarding rising antibiotic resistance rates[16,17] and the relationship between the 'medicalisation' of illness and the increasing likelihood of further consultation,[18,19] antibiotic prescribing rates for cough remain high. Estimates vary between countries; for example, the estimate is 40% for chil-

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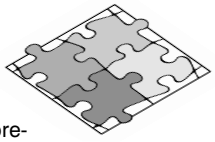

What do we know?

Cough generates large numbers of consultations and reconsultations in pre-school children in primary care. Professional and parental uncertainty regarding its natural history may be partly to blame. Parents want accessible and specific information to help them look after their children.

What does this paper add?

One in four pre-school children presenting to primary care with cough are no better after two weeks and one in eight may experience one or more complications. This prognostic information may help to set more realistic expectations and enable parents to decide when and if to consult.

dren with upper respiratory tract infection (URTI) in the UK,[4] and 70% for children with cough in the United States of America (USA).[20] Over half of all pre-school children in England and Wales received an antibiotic in 1996,[21]

Stott[4] has suggested that 'more realistic parental expectations might be set if doctors warned parents about symptoms such as cough, diarrhoea and vomiting that are commonly associated with upper RTIs in children'. Kai[22] found that parents of pre-school children want 'accessible and specific information to support their negotiation of children's illness'. Professional and parental uncertainty regarding the natural history of cough and RTI in pre-school children may in part be responsible for the high consultation, reconsultation and antibiotic prescribing rates in this age group. Some parents harbour extreme concerns when their children cough, such as 'death from choking on phlegm or vomit, asthma or cot death'.[23,24] Imparting knowledge and advice is one method of managing increasing demands on health services,[25] by empowering self-care and tempering rising expectations.[26] The aim of this paper is to review the evidence about the natural history of acute cough in children aged between 0 and 4 years of age presenting to primary care in terms of illness duration and complications.

Method

The review objectives and methods were examined by peers as part of the departmental review process. For study selection this review used the symptom of cough or undifferentiated acute respiratory tract infection with cough (UARTIC). Davy[27] has defined UARTIC as a cough which has failed to differentiate into a recognised clinical picture with known associated bacterial or viral aetiology, such as croup, whooping cough, pneumonia or bronchiolitis. UARTIC includes labels such as 'upper RTI', 'bronchitis', 'chest infection', and 'post nasal drip'.

Recommended[28] search strategies were used to identify studies which might describe the natural history of cough in pre-school children presenting to primary care. These included the control or placebo arms of RCTs, systematic reviews of RCTs, and cohort studies. Searches of MEDLINE (between 1966 and June 1998), EMBASE (between 1988 and September 1998) and the Cochrane Library databases, using MeSH terms 'respiratory tract infection', 'cough', and 'bronchitis', and the textwords 'cough', 'bronchitis', and 'chest infection' were limited to children aged between 0 and 4 years and English language articles.

Figure 1 summarises the method used to identify the articles. The corresponding author screened over 6000 titles on-line, and the grey literature. Because resources were limited, it was not feasible for a second reviewer to examine these titles. Four hundred and five relevant abstracts were printed for closer scrutiny. Of these, 21 studies fell within the inclusion criteria and 384 studies were excluded. 'Not UARTIC' refers to studies examining children with tuberculosis, pertussis, bronchiolitis, cystic fibrosis, and recurrent wheezing. 'Community studies' refers to those studies in which parents were recruited in the community and did not have to make the decision to consult a primary care clinician. These studies were excluded because we believe that the natural history of UARTIC may differ between those who consult and those who do not. This is supported by one study, which found a median duration of cough of 5.0 days in those who consult and 3.4 days in those who do not consult.[29] Studies based in developing countries were excluded because we wanted the results to be generalisable to primary care in developed countries, and children in the developing world experience higher rates of morbidity and mortality from RTIs than those in developed countries.[30]

Full papers were requested for the remaining 21 studies. Eleven were excluded at this stage. The remaining studies were independently assessed by two of the authors for study quality and data extracted. Differences were discussed and agreement reached by consensus. As quality scoring systems are subject to bias,[31] we decided to extract all available data which reflect potential sources of bias and present these for the reader to make their own judgement of the study quality.

