National Institute for Health and Care Excellence

Pneumonia: diagnosis and management (update)

[G] Evidence reviews for information for parents/carers of babies, children and young people about expected symptoms and duration of symptoms following treatment for CAP or HAP

NICE guideline [number]
Evidence reviews underpinning recommendations 1.10.2 to 1.10.4 in the NICE guideline

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Draft for consultation

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Contents

1 Information for patients and their parents or carers

1.1 Review question

What advice should be given to adults or parents/carers of babies, children and young people about what symptoms and duration of symptoms can be expected following treatment for community- or hospital-acquired pneumonia, and when should people be advised to consult or re-consult a GP?

1.1.1 Introduction

Many people and carers are unaware of what to expect when recovering from pneumonia. Similarly, many parents and carers are unaware of what to expect when their child is recovering from pneumonia. It is important to understand the natural history of symptoms experienced during the recovery phase of the illness and the usual time taken for people to return to normal functioning. It is anticipated that knowledge of the likely symptoms and their probable duration will reduce health anxiety, reduce unnecessary re-consultations with healthcare professionals, and promote appropriate re-consultation when this is required. Communicating this information to parents and carers could facilitate appropriate self-management, as well as helping them to understand symptoms that would indicate a need for their child to be re-assessed. The aim of this review is to establish the most common symptoms experienced after treatment for pneumonia and their standard duration.

The committee considered the previous guideline recommendations made for adults and agreed they did not require updating using a new evidence review.

The aim of this review is to establish the most common symptoms and their standard duration in babies, children and young people who have been diagnosed with pneumonia, so that information and advice can be given to their parents/carers about their expected recovery and when to seek further medical advice.

1.1.2 Summary of the protocol

Table 1: PICOS inclusion criteria

Population	**Inclusion** Babies over 28 days (corrected gestational age), children and young people (age <18 years) who have been treated for pneumonia (community or hospital acquired). • CAP is defined as pneumonia that is acquired outside hospital • HAP is defined as pneumonia that occurs 48 hours or more after admission to hospital and is not incubating at hospital admission, or within 10 days of a previous hospital admission for a different problem

	Exclusion • Babies up to and including 28 days (corrected gestational age) • People with COVID-19 pneumonia • People who acquire pneumonia while intubated (ventilator-associated pneumonia) • People who are severely immune-compromised (have a primary immune deficiency or secondary immune deficiency related to HIV infection, or severe drug or systemic disease-induced immunosuppression, for example, people who have taken immunosuppressant cancer therapy or undergone organ transplantation). • People in whom pneumonia is an expected terminal event. • People with non-pneumonic infective exacerbations of bronchiectasis. • People with non-pneumonic infective exacerbations of chronic obstructive pulmonary disease. • People with pneumonia associated with cystic fibrosis. • People with aspiration pneumonia as a result of inhaling a large bolus of gastric contents.
symptoms of interest	Key pneumonia symptoms: fever, chest pain, sputum production, cough, breathlessness, fatigue.
Comparator	N/A
Outcomes	• Proportion of patients with specific pneumonia symptoms (e.g. fatigue, cough, breathlessness) at specific time points after diagnosis (suggested time points: 2 weeks, 4 weeks, 6 weeks, 2 months, 6 months, but this will be dependent on what the included studies report). • Time to resolution of symptoms • Symptom duration (in days) at which each symptom had resolved in 90% of children. • Hospital readmission rate
Study type	Systematic reviews; prospective single arm studies that report longitudinal data on the duration or resolution of symptoms of pneumonia.

For the full protocol see appendix A.

1.1.3 Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described below or in the review protocol in appendix A and the methods document.

Where mean time to symptom resolution was reported, the NICE analyst used the standard deviation to calculate an estimate of the time to resolution in 95% of patients by adding 2 standard deviations to the mean. The committee asked the development team to do this because mean time to symptom resolution only provides information on the time at which 50% of children will have achieved symptom resolution and they were more interested in the point at which over 90% of children's symptoms have resolved.

It was not possible to perform meta-analyses because the outcomes reported were too different to combine. For example, for outcomes relating to fever the included studies

reported mean fever duration, rates of fever resolution within 12, 24 and 48 hours, and prevalence of fever at regular 2 week follow up points; these measures could not be pooled. Summaries of the evidence were therefore presented in a table. Similarly, GRADE could not be used to assess the quality of outcomes for single arm cohort studies, so the risk of bias and applicability ratings for the analysed studies were presented to the committee for each outcome to help inform their assessment of certainty in the evidence.

The CASP critical appraisal checklist was used to assess study quality rather than ROBINS-I because all included studies were observational cohort studies with no control group.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

1.1.3.1 Search methods

Each evidence review for this guideline had a search conducted in three parts. Part 1 was a single search for all systematic reviews relating to pneumonia published since 2014 that was screened for relevance to all the review questions. Part 2 was tailored to each evidence review. Part 3 covered the cost effectiveness elements of all review questions in a single search.

The searches for systematic reviews on all pneumonia topics were run on 20 November 2023 and re-run on 15 October 2024 in Cochrane Database of Systematic Reviews (CDSR) (Wiley) and Epistemonikos (https://www.epistemonikos.org).

The searches for effectiveness evidence on babies, children and young people were run on 13 May 2024. The following databases were searched: Cochrane Central Register of Controlled Trials (CENTRAL) (Wiley); Embase (Ovid); and MEDLINE ALL (Ovid). Limits were applied to remove animal studies, case reports, conference abstracts, editorials, empty registry entries, letters, news items and references not published in the English language. Standard NICE filters were used to limit to cohort studies.

The database searches were supplemented with additional search methods. Reference list checking and forward citation searching were conducted on Web of Science Core Collection on 9 May 204 using seed references identified from the scoping searches.

The searches for cost effectiveness evidence were run on 20 November 2023 and re-run on 14 October 2024 for papers published since 2014. The following databases were searched: Econlit (Ovid); Embase (Ovid); International HTA Database (https://database.inahta.org); MEDLINE ALL (Ovid); and NHS Economic Evaluation Database (NHS EED) (CRD). The same limits as in the effectiveness search were used. The validated NICE Cost Utility Filter was used on MEDLINE and Embase. Validated NICE filters were used in MEDLINE and Embase to remove references exclusively set in countries that are not OECD members.

A NICE senior information specialist (SIS) conducted the searches. The MEDLINE strategy was quality assured by another NICE SIS and all translated search strategies were peer reviewed to ensure their accuracy. Both procedures were adapted from the 2015 PRESS Guideline Statement.

Explanatory notes and full search strategies for each database are provided in appendix B.

1.1.4 Effectiveness evidence

1.1.4.1 Included studies

A systematic search carried out to identify potentially relevant studies found 4,074 references (see appendix B for the literature search strategy). These 4,074 references were screened at title and abstract level against the review protocol, with 4,021 excluded at this level. The full texts of 53 papers were ordered for closer inspection. 4 of these studies met the criteria specified in the review protocol (appendix A). They were all observational cohort studies with no control group and reported on the duration of symptoms or rates of symptom resolution at pre-specified follow-up points. No relevant studies were found that addressed the second part of the review question about when patients should be advised to re-consult a GP. For a summary of the 4 included studies see table 2.

The clinical evidence study selection is presented as a PRISMA diagram in appendix C.

See section 1.1.14 References – included studies for the full references of the included studies.

1.1.4.2 Excluded studies

Details of studies excluded at full text, along with reasons for exclusion are given in appendix J.

1.1.5 Summary of studies included in the effectiveness evidence

Table 2: Summary of studies included in the effectiveness evidence

Study details	Setting	Population	Pneumonia symptoms	Outcomes	Follow-up points	Risk of bias
Ashraf 2014 Bangladesh	Outpatient 'day-care' clinics where patients received hospital care between 8am and 5pm.	Children aged 2-59 months with severe or very severe pneumonia. Age in months, mean (SD) = 7.15 (7) 84% were aged between 2 and 11 months N = 251	Cough Fever Rapid breathing [a] Difficulty breathing Feeding difficulty Chest indrawing [b] Diarrhoea	Proportion of patients with symptom at each follow-up point Number of patients hospitalised	Children were seen in outpatient clinic at 2, 4, 6, 8, 10 and 12 weeks	Moderate – concerns about low follow-up rate
Ashraf 2012 Bangladesh	Outpatient 'day-care' clinic Inpatient hospital care	Children aged 2-59 months with severe pneumonia. Age in months, mean (SD) = 8 (7) 81% were aged between 2 and 11 months	Cough Fever Rapid breathing [a] Difficulty breathing Feeding difficulty Chest indrawing [b] Diarrhoea	Proportion of patients with symptom at each follow-up point Number of patients hospitalised	Children were seen in outpatient clinic at 2, 4, 6, 8, 10 and 12 weeks	Moderate – concerns about low follow-up rate and differences between outpatient and inpatient populations

Study details	Setting	Population	Pneumonia symptoms	Outcomes	Follow-up points	Risk of bias
		N = 360				
Don 2010 Italy	Paediatric hospital	Children aged 0.3 to 14.7 years with pneumonia. Mean age = 4.7 years N = 94	Fever	Mean duration of fever Number of patients with fever duration >24 hours; and >48 hours	Examination of patient records, or asking parents at follow-up visits or by phone call 12 hours, 24 hours, 48 hours after diagnosis	Moderate – outcome assessment based on parent-reported symptoms
Shoham 2005 Israel	Paediatric wards, the paediatric ED, and a primary care health clinic	Children aged under 3 years with pneumonia Mean age = 18.4 to 19.5 months (depending on setting) N = 213	Fever Cough Respiratory distress Diarrhoea Vomiting Reduced appetite Lethargy/tiredness	Mean number of days for each symptom	Telephone interviews with parents performed every 2-3 days for 21 days after initial hospital visit	Moderate - outcome assessment based on parent-reported symptoms

[a] Rapid breathing is defined as age-specific respiration rates of more than 50 breaths per minute for infants aged 2 to 11 months and more than 40 breaths per minute for children aged 12 to 59 months.
[b] Lower chest-wall-indrawing was defined as a condition where the lower chest-wall goes inward when the child inhales.

See appendix D for full evidence tables.

1.1.6 Summary of the evidence

Table 3: Resolution of pneumonia symptoms (time to resolution and symptom prevalence at specific follow-up points) and rate of hospital readmission

Number of studies	Design	Sample	Outcomes	Quality assessment
Duration of fever (mean [SD]) in hours after starting antibiotics				
1	Fever duration obtained from medical records for inpatients or via phone-call to parents 48-72 hours after diagnosis for outpatients	N = 94 (Don 2010)	• Full sample: 23.0 [19.2] hours • For children under 2 years = 15.6 [13.4] hours • For children aged 2-4 years = 18.9 [14.9] hours • For children aged ≥5 years = 31.2 [23.1] hours Mean and 95% confidence intervals: • Full sample: 23.0 hours (-15.4 to 61.4) • For children under 2 years = 15.6 hours (-11.2 to 42.4) • For children aged 2-4 years = 18.9 hours (-10.9 to 48.7) • For children aged ≥5 years = 31.2 hours (-15 to 77.4)	Risk of bias – moderate Directly applicable
Rates of fever resolution (%) within 12, 24, and 48 hours of starting antibiotics				
1	Fever duration obtained from medical records for inpatients or via phone-call to parents 48-72	N = 94 (Don 2010)	• Fever resolved within 12 hours: 47% • Fever resolved between 13 and 24 hours: 27% • Fever resolved between 25 and 48 hours: 22% • Fever resolved after 48 hours: 4%	Risk of bias – moderate Directly applicable

	hours after diagnosis for outpatients			
Prevalence (%) of fever at all follow-up points after diagnosis and initiation of antibiotic treatment				
2	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.	N = 360 (Ashraf 2012)	• 2 weeks after diagnosis: 13% • 4 weeks after diagnosis: 17% • 6 weeks after diagnosis: 16% • 8 weeks after diagnosis: 20% • 10 weeks after diagnosis: 18% • 12 weeks after diagnosis: 18%	Risk of bias – moderate Partially indirect
		N = 251 (Ashraf 2014)	• 2 weeks after diagnosis: 14% • 4 weeks after diagnosis: 31% • 6 weeks after diagnosis: 19% • 8 weeks after diagnosis: 25% • 10 weeks after diagnosis: 17% • 12 weeks after diagnosis: 14%	Risk of bias – moderate Partially indirect
Mean (SD) number of days of fever				
1	Telephone interviews with parents/carers every 2-3 days for 21 days of follow-up after the initial visit, to obtain details of the occurrence of key symptoms.	N = 213 (Shoham 2015)	• Paediatric ward patients: 4.9 (2.8) days • Paediatric ED patients: 4.8 (3.1) days • Primary care clinic patients: 3.3 (2.5) days Mean and 95% confidence intervals: • Paediatric ward patients: 4.9 days (-0.7 to 10.5) • Paediatric ED patients: 4.8 days (-1.4 to 11) • Primary care clinic patients: 3.3 days (-1.7 to 8.3)	Risk of bias – moderate Partially indirect

Prevalence (%) of cough at all follow-up points after diagnosis and initiation of antibiotic treatment				
2	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.	N = 360 (Ashraf 2012)	• 2 weeks after diagnosis: 26% • 4 weeks after diagnosis: 30% • 6 weeks after diagnosis: 26% • 8 weeks after diagnosis: 29% • 10 weeks after diagnosis: 29% • 12 weeks after diagnosis: 27%	Risk of bias – moderate Partially indirect
		N = 251 (Ashraf 2014)	• 2 weeks after diagnosis: 28% • 4 weeks after diagnosis: 31% • 6 weeks after diagnosis: 27% • 8 weeks after diagnosis: 29% • 10 weeks after diagnosis: 27% • 12 weeks after diagnosis: 23%	Risk of bias – moderate Partially indirect
Mean (SD) number of days of cough				
1	Telephone interviews with parents/carers every 2-3 days for 21 days of follow-up after the initial visit, to obtain details of the occurrence of key symptoms.	N = 213 (Shoham 2015)	• Paediatric ward patients: 11.6 (8.2) days • Paediatric ED patients: 10.5 (6.6) days • Primary care clinic patients: 11.8 (6.9) days Mean and 95% confidence intervals: • Paediatric ward patients: 11.6 days (-4.8 to 28) • Paediatric ED patients: 10.5 days (-2.7 to 23.7) • Primary care clinic patients: 11.8 days (-2 to 24.2)	Risk of bias – moderate Directly applicable
Prevalence (%) of rapid breathing at all follow-up points after diagnosis and initiation of antibiotic treatment				
2		N = 360 (Ashraf 2012)	• 2 weeks after diagnosis: 6% • 4 weeks after diagnosis: 9%	Risk of bias – moderate

	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.		• 6 weeks after diagnosis: 6% • 8 weeks after diagnosis: 7% • 10 weeks after diagnosis: 8% • 12 weeks after diagnosis: 7%	Partially indirect
		N = 251 (Ashraf 2014)	• 2 weeks after diagnosis: 14% • 4 weeks after diagnosis: 14% • 6 weeks after diagnosis: 15% • 8 weeks after diagnosis: 10% • 10 weeks after diagnosis: 9% • 12 weeks after diagnosis: 12%	Risk of bias – moderate Partially indirect
Prevalence (%) of difficulty breathing at all follow-up points after diagnosis and initiation of antibiotic treatment				
2	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.	N = 360 (Ashraf 2012)	• 2 weeks after diagnosis: 4% • 4 weeks after diagnosis: 4% • 6 weeks after diagnosis: 2%8 weeks after diagnosis: 3% • 10 weeks after diagnosis: 1% • 12 weeks after diagnosis: 3%	Risk of bias – moderate Partially indirect
		N = 251 (Ashraf 2014)	• 2 weeks after diagnosis: 4% • 4 weeks after diagnosis: 6% • 6 weeks after diagnosis: 6% • 8 weeks after diagnosis: 4% • 10 weeks after diagnosis: 4% • 12 weeks after diagnosis: 4%	Risk of bias – moderate Partially indirect
Mean (SD) number of days of respiratory distress				
1	Telephone interviews with	N = 213 (Shoham 2015)	• Paediatric ward patients: 3.8 (5.6) days • Paediatric ED patients: 2.8 (4.4) days • Primary care clinic patients: 2.2 (4.4) days	Risk of bias – moderate Directly applicable

	parents/carers every 2-3 days for 21 days of follow-up after the initial visit, to obtain details of the occurrence of key symptoms.		Mean and 95% confidence intervals: • Paediatric ward patients: 3.8 days (-7.4 to 15) • Paediatric ED patients: 2.8 days (-6 to 11.6) • Primary care clinic patients: 2.2 days (-6.6 to 11)	
Prevalence (%) of feeding difficulty at all follow-up points after diagnosis and initiation of antibiotic treatment				
2	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.	N = 360 (Ashraf 2012)	• 2 weeks after diagnosis: 2% • 4 weeks after diagnosis: 7% • 6 weeks after diagnosis: 6% • 8 weeks after diagnosis: 5% • 10 weeks after diagnosis: 5% • 12 weeks after diagnosis: 2%	Risk of bias – moderate Partially indirect
		N = 251 (Ashraf 2014	• 2 weeks after diagnosis: 4% • 4 weeks after diagnosis: 5% • 6 weeks after diagnosis: 6% • 8 weeks after diagnosis: 5% • 10 weeks after diagnosis: 4% • 12 weeks after diagnosis: 3%	Risk of bias – moderate Partially indirect
Mean (SD) number of days of decreased appetite				
1	Telephone interviews with parents/carers every 2-3 days for 21 days of follow-up after the initial visit, to obtain	N = 213 (Shoham 2015)	• Paediatric ward patients: 8.5 (5.4) days • Paediatric ED patients: 8.7 (6.6) days3 • Primary care clinic patients: 7.6 (6.1) days Mean and 95% confidence intervals: • Paediatric ward patients: 8.5 days (-2.3 to 19.3)	Risk of bias – moderate Directly applicable

	details of the occurrence of key symptoms.		• Paediatric ED patients: 8.7 days (-4.5 to 21.9) • Primary care clinic patients: 7.6 days (-4.6 to 19.8)	
Prevalence (%) of chest indrawing at all follow-up points after diagnosis and initiation of antibiotic treatment				
2	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.	N = 360 (Ashraf 2012)	• 2 weeks after diagnosis: 5% • 4 weeks after diagnosis: 7% • 6 weeks after diagnosis: 6% • 8 weeks after diagnosis: 5% • 10 weeks after diagnosis: 4% • 12 weeks after diagnosis: 4%	Risk of bias – moderate Partially indirect
		N = 251 (Ashraf 2014)	• 2 weeks after diagnosis: 4% • 4 weeks after diagnosis: 6% • 6 weeks after diagnosis: 5% • 8 weeks after diagnosis: 3% • 10 weeks after diagnosis: 2% • 12 weeks after diagnosis: 3%	Risk of bias – moderate Partially indirect
Prevalence (%) of diarrhoea at all follow-up points after diagnosis and initiation of antibiotic treatment				
2	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.	N = 360 (Ashraf 2012)	• 2 weeks after diagnosis: 7% • 4 weeks after diagnosis: 11% • 6 weeks after diagnosis: 9% • 8 weeks after diagnosis: 9% • 10 weeks after diagnosis: 7% • 12 weeks after diagnosis: 10%	Risk of bias – moderate Partially indirect
		N = 251 (Ashraf 2014)	• 2 weeks after diagnosis: 8% • 4 weeks after diagnosis: 5% • 6 weeks after diagnosis: 9% • 8 weeks after diagnosis: 8%	Risk of bias – moderate Partially indirect

			• 10 weeks after diagnosis: 7% • 12 weeks after diagnosis: 6%	
Mean (SD) number of days of diarrhoea				
1	Telephone interviews with parents/carers every 2-3 days for 21 days of follow-up after the initial visit, to obtain details of the occurrence of key symptoms.	N = 213 (Shoham 2015)	• Paediatric ward patients: 1.5 (3.8) days • Paediatric ED patients: 0.8 (1.8) days • Primary care clinic patients: 1.0 (2.8) days Mean and 95% confidence intervals: • Paediatric ward patients: 1.5 days (-6.1 to 9.1) • Paediatric ED patients: 0.8 days (-2.8 to 4.4) • Primary care clinic patients: 1.0 days (-4.6 to 6.6)	Risk of bias – moderate Directly applicable
Mean (SD) number of days of vomiting				
1	Telephone interviews with parents/carers every 2-3 days for 21 days of follow-up after the initial visit, to obtain details of the occurrence of key symptoms.	N = 213 (Shoham 2015)	• Paediatric ward patients: 2.1 (3.3) days • Paediatric ED patients: 1.3 (1.9) days • Primary care clinic patients: 1.6 (2.7) days Mean and 95% confidence intervals: • Paediatric ward patients: 2.1 days (-4.5 to 8.7) • Paediatric ED patients: 1.3 days (-2.5 to 5.1) • Primary care clinic patients: 1.6 days (-3.8 to 7)	Risk of bias – moderate Directly applicable
Mean (SD) number of days of lethargy/tiredness				
1	Telephone interviews with parents/carers	N = 213 (Shoham 2015)	• Paediatric ward patients: 3.8 (5.7) days • Paediatric ED patients: 2.7 (3.3) days • Primary care clinic patients: 1.1 (2.5) days	Risk of bias – moderate Directly applicable

	every 2-3 days for 21 days of follow-up after the initial visit, to obtain details of the occurrence of key symptoms.		Mean and 95% confidence intervals: • Paediatric ward patients: 3.8 days (-7.6 to 15.2) • Paediatric ED patients: 2.7 days (--3.9 to 9.3) • Primary care clinic patients: 1.1 days (-3.9 to 6.1)	
Rehospitalisation (%) during the follow-up period (3 months) after diagnosis and initiation of antibiotic treatment				
2	Patients attended follow-up visits to the hospital or outpatient clinic every 2 weeks for 3 months; signs and symptoms were recorded at each visit.	N = 360 (Ashraf 2012)	• 9.2% re-hospitalised •	Risk of bias – moderate Partially indirect
		N = 251 (Ashraf 2014)	• 4.4% re-hospitalised	Risk of bias – moderate Partially indirect

Notes. 95% confidence intervals calculated by NICE analyst.

