National Institute for Health and Care Excellence

Pneumonia: diagnosis and management

[B] Evidence review for clinical and cost-effectiveness of care outside of the acute hospital inpatient setting for people with community-acquired pneumonia who would otherwise be admitted to hospital

NICE guideline NG250

Evidence review underpinning recommendations 1.2.3, 1.2.9 to 1.2.11 in the NICE guideline

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Final

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1 Care outside of acute hospital settings

1.1 Review question

What is the clinical and cost effectiveness of care outside of the acute hospital setting (for example using intermediate care, hospital at home, or virtual wards) for people with community-acquired pneumonia who would otherwise be admitted to hospital?

1.1.1 Introduction

Since COVID-19, the NHS has begun to set up pathways for care that try to avoid acute hospital admissions, for example virtual wards (also known as hospital at home), same day emergency care (SDEC) units, and acute respiratory infection (ARI) hubs. These reduce the burden of respiratory infections on acute hospital bed use and may be preferred by some people who would rather be treated in their own home. To date, the evidence is unclear about the safety and efficacy of care outside of acute hospital settings for patients with pneumonia.

This evidence review aims to assess the safety, efficacy and cost-effectiveness of providing care outside of the acute hospital setting for people with community acquired pneumonia.

1.1.2 Summary of the protocol

Table 1: PICOS inclusion criteria

Population	**Inclusion:** People diagnosed with community-acquired pneumonia (CAP) that would normally be managed as an inpatient. • CAP is defined as pneumonia that is acquired outside hospital • Includes people who would otherwise be treated as an acute inpatient hospital admission, for example because they require oxygen, IV hydration, have moderate to severe work of breathing, or the diagnosing clinician is concerned about risk of deterioration. • CURB-65 score of >2 or PSI score of >90 may be used to indicate intermediate risk patients, but these are not the only way of capturing this. • Population includes adults (≥18 years) and babies (1 year and under), children (up to 12 years) and young people (between 12 and 17 years). **Exclusion:** • Babies up to and including 28 days old (corrected gestational age) • People with COVID-19 pneumonia

	• People who acquire pneumonia while intubated (ventilator associated pneumonia) • People who are severely immunocompromised See full protocol for list of all excluded groups.

Interventions	Care outside of the acute hospital inpatient setting, including:
	• Hospital at home, including care at home led by
	  ○ Secondary care physicians
	  ○ Primary care (GP and nurse)
	  ○ Both
	• Rapid response schemes
	• Virtual wards
	• Same day emergency care (SDEC)
	• Outpatient management
	See full protocol for expanded definitions of these interventions

Comparator	Inpatient hospital-based care / services
Outcomes	**Primary outcomes:** At 28 days: • Mortality • Antibiotic use (broad and narrow spectrum [WHO classification] • Length of hospital / intermediate care 'stay' At all reported timepoints: • Downstream healthcare resource use (including number of admissions to hospital, time in ICU, number of GP presentations, number of ED presentations) **Secondary outcomes:** At 28 days: • Adverse events (including *c. diff*) • Antibiotic resistance • HRQoL (measured using validated tools such as the EQ5D or SF-36; or using condition-specific measures such as the CAP Symptom Questionnaire or the St George's Respiratory Questionnaire) • Patient satisfaction
Study type	Systematic reviews of RCTs, RCTs Observational studies will be included if insufficient RCTs are identified.

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 in the review protocol in appendix A and the methods document.

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 the effectiveness evidence were run on 11 December 2023 and re-run on 21 October 2024. The following databases were searched: Cochrane Database of Systematic Reviews (CDSR) (Wiley); Cochrane Central Register of Controlled Trials (CENTRAL) (Wiley); Embase (Ovid); Emcare (Ovid); Health Management Information Consortium (HMIC) (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. Validated NICE filters were used in MEDLINE and Embase to remove references exclusively set in countries that are not OECD members.

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 7 December 2023 using seed references identified from the scoping searches and the search for systematic reviews. These were updated on 21 October 2024 using the included studies from the draft of this review.

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. The NICE OECD filters were used in MEDLINE and Embase.

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 3,395 references (see appendix B for the literature search strategy). These 3,395 references were screened at title and abstract level against the review protocol, with 3,363 excluded at this level. 10% of references were screened separately by two reviewers with 100% agreement.