As only two studies exclusively recruited children between 0 and 4 years of age,[32,33] it was decided to retain papers in the review which included the specified age range, but which also included older children. Similarly, as some studies failed to report recruitment and attrition rates, it was decided to retain all papers. Studies in which symptomatic treatment was allowed were included, as it has been shown that they make little impact on the course of most illnesses.[34] Outpatient or private clinic studies in the USA were included because of the primary care function they may perform.

Before meta-analysis of complication rates was considered, clinical definitions were examined and tests of homogeneity were performed. Similar complication definitions were used between authors. These were: the development of new symptoms or signs in the respiratory system denoting a progression of illness, such as tonsillitis, otitis media, bronchitis, or pneumonia; the development of a new non-respiratory system symptom, such as rash, diarrhoea, or vomiting; or, in one study,[35] cough and fever lasting longer than 14 days. Homogeneity was tested by looking for overlap of the 95% confidence limits (calculated using EpiInfo 6 exact binomial calculation)[36] on a graphic display. This demonstrated that the two non-antibiotic trials had 95% confidence limits outside the other studies (Table 4). Hutton[33]

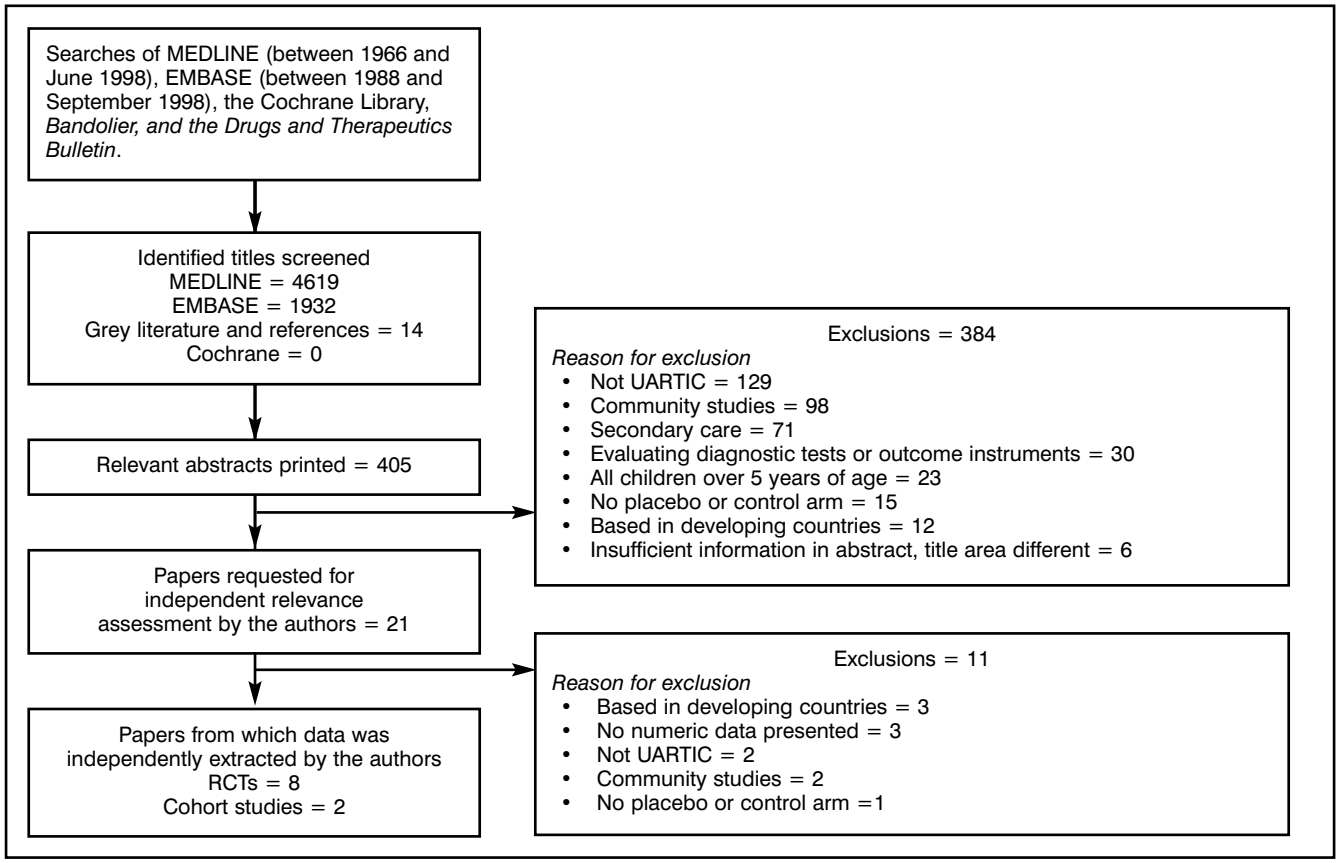

Figure 1. Flow chart showing the number of studies identified and reasons for exclusion.

had the lowest rate and may have included children with more mild illness, and Taylor,[37] which had the highest rate, combined side effects and complications. Chi-square testing with (*P* 0.01) and without (*P* = 0.11) the Hutton and Taylor studies gave further evidence of statistical homogeneity for complication rates in the remaining studies. Complication data were combined for quantitative synthesis by summing numerators (number with any complication) and denominators (number of children at risk) across the homogeneous studies and calculating the 95% confidence limits around this proportion. Meta-analysis was not attempted for specific complications as too few data existed for meaningful tests of homogeneity.

Results