1.1.7 Economic evidence

1.1.7.1 Included studies

A single search was performed to identify published economic evaluations of relevance to any of the questions in this guideline update. See Appendix B – Literature search strategies for the search strategy.

This search retrieved 3,201studies. Based on title and abstract screening, 3,168 of the studies could confidently be excluded for this question. Thirty-three studies were excluded following the full-text review. See Appendix G – Economic evidence study selection for the study selection process.

1.1.7.2 Excluded studies

See **Error! Reference source not found.**for a list of excluded studies, with reasons for exclusions.

1.1.8 Summary of included economic evidence

There are no included studies in this review question.

1.1.9 Economic model

No original economic modelling was completed for this review question.

1.1.10 Unit costs

No unit costs were supplied for this review question.

1.1.9 The committee's discussion and interpretation of the evidence

1.1.9.1 The outcomes that matter most

The committee agreed that time to symptom resolution in 90% of patients was the most important outcome for this review question because it would help them to understand the time point at which the majority of children reach symptom resolution. They agreed that this was more useful than mean time to resolution, because the mean time to resolution only provides information about the average symptom duration, therefore 50% of patients would have symptom durations above the mean. However, only 1 study reported rates of symptom resolution, and this was for fever only (Don 2010). The committee therefore agreed to take into account the standard deviation when mean time to resolution was being considered, with 2 standard deviations above the mean used to provide an estimate of the time to resolution in 95% of patients. The prevalence of symptoms at key follow-up points was also considered an important outcome. The committee agreed that the main symptoms of interest were fever, respiratory distress, and persistent tiredness or malaise, because these are the symptoms most indicative of serious illness or complications, but they agreed that it was useful to consider all pneumonia symptoms reported in the studies to obtain a complete picture of overall recovery. They also noted that cough duration is often of substantial concern to

patients and their families, and is a common reason for reconsulting, so this was also an important symptom of interest.

1.1.9.2 The quality of the evidence

The committee acknowledged that the evidence was limited, with only 4 cohort studies, 1 of which only reported data for fever (Don 2010) so there was only a small amount of evidence for each symptom. Due to the nature of the evidence (means and percent prevalence rates from single arm cohort studies) and the different outcomes reported by the studies (e.g. mean symptom duration and symptom prevalence), the data could not be combined. There was no evidence on when to reconsult a GP or other healthcare professional, and no evidence for children with HAP. The committee also noted that the studies predominantly included children treated as inpatients, so there was limited information on children managed in primary care. With the single arm cohort studies, the quality of outcomes could not be assessed using GRADE. Instead, the risk of bias and applicability ratings for the analysed studies were provided for each outcome, and while this does not provide a formal certainty rating as would be provided with GRADE, it enabled the committee's discussion of the reliability of the studies on which each finding was based.

The committee were concerned about the relevance of the 2 studies conducted in Bangladesh (Ashraf 2012 and Ashraf 2014), noting that it is a subtropical country with a high proportion of gastrointestinal illness in children, and where diagnostic and treatment processes for pneumonia may be different to that in the UK. They were also concerned that the relatively high prevalence of symptoms at 8 to 12 weeks follow-up, including gastrointestinal symptoms, may be indicative of new illnesses rather than a persistence of the index pneumonia. They agreed that it would be very unlikely to see the prevalence rates for fever, cough and rapid breathing that were reported in those studies at 3 months follow-up in a UK based population and highlighted that children presenting with those symptoms at that time point in the UK would likely be referred for imaging and further investigations. The committee also noted that the population in both studies was predominantly babies, so the evidence from these studies may not apply to older infants or children.

The committee expressed concern about the reliability of outcome assessments in the Don 2010 and Shoham 2005 studies, which both used parent-reported symptoms and assessments of fever. These can be subject to bias and may be less reliable than outcomes assessed by a clinician.

1.1.9.3 Benefits and harms

The committee agreed that the purpose of the evidence review was to establish the usual course of pneumonia symptom resolution in otherwise healthy children to provide information and reassurance to parents and carers about their child's recovery and the expected timescales. Reflecting on both the evidence and their clinical experience, the committee agreed that children's symptoms should steadily improve after starting treatment but noted that the rate of improvement can vary depending on several aspects, such as the severity of the pneumonia and the age of the child. Overall, the committee agreed that after starting treatment for pneumonia, a child's fever should resolve within 3-4 days and they made a

recommendation about this. They noted that the evidence suggested slightly longer fever durations and they considered recommending 5 days, but on balance and in consideration of the limitations of the evidence they agreed that 5 days was a long time for a child to have a fever related to a treated pneumonia, particularly a young child, and may suggest the need for medical review. They concluded that the recommendation should suggest fever resolution within 3-4 days.

The evidence for cough showed mean durations of 10-11 days for children treated in paediatric wards, EDs or primary care clinics. They agreed that the prevalence data from Ashraf 2012 and Ashraf 2014 was not reliable, so they were limited to evidence from one study at moderate risk of bias (Shoham 2015). The committee drew on their clinical experience and agreed that while it may take up to 6 weeks for a cough to gradually resolve in children, as in the NICE pneumonia recommendations for adults, that up to 4 weeks was a more appropriate timescale for children in terms of a cough that is not improving and when to seek further advice. They noted that for children with a continued cough after pneumonia, it often resolves gradually over time without need for further testing or treatment and agreed that a persistent cough in isolation would not necessarily require further review, particularly if the child is otherwise well. However, the committee agreed that a persistent cough would be more concerning when combined with a fever or other respiratory symptoms and can suggest the need for medical review.

The committee agreed that as well as outlining the course of symptom resolution in children who were showing a good recovery, it was also important to identify the symptom course of children who were deteriorating or not recovering as expected, potentially due to complications or other serious illnesses and for whom further consultation with a clinician would be important. They agreed that they would be particularly concerned about tuberculosis (TB), empyema, lung abscess, necrotising pneumonia and mycoplasma. Children with these complications would usually present with persistent fever and breathlessness or increased work of breathing, and for TB, unresolving appetite loss and lethargy, so the committee agreed that parents and carers should consult a healthcare professional if their child continued to experience these symptoms after receiving treatment for pneumonia. They agreed that persistent fever with any combination of these other ‘red flag’ symptoms (increased work of breathing, reduced appetite and ongoing fatigue) may indicate more serious illnesses or complications so recommended that parents or carers should seek further advice if these symptoms continued.

1.1.9.4 Cost effectiveness and resource use

There were no included health economic studies in this review. Since this review focuses on the information that should be provided to parents and caregivers of children, it is unlikely that there will be a substantial cost involved. There may be a slight increase in the time clinicians spend ensuring caregivers understand treatment and next steps. However, these recommendations should reflect current practice for most services. Additionally, the committee noted that, as a result of these recommendations, the exact content of the information provided by the clinicians may change but the time it takes may not significantly change. It is also hoped that this information will increase the confidence of parents and carers in caring for their child and reduce unnecessary repeat visits to the hospital. Parents

and caregivers will also be made aware of more severe symptoms that may need immediate treatment which may prompt them to take their child to the hospital before more serious complications arise. Therefore, these recommendations may result in slight cost savings.

1.1.9.5 Other factors the committee took into account

The committee discussed other NICE guidance on Fever in under 5s and the associated Quality Standard on safety net advice and when to seek help for parents or carers looking after a feverish child at home. They agreed that these existing NICE products give parents useful information about managing fever and when to seek further help and advice from healthcare professionals.

The committee examined the existing recommendations for adults on symptom resolution and agreed that they did not need updating.

1.1.10 Recommendations supported by this evidence review

This evidence review supports recommendations 1.10.2 and 1.10.4.

1.1.11 References – included studies

1.1.11.1 Effectiveness evidence

Ashraf, Hasan, Alam, Nur H, Chisti, Mohammod J et al. (2014) Observational follow-up study on a cohort of children with severe pneumonia after discharge from a day-care clinic in Dhaka, Bangladesh. Journal of health, population, and nutrition 32(2): 183-9

Ashraf, Hasan, Alam, Nur H, Chisti, Mohammod Jobayer et al. (2012) Observational follow-up study following two cohorts of children with severe pneumonia after discharge from day care clinic/hospital in Dhaka, Bangladesh. BMJ open 2(4)

Don, Massimiliano, Valent, Francesca, Canciani, Mario et al. (2010) Prediction of delayed recovery from pediatric community-acquired pneumonia. Italian journal of pediatrics 36: 51

Shoham, Yaron, Dagan, Ron, Givon-Lavi, Noga et al. (2005) Community-acquired pneumonia in children: quantifying the burden on patients and their families including decrease in quality of life. Pediatrics 115(5): 1213-9

Appendices

Appendix A – Review protocols

Review protocol for RQ7.1 information for patients

ID	Field	Content
1.	Review title	What advice should be given to adults or parents/carers of babies, children and young people about what symptoms and duration of symptoms can be expected following treatment for community- or hospital-acquired pneumonia, and when should people be advised to consult or re-consult a GP?
2.	Review question	What advice should be given to adults or parents/carers of babies, children and young people about what symptoms and duration of symptoms can be expected following treatment for community- or hospital-acquired pneumonia, and when should people be advised to consult or re-consult a GP?
3.	Objective	The aim of this review is to establish the most common symptoms and their standard duration in babies, children and young people who have been diagnosed with pneumonia, so that information and advice can be given to their parents/carers about their expected recovery and when to seek further medical advice.

4.	Searches	**Overall approach** The searches will comprise the following elements: • a combined search for cost effectiveness evidence covering all review questions in this guideline. • a combined search for systematic reviews covering all review questions in this guideline. • searches for effectiveness evidence specific to this review question. **Searches for cost effectiveness evidence** A combined search will be undertaken to cover the cost effectiveness aspects of all the review questions in a single search. The following databases will be searched for the cost effectiveness evidence: • Econlit via Ovid • Embase via Ovid • International HTA database via INAHTA website • MEDLINE ALL via Ovid The sensitive version of the validated NICE cost utility filter will be applied to the MEDLINE and Embase search strategies (Hubbard et al., 2022 [doi: 10.1186/s12874-022-01796-2]).

		Searches for cost effectiveness evidence will be limited to 2014-current (the searches for NICE guideline CG191 were completed in March 2014). The MEDLINE and Embase searches will be limited to evidence from Organisation for Economic Co-operation and Development (OECD) member states using the validated NICE filter (Ayiku et al., 2021 [doi: 10.5195/jmla.2021.1224]). **Effectiveness evidence: combined search for systematic reviews** The search for systematic reviews relating to all review questions in this guideline will cover reviews published since the searches for NICE guideline CG191 were completed in March 2014. The sources for this will be: • Cochrane Database of Systematic Reviews (CDSR) via Wiley • Epistemonikos via https://www.epistemonikos.org/ This is the standard NICE practice agreed by the Guidelines Methods Group in September 2022 for identifying systematic reviews for routine guideline searches. **Effectiveness evidence: searches specific to this review question**

		The searches for effectiveness evidence specific to this review question will use the following databases: • Cochrane Central Register of Controlled Trials (CENTRAL) via Wiley • Embase via Ovid • MEDLINE ALL via Ovid The principal search strategy will be developed in MEDLINE and then adapted, as appropriate, for use in the other sources listed, taking into account their size, search functionality and subject coverage. To ensure potentially relevant records are not missed the following will be checked as required: • The reference lists of any appropriate studies. • Later citations of any key studies. The seed references for these actions could comprise key reviews, trials, protocols or other papers. They will be identified from the search for systematic reviews, the scoping searches for this guideline, or the evidence reviews for previous NICE guidelines. The guideline committee or other stakeholders could also be asked if they are aware of any other potentially relevant studies that could be considered.

		No date limits will be applied as there have not been any previous searches for the evidence on babies, children and young people. **Managing all search results** Database functionality will be used, where available, to exclude from all searches: • Animal studies • Editorials, letters, news items and commentaries • Conference abstracts and posters • Registry entries for ongoing clinical trials or those that contain no results • Theses and dissertations • Papers not published in the English language. With the agreement of the guideline committee, the searches will be re-run 6-8 weeks before final submission of the review and further studies retrieved for inclusion. The information services team at NICE will quality assure the principal search strategy and peer review the other strategies. Any revisions or additional steps will be agreed by the review team before being implemented.

		The full search strategies for all databases will be published in the final review.
5.	Condition or domain being studied	Community- or hospital-acquired pneumonia
6.	Population	<u>Inclusion:</u> Babies over 28 days (corrected gestational age), children, young people (age <18 years), with pneumonia (community or hospital acquired). • CAP is defined as pneumonia that is acquired outside hospital • HAP is defined as pneumonia that occurs 48 hours or more after admission to hospital and is not incubating at hospital admission, or within 10 days of a previous hospital admission for a different problem. <u>Exclusion:</u> • Babies up to and including 28 days (corrected gestational age). • People with COVID-19 pneumonia. • People who acquire pneumonia while intubated (ventilator-associated pneumonia). • People who are severely immune-compromised (have a primary immune deficiency or secondary immune deficiency related to HIV infection, or severe

		drug or systemic disease-induced immunosuppression, for example, people who have taken immunosuppressant cancer therapy or undergone organ transplantation). • People in whom pneumonia is an expected terminal event. • People with non-pneumonic infective exacerbations of bronchiectasis. • People with non-pneumonic infective exacerbations of chronic obstructive pulmonary disease. • People with pneumonia associated with cystic fibrosis. • People with aspiration pneumonia as a result of inhaling a large bolus of gastric contents.
7.	Intervention/Exposure/Test	Key pneumonia symptoms: fever, chest pain, sputum production, cough, breathlessness, fatigue.
8.	Comparator/Reference standard/Confounding factors	N/A
9.	Types of study to be included	Systematic reviews, prospective single arm studies that report longitudinal data on the duration or resolution of symptoms of pneumonia (retrospective may be used if prospective studies are not found)).

10.	Other exclusion criteria	
11.	Context	Many patients are unaware of what to expect when recovering from pneumonia. Similarly, many parents/carers are unaware of what to expect when their child is recovering from pneumonia. It is important to understand the natural history of symptoms experienced during the recovery phase of the illness and the usual time taken for people to return to 'normal' functioning. It is anticipated that knowledge of the likely symptoms and their probable duration will reduce unnecessary anxiety, reduce unnecessary re-consultations with healthcare professionals, and promote appropriate re-consultation when this is required. Communicating this information to parents/carers could facilitate appropriate self-management, as well as helping them to understand 'red flag' symptoms that would indicate a need for their child to be re-assessed.
12.	Primary outcomes (critical outcomes)	• Proportion of patients with specific pneumonia symptoms (e.g. fatigue, cough, breathlessness) at specific time points after diagnosis (suggested time points: 2 weeks, 4 weeks, 6 weeks, 2 months, 6 months, but this will be dependent on what the included studies report). • Time to resolution of symptoms • Symptom duration (in days) at which each symptom had resolved in 90% of children. • Hospital readmission rate

13.	Secondary outcomes (important outcomes)	• Return to usual activities or activities of daily living (adapted for use with children)
14.	Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated. 10% of the abstracts will be reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer. The full text of potentially eligible studies will be retrieved and will be assessed in line with the criteria outlined above. Any disagreements will be resolved by discussion with other members of the technical review team. A standardised form will be used to extract data from studies (see Developing NICE guidelines: the manual section 6.4). Study investigators may be contacted for missing data where time and resources allow. The priority screening functionality within the EPPI-reviewer software will not be used for this review.
15.	Risk of bias (quality) assessment	Risk of bias will be assessed using the appropriate checklist as described in Developing NICE guidelines: the manual.