The full texts of 32 papers were ordered for closer inspection. 3 of these studies were RCTs that met the criteria specified in the review protocol (appendix A). However, this RCT evidence was considered insufficient because 2 of the RCTs were small feasibility studies with very small samples (n=49 and n=14) and they did not report full analyses. Evidence from non-randomised studies was therefore also considered. After full text review, 1 non-randomised controlled trial and 1 before and after study were also included, resulting in 5 included studies. 27 papers were excluded at full text. Four of the 5 included studies were in adults aged over 18. In the other study it is unclear what age range was included however no specific reference is made to children and young people so it was assumed to be a study of adults. Three studies assessed alternatives to hospital admission, 2 focussed on early discharge to a virtual ward or home hospital. For a summary of the 5 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	Study type	Population	Intervention	Comparison	Outcomes	Risk of bias
Atlas 1998 Boston, USA	Before and after study; before arm is retrospective. Prospectively enrolled patients with pneumonia presenting to an ED during the study period were compared with retrospective controls identified during the prior year.	Adult patients aged 18-84 years attending the ED and diagnosed with CAP. PSI score ≤90 (mean 54; predominantly categorised into least severe risk category, class I). N = 521	The intervention was designed to increase the proportion of low-risk patients treated at home by identifying eligible patients, providing PSI scores and mortality risk information to the ED physician, and supporting outpatient management by providing enhanced visiting nurse services, an antibiotic, and access to a primary care physician. Nurse visits included assessment of vital signs and symptoms, review of medications, and measurement of oxygen saturation by pulse oximetry.	Standard hospital care	• Proportion treated as outpatients • Length of stay • Mortality within 30 days • Subsequent hospital admission • Self-rated symptom severity • Satisfaction with overall care	Serious
Carratala 2005 Barcelona, Spain	RCT	Adult patients aged ≥18 years attending the ED and diagnosed with CAP. PSI risk classes II or III.	Patients assigned to outpatient care were given oral levofloxacin (500mg/d). They were visited at home by a nurse 48 hours after discharge from the ED, who assessed vital signs and measured oxygen saturation by pulse	Hospitalised patients received sequential intravenous and oral levofloxacin (500mg/d). They were seen daily during their hospital stay by attending physicians and by at	• Duration of antibiotic therapy • Overall successful outcome (composite measure combining 7 indicators) • Mortality within 30 days	Moderate

Study details	Study type	Population	Intervention	Comparison	Outcomes	Risk of bias
		N = 224	oximetry. If the nurse thought a patient's condition was not improving or there was a worsening of vital signs / oxygen saturation, one of the investigator physicians made an additional visit.	least 1 of the investigators.	• Subsequent hospital admission • Cure of pneumonia • Health related QoL (SF-36) • Satisfaction with overall care • Adverse drug reactions • Medical complications	
Collins 2014 Liverpool, UK	RCT (small feasibility study)	Adult patients aged ≥18 years admitted to hospital for pneumonia (CAP or HAP) or LRTI. Only patients who would have required 'at least one more night of hospitalisation before discharge' were eligible. N = 14	Early Supported Discharge Scheme (ESDS). Patients received specialist respiratory care in their own home to substitute acute hospital care. This care was provided by an experienced hospital respiratory doctor and nurse team who provided up to twice daily direct care and were able to perform blood tests, observations and clinical examinations.	Standard hospital care	• Length of stay • Mortality within 30 days • Subsequent hospital admission • Symptom improvement (CAP-SYM) • Health related QoL (SF-36) • Adverse event – Hospital acquired infection	Low
Llorens 2011 Alicante, Spain	Prospective non-randomised trial.	Adult patients aged >18 years attending the ED and diagnosed with CAP. Patients with a clinical situation requiring	Alternative hospital care model: a multidisciplinary model consisting of admission to the ED-dependent short stay unit (SSU) with early discharge and outpatient monitoring in the day hospital	Standard hospital care	• Length of stay • Mortality within 30 days	Serious