Ten studies met the review criteria. These comprised eight RCTs of antibiotics or symptomatic treatments for UARTIC and two prospective observational cohort studies. Table 1(a) and 1(b) summarise the extracted data. Pre-school children form the majority age group, representing 65% of all children in the review where age data were presented. In the other studies, the mean ages for Todd[38] and Taylor[37] were 2.5 and 4.9 years, respectively.

The studies met the UARTIC criteria, although there were some minor variations in inclusion criteria. Taylor (1977)[39] also included children with croup, Taylor (1993)[37] included children with a significant night-time cough of less than two weeks' duration, and Gulbrandsen[40] included children who attended or contacted the surgery by telephone with otitis media or pneumonia. Hardy[35] stipulated at least 12 hours' fever duration at presentation. From previous work[3] it can be estimated that 65% of the children included in the studies had UARTIC.

Recruitment rates were not reported in four studies and varied from between 73% and 100% in the others. Most trial authors did not state whether control or placebo children received symptomatic treatment. Hutton[33] asked parents to give nothing, and Hardy[35] allowed 'routine care for fever', aspirin (now contraindicated in children under the age of 12 years), sponge bath or 'tepid pack'. In the cohort studies, Stott[4] found that 40% received antibiotics, 30% cough mixtures or decongestants, 30% advice alone, and Gulbrandsen[40] gave advice, explanation, analgesics, ephedrine mixtures or vasoconstrictor nose drops if well, and penicillin or erythromycin in 42% if there were 'signs of exacerbation'.

Despite its potential relationship to illness duration after recruitment, only the Gulbrandsen study[40] presents illness duration at recruitment. Forty-nine per cent had been unwell for less than four days, while 16% had been unwell for more than two weeks. Follow-up rates varied from between 63% and 100% and depended on study design, although two studies did not report these data. Ackerman[32] achieved the most comprehensive follow-up (100% at 28 days). Observation of the groups varied between studies in terms of duration of follow-up (range = 2 to 28 days) and who initiated repeat consultations (parent or physician). Both of these factors are likely to affect reported complication rates

Table 1(a).Characteristics of included studies.