		For SRs, the ROBIS (Risk of Bias in Systematic Reviews) checklist will be used. For observational studies, the Cochrane ROBINS-I tool will be the preferred tool. The CASP cohort study checklist will be used if ROBINS-I is not appropriate.
16.	Strategy for data synthesis	In adults, existing recommendations for adults will be updated based on committee consensus without requiring an update to the evidence review for adults. For babies, children, and young people, a de novo evidence review will be undertaken. Where possible, meta-analyses of outcome data will be conducted for all outcomes that are reported by more than one study.. Where data can be disambiguated it will be separated into the subgroups identified in section 17 (below).
17.	Analysis of sub-groups	The following groups will be considered separately if data are available: • CAP and HAP • Pneumonia severity assessed using CURB-65 or PSI

		• Age: 0-1; 1-5; 5-18 years		
18.	Type and method of review	☐ Intervention ☐ Diagnostic ☐ Prognostic ☐ Qualitative ☒ Epidemiologic ☐ Service Delivery ☐ Other (please specify)		
19.	Language	English		
20.	Country	England		
21.	Anticipated or actual start date	TBC		
22.	Anticipated completion date	TBC		
23.	Stage of review at time of this submission	**Review stage**	**Started**	**Completed**
		Preliminary searches	☐	☐

		Piloting of the study selection process	☐	☐
		Formal screening of search results against eligibility criteria	☐	☐
		Data extraction	☐	☐
		Risk of bias (quality) assessment	☐	☐
		Data analysis	☐	☐
24.	Named contact	**5a. Named contact** Guideline Development Team B, Centre for Guidelines, NICE. **5b Named contact e-mail** pneumoniadev@nice.org.uk		

		5c Organisational affiliation of the review National Institute for Health and Care Excellence (NICE)
25.	Review team members	From the Guideline Development Team: • Chris Carmona, Technical Advisor • Hannah Stockton, Technical Analyst • Michellie Young, Technical Analyst • Rachel Walsh, Technical Analyst • Steph Armstrong, Health Economist • Eric Slade, Health Economic Advisor • Paul Levay, Information specialist • Christine Harris, Project Manager • Adam O'Keefe, Project Manager
26.	Funding sources/sponsor	This systematic review is being completed by the Guideline Development Team which receives funding from NICE.
27.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee

		meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
28.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: : Project information | Pneumonia: diagnosis and management (update) | Guidance | NICE
29.	Other registration details	
30.	Reference/URL for published protocol	
31.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts

		• issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.
32.	Keywords	Pneumonia, community acquired infections, hospital acquired infections, symptoms, symptom duration, resolution of symptoms, patient reported outcome measures, functional status.
33.	Details of existing review of same topic by same authors	None
34.	Current review status	☐ Ongoing ☐ Completed but not published ☐ Completed and published ☐ Completed, published and being updated ☐ Discontinued
35..	Additional information	

36.	Details of final publication	www.nice.org.uk

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Appendix B – Literature search strategies

Background and development

Overall approach

Each evidence review for this guideline has a search conducted in three parts:

- Part 1: Systematic review searches

A single search for all systematic reviews relating to pneumonia published from 2014-current was done separately in November 2023 and re-run in October 2024. The results were screened for relevance to all the review questions. The potentially relevant results from this search were also used to create the seed references for reference list checking and forward citation searching for the effectiveness evidence searches.

- Part 2: Effectiveness evidence searches

This search was developed separately and tailored to each evidence review. The searches for effectiveness evidence on babies, children and young people (Part 2) were run on 13 May 2024. There were no searches for effectiveness evidence on adults (for Part 2), as there was evidence from CG191 that had been updated in a systematic review identified in Part 1.

- Part 3: Cost effectiveness searches

A single search covering the cost effectiveness elements of all review questions was done separately in November 2023 and re-run in October 2024. This was a top-level search for all cost utility studies published from 2014-current.

Search design and peer review

A NICE Senior Information Specialist (SIS) conducted the literature searches for each part.

This search report is based on the requirements of the PRISMA Statement for Reporting Literature Searches in Systematic Reviews (for further details see: Rethlefsen M et al. PRISMA-S. *Systematic Reviews*, 10(1), 39).

The MEDLINE strategies below were quality assured (QA) by a trained NICE SIS. The principal search strategies were developed in MEDLINE (Ovid interface) and adapted, as appropriate, for use in the other sources listed in the protocol, taking into account their size, search functionality and subject coverage. All translated search strategies were peer reviewed by another SIS to ensure their accuracy. The QA procedures were adapted from the Peer Review of Electronic Search Strategies Guideline Statement (for further details see: McGowan J et al. PRESS 2015 Guideline Statement. *Journal of Clinical Epidemiology*, 75, 40-46).

Review management

All search results were managed in EPPI-Reviewer v5. Duplicates were removed in EPPI-R5 using a two-step process. First, automated deduplication is performed using a high-value algorithm. Second, manual deduplication is used to assess ‘low-probability’ matches. All decisions made for the review can be accessed via the deduplication history.

Search limits, restrictions and filters

Formats

Limits were applied in adherence to standard NICE practice (as set out in the Identifying the evidence chapter of the manual) and the eligibility criteria listed in the review protocol to exclude:

- Animal studies
- Case reports
- Conference abstracts and posters
- Editorials, letters, news items and commentaries
- References not published in the English language
- Registry entries for ongoing clinical trials or those that contain no results
- Theses and dissertations.

The limit to remove animal studies in the searches was the standard NICE practice, which has been adapted from:

> Dickersin K, Scherer R & Lefebvre C. (1994) Systematic Reviews: Identifying relevant studies for systematic reviews. *BMJ*, 309(6964), 1286.

OECD countries

For the Cost Effectiveness (Part 3) searches, the validated NICE OECD filters were used in MEDLINE and Embase to remove records exclusively set in countries that are not members of the Organisation for Economic Co-operation and Development (OECD), in line with the search protocol. The filters were used without amendment. The filters are not available for the other databases used. The OECD filters were not applied to the Systematic Review (Part 1) or Effectiveness (Part 2) searches.

> Ayiku L et al. (2021) The NICE OECD countries' geographic search filters: Part 2 - Validation of the MEDLINE and Embase (Ovid) filters. *Journal of the Medical Library Association*, 109(4), 583–589.

Date limits

A date limit of 2014-current was applied to the Systematic Review (Part 1) and Cost Effectiveness (Part 3) searches. This date limit was used because the searches for NICE CG191 Pneumonia in adults: diagnosis and management (published in December 2014) were last run on 17 March 2014.

The Effectiveness searches on babies, children and young people (Part 2) did not have a date limit applied as this was a new aspect to the research question.

Study-type filters

The Systematic Review (Part 1) searches had no filters, as the content for CDSR and Epistemonikos is pre-filtered.

The searches for Effectiveness (Part 2) applied standard NICE filters for cohort studies, as specified in the protocol.

Cost effectiveness searches

In line with the protocol, the validated NICE Cost Utility Filter was used in the MEDLINE and Embase searches for Cost Effectiveness (Part 3). The sensitive version of the filter was selected and it was used without amendment. Subject coverage in the Econlit, International HTA Database and NHS EED databases is already pre-specified and so it is not appropriate to apply filters in them.

Hubbard W et al. (2022) Development and validation of paired MEDLINE and Embase search filters for cost-utility studies. *BMC Medical Research Methodology*, 22(1), 310.

Key decisions

Part 1: Systematic review searches

This search was conducted according to the standard NICE practice since the "Proposal to limit systematic review (SR) searching for routine guideline searches" was accepted by the NICE Guideline Methods Group (GMG) in September 2022. This process means that only sources which aggregate systematic reviews are searched in addition to the Cochrane Database of Systematic Reviews. The methods used to aggregate reviews for Epistemonikos are sufficiently sensitive with higher precision (Rada et al., 2020) compared to using standard Boolean search filters in general medical databases (Lee et al., 2012). Testing during scoping showed that other aggregators of systematic reviews, such as the Campbell Collaboration, Dopher and Health Evidence, would not be relevant for inclusion in this protocol.

Lee E. et al. (2012) An optimal search filter for retrieving systematic reviews and meta-analyses. *BMC Medical Research Methodology,* 12(1), 51.

Rada G et al. (2020) Epistemonikos: a comprehensive database of systematic reviews for health decision-making. *BMC Medical Research Methodology*, 20, 286.

Parts 1-3: Pneumonia terms

The same set of pneumonia terms was developed in November 2023 to use in all evidence reviews for this guideline. These terms aimed to cover all the included populations named in the final scope (section 3.1), namely babies over 28 days (corrected gestational age), children, young people and adults with suspected or diagnosed community-acquired or hospital acquired pneumonia.

A set containing 183 items was created to test the comprehensiveness of the searches. The 183 records were derived from the papers included in CG191 and the papers included in the 10 most recent Cochrane reviews about pneumonia.

The search terms built on the search strategies developed for NICE CG191 Pneumonia in adults and two antibiotic prescribing guidelines (NG138 and NG139).

The CG191 searches had a line to NOT out the MeSH term "pneumonia, ventilator-associated". This was not retained in the search as it was inadvertently excluding relevant papers that discussed several types of pneumonia (e.g. see PMIDs 29722052 or 32822880 or 28655326 or 34823043).

The CG191 searches truncated the free text to pneumoni* but this was amended following clinical advice that pneumonia is a form of pneumonitis but not all pneumonitis is pneumonia.

The CG191 searches had an additional line describing chest infection. It was not necessary to retain this line in order to retrieve any of the 183 items in the test set and so it was removed, which reduced the population search by around 41,000 results in MEDLINE.

The previous strategies could not be used directly because of changes to Medical Subject Headings (MeSH) since 2019. Using the previous searches would now retrieve all MEDLINE results about COVID-19, as well as pneumonia. It is now necessary to choose individual MeSH headings from the hierarchy. The choice of headings was made in conjunction with the technical team in the scoping searches in October 2023. Headings for Aspiration, Lipid, Enzootic and Swine Pneumonia, as well as Pneumocystis and COVID-19 were not included. This approach reduced the number of results with just the population terms from 340,000 with the CG191 approach to 124,000. None of the test set were lost by adopting this approach.

Seven options were then tested to optimise the precision of the pneumonia free-text terms. The options tested the feasibility of excluding free-text terms for aspects known to be out of scope (such as COVID-19 or ventilator-associated pneumonia). None of the options made a sufficient difference to the volume to justify making the strategies much more complicated and risk missing relevant papers (the most plausible option only reduced the entire pneumonia literature from 227,500 to 225,900 results). The option to add further free text to define the relevant types of pneumonia (such as bacterial pneumonia) was rejected as it risked missing relevant papers because some abstracts just referred to treating pneumonia, without specifying which type or subtype it was.

At the committee meeting GCOMM1 on 20 December 2023 feedback was received from the committee that rickettsial and cryptogenic organizing pneumonia were not relevant to the UK context and could safely be removed from the search strategies. These terms feature in the Part 1 systematic review and Part 3 cost effectiveness searches as these were completed before the meeting (and were retained in the re-runs for consistency).

The same approach to subject headings was applied in Embase, although the COVID-19 headings are not part of the pneumonia hierarchy in Emtree. The following headings from the pneumonia hierarchy were not chosen: Acute chest syndrome, Acute lupus pneumonitis, Allergic pneumonitis, Aspiration pneumonia, Chemical pneumonitis, Enzootic pneumonia, Eosinophilic pneumonia, Loeffler pneumonia, Experimental pneumonia, Lung infiltrate, Pneumonic effusion, Radiation pneumonia, Parasitic pneumonia, Pneumocystis pneumonia, Pulmonary candidiasis, Pulmonary toxoplasmosis, Legionnaire disease, Pulmonary actinomycosis, Ventilator associated pneumonia, Ventilator associated bacterial pneumonia, Checkpoint inhibitor pneumonitis, and Severe acute respiratory syndrome. Searches after 20/12/23 also excluded Rickettsial pneumonia and Bronchiolitis obliterans organizing pneumonia.

The same free-text terms developed initially in MEDLINE were used in Embase.

Part 2: Effectiveness evidence searches

Adults were covered in CG191 in March 2014. The systematic review searches in Part 1 identified a more up to date review from Pick et al. (2019) and the committee agreed on 28/3/24 that a full search was not required for this aspect.

> Pick HJ (2019) Patient-reported outcome measures in the recovery of adults hospitalised with community-acquired pneumonia: a systematic review. *European Respiratory Journal*, 53(3).

The Part 2 searches cover babies, children and young people and the strategies are in the structure:

> Pneumonia AND (Aftercare OR (Patient Discharge AND Symptom Duration)) AND Children AND Cohort Studies AND Limits

No directly applicable test papers were identified. To test the Aftercare and Symptom duration terms 11 test papers were identified from the adults evidence (comprising one review and 9 observational studies included in CG191 plus Pick et al.). Subject headings were identified from the search strategies used in CG191 and in Pick et al. They were expanded by checking the 11 test papers on the Yale MeSH Analyzer at https://mesh.med.yale.edu on 3/5/24, using these PubMed IDs.

> (30635298 or 8531309 or 11029678 or 19967464 or 17035452 or 20047677 or 17296651 or 10683053 or 9926169 or 9229281 or 23114195).ui

The headings were divided into those that always occur after treatment (such as Convalescence) and those that would need to be combined with Patient Discharge (e.g. Health Status). On 3/5/24 the same 11 test papers were run through PubMed PubReMiner at https://hgserver2.amc.nl/cgi-bin/miner/miner2.cgi using the TI and AB fields. There were 70 terms occurring in the title field, with only 12 occurring in more than one title. There were 572 terms in the combined title and abstract fields, with 229 in more than one paper. These results, along with the strategies for CG191 and Pick et al., were used to identify free text. The current strategy was compared to the one for CG191 and a sample of the 500 results that would not be retrieved by this version was reviewed, which confirmed that no potentially relevant papers would be missed. The new MEDLINE strategy had around 1800 results that the one for CG191 (with the same children and cohort terms applied) would not find.

The Emtree terms for aftercare, patient discharge and symptom duration were all focussed, as was the case in CG191. This reduced the test search by 1684 from 4504 to 2820. A sample of the papers that would be missed was reviewed and none were relevant to this protocol. The risk of missing a relevant paper was minimal as it would have to be: not retrieved or unavailable from MEDLINE or CENTRAL; not have any relevant free-text terms; and not be indexed with a focussed Emtree heading.

The terms for children and young people in were adopted from the standard NICE strategies used for these population groups, as amended for previous reviews for this guideline.

In order to identify seed references for the citation searching, a precise version of the MEDLINE strategy was run with the free text in title only and the MeSH terms focussed. This had 231 results and these were screened by title in Ovid to identify any potentially relevant papers, with 15 being selected, as listed in the table 'Forward citation searching and reference list checking'.

The cohort studies filter followed standard NICE practice e.g. they have been used in Tobacco NG209 (Review J: NRT in pregnancy) in March 2019 and Gambling-related harms (NG248) (Review A: Factors) in November 2022. They were originally based on the BMJ MEDLINE cohort study strategy from the BMJ Best Practice Evidence-based medicine (EBM) toolkit and from reviewing the terms used by Waffenschmidt et al.

> Waffenschmidt S et al. (2020) Development and validation of study filters for identifying controlled non-randomized studies in PubMed and Ovid MEDLINE. *Research Synthesis Methods*, 11(5): 617-626.

It is unusual to add study filters to CENTRAL strategies, as this source is already pre-filtered. The protocol specifies that only cohort studies are required and CENTRAL is considered a database of RCTs and quasi-RCTs. Testing showed that nearly 211,000 records were indexed with the MeSH term 'Cohort Studies' and that translating the MEDLINE filter would retrieve over 466,000. It was felt applying this filter was preferable to removing CENTRAL from the list of sources (considering it as a source of RCTs); or to searching it without a filter, when RCTs were excluded by the protocol. The version without the translated cohort filter had 999 results and the version with it had 302 (before other limits were applied). The results were sorted by relevance and 50 of the 697 that would be missed were reviewed on screen, before re-sorting by date of publication and checking 25 of the most recent articles. None of these 75 were potentially relevant.

Part 1: Systematic review searches

Database results

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Cochrane Database of Systematic Reviews (CDSR)	20/11/2023	Wiley	Cochrane Database of Systematic Reviews Issue 11 of 12, November 2023	177
Epistemonikos	20/11/2023	Epistemonikos	Version available on 20/11/23	2096

Re-run results

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Cochrane Database of Systematic Reviews (CDSR)	15/10/2024	Wiley	Cochrane Database of Systematic Reviews Issue 10 of 12, October 2024	8
Epistemonikos	15/10/2024	Epistemonikos	Version available on 15/10/2024	2571

Search strategy history

Database name: Cochrane Database of Systematic Reviews (CDSR)

Searches
#1 [mh ^pneumonia] or [mh ^bronchopneumonia] or [mh ^pleuropneumonia] or [mh ^"pneumonia, bacterial"] or [mh ^"chlamydial pneumonia"] or [mh ^"pneumonia, mycoplasma"] or [mh ^"pneumonia, pneumococcal"] or [mh ^"pneumonia, rickettsial"] or [mh ^"pneumonia, staphylococcal"] or [mh ^"pneumonia, necrotizing"] or [mh ^"pneumonia, viral"] or [mh ^"organizing pneumonia"] or [mh ^"cryptogenic organizing pneumonia"] or [mh ^"healthcare-associated pneumonia"] 5252
#2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*):ti,ab 15137
#3 #1 or #2 16754
#4 #1 or #2 in Cochrane Reviews 244
#5 #1 or #2 with Cochrane Library publication date Between Jan 2014 and Nov 2023, in Cochrane Reviews 177
Note: in the re-run Line #5 was changed to #1 or #2 with Cochrane Library publication date Between Nov 2023 and Oct 2024, in Cochrane Reviews.