Study ID	Methods	Age group of participants (percentage <5 years of age)	Inclusion criteria	Exclusion criteria	Recruitment rates (R)[a] Follow-up rates (F)[b]	Duration of follow-up
Hardy *et al* (1956)[35]	Randomised placebo controlled trial (RPCT) [of various antibiotics, outpatients, USA[c]	<14 years (78%)	Fever (≥38°C) and nasopharyngitis and no other abnormalities on physical examination	None stated	No data given	14 days
Townsend EH *et al*[44]	RPCT of various antibiotics, private paediatric practice, USA	2 months–12 years (not available)	Suspected of viral respiratory infection, e.g. symptoms of cough, fever, headache and 'few objective signs indicating bacterial infection'	Measles, herpangina, tonsillitis, otitis media, pneumonia or presumed bacterial infection	R: 845/845 (100%) F: 303/303 (100%)	'Seen on at least two visits during illness, most complications said to occur on days 3 to 4', no other data presented
Townsend EH *et al*[41]	RPCT of various antibiotics, private paediatric practice, USA	0–12 years (74%)	Febrile respiratory illness (with respiratory symptoms and signs) assumed to be viral	Streptococcal sore throats, pertussis, roseola or presumed bacterial infection	R: 781/795 (98%) F: 245/358 (68%) Temperature cards returned, on which illness duration based	Not stated
Ackerman *et al*[32]	RPCT of penicillin or tetracycline, army dispensary, USA	3–12 months (100%)	Acute change in health, undifferentiated symptoms and signs of respiratory disease (rhinorrhoea, nasal congestion, pharyngeal erythema, cough, rhonchi or nasal breathing) and rectal temperature >37.5°C	Pneumonia, croup, bronchiolitis, exudative tonsillitis, otitis media, fever without respiratory disease, or 'persistent' respiratory symptoms	R: 60 consecutive cases F: 20/20 (100%)	Physician follow-up at 2, 7, 14, 21 and 28 days
Taylor *et al*[39]	RPCT of amoxycillin or co-trimoxazole, primary care, New Zealand	2–10 years (n/a)	'Presumed viral infections': nasopharyngitis, pharyngotonsillitis, bronchitis, and croup	Clinical diagnosis of otitis media or pneumonia and β-haemolytic Streptococcus detected on throat swab	R: not stated F: 7/66 (11%) withdrawn because thought to require antibiotics. Thereafter 59/59 followed up	8 days (physician assessment)
Todd *et al*[38]	RPCT of cephalexin and/or antihistamine-decongestant, two paediatric offices and one army paediatric clinic, USA	>2 months (n/a)	Purulent anterior nasal discharge	Abnormal tympanic membrane, nasal foreign body, another indication for antibiotic (at entry and during study), history of allergic rhinitis, allergy to study drug	R: not stated F: 11/35 (31%) withdrawn if developed more severe illness, drug side effect, compliance not confirmed or failing to attend follow-up visit or group A Streptococcus on throat swab	5–6 days (physician and parent assessment)

[a]Calculated from placebo/control *and* intervention groups. [b]Calculated from placebo/control group unless otherwise stated. [c]Only 'clinic group' data used. Continued next page.

Table 1(a) continued. Characteristics of included studies.