Database name: Epistemonikos

Searches
These are the lines as they were input into the interface for the re-run:
1 title:(bronchopneumonia* OR pleuropneumonia* OR broncho-pneumonia OR pleuro-pneumonia or broncho-pneumonias OR pleuro-pneumonias OR "broncho pneumonia" OR "pleuro pneumonia" or "broncho pneumonias" OR "pleuro pneumonias")
2 abstract:(bronchopneumonia* OR pleuropneumonia* OR broncho-pneumonia OR pleuro-pneumonia or broncho-pneumonias OR pleuro-pneumonias OR "broncho pneumonia" OR "pleuro pneumonia" or "broncho pneumonias" OR "pleuro pneumonias")
3 title:(pneumonia OR pneumonias)
4 abstract:((pneumonia OR pneumonias) AND (HAP OR nosocomial* OR crossinfect* OR cross-infection OR cross-infected OR cross-infecting OR "cross infection" OR "cross infected" OR "cross infecting" or hospitalised* or hospitalized* or hospitalisation* or hospitalization*))
5 abstract:((pneumonia OR pneumonias) AND ("healthcare acquire" OR "healthcare acquired" OR "healthcare acquiring" OR "healthcare onset" OR "healthcare associate" OR "healthcare associated" OR "healthcare associating"))
6 abstract:((pneumonia OR pneumonias) AND ("health care acquire" OR "health care acquired" OR "health care acquiring" OR "health care onset" OR "health care associate" OR "health care associated" OR "health care associating"))
7 abstract:((pneumonia OR pneumonias) AND ("hospital acquire" OR "hospital acquired" OR "hospital acquiring" OR "hospital onset" OR "hospital associate" OR "hospital associated" OR "hospital associating"))
8 abstract:((pneumonia OR pneumonias) AND ("inpatient acquire" OR "inpatient acquired" OR "inpatient acquiring" OR "inpatient onset" OR "inpatient associate" OR "inpatient associated" OR "inpatient associating"))
9 abstract:((pneumonia OR pneumonias) AND (healthcare-acquire OR healthcare-acquired OR healthcare-acquiring OR healthcare-onset OR healthcare-associate OR healthcare-associated OR healthcare-associating))

Searches
10 abstract:((pneumonia OR pneumonias) AND (health-care-acquire OR health-care-acquired OR health-care-acquiring OR health-care-onset OR health-care-associate OR health-care-associated OR health-care-associating))
11 abstract:((pneumonia OR pneumonias) AND (hospital-acquire OR hospital-acquired OR hospital-acquiring OR hospital-onset OR hospital-associate OR hospital-associated OR hospital-associating))
12 abstract:((pneumonia OR pneumonias) AND (inpatient-acquire OR inpatient-acquired OR inpatient-acquiring OR inpatient-onset OR inpatient-associate OR inpatient-associated OR inpatient-associating))
13 abstract:((pneumonia OR pneumonias) AND (CAP OR community* OR communities* OR outpatient* OR nonhospital* OR "non hospital" OR non-hospital OR "non hospitalised" OR non-hospitalised OR "non hospitalized" OR non-hospitalized OR "non hospitalisation" OR non-hospitalisation OR "non hospitalization" OR non-hospitalization))
14 abstract:((pneumonia OR pneumonias) AND (bacterial* OR chlamydial* OR mycoplasma* OR pneumococcal* OR rickettsial* OR staphylococcal* OR staphylococcus* OR necrotiz* OR necrotis* OR viral* OR organizing* OR organising* OR cryptogenic* OR bilateral* OR granulomatous* OR infectious* OR interstitial* OR neonatal* OR obstructive* OR lobar* OR escherichia* OR haemophilus* OR hemophilus* OR influenzae* OR nocardiosis* OR streptococcus* OR streptococcal*))
This is the final search as formatted by Epistemonikos:
title:((bronchopneumonia* OR pleuropneumonia* OR broncho-pneumonia OR pleuro-pneumonia OR broncho-pneumonias OR pleuro-pneumonias OR "broncho pneumonia" OR "pleuro pneumonia" OR "broncho pneumonias" OR "pleuro pneumonias")) OR abstract:((bronchopneumonia* OR pleuropneumonia* OR broncho-pneumonia OR pleuro-pneumonia OR broncho-pneumonias OR pleuro-pneumonias OR "broncho pneumonia" OR "pleuro pneumonia" OR "broncho pneumonias" OR "pleuro pneumonias")) OR title:((pneumonia OR pneumonias)) OR abstract:(((pneumonia OR pneumonias) AND (HAP OR nosocomial* OR crossinfect* OR cross-infection OR cross-infected OR cross-infecting OR "cross infection" OR "cross infected" OR "cross infecting" OR hospitalised* OR hospitalized* OR hospitalisation* OR hospitalization*))) OR abstract:(((pneumonia OR pneumonias) AND ("healthcare acquire" OR "healthcare acquired" OR "healthcare acquiring" OR "healthcare onset" OR "healthcare associate" OR "healthcare associated" OR "healthcare associating"))) OR abstract:(((pneumonia OR pneumonias) AND ("health care acquire" OR "health care acquired" OR "health care acquiring" OR "health care onset" OR "health care associate" OR "health care associated" OR "health care associating"))) OR abstract:(((pneumonia OR pneumonias) AND ("hospital acquire" OR "hospital acquired" OR "hospital acquiring" OR "hospital onset" OR "hospital associate" OR "hospital associated" OR "hospital associating"))) OR abstract:(((pneumonia OR pneumonias) AND ("inpatient acquire" OR "inpatient acquired" OR "inpatient acquiring" OR "inpatient onset" OR "inpatient associate" OR "inpatient associated" OR "inpatient associating"))) OR abstract:(((pneumonia OR pneumonias) AND (healthcare-acquire OR healthcare-acquired OR healthcare-acquiring OR healthcare-onset OR healthcare-associate OR healthcare-associated OR healthcare-associating))) OR abstract:(((pneumonia OR pneumonias) AND (health-care-acquire OR health-care-acquired OR health-care-acquiring OR health-care-onset OR health-care-associate OR health-care-associated OR health-care-associating))) OR abstract:(((pneumonia OR pneumonias) AND (hospital-acquire OR hospital-acquired OR hospital-acquiring OR hospital-onset OR hospital-associate OR hospital-associated OR hospital-associating))) OR abstract:(((pneumonia OR pneumonias) AND (inpatient-acquire OR inpatient-acquired OR inpatient-acquiring OR inpatient-onset OR inpatient-associate OR inpatient-associated OR inpatient-associating))) OR abstract:(((pneumonia OR pneumonias) AND (CAP OR community* OR communities* OR outpatient* OR nonhospital* OR "non hospital" OR non-hospital OR "non hospitalised" OR non-hospitalised OR "non hospitalized" OR non-hospitalized OR "non hospitalisation" OR non-hospitalisation OR "non hospitalization" OR non-hospitalization))) OR abstract:(((pneumonia OR pneumonias) AND

Searches
(bacterial* OR chlamydial* OR mycoplasma* OR pneumococcal* OR rickettsial* OR staphylococcal* OR staphylococcus* OR necrotiz* OR necrotis* OR viral* OR organizing* OR organising* OR cryptogenic* OR bilateral* OR granulomatous* OR infectious* OR interstitial* OR neonatal* OR obstructive* OR lobar* OR escherichia* OR haemophilus* OR hemophilus* OR influenzae* OR nocardiosis* OR streptococcus* OR streptococcal*)))
Results:
Total: 48055
Apply Publication Year limits of 2014-2024: 30820
Download 1: Apply Publication type - Systematic Review: 2307
Download 2: Apply Publication type - Broad Synthesis: 223
Download 3: Apply Publication type - Structured Summary: 41
Note:
The re-run search covered the whole timespan 2014-2024 as the phrases in the free text were updated to use a version with a hyphen and to spell out the words rather than truncating them. The main search had used Publication Year limits of 2014-2023.

Part 2: Effectiveness evidence searches

Database results

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Cochrane Central Register of Controlled Trials (CENTRAL)	13/5/2024	Wiley	Cochrane Central Register of Controlled Trials Issue 4 of 12, April 2024	194
Embase	13/5/2024	Ovid	Embase 1974 to 2024 May 10	2820
MEDLINE ALL	13/5/2024	Ovid	Ovid MEDLINE(R) ALL 1946 to May 10, 2024	2327

Additional search techniques

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Forward citation searching	9/5/2024	Web of Science (WOS) Core Collection (1990-present)	Data updated 2024-05-07	12
Reference list checking	9/5/2024	Web of Science (WOS) Core Collection (1990-present)	Data updated 2024-05-07	41

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Other NICE evidence review post search	17/10/24	N/A	N/A	3

Search strategy history

Database name: Cochrane Central Register of Controlled Trials (CENTRAL)

Searches
#1 [mh ^pneumonia] or [mh ^bronchopneumonia] or [mh ^pleuropneumonia] or [mh ^"pneumonia, bacterial"] or [mh ^"chlamydial pneumonia"] or [mh ^"pneumonia, mycoplasma"] or [mh ^"pneumonia, pneumococcal"] or [mh ^"pneumonia, staphylococcal"] or [mh ^"pneumonia, necrotizing"] or [mh ^"pneumonia, viral"] or [mh ^"organizing pneumonia"] or [mh ^"healthcare-associated pneumonia"] 4436
#2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*):ti,ab 15898
#3 #1 or #2 17143
#4 [mh ^"Patient Readmission"] 1614
#5 [mh ^Retreatment] 1172
#6 [mh ^Aftercare] 1219
#7 [mh ^Convalescence] 182
#8 [mh Recurrence] 16533
#9 [mh ^"Recovery of Function"] 7275
#10 [mh ^"Breakthrough Infections"] 8
#11 [mh ^"Persistent Infection"] 17
#12 (aftercare* or after-care* or convalescen*):ti,ab 2853
#13 (re-treat* or retreat* or reinfect* or re-infect* or re-consult* or reconsult* or re-hospital* or rehospitali* or re-admit* or readmit* or re-admission* or readmission* or re-crudescen* or recrudescen*):ti,ab 17558
#14 ((second* or followup* or follow-up* or repeat* or repetiti* or return* or subsequent*) NEAR/2 (consult* or hospitalis* or hospitaliz* or admission* or visit* or appointment* or session*)):ti,ab 30973
#15 ((symptom* or function* or fitness* or strength* or physical* or activity* or activities*) NEAR/3 (resolution* or resolv* or unresolv* or recover* or nonrecover* or relaps* or remit* or remission* or recuperat* or return* or refractory*)):ti,ab 22010
#16 (symptom* NEAR/3 (reappear* or flare* or trajector* or duration* or length* or persist* or prolong* or protract* or lasting* or continuing* or ongoing* or endur* or recur* or rebound* or return* or sequela*)):ti,ab 11423
#17 ((resolution* or resolv* or recover* or nonrecover* or rehab* or recuperat*) NEAR/3 (time* or timing* or month* or year* or week* or delay* or continual* or discontinu* or disrupt* or slow* or gradual* or long* or fast* or rapid* or phase* or periodic* or intermittent* or interrupt* or sporadic* or regular* or irregular* or constant* or interval* or episodic* or complicat* or red-flag* or warning-sign*)):ti,ab 31891
#18 (infect* NEAR/3 (breakthrough* or relaps* or refractory* or recur* or persist* or chronic*)):ti,ab 8311
#19 {or #4-#18} 134654
#20 [mh "Treatment failure"] 4165

Searches
#21 [mh ^"patient discharge"] 2689
#22 (discharge* or discharging* or postdischarg*):ti,ab 50613
#23 (posthospital* or posttreatment* or posttherap*):ti,ab 27421
#24 ((after* or post* or following*) NEAR/1 (hospital* or treatment* or therap*)):ti,ab 117622
#25 (postpneumon* or postbronchopneumon* or postpleuropneumon* or postinfect* or postacute* or post-pneumon* or post-bronchopneumon* or post-pleuropneumon* or post-infect* or post-acute*):ti,ab 1530
#26 ((treatment* or therap*) NEAR/3 (second* or followup* or follow-up* or repeat* or repetiti* or return* or subsequent* or fail*)):ti,ab 68062
#27 {or #20-#26} 222852
#28 [mh ^"Symptom Assessment"] 454
#29 [mh ^"treatment outcome"] 191339
#30 [mh ^"Physical fitness"] or [mh ^"Activities of daily living"] 10485
#31 [mh ^"time factors"] or [mh ^"episode of care"] or [mh ^"length of stay"] 89268
#32 [mh ^"Patient Acuity"] 230
#33 [mh ^"Clinical Deterioration"] 49
#34 [mh ^"Outcome Assessment (Health Care)"] 11079
#35 [mh ^"health status"] or [mh ^"Health Status Indicators"] 6145
#36 [mh ^morbidity] 1148
#37 [mh ^"Survival Analysis"] or [mh ^"Survival Rate"] or [mh ^"Severity of Illness Index"] 48851
#38 (re-assess* or reassess* or revisit* or re-visit* or re-examin* or reexamin*):ti,ab 8254
#39 ((symptom* or illness* or disease* or condition*) NEAR/3 (evaluat* or cure* or assess* or burden* or time* or timing* or month* or year* or week* or delay* or continual* or discontinu* or disrupt* or slow* or gradual* or long* or fast* or rapid* or phase* or periodic* or intermittent* or interrupt* or sporadic* or regular* or irregular* or constant* or interval* or episodic* or predict* or elevat* or severity* or prognos* or complicat* or improv* or declin* or deteriorat* or clearance* or trajector*)):ti,ab 189046
#40 ((recover* or nonrecover* or rehab* or recuperat*) NEAR/3 (improv* or declin* or deteriorat*)):ti,ab 7612
#41 (clinical* NEAR/2 (cure* or clearance* or improv* or declin* or deteriorat*)):ti,ab 34703
#42 (Patient* NEAR/1 (Acuit* or recover* or nonrecover* or relaps* or recuperat* or refractory* or improv* or declin* or deteriorat*)):ti,ab 22773
#43 (health* NEAR/1 (risk* or status* or outcome*) NEAR/2 (indicator* or appraisal* or index* or assess* or phase* or red-flag* or warning-sign* or indice* or analys* or rate* or improv* or declin* or deteriorat*)):ti,ab 4795
#44 morbidity*:ti,ab 44622
#45 ((survival* or severity*) NEAR/3 (indicator* or appraisal* or index* or indice* or outcome* or analys* or rate*)):ti,ab 53341
#46 {or #28-#45} 553535
#47 #27 and #46 90441
#48 #19 or #47 208431
#49 #3 and #48 3508
#50 [mh "pediatrics"] or [mh ^Infant] or [mh ^"Infant Health"] or [mh ^"Infant Welfare"] or [mh ^"Infant Care"] or [mh Child] or [mh "Child Behavior"] or [mh ^"Child Health"] or [mh

Searches
^"Child Welfare"] or [mh ^"Child Care"] or [mh ^Minors] or [mh ^" Child, Hospitalized"] 94934
#51 (pediatric* or paediatric* or infan* or baby* or babies or toddler* or (pre NEXT school*) or preschool* or kindergar* or child* or minor or minors or boy* or girl* or kid or kids):ti,ab 239622
#52 [mh ^Adolescent] or [mh ^"Adolescent Behavior"] or [mh ^"Adolescent Health"] or [mh ^Puberty] or [mh ^"Adolescent, Hospitalized"] 136971
#53 ((under NEXT 18*) or (under NEXT eighteen*)):ti,ab 16924
#54 (adolescen* or pubescen* or prepubescen* or puberty* or prepubert* or teen* or preteen* or juvenil* or youth* or youngster* or schoolchild* or (school NEXT age*) or schoolage* or underage* or (under NEXT age*)):ti,ab 52387
#55 (young* NEAR/1 (adult* or person* or people* or men or man or women* or woman* or male* or female* or patient* or inpatient* or outpatient*)):ti,ab 30090
#56 {or #50-#55} 397578
#57 #49 and #56 999
#58 [mh "Cohort studies"] 210983
#59 ((follow-up* or followup* or concurrent* or incidence* or population*) NEAR/3 (study* or studies* or analy* or observation* or design* or method* or research*)):ti,ab 74092
#60 (longitudinal* or prospective* or retrospective* or cohort*):ti,ab 328753
#61 [mh ^"epidemiologic methods"] with Publication Year from 1970 to 1989, in Trials 58
#62 {or #58-#61} 466180
#63 #57 and #62 302
#64 ((clinicaltrials or trialsearch* or trial-registry or trials-registry or clinicalstudies or trialsregister* or trialregister* or trial-number* or studyregister* or study-register* or controlled-trials-com or current-controlled-trial or AMCTR or ANZCTR or ChiCTR* or CRiS or CTIS or CTRI* or DRKS* or EU-CTR* or EUCTR* or EUDRACT* or ICTRP or IRCT* or JAPIC* or JMCTR* or JRCT or ISRCTN* or LBCTR* or NTR* or ReBec* or REPEC* or RPCEC* or SLCTR or TCTR* or UMIN*):so or (ctgov or ictrp)):an 511393
#65 #63 not #64 226
#66 "conference":pt 242579
#67 #65 not #66 203
#68 #65 not #66 in Trials 194

Database name: Embase

Searches
1 pneumonia/ or bilateral pneumonia/ or bronchopneumonia/ or granulomatous pneumonia/ or infectious pneumonia/ or interstitial pneumonia/ or necrotizing pneumonia/ or neonatal pneumonia/ or obstructive pneumonia/ or organizing pneumonia/ or bacterial pneumonia/ or community acquired pneumonia/ or health care associated pneumonia/ or exp lobar pneumonia/ or virus pneumonia/ or chlamydial pneumonia/ or escherichia coli pneumonia/ or haemophilus influenzae pneumonia/ or pulmonary nocardiosis/ or mycoplasma pneumonia/ or exp staphylococcal pneumonia/ or exp streptococcus pneumonia/ or hospital acquired pneumonia/ 324415
2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab. 240637
3 1 or 2 408660
4 *hospital readmission/ 19472
5 *retreatment/ 1943

Searches
6 *aftercare/ 2822
7 *convalescence/ 8752
8 exp *reinfection/6960
9 *recurrent disease/ 25680
10 *recrudescence/ 34
11 *relapse/ 36999
12 *remission/ 26040
13 *breakthrough infection/ 767
14 *chronic infection/ 752
15 (aftercare* or "after care*" or convalescen*).ti,ab. 32118
16 (re-treat* or retreat* or reinfect* or re-infect* or re-consult* or reconsult* or re-hospital* or rehospitali* or re-admit* or readmit* or re-admission* or readmission* or re-crudescen* or recrudescen*).ti,ab. 165585
17 ((second* or followup* or follow-up* or repeat* or repetiti* or return* or subsequent*) adj2 (consult* or hospitalis* or hospitaliz* or admission* or visit* or appointment* or session*)).ti,ab. 110145
18 ((symptom* or function* or fitness* or strength* or physical* or activity* or activities*) adj3 (resolution* or resolv* or unresolv* or recover* or nonrecover* or relaps* or remit* or remission* or recuperat* or return* or refractory*)).ti,ab. 216655
19 (symptom* adj3 (reappear* or re-appear* or flare* or trajector* or duration* or length* or persist* or prolong* or protract* or lasting* or continuing* or ongoing* or endur* or recur* or rebound* or return* or sequela*)).ti,ab. 108986
20 ((resolution* or resolv* or recover* or nonrecover* or rehab* or recuperat*) adj3 (time* or timing* or month* or year* or week* or delay* or continual* or discontinu* or disrupt* or slow* or gradual* or long* or fast* or rapid* or phase* or periodic* or intermittent* or interrupt* or sporadic* or regular* or irregular* or constant* or interval* or episodic* or complicat* or "red flag*" or "warning sign*")).ti,ab. 279199
21 (infect* adj3 (breakthrough* or relaps* or refractory* or recur* or persist* or chronic*)).ti,ab. 172150
22 or/4-21 1092219
23 *treatment failure/ 14317
24 *hospital discharge/ 17610
25 (discharge* or discharging* or postdischarg*).ti,ab. 583267
26 (posthospital* or posttreatment* or posttherap*).ti,ab. 33651
27 ((after* or post* or following*) adj1 (hospital* or treatment* or therap*)).ti,ab. 653715
28 (postpneumon* or postbronchopneumon* or postpleuropneumon* or postinfect* or postacute* or post-pneumon* or post-bronchopneumon* or post-pleuropneumon* or post-infect* or post-acute*).ti,ab. 54106
29 ((treatment* or therap*) adj3 (second* or followup* or follow-up* or repeat* or repetiti* or return* or subsequent* or fail*)).ti,ab. 401515
30 or/23-29 1615092
31 *symptom assessment/ 1790
32 *treatment outcome/ or *clinical outcome/ or *treatment duration/ or *treatment response/ 144971
33 *Fitness/ 17163
34 *daily life activity/ 17132
35 *illness trajectory/ or *time factor/ or *"length of stay"/ 18221

Searches
36 *patient acuity/ 243
37 *deterioration/ 4202
38 *outcome assessment/ 74732
39 *health status/ or *health status indicator/ 41752
40 *morbidity/ 30484
41 *Survival Analysis/ or *Survival Rate/ or *Severity of Illness Index/ 15680
42 *disease clearance/ 282
43 (re-assess* or reassess* or revisit* or re-visit* or re-examin* or reexamin*).ti,ab. 131735
44 ((symptom* or illness* or disease* or condition*) adj3 (evaluat* or cure* or assess* or burden* or time* or timing* or month* or year* or week* or delay* or continual* or discontinu* or disrupt* or slow* or gradual* or long* or fast* or rapid* or phase* or periodic* or intermittent* or interrupt* or sporadic* or regular* or irregular* or constant* or interval* or episodic* or predict* or elevat* or severity* or prognos* or complicat* or improv* or declin* or deteriorat* or clearance* or trajector*)).ti,ab. 1527905
45 ((recover* or nonrecover* or rehab* or recuperat*) adj3 (improv* or declin* or deteriorat*)).ti,ab. 42137
46 (clinical* adj2 (cure* or clearance* or improv* or declin* or deteriorat*)).ti,ab. 200202
47 (Patient* adj1 (Acuit* or recover* or nonrecover* or relaps* or recuperat* or refractory* or improv* or declin* or deteriorat*)).ti,ab. 229832
48 (health* adj1 (risk* or status* or outcome*) adj2 (indicator* or appraisal* or index* or assess* or phase* or "red flag*" or "warning sign*" or indice* or analys* or rate* or improv* or declin* or deteriorat*)).ti,ab. 42153
49 morbidity*.ti,ab. 705540
50 ((survival* or severity*) adj3 (indicator* or appraisal* or index* or indice* or outcome* or analys* or rate*)).ti,ab. 550690
51 or/31-50 3384544
52 30 and 51 351467
53 22 or 52 1381650
54 3 and 53 44157
55 exp pediatrics/ or Juvenile/ or exp child/ or child health/ or infant welfare/ or Child Behavior/ or Child Welfare/ or exp child care/ or "minor (person)"/ or hospitalized child/ or hospitalized infant/ or child hospitalization/ 3333737
56 pediatric hospital/ or pediatric ward/ or pediatric intensive care unit/ 53336
57 (pediatric* or paediatric* or infan* or baby* or babies or toddler* or pre-school* or preschool* or kindergar* or child* or minor or minors or boy* or girl* or kid or kids).ti,ab. 3398506
58 exp adolescent/ or adolescent behavior/ or adolescent health/ or exp Puberty/ or hospitalized adolescent/ 1874490
59 elementary student/ or high school student/ or middle school student/ 13727
60 (under-18* or under-eighteen*).ti,ab. 8027
61 (adolescen* or pubescen* or prepubescen* or puberty* or prepubert* or teen* or preteen* or juvenil* or youth* or youngster* or schoolchild* or school-age* or schoolage* or underage* or under-age*).ti,ab. 795189
62 (young* adj1 (adult* or person* or people* or men or man or women* or woman* or male* or female* or patient* or inpatient* or outpatient*)).ti,ab. 483602
63 or/55-62 5683700
64 54 and 63 10854

Searches
65 cohort analysis/ 1160113
66 longitudinal study/ 212754
67 prospective study/ 917854
68 retrospective study/ 1616914
69 follow up/ 2186860
70 ((follow up* or followup* or concurrent* or incidence* or population*) adj3 (study* or studies* or analy* or observation* or design* or method* or research*)).ti,ab. 844100
71 (longitudinal* or prospective* or retrospective* or cohort*).ti,ab. 4304017
72 or/65-71 6415454
73 64 and 72 5125
74 limit 73 to english language 4899
75 (letter or editorial).pt. 2125890
76 74 not 75 4885
77 Case report/ 2998571
78 76 not 77 4042
79 nonhuman/ not human/ 5441331
80 78 not 79 4020
81 (conference abstract* or conference review or conference paper or conference proceeding).db,pt,su. 5932576
82 80 not 81 2820

Database name: MEDLINE ALL

Searches
1 pneumonia/ or bronchopneumonia/ or pleuropneumonia/ or pneumonia, bacterial/ or chlamydial pneumonia/ or pneumonia, mycoplasma/ or pneumonia, pneumococcal/ or pneumonia, staphylococcal/ or pneumonia, necrotizing/ or pneumonia, viral/ or organizing pneumonia/ or healthcare-associated pneumonia/ 125351
2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab. 163547
3 1 or 2 233574
4 Patient Readmission/ 23591
5 Retreatment/ 10045
6 Aftercare/ 13809
7 Convalescence/ 4002
8 exp Recurrence/ 203903
9 Recovery of Function/ 59755
10 Breakthrough Infections/ 303
11 Persistent Infection/ 540
12 (aftercare* or "after care*" or convalescen*).ti,ab. 25915
13 (re-treat* or retreat* or reinfect* or re-infect* or re-consult* or reconsult* or re-hospital* or rehospitali* or re-admit* or readmit* or re-admission* or readmission* or re-crudescen* or recrudescen*).ti,ab. 98762
14 ((second* or followup* or follow-up* or repeat* or repetiti* or return* or subsequent*) adj2 (consult* or hospitalis* or hospitaliz* or admission* or visit* or appointment* or session*)).ti,ab. 63066

Searches
15 ((symptom* or function* or fitness* or strength* or physical* or activity* or activities*) adj3 (resolution* or resolv* or unresolv* or recover* or nonrecover* or relaps* or remit* or remission* or recuperat* or return* or refractory*)).ti,ab. 146547
16 (symptom* adj3 (reappear* or re-appear* or flare* or trajector* or duration* or length* or persist* or prolong* or protract* or lasting* or continuing* or ongoing* or endur* or recur* or rebound* or return* or sequela*)).ti,ab. 68279
17 ((resolution* or resolv* or recover* or nonrecover* or rehab* or recuperat*) adj3 (time* or timing* or month* or year* or week* or delay* or continual* or discontinu* or disrupt* or slow* or gradual* or long* or fast* or rapid* or phase* or periodic* or intermittent* or interrupt* or sporadic* or regular* or irregular* or constant* or interval* or episodic* or complicat* or "red flag*" or "warning sign*")).ti,ab. 212920
18 (infect* adj3 (breakthrough* or relaps* or refractory* or recur* or persist* or chronic*)).ti,ab. 122414
19 or/4-18 933214
20 exp Treatment failure/ 37633
21 patient discharge/ 41555
22 (discharge* or discharging* or postdischarg*).ti,ab. 358648
23 (posthospital* or posttreatment* or posttherap*).ti,ab. 26394
24 ((after* or post* or following*) adj1 (hospital* or treatment* or therap*)).ti,ab. 431572
25 (postpneumon* or postbronchopneumon* or postpleuropneumon* or postinfect* or postacute* or post-pneumon* or post-bronchopneumon* or post-pleuropneumon* or post-infect* or post-acute*).ti,ab. 40958
26 ((treatment* or therap*) adj3 (second* or followup* or follow-up* or repeat* or repetiti* or return* or subsequent* or fail*)).ti,ab. 251024
27 or/20-26 1072668
28 Symptom Assessment/ 7118
29 treatment outcome/ 1186930
30 Physical fitness/ or Activities of daily living/ 103874
31 time factors/ or episode of care/ or length of stay/ 1324234
32 Patient Acuity/ 3097
33 Clinical Deterioration/ 727
34 "Outcome Assessment (Health Care)"/ 83341
35 health status/ or Health Status Indicators/ 113095
36 morbidity/ 34865
37 Survival Analysis/ or Survival Rate/ or Severity of Illness Index/ 590214
38 (re-assess* or reassess* or revisit* or re-visit* or re-examin* or reexamin*).ti,ab. 107057
39 ((symptom* or illness* or disease* or condition*) adj3 (evaluat* or cure* or assess* or burden* or time* or timing* or month* or year* or week* or delay* or continual* or discontinu* or disrupt* or slow* or gradual* or long* or fast* or rapid* or phase* or periodic* or intermittent* or interrupt* or sporadic* or regular* or irregular* or constant* or interval* or episodic* or predict* or elevat* or severity* or prognos* or complicat* or improv* or declin* or deteriorat* or clearance* or trajector*)).ti,ab. 1011232
40 ((recover* or nonrecover* or rehab* or recuperat*) adj3 (improv* or declin* or deteriorat*)).ti,ab. 30228
41 (clinical* adj2 (cure* or clearance* or improv* or declin* or deteriorat*)).ti,ab. 124640

Searches
42 (Patient* adj1 (Acuit* or recover* or nonrecover* or relaps* or recuperat* or refractory* or improv* or declin* or deteriorat*)).ti,ab. 139365
43 (health* adj1 (risk* or status* or outcome*) adj2 (indicator* or appraisal* or index* or assess* or phase* or "red flag*" or "warning sign*" or indice* or analys* or rate* or improv* or declin* or deteriorat*)).ti,ab. 33652
44 morbidity*.ti,ab. 469464
45 ((survival* or severity*) adj3 (indicator* or appraisal* or index* or indice* or outcome* or analys* or rate*)).ti,ab. 361105
46 or/28-45 4609874
47 27 and 46 374006
48 19 or 47 1241409
49 3 and 48 21581
50 exp pediatrics/ or Infant/ or Infant Health/ or Infant Welfare/ or Infant Care/ or exp Child/ or exp Child Behavior/ or Child Health/ or Child Welfare/ or Child Care/ or Minors/ or Child, Hospitalized/ 2517663
51 (pediatric* or paediatric* or infan* or baby* or babies or toddler* or pre-school* or preschool* or kindergar* or child* or minor or minors or boy* or girl* or kid or kids).ti,ab. 2674284
52 Adolescent/ or Adolescent Behavior/ or Adolescent Health/ or Puberty/ or Adolescent, Hospitalized/ 2250768
53 (under-18* or under-eighteen*).ti,ab. 4554
54 (adolescen* or pubescen* or prepubescen* or puberty* or prepubert* or teen* or preteen* or juvenil* or youth* or youngster* or schoolchild* or school-age* or schoolage* or underage* or under-age*).ti,ab. 620350
55 (young* adj1 (adult* or person* or people* or men or man or women* or woman* or male* or female* or patient* or inpatient* or outpatient*)).ti,ab. 352902
56 or/50-55 5057638
57 49 and 56 6091
58 exp Cohort studies/ 2603496
59 ((follow up* or followup* or concurrent* or incidence* or population*) adj3 (study* or studies* or analy* or observation* or design* or method* or research*)).ti,ab. 502236
60 (longitudinal* or prospective* or retrospective* or cohort*).ti,ab. 2715685
61 epidemiologic methods/ and (197* or 198*).yr. 10282
62 or/58-61 3975060
63 57 and 62 2668
64 limit 63 to english language 2433
65 limit 64 to (letter or historical article or comment or editorial or news or case reports) 101
66 64 not 65 2332
67 Animals/ not (Animals/ and Humans/) 5185862
68 66 not 67 2327

Additional search techniques

Forward citation searching and reference list checking

Date of search	9/5/24

How the searches were managed	Forward citation searching and reference list checking were done separately as two different operations using the same sources, seed references and decision-making criteria.
How the seed papers were identified	From the scoping searches (results were screened from running a precise version of the MEDLINE strategy)
Databases used	Web of Science (WOS) Core Collection (1990-present) • Science Citation Index Expanded (1990-present) • Social Sciences Citation Index (1990-present) • Arts & Humanities Citation Index (1990-present) • Emerging Sources Citation Index (2019-present)
Date of last update	Data updated 2024-05-07
How results were managed	Only those references that could be accessed through the NICE subscription to WOS were added to the search results. Duplicates were removed from the marked list in WOS before downloading the results.
How the results were selected	Included any papers potentially relevant to readmissions or duration of symptoms. Did not include any papers that were obviously only about adults; included papers that were obviously about children from the title; and included papers where it was unclear what age groups might be covered. Did not make any decisions based on the location of the study. Did not include any papers about COVID-19 Did not include any papers that were about methods or epidemiology. Did not include systematic reviews, animal studies, letters or editorials. Did not include anything that was not written in English.
List of seed papers used	Ashraf H et al. (2012) Observational follow-up study following two cohorts of children with severe pneumonia after discharge from day care clinic/hospital in Dhaka, Bangladesh. *BMJ Open*, 2(4). Azmeraw S et al. (2022) Joint modeling of longitudinal measures of pneumonia and time to convalescence among pneumonia patients: a comparison of separate and joint models. *Pneumonia*, 14(1), 10.

	Huang L et al. (2018) Independent predictors for longer radiographic resolution in patients with refractory mycoplasma pneumoniae pneumonia: a prospective cohort study. *BMJ Open*, 8(12), e023719. Li Z et al. (2024) Clinical characteristics of persistent or recurrent pneumonia combined with airway malacia in children. *Clinical Respiratory Journal*, 18(5), e13767. Luo Y et al. (2023) Development and validation of a simple-to-use nomogram for predicting the delayed radiographic recovery in children with mycoplasma pneumoniae pneumonia complicated with atelectasis. *Journal of Investigative Medicine*, 71(7), 722-729. Markham JL et al. (2021) Readmissions following hospitalization for infection in children with or without medical complexity. *Journal of Hospital Medicine*, 16(3), 134-141. Neuman MI et al. (2014) Readmissions among children previously hospitalized with pneumonia. *Pediatrics*, 134(1), 100-9. Ngari MM et al. (2017) Mortality after inpatient treatment for severe pneumonia in children: a cohort study. *Paediatric and Perinatal Epidemiology*, 31(3), 233-242. Panelo CI et al. (2011) Understanding predictors of postdischarge deaths: a prospective evaluation of children 5 years and younger discharged from Philippine district hospitals. *Asia-Pacific Journal of Public Health*, 23(2), 133-40. Shafi O et al. (2024) Characteristics, outcomes, and 30-day readmissions following pediatric extracorporeal membrane oxygenation in the United States: a nationwide readmissions database study. *Perfusion*, 39(2), 399-407. Sung M et al. (2022) Assessment of variables associated with prolonged admission duration in children with mycoplasma pneumoniae pneumonia.

	Clinical Respiratory Journal, 16(11), 756-767. Tirore LL et al. (2021) Time to recovery from severe pneumonia and its predictors among children 2-59 months of age admitted to pediatric ward of Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Hossana, Ethiopia: retrospective cohort study. *Pediatric Health Medicine & Therapeutics*, 12, 347-357. Wang L et al. (2019) Risk factors of 90-day rehospitalization following discharge of pediatric patients hospitalized with mycoplasma pneumoniae pneumonia. *BMC Infectious Diseases*, 19(1), 966. Yan Q et al. (2021) Risk factors for delayed radiographic resolution in children with refractory mycoplasma pneumoniae pneumonia. *Journal of International Medical Research*, 49(5), 3000605211015579. Zheng Y et al. (2024) Early predictors of delayed radiographic resolution of lobar pneumonia caused by mycoplasma pneumoniae in children: a retrospective study in China. *BMC Infectious Diseases*, 24(1), 414.
No. of forward citation searching results	12
No. of reference list checking results	41

Other NICE evidence review

Date of search	17/10/2024
How the seed papers were identified	In line with section 6.1 of the NICE manual (Ensuring relevant records are not missed), potentially relevant papers were identified while screening the results for RQ1.1 (Prediction tools) and passed over for more detailed screening in line with this protocol.
How results were managed	The studies were downloaded from EPPI as a RIS file and imported into this review.
No. of results	3
Seed paper considered	Bhat JI et al. (2021) Risk of Hospitalization in Under-five Children With Community-Acquired Pneumonia: A Multicentric Prospective Cohort Study. Indian Pediatrics, 58(11), 1019–1023. Mahajan V et al. (2016) Clinical predictors of hospital admission in acute lower respiratory

	tract infection in 2 months to 2-year-old children. Respirology, 21(2), 350–356. Muhe L (1998) Pattern of resolution of tachypnoea and fever in childhood pneumonia. East African Medical Journal, 75(2), 63–67.

Part 3: Cost effectiveness searches

Database results

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Econlit	20/11/2023	Ovid	Econlit 1886 to November 11, 2023	90
Embase	20/11/2023	Ovid	Embase 1974 to 2023 November 17	2288
International HTA Database	20/11/2023	INAHTA	Version available on 20/11/23 with 21319 records	30
MEDLINE ALL	20/11/2023	Ovid	Ovid MEDLINE(R) ALL 1946 to November 17, 2023	1534
NHS Economic Evaluation Database (NHS EED)	20/11/2023	CRD	Archived – last updated 31 March 2015	11

Re-run results

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Econlit	14/10/2024	Ovid	Econlit 1886 to October 03, 2024	6
Embase	14/10/2024	Ovid	Embase 1974 to 2024 October 11	306
International HTA Database	14/10/2024	INAHTA	Version available on 14/10/24 with 23533 records	6
MEDLINE ALL	14/10/2024	Ovid	Ovid MEDLINE(R) ALL 1946 to	157

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
			October 11, 2024	

Search strategy history

Database name: Econlit

Searches	
1	(pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).af. 150
2	limit 1 to yr="2014 -Current" 90
Note: in the re-run Line 2 was changed to limit 1 to yr="2023 -Current".	

Database name: Embase

Searches	
1	pneumonia/ or bilateral pneumonia/ or bronchopneumonia/ or granulomatous pneumonia/ or infectious pneumonia/ or interstitial pneumonia/ or necrotizing pneumonia/ or neonatal pneumonia/ or obstructive pneumonia/ or exp organizing pneumonia/ or bacterial pneumonia/ or community acquired pneumonia/ or health care associated pneumonia/ or hospital acquired pneumonia/ or exp lobar pneumonia/ or virus pneumonia/ or chlamydial pneumonia/ or escherichia coli pneumonia/ or haemophilus influenzae pneumonia/ or pulmonary nocardiosis/ or mycoplasma pneumonia/ or rickettsial pneumonia/ or exp staphylococcal pneumonia/ or exp streptococcus pneumonia/ 314875
2	(pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab. 232562
3	1 or 2 395881
4	cost utility analysis/ 12471
5	quality adjusted life year/ 35716
6	cost*.ti. 195365
7	(cost* adj2 utilit*).tw. 12784
8	(cost* adj2 (effective* or assess* or evaluat* or analys* or model* or benefit* or threshold* or quality or expens* or saving* or reduc*)).tw. 385741
9	(economic* adj2 (evaluat* or assess* or analys* or model* or outcome* or benefit* or threshold* or expens* or saving* or reduc*)).tw. 66452
10	(qualit* adj2 adjust* adj2 life*).tw. 27335
11	QALY*.tw. 26801
12	(incremental* adj2 cost*).tw. 28720
13	ICER.tw. 13032
14	utilities.tw. 15135
15	markov*.tw. 40152
16	(dollar* or USD or cents or pound or pounds or GBP or sterling* or pence or euro or euros or yen or JPY).tw. 72706
17	((utility or effective*) adj2 analys*).tw. 37800
18	(willing* adj2 pay*).tw. 14735
19	(EQ5D* or EQ-5D*).tw. 26137