Study ID	Methods	Age group of participants (percentage <5 years of age)	Inclusion criteria	Exclusion criteria	Recruitment rates (R)[a] Follow-up rates (F)[b]	Duration of follow-up
Hutton *et al* [33]	RPCT of antihistamine-decongestant. Paediatric walk-in and primary care clinics, USA	>6 months and <5 years (100%)	'Symptoms of a cold' with physician assessment to ensure presence of rhinorrhoea or nasal congestion	Temperature >38.9 °C, vomiting, >3 loose stools/24 hours, stridor, stools/24 chest retractions, antibiotics prescribed, abnormal laboratory tests, history of seizures or neurological problem	R: 96/132 (73%) F: interviews available for 24/27 (89%) placebo and 30/33 (91%) no-treatment groups	2 days (telephone interviews)
Taylor *et al*[37]	RPCT of cough suppressant. Private paediatric practice, USA	18 months–12 years (n/a)	'Significant night cough' lasting <14 days where parent rates cough as often, i.e. one prolonged coughing episode or about 10–20 coughs during the night	Asthma, cystic fibrosis, broncho-pulmonary dysplasia, reactive airway disease or need for antibiotics or bronchodilators during study	R: not stated F: 49/57 (86%) for all groups	3 days (parental questionnaire)
Stott NCH[4]	Prospective cohort study. Single GP surgery, Wales, UK	<10 years (58%)	URTIs, i.e. cough, tonsillitis, coryza, 'non-specific URTI'	Otitis media ('minor degrees of infection of eardrums associated with dominant diagnosis of URTI' acceptable)	R: 965 consecutive cases F: 965 notes examined	New symptoms (lasting <14 days), delayed resolution (at 14 days) and at 6 months for further URTI
Gulbrandsen *et al*[40]	Prospective cohort study. Primary care, Western Norway	<16 years (59%)	Attending or contacting by telephone with 'RTI' (URTI, influenza, tonsillitis, sinusitis, otitis media, laryngitis, bronchitis or pneumonia)	Visitors, known chronic suppurative or serous otitis media	R: All RTIs for 4 months, all GPs F: 57/90 (63%) patient forms (from 80 children) returned. 84% returned for first visit, 62% for at least two visits	Follow-up at surgery requested at 5–7 and 21–28 days or more often

[a]Calculated from placebo/control *and* intervention groups. [b]Calculated from placebo/control group unless otherwise stated. [c]Only 'clinic group' data used.

Table 1(b). Outcome data.

Study ID	Illness duration (physician-measured outcomes)	Illness duration (parent-measured outcomes)	Complication rate
Hardy *et al*[35]	Recovery times mean[a] = 5.8 days with no complications and 9.1 days with complications. No indication of how illness duration is defined	No parent-defined outcomes measured	Complications (tonsillitis, paratonsillar abscess, laryngotracheitis, stomatitis, cough and fever >14 days, otitis media (2)[e], cervical adenitis (1)[e], pneumonia (6)[e], bronchitis (1)[e] in 10/68 (15%). 0–2 years = 4/35 (11%), 2–4 years = 3/18 (17%) and 4–13 years = 3/15 (20%)
Townsend EH *et al*[44]	None measured	None reported	Complications (new sign or symptom of respiratory system, e.g. otitis media, pneumonia, tonsillitis) in 27/303 (8.9%).

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Table 1(b) continued. Outcome data.