Searches
20 ((euroqol or euro-qol or euroquol or euro-quol or eurocol or euro-col) adj3 ("5" or five)).tw. 5262
21 (european* adj2 quality adj3 ("5" or five)).tw. 996
22 or/4-21 635358
23 3 and 22 7788
24 afghanistan/ or africa/ or "africa south of the sahara"/ or albania/ or algeria/ or andorra/ or angola/ or argentina/ or "antigua and barbuda"/ or armenia/ or exp azerbaijan/ or bahamas/ or bahrain/ or bangladesh/ or barbados/ or belarus/ or belize/ or benin/ or bhutan/ or bolivia/ or borneo/ or exp "bosnia and herzegovina"/ or botswana/ or exp brazil/ or brunei darussalam/ or bulgaria/ or burkina faso/ or burundi/ or cambodia/ or cameroon/ or cape verde/ or central africa/ or central african republic/ or chad/ or exp china/ or comoros/ or congo/ or cook islands/ or cote d'ivoire/ or croatia/ or cuba/ or cyprus/ or democratic republic congo/ or djibouti/ or dominica/ or dominican republic/ or ecuador/ or el salvador/ or egypt/ or equatorial guinea/ or eritrea/ or eswatini/ or ethiopia/ or exp "federated states of micronesia"/ or fiji/ or gabon/ or gambia/ or exp "georgia (republic)"/ or ghana/ or grenada/ or guatemala/ or guinea/ or guinea-bissau/ or guyana/ or haiti/ or honduras/ or exp india/ or exp indonesia/ or iran/ or exp iraq/ or jamaica/ or jordan/ or kazakhstan/ or kenya/ or kiribati/ or kosovo/ or kuwait/ or kyrgyzstan/ or laos/ or lebanon/ or liechtenstein/ or lesotho/ or liberia/ or libyan arab jamahiriya/ or madagascar/ or malawi/ or exp malaysia/ or maldives/ or mali/ or malta/ or mauritania/ or mauritius/ or melanesia/ or moldova/ or monaco/ or mongolia/ or "montenegro (republic)"/ or morocco/ or mozambique/ or myanmar/ or namibia/ or nauru/ or nepal/ or nicaragua/ or niger/ or nigeria/ or niue/ or north africa/ or oman/ or exp pakistan/ or palau/ or palestine/ or panama/ or papua new guinea/ or paraguay/ or peru/ or philippines/ or polynesia/ or qatar/ or "republic of north macedonia"/ or romania/ or exp russian federation/ or rwanda/ or sahel/ or "saint kitts and nevis"/ or "saint lucia"/ or "saint vincent and the grenadines"/ or saudi arabia/ or senegal/ or exp serbia/ or seychelles/ or sierra leone/ or singapore/ or "sao tome and principe"/ or solomon islands/ or exp somalia/ or south africa/ or south asia/ or south sudan/ or exp southeast asia/ or sri lanka/ or sudan/ or suriname/ or syrian arab republic/ or taiwan/ or tajikistan/ or tanzania/ or thailand/ or timor-leste/ or togo/ or tonga/ or "trinidad and tobago"/ or tunisia/ or turkmenistan/ or tuvalu/ or uganda/ or exp ukraine/ or exp united arab emirates/ or uruguay/ or exp uzbekistan/ or vanuatu/ or venezuela/ or viet nam/ or western sahara/ or yemen/ or zambia/ or zimbabwe/ 1716014
25 exp "organisation for economic co-operation and development"/ 2774
26 exp australia/ or "australia and new zealand"/ or austria/ or baltic states/ or exp belgium/ or exp canada/ or chile/ or colombia/ or costa rica/ or czech republic/ or denmark/ or estonia/ or europe/ or exp finland/ or exp france/ or exp germany/ or greece/ or hungary/ or iceland/ or ireland/ or israel/ or exp italy/ or japan/ or korea/ or latvia/ or lithuania/ or luxembourg/ or exp mexico/ or netherlands/ or new zealand/ or north america/ or exp norway/ or poland/ or exp portugal/ or scandinavia/ or sweden/ or slovakia/ or slovenia/ or south korea/ or exp spain/ or switzerland/ or "Turkey (republic)"/ or exp united kingdom/ or exp united states/ or western europe/ 3801223
27 european union/ 31487
28 developed country/ 35727
29 or/25-28 3834983
30 24 not 29 1561961
31 23 not 30 6971
32 limit 31 to english language 6647
33 (letter or editorial).pt. 2081948
34 32 not 33 6549
35 Case report/ 2939178
36 34 not 35 6182

Searches
37 nonhuman/ not human/ 5325269
38 36 not 37 6027
39 (conference abstract* or conference review or conference paper or conference proceeding).db,pt,su. 5742113
40 38 not 39 4181
41 limit 40 to yr="2014 -Current" 2288
Note: in the re-run Line 41 was changed to limit 40 to dc=20231101-20241014.

Database name: International HTA Database

Searches
1 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*)[abs] AND (English)[Language] FROM 2014 TO 2023 15
2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*)[Title] AND (English)[Language] FROM 2014 TO 2023 7
3 ("pneumonia"[mh] or "bronchopneumonia"[mh] or "pleuropneumonia"[mh] or "pneumonia bacterial"[mh] or "chlamydial pneumonia"[mh] or "pneumonia mycoplasma"[mh] or "pneumonia pneumococcal"[mh] or "pneumonia rickettsial"[mh] or "pneumonia staphylococcal"[mh] or "pneumonia necrotizing"[mh] or "pneumonia viral"[mh] or "organizing pneumonia"[mh] or "cryptogenic organizing pneumonia"[mh] or "healthcare-associated pneumonia"[mh]) AND (English)[Language] FROM 2014 TO 2023 21
4 1 OR 2 OR 3 30
Note: in the re-run the date was changed to FROM 2023 TO 2024.

Database name: MEDLINE ALL

Searches
1 pneumonia/ or bronchopneumonia/ or pleuropneumonia/ or pneumonia, bacterial/ or chlamydial pneumonia/ or pneumonia, mycoplasma/ or pneumonia, pneumococcal/ or pneumonia, rickettsial/ or pneumonia, staphylococcal/ or pneumonia, necrotizing/ or pneumonia, viral/ or organizing pneumonia/ or cryptogenic organizing pneumonia/ or healthcare-associated pneumonia/ 125178
2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab. 159311
3 1 or 2 229286
4 Cost-Benefit Analysis/ 93463
5 Quality-Adjusted Life Years/ 15940
6 Markov Chains/ 16047
7 exp Models, Economic/ 16244
8 cost*.ti. 146284
9 (cost* adj2 utilit*).tw. 7812
10 (cost* adj2 (effective* or assess* or evaluat* or analys* or model* or benefit* or threshold* or quality or expens* or saving* or reduc*)).tw.279720
11 (economic* adj2 (evaluat* or assess* or analys* or model* or outcome* or benefit* or threshold* or expens* or saving* or reduc*)).tw. 47585
12 (qualit* adj2 adjust* adj2 life*).tw. 18059
13 QALY*.tw. 14611
14 (incremental* adj2 cost*).tw. 17628
15 ICER.tw. 6134

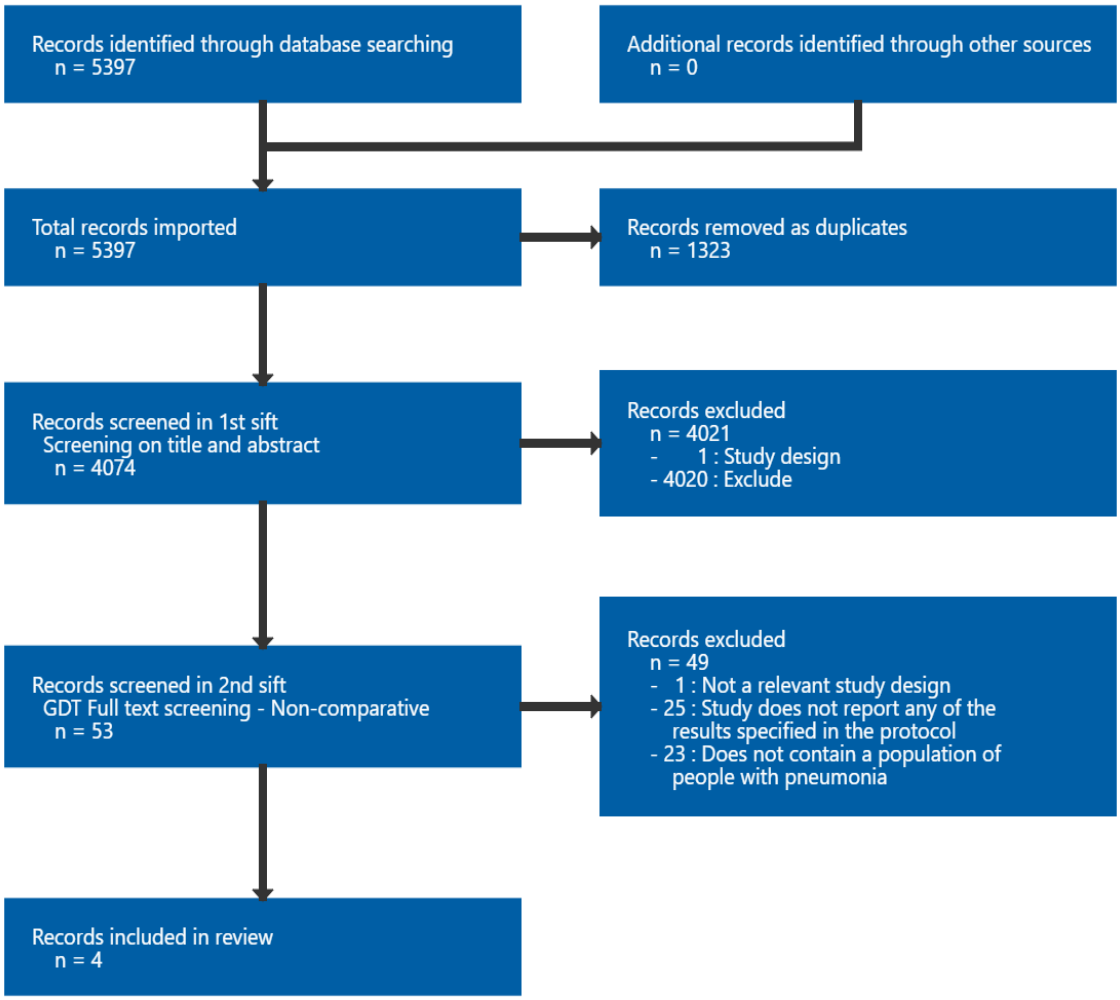
Searches
16 utilities.tw. 9537
17 markov*.tw. 32169
18 (dollar* or USD or cents or pound or pounds or GBP or sterling* or pence or euro or euros or yen or JPY).tw. 54722
19 ((utility or effective*) adj2 analys*).tw. 25292
20 (willing* adj2 pay*).tw. 9954
21 (EQ5D* or EQ-5D*).tw. 13646
22 ((euroqol or euro-qol or euroquol or euro-quol or eurocol or euro-col) adj3 ("5" or five)).tw. 3930
23 (european* adj2 quality adj3 ("5" or five)).tw. 723
24 or/4-23 506237
25 3 and 24 3855
26 afghanistan/ or africa/ or africa, northern/ or africa, central/ or africa, eastern/ or "africa south of the sahara"/ or africa, southern/ or africa, western/ or albania/ or algeria/ or andorra/ or angola/ or "antigua and barbuda"/ or argentina/ or armenia/ or azerbaijan/ or bahamas/ or bahrain/ or bangladesh/ or barbados/ or belize/ or benin/ or bhutan/ or bolivia/ or borneo/ or "bosnia and herzegovina"/ or botswana/ or brazil/ or brunei/ or bulgaria/ or burkina faso/ or burundi/ or cabo verde/ or cambodia/ or cameroon/ or central african republic/ or chad/ or exp china/ or comoros/ or congo/ or cote d'ivoire/ or croatia/ or cuba/ or "democratic republic of the congo"/ or cyprus/ or djibouti/ or dominica/ or dominican republic/ or ecuador/ or egypt/ or el salvador/ or equatorial guinea/ or eritrea/ or eswatini/ or ethiopia/ or fiji/ or gabon/ or gambia/ or "georgia (republic)"/ or ghana/ or grenada/ or guatemala/ or guinea/ or guinea-bissau/ or guyana/ or haiti/ or honduras/ or independent state of samoa/ or exp india/ or indian ocean islands/ or indochina/ or indonesia/ or iran/ or iraq/ or jamaica/ or jordan/ or kazakhstan/ or kenya/ or kosovo/ or kuwait/ or kyrgyzstan/ or laos/ or lebanon/ or liechtenstein/ or lesotho/ or liberia/ or libya/ or madagascar/ or malaysia/ or malawi/ or mali/ or malta/ or mauritania/ or mauritius/ or mekong valley/ or melanesia/ or micronesia/ or monaco/ or mongolia/ or montenegro/ or morocco/ or mozambique/ or myanmar/ or namibia/ or nepal/ or nicaragua/ or niger/ or nigeria/ or oman/ or pakistan/ or palau/ or exp panama/ or papua new guinea/ or paraguay/ or peru/ or philippines/ or qatar/ or "republic of belarus"/ or "republic of north macedonia"/ or romania/ or exp russia/ or rwanda/ or "saint kitts and nevis"/ or saint lucia/ or "saint vincent and the grenadines"/ or "sao tome and principe"/ or saudi arabia/ or serbia/ or sierra leone/ or senegal/ or seychelles/ or singapore/ or somalia/ or south africa/ or south sudan/ or sri lanka/ or sudan/ or suriname/ or syria/ or taiwan/ or tajikistan/ or tanzania/ or thailand/ or timor-leste/ or togo/ or tonga/ or "trinidad and tobago"/ or tunisia/ or turkmenistan/ or uganda/ or ukraine/ or united arab emirates/ or uruguay/ or uzbekistan/ or vanuatu/ or venezuela/ or vietnam/ or west indies/ or yemen/ or zambia/ or zimbabwe/ 1312779
27 "organisation for economic co-operation and development"/ 565
28 australasia/ or exp australia/ or austria/ or baltic states/ or belgium/ or exp canada/ or chile/ or colombia/ or costa rica/ or czech republic/ or exp denmark/ or estonia/ or europe/ or finland/ or exp france/ or exp germany/ or greece/ or hungary/ or iceland/ or ireland/ or israel/ or exp italy/ or exp japan/ or korea/ or latvia/ or lithuania/ or luxembourg/ or mexico/ or netherlands/ or new zealand/ or north america/ or exp norway/ or poland/ or portugal/ or exp "republic of korea"/ or "scandinavian and nordic countries"/ or slovakia/ or slovenia/ or spain/ or sweden/ or switzerland/ or turkey/ or exp united kingdom/ or exp united states/ 3515662
29 european union/ 17814
30 developed countries/ 21444
31 or/27-30 3531767
32 26 not 31 1222696
33 25 not 32 3418

Searches		
34	limit 33 to english language	3185
35	limit 34 to (letter or historical article or comment or editorial or news or case reports)	181
36	34 not 35	3004
37	Animals/ not (Animals/ and Humans/)	5137547
38	36 not 37	2921
39	limit 38 to yr="2014 -Current"	1534
Note: in the re-run the following lines were used:		
38	36 not 37	
39	limit 38 to ed=20231101-20241014	
40	limit 38 to dt=20231101-20241014	
41	39 or 40	

Database name: NHS Economic Evaluation Database (NHS EED)

Searches
1 MeSH DESCRIPTOR Pneumonia 252
2 MeSH DESCRIPTOR bronchopneumonia 1
3 MeSH DESCRIPTOR pleuropneumonia 0
4 MeSH DESCRIPTOR pneumonia, bacterial 90
5 MeSH DESCRIPTOR chlamydial pneumonia 0
6 MeSH DESCRIPTOR pneumonia, mycoplasma 3
7 MeSH DESCRIPTOR pneumonia, pneumococcal 48
8 MeSH DESCRIPTOR pneumonia, rickettsial 0
9 MeSH DESCRIPTOR pneumonia, staphylococcal 10
10 MeSH DESCRIPTOR pneumonia, necrotizing 0
11 MeSH DESCRIPTOR pneumonia, viral 9
12 MeSH DESCRIPTOR Cryptogenic Organizing Pneumonia 0
13 MeSH DESCRIPTOR healthcare-associated pneumonia 0
14 (pneumonia) OR (pneumonias) 1118
15 (bronchopneumon*) OR (pleuropneumon*) 3
16 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 1120
17 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15) IN NHSEED 425
18 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15) IN NHSEED FROM 2014 TO 2024 11
Note: no re-run required as the database has been archived and not updated since 31 March 2015.

Appendix C – Effectiveness evidence study selection



Appendix D – Effectiveness evidence

Ashraf, 2014

Bibliographic Reference	Ashraf, Hasan; Alam, Nur H; Chisti, Mohammod J; Salam, Mohammed A; Ahmed, Tahmeed; Gyr, Niklaus; Observational follow-up study on a cohort of children with severe pneumonia after discharge from a day-care clinic in Dhaka, Bangladesh.; Journal of health, population, and nutrition; 2014; vol. 32 (no. 2); 183-9

Study Characteristics

Study type	Observational cohort study
Study details	Study location: Bangladesh Study setting: Outpatient 'day-care' clinic (This is a 12-bed clinic staffed by a physician, 2 nurses and 4 healthcare workers who provide care to children from 8am to 5pm. These clinics help with the management of common childhood illnesses, and patients are provided with antibiotics, feeding and supportive care, including oxygen when required). Study dates: 2003 to 2006 Sources of funding: The study was funded by the Swiss Agency for Development and Cooperation (SDC), Bern; the Gastrointestinal Research Foundation, Liestal; and the University of Basel, Switzerland
Inclusion criteria	Children aged 2 to 59 months with severe or very severe pneumonia (according to WHO criteria), living within a 5lm radius of the study clinic.
Exclusion criteria	Children with severe acute malnutrition (defined as children having either less than -3 weight-for-height/length z-score -3 ZWH, or bilateral pitting oedema, or mid-upper arm circumference (MUAC) <115mm).
Length of follow-up	3 months
Loss to follow-up	The compliance with follow-up visits after discharge from the clinic gradually dropped over time. Follow-up compliance rates were: 2 weeks = 231 (92%) 4 weeks = 234 (93%) 6 weeks = 228 (91%)

	8 weeks = 219 (87%) 10 weeks = 213 (85%) 12 weeks = 212 (85%) Overall compliance was 236/251 (94%); the children who failed to attend for all follow-up were either hospitalised 11/251 (4.4%) or died 4/251 (1.6%).
Outcome (s)	Cough Fever Rapid breathing Difficulty breathing Feeding difficulties Diarrhoea Hospitalisation Chest indrawing

Population characteristics

Study-level characteristics

Characteristic	**Study (N = 251)**
% Female No of events	n = 92 ; % = 37
Mean age (SD) (Months) Mean (SD)	7.15 (7)
  Median age (IQR) (months)	5 (3 to 9)
Number of infants (2-11 months) No of events	n = 212 ; % = 84
Number of children (12-59 months) No of events	n = 39 ; % = 16

Characteristic	Study (N = 251)
Length of clinic stay (days) Mean (SD)	7.04 (2.34)
Length of clinic stay (days) Median (IQR)	6.5 (6 to 8)

Critical appraisal - CASP Critical appraisal checklist for cohort studies

Overall bias	Overall risk of bias	Moderate *(Some concerns about low follow-up rate: compliance with follow-up visits declined over time from 92% at 2 weeks to ~85% at 12 weeks. Many of the children who did not attend for follow up were either hospitalised or had died, which introduces bias into the rates of symptoms reported in the population that did attend for follow-up).*
Overall directness	Directness	Partially indirect *(Population was largely babies so didn't cover all age groups of interest, and study was based in Bangladesh where diagnostic and treatment processes for pneumonia may differ from the UK)*

Ashraf, 2012

Bibliographic Reference	Ashraf, Hasan; Alam, Nur H; Chisti, Mohammod Jobayer; Salam, Mohammed Abdus; Ahmed, Tahmeed; Gyr, Niklaus; Observational follow-up study following two cohorts of children with severe pneumonia after discharge from day care clinic/hospital in Dhaka, Bangladesh.; BMJ open; 2012; vol. 2 (no. 4)

Study Characteristics

Study type	Observational cohort study
Study details	Study location: Bangladesh Study setting: Half of the sample were treated as inpatients in the hospital and half the sample were treated in outpatient 'day-care' clinics

	where they were provided with hospital level care (antibiotics, feeding, supportive care, oxygen if required) between 8am and 5pm. Study dates: September 2006 to November 2008 Sources of funding: This work was supported by the Eagle Foundation (Geneva, Switzerland) (grant GR-00485).
Inclusion criteria	Children aged 2-59 months with severe pneumonia according to WHO criteria.
Exclusion criteria	No exclusion criteria reported
Length of follow-up	3 months, with assessments every 2 weeks
Loss to follow-up	Compliance with all 6 follow-up visits was 89%. Follow-up compliance at each follow-up visit was: 2 weeks = 342/360 (95%) 4 weeks = 335/360 (93%) 6 weeks = 322/360 (89%) 8 weeks = 315/360 (88%) 10 weeks = 311/360 (86%) 12 weeks = 308/360 (85%)
Outcome (s)	Cough Fever Rapid breathing Difficulty breathing Feeding difficulties Diarrhoea Hospitalisation Chest indrawing