Study ID	Illness duration (physician-measured outcomes)	Illness duration (parent-measured outcomes)	Complication rate
Townsend EH *et al*[41]	'Complications' may only be recorded in those reconsulting	Mean[a] illness duration (days with fever >37.7 °C) in those without complications = 3.6 days, with complications = 3.7 days	Complications (new symptoms or signs referable to respiratory system, e.g. rales, otalgia, tonsillar exudate) in 53/358 (15%). Eight defined as: otitis media (3); purulent nose or throat (2); purulent tonsillitis (2); purulent conjunctivitis (1)
Ackerman *et al*[32]	At 2 days 12/20 (60%) were improved; 4/20 (20%) were unchanged; 4/20 (20%) were worse. Mean[a] fever duration = 2–3 days	Recovery rates from 'continuous respiratory morbidity': 15/20 (75%) at 7 days, 16/20 (80%) at 14 days, 19/20 (95%) at 21 days and 20/20 (100%) at 28 days. Mean[a] duration = 7.5 days, median = 5 days. Fever duration: 1–2 days = 11/20 (55%), 3–5 days = 9/20 (45%), 6+ days = 0/20 (0%)	1/20 (5%) URTI progressed to bronchitis, 0/20 (0%) progressed to pneumonia or bronchiolitis. Before the end of illness there were: otitis media = 1/20 (5%), vomiting or diarrhoea = 1/20 (5%), maculo-papular rash = 4/20 (20%), furuncles = 1/20 (5%)[b]
Taylor *et al*[39]	Return consultation rate within 8 days in 10/66 (15%).	At day 8 appetite had normalised in 51/59 (86%) and activity in 57/59 (97%). At day 8, 22/59 (37%) had clear runny nose, 9/59 (15%) had purulent runny nose, 3/59 (5%) had sore throat, 29/59 (49%) cough, 6/59 (10%) wheezy chest and 1/59 (2%) hot and feverish	All complications: 11/59 (19%). Diarrhoea in 6/59 (10%), rash in 6/59 (10%), vomiting in 7/59 (12%) and painful ears in 8/59 (14%)[b]
Todd *et al*[38]	15/24 (63%) with nasal discharge at 5–6 days	Results limited to comparisons between treatment groups	2/24(8%) with complications (otitis media or more severe illness)
Hutton *et al* [33]	None measured	Better[c] at 2 days (parental overall impression): 17/24 (71%) placebo; 17/30 (57%) no treatment	1/24 placebo + 0/30 no treatment = 1/54 (2%) child reported loose stools
Taylor *et al*[37]	None measured	Study-specific symptom scores presented. No duration or overall impression data given	'Side effects' reported in 7/13 (54%); drowsiness 3/13 (23%); diarrhoea 3/13 (23%)[b]
Stott[4]	232/965 (24%) had a return consultation during the same episode. 71/965 (7%) had a routine return consultation. 61/965 (6%) had a complication. 50/965 (5%) had new symptoms <14 days. 27/965 (3%) had delayed resolution, most commonly cough. 23/965 (2%) had a wrong diagnosis (measles, mumps, chicken pox, rubella, tonsillitis). 438/965 (45%) consulted with further URTI within 6 months	None reported	At reconsultation complications (otitis media, lower RTI, more toxic/ill, penicillin allergy, middle RTI, otitis externa, acute nephritis, febrile convulsion) = 61/965 (6%) and 'new symptoms' <14 days (cough, diarrhoea and vomiting, bronchospasm, rash, abdominal pain, aphthous ulcers) = 50/965 (5%)
Gulbrandsen *et al*[40]	Physician assessment as recovered were: 46/90 (51%) at 7 days, 68/90 (76%) at 14 days, 74/90 (82%) at 21 days and 84/90 (93%) at 28 days[c]	Recovery rates (symptom free) were: 7/90 (8%) at 7 days, 31/90 (34%) at 14 days, 42/90 (47%) at 21 days and 63/90 (70%) at 28 days.[c] At 20 days 10% were still experiencing reduced appetite, 5% reduced activity, 20% temperature, 20% nasal discharge, 10% cough, 5% pain on swallowing and 5% ear pain[d]	Only drug reactions recorded

[a]The mean is problematic because the proportion of children recovering per day is not normally distributed, but positively skewed. In these circumstances the preferred summary statistic should be the median. [b]Event rates may count same individual more than once. [c]The denominator should change to reflect increasing attrition and 'cases' are not independent. [c]'Better' is a poor descriptor because it is not clear whether it means the illness has improved, resolved, or either. [d]These data were presented graphically; numeric conversion is therefore approximate. [e]These categories are mutually exclusive.

in addition to participating in a trial. For example, Townsend[41] appeared to report complications only in those children whose parents chose to reconsult. Physician and parent-measured outcomes were separated owing to the differing perspectives these observers may have on the point of recovery.

Illness duration

Table 2 shows the proportion of children in whom the illness had improved or resolved in the 28 days following entry to the studies. Meta-analysis was not performed here as authors used differing illness duration definitions. As expected, the proportion of children improving or recovering increases with time, although up to 24% may not have improved or are worse two weeks post consultation, and up to 66% may still be experiencing symptoms. The Gulbrandsen[41] data suggest that parents report slower recovery than physicians, perhaps because of greater parental exposure to the child's symptoms.

Table 3 shows the symptom course of acute cough at between 1 to 2 days, 5 to 8 days, and at 21 days. Most of these data are derived from parent-held symptom diaries,[32,39] with the exception of some physician-recorded nasal discharge data from Todd.[38] This shows that nasal discharge and cough are still present in half of children at one week and between 10% and 20% at three weeks.

Four studies report fever duration data. In all studies parents were asked to record temperatures, although no method is described except by Ackerman[32] and Gulbrandsen,[40] who asked parents to record rectal temperatures twice daily. The Ackerman[32] study suggests a median temperature duration of between 1 and 2 days (Table 3). Taylor[40] reports that 2% were 'hot and feverish' on day 8. Mean temperature durations of 7.5 days[32] and 3.6 days[41] were also reported. A median summary statistic is preferable because the proportion of children recovering per day is positively skewed. Nevertheless, it suggests that fever may be prolonged in some children.

Complications

Table 4 summarises the rates for any complication, and the meta-analysis from the homogeneous studies suggests that 12% (10.6 to 13.6) of children can expect to experience one or more complications with acute cough, probably for the most part within two weeks of consulting.

Table 5 itemises the specific complication rates where authors presented the relevant data. They suggest that otitis media or painful ears is the commonest complication and around 10% may experience one or more of rash, diarrhoea or vomiting, and between 5% and 10% may progress to bronchitis or pneumonia. Bronchitis appears as both an inclusion criterion and a complication because cough in young children may be related to both upper or lower RTI, and bronchitis may reflect the progression from upper to lower RTI. No deaths were reported in any study control/placebo group. Taylor[39] reports that 15% of children returned before the arranged Day 8 follow-up, although because this was a placebo-controlled trial of antibiotics, parental anxiety regarding treatment allocation may have altered the reconsultation rate. In Stott's observational study[4] 24% returned during the same illness episode, 6% of whom had a complication, 5% new symptoms and 3% delayed resolution (most commonly cough).

Conclusion

The representativeness of this systematic review is limited by the selection of published English language articles only. Publication bias is unlikely to alter the results as only cohort, placebo or control groups of trials were included in the review. Relevant studies with ambiguous titles may also have been overlooked by a single reviewer and no attempt was made to contact study authors or pharmaceutical companies for further articles or data. While the review aimed to describe the natural history of acute cough in pre-school children, an estimated 35% of children studied were aged 5 years or more, and an estimated 35% may not have had a cough. To the authors' knowledge it is not known whether younger children experience a different natural history to older children, although it is known that pre-school children experience higher mean annual incidence rates of respiratory illness than older children[5] and in the UK consult their GP more frequently with acute RTI.[2]

The decision to exclude community studies in which parents did not have to consult a primary care clinician means that the results are generalisable only to consultations with children in primary care. It follows that the reliability of the data presented in this paper depends on illness behaviour remaining stable. Should thresholds to consult become lower, we might expect illness duration to fall.[29]

Biases may have distorted the results of the studies in this

Table 2. Percentage of illness improved or resolved with time.

Study author and study group size	Illness duration definition	1–2 days	5–8 days	14 days	20–21 days	28 days
Ackerman[32] (n = 20)	Parent-held symptom diary rating child's major symptom as improved or gone	60	75	80	95	100
Taylor[39] (n = 59)	Parent-held symptom diary recording normal activity and appetite		86			
Hutton[33] (n = 54)	Parental overall rating as 'better' at telephone assessment	63				
Gulbrandsen[40] (n = 90)	Parent-held symptom diary indicating recovery (freedom from symptoms)		8	34	47	70
Gulbrandsen[40] (n = 90)	Physician assessment as 'recovered'		51	76	82	93

review. Ethical considerations and clinical equipoise[42] may have led to the exclusion of both well and/or unwell children (45 to 100% recruitment rates) who may experience different complication rates and different illness duration.[43] Todd[38] and Taylor[39] excluded children thought to require antibiotics from analysis. Lead-time bias can occur when follow-up of groups does not begin at comparable stages in the natural history of the condition. This potential source of bias remains unquantified in this review as few studies report illness duration at recruitment, and this could lead to an over or underestimation of illness duration. Reasons for the attrition rates (between 0 and 38%) are not given, but may include illness resolution or hospital admission.