Population characteristics

Study-level characteristics

Characteristic	Study (N = 360)
% Female No of events	n = 140 ; % = 39
Mean age (SD) Mean (SD)	8 (7)
Number of infants (2-11 months) No of events	n = 291 ; % = 81
Number of children (12-59 months) No of events	n = 69 ; % = 19
Length of clinic/hospital stay (days) Mean (SD)	6.85 (2.61)

Critical appraisal - CASP Critical appraisal checklist for cohort studies

Overall bias	Overall risk of bias	Moderate *(Some concerns about low follow-up rate: compliance with follow-up visits declined over time from 95% at 2 weeks to ~85% at 12 weeks. During the follow-up period, more of the children treated in the outpatient day care setting required re-hospitalisation than the inpatient care group and there were differences in the symptom patterns across the 2 groups throughout the follow-up period, but overall rates were only reported for the overall sample rather than subdivide by setting)*
Overall directness	Directness	Partially indirect *(Population was largely babies [mean age 8 months] so didn't cover all age groups of interest, and study was based in Bangladesh where diagnostic and treatment processes for pneumonia may differ from the UK)*

Don, 2010

Bibliographic Reference	Don, Massimiliano; Valent, Francesca; Canciani, Mario; Korppi, Matti; Prediction of delayed recovery from pediatric community-acquired pneumonia.; Italian journal of pediatrics; 2010; vol. 36; 51

Study Characteristics

Study type	Observational cohort study
Study details	Study location: Italy Study setting: Paediatric hospital Study dates: 15 month period during 2001-2002 Sources of funding: The authors declare they received no financial support
Inclusion criteria	Previously healthy children with signs and/or symptoms compatible with respiratory infection (fever ≥37°C, tachypnea, cough and/or findings of crackles, bronchial breathing or silenced sounds on auscultation) and radiological infiltrations consistent with pneumonia
Exclusion criteria	Neonatal age, chronic infectious and non-infectious underlying diseases, wheezing on auscultation and hospital-acquired pneumonia
Length of follow-up	>48 hours after starting antibiotic treatment
Loss to follow-up	Body temperature data were available in 94/101 (93%) of children; this formed the sample for the present study.
Outcome (s)	Stable disappearance of fever / length of fever This was obtained through patient records for inpatients (body temperature was taken by nurses every 6 hours for hospitalised patients), and for outpatients, the parents/carers were required to take and document body temperature, at home, at least twice a day using standard mercury thermometers supplied by the investigators. Parents received brief training from nurses in body temperature measuring. “Length of fever” was defined as the period in which a patient became spontaneously (without the use of antipyretic) and steadily non-feverish: the hours elapsed from the time of CAP diagnosis to the time a body temperature >37°C was last recorded

Population characteristics

Study-level characteristics

Characteristic	Study (N = 94)
Mean age (SD) (years) Range	0.3 to 14.7
Mean age (SD) (years) Mean (SD)	4.7 (NR)
Age < 24 months No of events	n = 17 ; % = 18
2 to 4 years No of events	n = 41 ; % = 44
5 years No of events	n = 36 ; % = 38
Number admitted to hospital No of events	n = 25 ; % = 27
Hospital duration in patients admitted (days) Range	3 to 13
Hospital duration in patients admitted (days) Mean (SD)	5 (NR)

Critical appraisal - CASP Critical appraisal checklist for cohort studies

Overall bias	Overall risk of bias	Moderate *(Some concerns about the assessment of fever – for hospitalised children this was obtained through patient records (body temperature was taken and recorded by nurses every 6 hours), and for outpatients, the parents/carers were required to take and document body temperature at home. This inconsistent assessment of body temperature and use of parent-report may introduce bias.*

Overall directness	Directness	Directly applicable

Shoham, 2005

Bibliographic Reference	Shoham, Yaron; Dagan, Ron; Givon-Lavi, Noga; Liss, Zvika; Shagan, Tomer; Zamir, Orly; Greenberg, David; Community-acquired pneumonia in children: quantifying the burden on patients and their families including decrease in quality of life.; Pediatrics; 2005; vol. 115 (no. 5); 1213-9

Study Characteristics

Study type	Observational cohort study
Study details	Study location: Israel Study setting: Paediatric wards, the paediatric ED, and a primary care health clinic Study dates: 12th Oct 2000 to 24th June 2001 Sources of funding: Not reported
Inclusion criteria	Patients diagnosed as having pneumonia were enrolled if: (1) they were <3 years old; (2) their parents had an available phone connection; (3) their parents were fluent in the Hebrew language; (4) they were not participating concurrently in another clinical survey or trial; (5) they did not have any known chronic, progressive, or oncologic illnesses (except for asthma); and (6) parents or legal guardians signed an informed consent.
Exclusion criteria	None reported
Length of follow-up	21 days from first hospital visit / diagnosis
Loss to follow-up	7 patients (2.2%) were lost to follow-up
Outcome (s)	Cough Fever Respiratory distress Feeding difficulties / decreased appetite Diarrhoea Vomiting

	Lethargy / tiredness

Population characteristics

Study-level characteristics

Characteristic	Study (N = 213)
Number of females	
Paediatric ward patients (n=34) No of events	n = 13 ; % = 38
Paediatric ED patients (n=73) No of events	n = 38 ; % = 52
Primary care clinic patients (n=106) No of events	n = 54 ; % = 51
Age (in months)	
Paediatric ward patients (n=34) Mean (SD)	18.4 (8.7)
Paediatric ED patients (n=73) Mean (SD)	19.2 (8.7)
Primary care clinic patients (n=106) Mean (SD)	19.5 (9.2)
Length of hospital stay (in days)	
Paediatric ward patients (n=34) Mean (SD)	4.7 (2.9)
Paediatric ED patients (n=73) Mean (SD)	0.2 (1.2)
Primary care clinic patients (n=106) Mean (SD)	0.1 (0.4)

Critical appraisal - CASP Critical appraisal checklist for cohort studies

Overall bias	Overall risk of bias	Moderate *(Some concerns about the reliability of outcome*

		assessments, which were based on parent-reported symptoms during telephone interviews)
Overall directness	Directness	Directly applicable

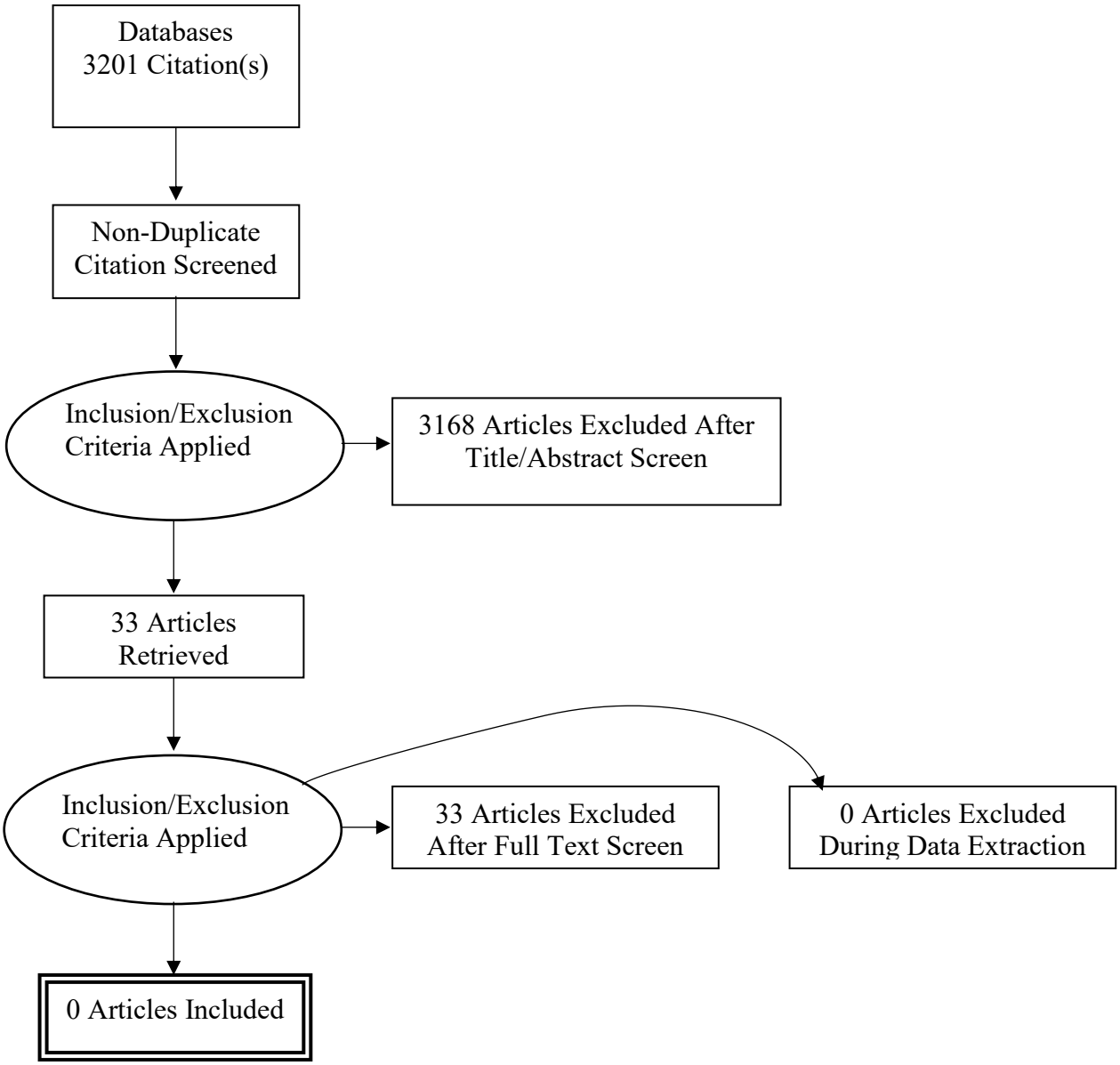
Appendix E – Forest plots

No meta-analyses performed for this review

Appendix F – GRADE tables

GRADE assessments were not conducted for this review.

Appendix G – Economic evidence study selection



Appendix H – Economic evidence tables

No studies were included in this review question.

Appendix I – Health economic model

No original health economic modelling was done for this review question.

Appendix J – Excluded studies

Clinical

Study	Code [Reason]
Abzug, M J, Beam, A C, Gyorkos, E A et al. (1990) Viral pneumonia in the first month of life. The Pediatric infectious disease journal 9(12): 881-5	- Does not contain a population of children with pneumonia *Population was neonates (<30 days old) - scope excludes babies under 28 days.*
Assfaw, Tigabnesh, Yenew, Chalachew, Alemu, Kassahun et al. (2021) Time-to-Recovery from Severe Pneumonia and Its Determinants Among Children Under-Five Admitted to University of Gondar Comprehensive Specialized Hospital in Ethiopia: A Retrospective Follow-Up Study; 2015-2020. Pediatric health, medicine and therapeutics 12: 189-196	- Study does not report any of the results specified in the protocol *This study reports on 'time to recovery' only but does not provide a definition of recovery and no specific pneumonia symptoms are listed so not possible to ascertain time to recovery of individual symptoms.*
Bari, A., Zafar, A., Mushtaq, A. et al. (2014) Disease pattern and bacteriological profile of childhood pneumonia. Pakistan Paediatric Journal 38(1): 47-52	- Study does not report any of the results specified in the protocol *Study focuses on bacteriological profile / pathogens identified. Does not report symptom durations or resolution over time*
Biru, G.D.; Derebe, M.A.; Workie, D.L. (2023) Joint modeling of longitudinal changes of pulse rate and body temperature with time to recovery of pneumonia patients under treatment: a prospective cohort study. BMC Infectious Diseases 23(1): 682	- Does not contain a population of children with pneumonia *Adult population; children not included*
Biscardi, Sandra, Lorrot, Mathie, Marc, Elizabeth et al. (2004) Mycoplasma pneumoniae and asthma in children. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 38(10): 1341-6	- Does not contain a population of children with pneumonia *Main study population was children with acute exacerbations of asthma; only a small sub-sample had pneumonia. Study also does not report pneumonia symptom duration over time.*
Bolursaz, Mohammad Reza, Lotfian, Ferial, Ghaffaripour, Hossein Ali et al. (2017) Underlying Causes of Persistent and Recurrent Pneumonia in Children at a Pulmonary Referral Hospital in Tehran, Iran. Archives of Iranian medicine 20(5): 266-269	- Study does not report any of the results specified in the protocol *This study was an investigation of the underlying causes of persistent or recurrent pneumonia. It does not report symptom durations.*
Brancati, F L, Chow, J W, Wagener, M M et al. (1993) Is pneumonia really the old man's friend? Two-year prognosis after community-acquired pneumonia. Lancet (London, England) 342(8862): 30-3	- Does not contain a population of children with pneumonia *Adult population; no children included*

Study	Code [Reason]
Campbell, S.G., Murray, D.D., Urquhart, D.G. et al. (2004) Utility of follow-up recommendations for patients discharged with community-acquired pneumonia. Canadian Journal of Emergency Medicine 6(2): 97-103	- Does not contain a population of children with pneumonia *Adult population; no children included*
Capelastegui, Alberto, Espana, Pedro P, Bilbao, Amaia et al. (2010) Study of community-acquired pneumonia: incidence, patterns of care, and outcomes in primary and hospital care. The Journal of infection 61(5): 364-71	- Does not contain a population of children with pneumonia *Adult population; no children included*
Ciftci, Ergin, Gunes, Meltem, Koksal, Yavuz et al. (2003) Underlying causes of recurrent pneumonia in Turkish children in a university hospital. Journal of tropical pediatrics 49(4): 212-5	- Study does not report any of the results specified in the protocol *This study investigated the underlying causes of recurrent pneumonia. It did not report on symptoms over time or their resolution.*
Dagan, Elad; Novack, Victor; Porath, Avi (2006) Adverse outcomes in patients with community acquired pneumonia discharged with clinical instability from Internal Medicine Department. Scandinavian journal of infectious diseases 38(10): 860-6	- Does not contain a population of children with pneumonia *Adult population; no children included*
Eastham, K M, Hammal, D M, Parker, L et al. (2008) A follow-up study of children hospitalised with community-acquired pneumonia. Archives of disease in childhood 93(9): 755-9	- Study does not report any of the results specified in the protocol *Study reports on medium- to long-term outcomes for children hospitalised with pneumonia. Does not report on symptom duration or resolution.*
Field, Madeline R, Ambroggio, Lilliam, Lorenz, Douglas et al. (2024) Time to Clinical Stability in Children With Community-Acquired Pneumonia. Pediatrics 153(5)	- Study does not report any of the results specified in the protocol *Reports on time to clinical stability and suitability for hospital discharge - does not provide data on symptom duration over follow-up period*
Hay, Alastair D and Wilson, Andrew D (2002) The natural history of acute cough in children aged 0 to 4 years in primary care: a systematic review. The British journal of general practice : the journal of the Royal College of General Practitioners 52(478): 401-9	- Does not contain a population of children with pneumonia *SR of children with acute cough / ARI. Not specific to children with pneumonia*
Hedlund, J U, Ortqvist, A B, Kalin, M E et al. (1993) Factors of importance for the long term prognosis after hospital treated pneumonia. Thorax 48(8): 785-9	- Does not contain a population of children with pneumonia *Adult population - does not include children*

Study	Code [Reason]
Heffelfinger, JD Davis, TE Gebrian, B Bordeau, R Schwartz, B Dowell, SF (2002) Evaluation of children with recurrent pneumonia diagnosed by World Health Organization criteria. PEDIATRIC INFECTIOUS DISEASE JOURNAL 21(2): 108 - 112	- Study does not report any of the results specified in the protocol *Case-control study of children with recurrent pneumonia compared to healthy controls. Investigates underlying causes of recurrent pneumonia (e.g. asthma). Does not report on symptom duration or time to resolution.*
Huang, Lizhen, Huang, Xia, Jiang, Wujiang et al. (2018) Independent predictors for longer radiographic resolution in patients with refractory Mycoplasma pneumoniae pneumonia: a prospective cohort study. BMJ open 8(12): e023719	- Study does not report any of the results specified in the protocol *This study investigates factors impacting on time to radiographic clearance in children with mycoplasma. It does not report on symptom durations or resolution.*
Jehloh, D Ma-a-Lee, A Tongkumchum, P (2022) Factors associated with Children Under Five Years of age with 30-day Readmissions after Hospitalization for Pneumonia in Yala Hospital. THAI JOURNAL OF MATHEMATICS: 250 - 255	- Study does not report any of the results specified in the protocol *This study focused on rates of readmission and factors that determined likelihood of need for re-admission. It did not provide data on symptom duration or time to resolution.*
Lange, J., Kozielski, J., Bartolik, K. et al. (2023) The incidence of pneumonia in the paediatric population in Poland in light of the maps of health needs. Journal of Public Health (Germany) 31(3): 457-465	- Study does not report any of the results specified in the protocol *Study of the incidence of pneumonia in Poland. Does not report on the rates of symptoms over time or their resolution.*
Lee, Eun and Young Lee, Yun (2020) Risk factors for the development of post-infectious bronchiolitis obliterans after Mycoplasma pneumoniae pneumonia in the era of increasing macrolide resistance. Respiratory medicine 175: 106209	- Study does not report any of the results specified in the protocol *Paper does not report symptom duration or proportion of patients with specific symptoms at any follow up point. Focus of this paper is on the development of post-infectious bronchiolitis obliterans.*
Macfarlane, J T, Colville, A, Guion, A et al. (1993) Prospective study of aetiology and outcome of adult lower-respiratory-tract infections in the community. Lancet (London, England) 341(8844): 511-4	- Does not contain a population of children with pneumonia *Adult population; no children included*
Mei, Mei, Dai, Dan, Guo, Zhuoyao et al. (2023) Underlying causes and outcomes of recurrent pneumonia in hospitalized children. Pediatric pulmonology 58(6): 1674-1682	- Study does not report any of the results specified in the protocol *Study investigates underlying illnesses in children with recurrent pneumonia.*
Mengist, Belayneh; Tesfa, Mulugeta; Kassie, Bekalu (2020) Time to recovery and predictors of severe community-acquired pneumonia among pediatric patients in Debre Markos referral hospital, North West	- Study does not report any of the results specified in the protocol *The study only reports on median time to recovery, which is based on clinician judgement. All patients were hospitalised*