While overall illness had improved or resolved in 66% of children two days after consultation, nasal discharge or cough were still present in 50% one week after consultation. This may represent a higher symptom prevalence than might be expected by parents or clinicians. Authors did not separate 'improvement' from 'recovery' when presenting their results. Some parents may choose to reconsult because the child's illness has not resolved, despite improvement in their overall condition. Rates for any complication are high at 12% and this should be explained to parents. The number of children progressing to pneumonia or bronchitis is higher than the authors expected, but some of them may have received these labels in order to justify the use of a subsequent antibiotic.[20] These studies have not considered the children's or parents' perspective of quality of life or disruption to parental work or sleep, but instead focused on judgements about overall illness severity, specific symptoms and doctor-defined complications.

To the authors' knowledge, no study has described the professional or parental expectation of illness duration or severity or examined the relationship to reconsultation behaviour. However, this review offers parents and clinicians more precise information about the duration of illness and specific symptoms as well as likely complication rates, which may reassure both groups of the benign nature of the illness and help them decide when and if to reconsult. Given that many children still experience nasal discharge and cough one week after the consultation, it may be necessary to advise parents to delay reconsultation for these symptoms in an otherwise well child for two to three weeks. This information may be useful to GPs, nurse practitioners, health visitors, and those designing patient information and self-help resources.

Table 3. Symptom prevalence with time (%).

Assessment point	1–2 days	5–8 days	20–21 days[a]
Nasal discharge		55[40,39]	20[41]
Cough		49[40]	10[41]
Appetite abnormal		14[40]	10[41]
Wheezy chest		10[40]	
Sore throat		5[40]	5[41]
Activity abnormal		3[40]	
Temperature	55[33]	1[40,33]	20[41]
Ear pain			5[41]

[a]Interpret with caution: there are doubts regarding data validity in this study (fewer patient diaries returned than cases reported) and 37% attrition rate.

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Table 4. Percentage of children experiencing any complication.

Author and study group size	Duration of follow-up (days)	Percentage any complication (95% CI)	Used in meta-analysis?
Hardy[35] (n = 68)	14	14.7 (7.3–25.4)	Yes
Townsend[44] (n = 303)	Not stated	8.9 (5.9–12.7)	Yes
Townsend[41] (n = 358)[a]	Not stated	14.8 (11.3–18.9)	Yes
Taylor[39] (n = 59)	8	18.6 (9.7–30.9)	Yes
Todd[38] (n = 24)	5–6	8.3 (1.0–27.0)	Yes
Hutton[33] (n = 54)	2	1.9 (4.7–9.9)	No
Taylor[37] (n = 13)	3	53.8 (25.1–80.8)	No
Combined trials (n = 812)	2–14	12.7 (10.5–15.2)	
Stott[4] (n = 965)[b]	14	11.5 (9.6–13.7)	Yes
Combined studies (n = 1777)	2–14	12.0 (10.6–13.6)	

[a]This Townsend study probably recorded complications only in children who reconsulted. [b]Cohort study.

Table 5. Percentage of children experiencing specific complications.

Author	Rash (95% CI)	Otitis media or painful ears (95% CI)	Diarrhoea (95% CI)	Vomiting (95% CI)	Progression to bronchitis or pneumonia (95% CI)
Hardy[35]					10 (4–20)
Ackerman[32]	20 (5–44)	5 (0.1–25)			5 (0.1–25)
Taylor[39]	10 (4–21)	18 (10–30)	10 (4–21)	12 (5–23)	

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