Study	Code [Reason]
Ethiopia: A retrospective follow-up study. PloS one 15(9): e0239655	*and TTR is basically discharge, so outcome is essentially length of hospital stay. No data reported on duration of specific pneumonia symptoms.*
Metlay, J P, Atlas, S J, Borowsky, L H et al. (1998) Time course of symptom resolution in patients with community-acquired pneumonia. Respiratory medicine 92(9): 1137-42	- Does not contain a population of children with pneumonia *Adult population; no children included*
Mufson, Maurice A, Hao, Jenelle B, Stanek, Ronald J et al. (2012) Clinical features of patients with recurrent invasive Streptococcus pneumoniae disease. The American journal of the medical sciences 343(4): 303-9	- Study does not report any of the results specified in the protocol *This study examines the risk factors for recurrent invasive Streptococcus pneumoniae disease (IPD). It does not report on symptom duration, and the sample includes both adults and children*
Nakamura, Mari M. Zaslavsky, Alan M. Toomey, Sara L. Petty, Carter R. Bryant, Maria C. Geanacopoulos, Alexandra T. Jha, Ashish K. Schuster, Mark A. (2017) Pediatric Readmissions After Hospitalizations for Lower Respiratory Infections. PEDIATRICS 140(2)	- Does not contain a population of children with pneumonia *Population is children with LRTI; does not provide results for pneumonia subgroup*
Nandan, D., Mittal, H., Sharma, A. et al. (2021) Thinking beyond infections in children with recurrent/persistent pneumonia. Tropical Doctor 51(3): 356-361	- Study does not report any of the results specified in the protocol *This study is an examination of the various underlying aetiologies of recurrent or persistent pneumonia. It does not report specific symptom durations or time to resolution, only the rate of certain diagnoses in a sample of children with unresolved pneumonia.*
Nantanda, R., Bwanga, F., Najjingo, I. et al. (2021) Prevalence, risk factors and outcome of Mycoplasma pneumoniae infection among children in Uganda: a prospective study. Paediatrics and International Child Health 41(3): 188-198	- Study does not report any of the results specified in the protocol *This study investigates the prevalence of and risk factors for mycoplasma pneumoniae. It does not track symptom duration or resolution over time and does not report data for specific symptoms of interest.*
Neuman, Mark I, Hall, Matthew, Gay, James C et al. (2014) Readmissions among children previously hospitalized with pneumonia. Pediatrics 134(1): 100-9	- Study does not report any of the results specified in the protocol *Reports readmission data only - does not provide information on symptom durations or time to resolution*
Nicolai, Ambra, Frassanito, Antonella, Nenna, Raffaella et al. (2017) Risk Factors	- Does not contain a population of children with pneumonia

Study	Code [Reason]
for Virus-induced Acute Respiratory Tract Infections in Children Younger Than 3 Years and Recurrent Wheezing at 36 Months Follow-Up After Discharge. The Pediatric infectious disease journal 36(2): 179-183	*This study reports risk factors for ARI; it does not report on a population of CYP with pneumonia.*
Osman, Mayada, Manosuthi, Weerawat, Kaewkungwal, Jaranit et al. (2021) Etiology, Clinical Course, and Outcomes of Pneumonia in the Elderly: A Retrospective and Prospective Cohort Study in Thailand. The American journal of tropical medicine and hygiene 104(6): 2009-2016	- Does not contain a population of children with pneumonia *Adult population; no children included*
Owayed, A F; Campbell, D M; Wang, E E (2000) Underlying causes of recurrent pneumonia in children. Archives of pediatrics & adolescent medicine 154(2): 190-4	- Study does not report any of the results specified in the protocol *Study investigates underlying illnesses in children with recurrent pneumonia. Does not report symptom durations or resolution over time.*
Panelo, Carlo Irwin A, Shimkhada, Riti, Solon, Orville C et al. (2011) Understanding predictors of postdischarge deaths: a prospective evaluation of children 5 years and younger discharged from Philippine district hospitals. Asia-Pacific journal of public health 23(2): 133-40	- Study does not report any of the results specified in the protocol *Study investigates causes of post-discharge mortality.*
Polic-Vizintin, Marina, Leppee, Marcel, Stimac, Danijela et al. (2005) Risk of pneumonia recurrence in patients previously hospitalized for pneumonia--a retrospective study (1998-2000). Collegium antropologicum 29(1): 213-9	- Does not contain a population of children with pneumonia *Population is adults with pneumonia. Not a study of children.*
Ram, H.; Panda, S.; Nizampatnam, M. (2022) A Prospective Study to Assess Outcome and Complications in Children Less than 5 years of Age Admitted to Hospitals with Severe and Very Severe Pneumonia. International Journal of Pharmaceutical and Clinical Research 14(2): 363-370	- Study does not report any of the results specified in the protocol *Assessed outcomes (death, recovery) and complications in children with pneumonia, but did not report on symptom durations or time to resolution of symptoms.*
Shan, Wei, Shi, Ting, Chen, Kaile et al. (2019) Risk Factors for Severe Community-aquired Pneumonia Among Children Hospitalized With CAP Younger Than 5 Years of Age. The Pediatric infectious disease journal 38(3): 224-229	- Study does not report any of the results specified in the protocol *This study examined risk factors for severe pneumonia in under-5s. It did not report on symptom duration or time to resolution.*

Study	Code [Reason]
Sicras-Mainar, Antoni, Ibanez-Nolla, Jordi, Cifuentes, Isabel et al. (2012) Retrospective epidemiological study for the characterization of community- acquired pneumonia and pneumococcal pneumonia in adults in a well-defined area of Badalona (Barcelona, Spain). BMC infectious diseases 12: 283	- Does not contain a population of children with pneumonia *Adult population*
Sinishaw, Kalkidan Mekonnen; Sebsbie, Girum; Kebede, Mekonen Adimasu (2024) Predictors of recovery time from severe community-acquired pneumonia among paediatrics patients in selected hospitals in Addis Ababa, Ethiopia: an institution-based retrospective cohort study. BMJ open 14(3): e078721	- Study does not report any of the results specified in the protocol *This study looked at predictors of recovery time. It did not report on symptom duration or time to symptom resolution.*
Song, Shaoxiu and Xu, Yongsheng (2023) A retrospective study of the clinical characteristics of 9 children with pulmonary embolism associated with Mycoplasma pneumoniae pneumonia. BMC pediatrics 23(1): 370	- Does not contain a population of children with pneumonia *Population is patients with pneumonia AND pulmonary embolism*
Teo, J, Vellayappan, K, Yip, W C et al. (1986) Mycoplasma pneumoniae and viral infections in childhood asthma. Journal of tropical pediatrics 32(2): 87-9	- Does not contain a population of children with pneumonia *Population is children with asthma and recurrent wheezing.*
Tirore, Lire Lemma, Abame, Desta Erkalo, Sedoro, Tagesse et al. (2021) Time to Recovery from Severe Pneumonia and Its Predictors Among Children 2-59 Months of Age Admitted to Pediatric Ward of Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Hossana, Ethiopia: Retrospective Cohort Study. Pediatric health, medicine and therapeutics 12: 347-357	- Study does not report any of the results specified in the protocol *Paper only reports on median time to recovery, but this is based on clinician judgement and does not report on the proportion of patients with pneumonia-specific symptoms at follow-up.*
Vecchiarino, Pamela, Bohannon, Richard W, Ferullo, Jenifer et al. (2004) Short-term outcomes and their predictors for patients hospitalized with community-acquired pneumonia. Heart & lung : the journal of critical care 33(5): 301-7	- Does not contain a population of children with pneumonia *Adults only; children not included*
Wang, C.-Y.; Song, C.-M.; Liu, G.-H. (2021) Mycoplasma pneumoniae and recurrent respiratory tract infection within one year after treatment in infants: Risk factors and prevalence. Iranian Journal of Pediatrics 31(4): e112283	- Study does not report any of the results specified in the protocol *Study reports on risk factors for recurrent respiratory tract infection. Does not report symptom duration or proportion of patients with ongoing pneumonia symptoms.*

Study	Code [Reason]
Wesley, A G and Kalideen, J M (1984) A retrospective study of children after pneumonia. South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde 66(9): 325-6	- Not a relevant study design *Study follow-up period is 5 years*
Wolf, Rachel B, Edwards, Kathryn, Grijalva, Carlos G et al. (2015) Time to clinical stability among children hospitalized with pneumonia. Journal of hospital medicine 10(6): 380-3	- Study does not report any of the results specified in the protocol *Focus of this study is on time to clinical stability (and therefore suitability for hospital discharge). It does not provide data on symptom duration or time to resolution of specific symptoms after hospital discharge.*
Wong, Kerry; Robinson, Joan L; Hawkes, Michael T (2021) Risk of Repeated Admissions for Respiratory Syncytial Virus in a Cohort of >10 000 Hospitalized Children. Journal of the Pediatric Infectious Diseases Society 10(3): 352-358	- Does not contain a population of children with pneumonia *Patients had RSV. Only 13% had pneumonia.*
Wood, Pamela R, Kampschmidt, Jordan C, Dube, Peter H et al. (2017) Mycoplasma pneumoniae and health outcomes in children with asthma. Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology 119(2): 146-152e2	- Does not contain a population of children with pneumonia *Patients were children with asthma*
Wootton, D.G., Dickinson, L., Pertinez, H. et al. (2017) A longitudinal modelling study estimates acute symptoms of community acquired pneumonia recover to baseline by 10 days. European Respiratory Journal 49(6): 1602170	- Does not contain a population of children with pneumonia *Adult population - does not include children*
Zhu, Yibing, Chen, Lumin, Miao, Yecheng et al. (2023) An analysis of risk factors associated with recurrent wheezing in the pediatric population. Italian journal of pediatrics 49(1): 31	- Does not contain a population of children with pneumonia *Patients have recurrent wheeze.*

Economic

Study	Code [Reason]
Akyil, Fatma Tokgoz, Hazar, Armagan, Erdem, Ipek et al. (2015) Hospital Treatment Costs and Factors Affecting These Costs in Community-Acquired	- Study does not contain a relevant intervention *Costing study, does not compare interventions*

Study	Code [Reason]
Pneumonia. Turkish thoracic journal 16(3): 107-113	
Andrews, Annie Lintzenich, Simpson, Annie N, Heine, Daniel et al. (2015) A Cost-Effectiveness Analysis of Obtaining Blood Cultures in Children Hospitalized for Community-Acquired Pneumonia. The Journal of pediatrics 167(6): 1280-6	- US study
Antunes, C, Pereira, M, Rodrigues, L et al. (2020) Hospitalization direct cost of adults with community-acquired pneumonia in Portugal from 2000 to 2009. Pulmonology 26(5): 264-267	- Study does not contain a relevant intervention *Costing study, does not compare interventions*
Asti, L, Bartsch, S M, Umscheid, C A et al. (2019) The potential economic value of sputum culture use in patients with community-acquired pneumonia and healthcare-associated pneumonia. Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases 25(8): 1038e1-1038e9	- US study
Buendia, Jefferson A and Patino, Diana Guerrero (2023) Corticosteroids for the treatment of respiratory infection by Mycoplasma pneumoniae in children: A cost-utility analysis. Pediatric pulmonology 58(10): 2809-2814	- Non OECD country *Columbia*
Cammarota, Gianmaria; Vetrugno, Luigi; Longhini, Federico (2023) Lung ultrasound monitoring: impact on economics and outcomes. Current opinion in anaesthesiology 36(2): 234-239	- Does not contain a population of people with only pneumonia, includes people with acute respiratory failure *Unclear if the patients are intubated* - US study *Unclear if the study is US or Europe* -Abstract only
Ceyhan, Mehmet, Ozsurekci, Yasemin, Aykac, Kubra et al. (2018) Economic burden of pneumococcal infections in children under 5 years of age. Human vaccines & immunotherapeutics 14(1): 106-110	- Study does not contain a relevant intervention *Non-comparative costing analysis*
Cisco, Giulio, Meier, Armando N, Senn, Nicolas et al. (2024) Cost-effectiveness analysis of procalcitonin and lung ultrasonography guided antibiotic	- setting in primary care whereas the review was in secondary care

Study	Code [Reason]
prescriptions in primary care. The European journal of health economics : HEPAC : health economics in prevention and care	
Costa, Nadege, Hoogendijk, Emiel O, Mounie, Michael et al. (2017) Additional Cost Because of Pneumonia in Nursing Home Residents: Results From the Incidence of Pneumonia and Related Consequences in Nursing Home Resident Study. Journal of the American Medical Directors Association 18(5): 453e7-453e12	- Study does not contain a relevant intervention *Non-comparative costing analysis*
Hyams, Catherine; Williams, O Martin; Williams, Philip (2020) Urinary antigen testing for pneumococcal pneumonia: is there evidence to make its use uncommon in clinical practice?. ERJ open research 6(1)	- Review article but not a systematic review, all primary studies were check for relevance
Ito, Akihiro, Ishida, Tadashi, Tokumasu, Hironobu et al. (2017) Impact of procalcitonin-guided therapy for hospitalized community-acquired pneumonia on reducing antibiotic consumption and costs in Japan. Journal of infection and chemotherapy : official journal of the Japan Society of Chemotherapy 23(3): 142-147	- Not a relevant study design *Costing study not a cost utility study*
Javanbakht, Mehdi, Moradi-Lakeh, Maziar, Mashayekhi, Atefeh et al. (2022) Continuous Monitoring of Respiratory Rate with Wearable Sensor in Patients Admitted to Hospital with Pneumonia Compared with Intermittent Nurse-Led Monitoring in the United Kingdom: A Cost-Utility Analysis. PharmacoEconomics - open 6(1): 73-83	- Study does not contain a relevant intervention *Continuous monitoring versus intermittent monitoring, NEWS used in both arms*
Khole, Aalok V, Dionne, Emily, Zitek-Morrison, Emily et al. (2023) Cefepime extended infusion versus intermittent infusion: Clinical and cost evaluation. Antimicrobial stewardship & healthcare epidemiology : ASHE 3(1): e119	- US study
Latif, Marina, Guo, Ning, Tereshchenko, Larisa G et al. (2023) Association of hospital spending with care patterns and mortality in patients hospitalized with community-acquired pneumonia. Journal of hospital medicine 18(11): 986-993	- Study does not contain a relevant intervention *US costing study with no comparative interventions*
Leem, Ah Young, Jung, Won Jai, Kang, Young Ae et al. (2014) Comparison of methicillin-resistant Staphylococcus aureus	- Not a relevant study design *Not a health economic study*

Study	Code [Reason]
community-acquired and healthcare-associated pneumonia. Yonsei medical journal 55(4): 967-74	
Macaya, M.C.; Ridulfo, A.H.; Ramirez-Santana, M. (2015) Comparison of costs and health outcomes of users with community-acquired pneumonia treated at home or in traditional hospitalization: An exploratory study of 40 cases. Value in Health Regional Issues 8: 112-115	- Study not reported in English *Reported in Spanish*
McKinnell, James A, Corman, Shelby, Patel, Dipen et al. (2018) Effective Antimicrobial Stewardship Strategies for Cost-effective Utilization of Telavancin for the Treatment of Patients With Hospital-acquired Bacterial Pneumonia Caused by Staphylococcus aureus. Clinical therapeutics 40(3): 406-414e2	- Study does not contain a relevant intervention *US study that compares different antibiotics rather than length of treatments*
Meacock, Rachel, Sutton, Matt, Kristensen, Soren Rud et al. (2017) Using Survival Analysis to Improve Estimates of Life Year Gains in Policy Evaluations. Medical decision making : an international journal of the Society for Medical Decision Making 37(4): 415-426	- Study does not contain a relevant intervention *Modelling survival not cost effectiveness of treatment*
Miners, Lisa, Huntington, Susie, Lee, Nathaniel et al. (2023) An economic evaluation of two PCR-based respiratory panel assays for patients admitted to hospital with community-acquired pneumonia (CAP) in the UK, France and Spain. BMC pulmonary medicine 23(1): 220	- Not a relevant study design *Cost consequence study*
Patel, Archana B, Bang, Akash, Singh, Meenu et al. (2015) A randomized controlled trial of hospital versus home based therapy with oral amoxicillin for severe pneumonia in children aged 3 - 59 months: The IndiaCLEN Severe Pneumonia Oral Therapy (ISPOT) Study. BMC pediatrics 15: 186	- Non OECD country *India*
Pliakos, Elina Eleftheria, Andreatos, Nikolaos, Tansarli, Giannoula S et al. (2019) The Cost-Effectiveness of Corticosteroids for the Treatment of Community-Acquired Pneumonia. Chest 155(4): 787-794	- US study

Study	Code [Reason]
Prasath, T.M., Ramachandran, V., Geetha, S. et al. (2019) Hidden Markov model-based cough sound analysis for classification of asthma and pneumonia in pediatric. Drug Invention Today 11(7): 1692-1695	- Full text paper not available
Przybilla, Jens, Ahnert, Peter, Bogatsch, Holger et al. (2020) Markov State Modelling of Disease Courses and Mortality Risks of Patients with Community-Acquired Pneumonia. Journal of clinical medicine 9(2)	- Study does not contain a relevant intervention *Does not include costs*
Reynolds, Courtney A, Finkelstein, Jonathan A, Ray, G Thomas et al. (2014) Attributable healthcare utilization and cost of pneumonia due to drug-resistant streptococcus pneumonia: a cost analysis. Antimicrobial resistance and infection control 3: 16	- Study does not contain a relevant intervention *Looking at different antibiotics not the length of the courses*
Rozenbaum, Mark H, Mangen, Marie-Josee J, Huijts, Susanne M et al. (2015) Incidence, direct costs and duration of hospitalization of patients hospitalized with community acquired pneumonia: A nationwide retrospective claims database analysis. Vaccine 33(28): 3193-9	- Study does not contain a relevant intervention *Costing analysis without comparators*
Shi, Honghao, Guo, Wanjie, Zhu, He et al. (2019) Cost-Effectiveness Analysis of Xiyanping Injection (Andrographolide Sulfonate) for Treatment of Adult Community Acquired Pneumonia: A Retrospective, Propensity Score-Matched Cohort Study. Evidence-based complementary and alternative medicine : eCAM 2019: 4510591	- Study does not contain a relevant intervention *Andrographolide Sulfonate injection*
Shiri, Tinevimbo, Khan, Kamran, Keaney, Katherine et al. (2019) Pneumococcal Disease: A Systematic Review of Health Utilities, Resource Use, Costs, and Economic Evaluations of Interventions. Value in health : the journal of the International Society for Pharmacoeconomics and Outcomes Research 22(11): 1329-1344	- Study does not contain a relevant intervention *Vaccines and antibiotics (not length of treatment)*
Sultana, Marufa, Sarker, Abdur Razzaque, Ali, Nausad et al. (2019) Economic evaluation of community acquired pneumonia management strategies: A	- Study does not contain a relevant intervention

Study	Code [Reason]
systematic review of literature. PloS one 14(10): e0224170	*Different antibiotics in adults and bubble continuous positive airway pressure in newborns*
Tesfaye, Solomon H, Loha, Eskindir, Johansson, Kjell Arne et al. (2022) Cost-effectiveness of pulse oximetry and integrated management of childhood illness for diagnosing severe pneumonia. PLOS global public health 2(7): e0000757	- Non OECD country *Ethiopia*
Torres, Antoni, Bassetti, Matteo, Welte, Tobias et al. (2020) Economic analysis of ceftaroline fosamil for treating community-acquired pneumonia in Spain. Journal of medical economics 23(2): 148-155	- Study does not contain a relevant intervention *Different antibiotics not different durations*
Wagner, A P, Enne, V I, Livermore, D M et al. (2020) Review of health economic models exploring and evaluating treatment and management of hospital-acquired pneumonia and ventilator-associated pneumonia. The Journal of hospital infection 106(4): 745-756	- Study does not contain a relevant intervention *Different antibiotics not different durations*
Xie, Xuanqian; Sinclair, Alison; Dendukuri, Nandini (2017) Evaluating the accuracy and economic value of a new test in the absence of a perfect reference test. Research synthesis methods 8(3): 321-332	Included in review question 4.2
Zhang, Shanshan, Sammon, Peter M, King, Isobel et al. (2016) Cost of management of severe pneumonia in young children: systematic analysis. Journal of global health 6(1): 010408	- Study does not contain a relevant intervention *Costing study with no outcomes*