Study details	Study type	Population	Intervention	Comparison	Outcomes	Risk of bias
		hospitalisation and an expected maximum stay of less than 3 days. PSI risk class ≥IV: 62% intervention group, 37% control group. CURB-65 score > 2: 36% intervention group; 23% control group. N = 382	or at home by the home hospitalisation staff. The model is organised to allow continuing care activity where only the physical setting changes but the same therapeutic measures are adopted. Nursing staff focus on holistic care and prevention of functional decline (e.g. early mobilisation programs, nutrition, prevention of pressure ulcers, chest physiotherapy etc).			
Richards 2005 Christchurch, New Zealand	RCT	All patients[1] attending the ED and diagnosed with CAP. CURB-65 scores of 0-2. N = 49	Extended Care At Home (ECAH) service: provides medical and nursing care to patients in their homes, and is provided by a GP Medical Director and experienced primary care nurses in conjunction with the patients' own primary care team. It covers a similar range of activities to hospital at home, providing an IV antibiotic service using standard cannulae, home support services, short-term home nursing care and mobile	Standard hospital care	• Length of stay • Duration of antibiotic therapy • Self-rated symptom severity • Health related QoL (SF-36) • Medical complications • Satisfaction with overall care	Moderate

Study details	Study type	Population	Intervention	Comparison	Outcomes	Risk of bias
			diagnostic testing. Includes daily visit from a GP and twice daily visits from a nurse.			

[1] Paper does not specify whether only adult patients were included and only provides mean age – no range or eligible age range provided. No reference to children throughout the paper, so assume this is a study of adults.

Notes: CAP: Community acquired pneumonia; EDs: Emergency Departments; HAP: Hospital acquired pneumonia; LRTI Lower respiratory tract infection; PSI: Pneumonia Severity Index.

See appendix D for full evidence tables.

1.1.6 Summary of the effectiveness evidence

1.1.6.1 Data quality and approach to analysis

3 RCTs, 1 non-randomised controlled trial, and 1 before and after study were included. Data for 1 outcome (readmission within 30 days) from the 3 RCTs could be pooled for meta-analysis; data for the remaining outcomes could not be pooled because the outcome data from 2 of the trials were presented as medians and ranges or in another format that could not be meta-analysed, and because RCT and non-RCT evidence should not be pooled. For 1 RCT (Carratala 2005), we report the summary of findings for all eligible outcomes in Table 3; corresponding forest plots and GRADE tables are in appendix E and appendix F, respectively. The other 2 RCTs (Collins 2014, Richards 2005) were small feasibility studies that did not report full analyses or detailed descriptive statistics by condition, so for these trials we report a narrative summary of their findings, as reported in the papers (section 1.1.6.2). This section also contains a narrative summary of the findings from the non-RCT and the before and after study included in this review. Section 1.1.11 contains evidence statements relating to findings from all included studies, reported by outcome.

Table 3: Summary of findings table for home-based treatment versus inpatient hospital care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)	Interpretation of effect
	Assumed risk Control	Corresponding risk Intervention				
Antibiotic duration		MD **0.19 higher** (0.41 lower to 0.79 higher)	-	224 (1 RCT)	⊕⊕◯◯ Low[a,b]	Could not differentiate between interventions
Overall mortality within 30 days	0 per 1,000	**0 per 1,000** (0 to 0)	**OR 3.14** (0.13 to 77.83)	224 (1 RCT)	⊕◯◯◯ Very low[a,b,c]	Could not differentiate between interventions
Overall successful outcome[1]	807 per 1,000	**836 per 1,000** (722 to 910)	**OR 1.22** (0.62 to 2.43)	224 (1 RCT)	⊕◯◯◯ Very low[a,b,c]	Could not differentiate between interventions
Subsequent hospital admission within 30 days (RCTs only)	76 per 1,000	**62 per 1,000** (27 to 139)	**OR 0.81** (0.34 to 1.97)	287 (3 studies)	⊕◯◯◯ Very low[d,e,f,g]	Could not differentiate between interventions
Subsequent hospital admission within 30 days (before and after study)	0 per 1,000	**0 per 1,000** (0 to 0)	**OR 15.82** (0.91 to 276.51)	313 (1 study)	⊕◯◯◯ Very low[b,c,h,i]	Could not differentiate between interventions
Health related quality of life (SF-36) at 7 days - Physical functioning		MD **2.8 higher** (4.01 lower to 9.61 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,j]	Could not differentiate between interventions
Health related quality of life (SF-36) at 7 days - Physical role		MD **7.3 higher** (3.68 lower to 18.28 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions
Health related quality of life (SF-36) at 7 days - Bodily pain		MD **4.7 higher** (4.23 lower to 13.63 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions
Health related quality of life (SF-36) at 7 days - General health		MD **4.3 higher** (1.58 lower to 10.18 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,l]	Could not differentiate between interventions
Health related quality of life (SF-36) at 7 days - Vitality		MD **1.5 higher** (5.38 lower to 8.38 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,j]	Could not differentiate between interventions

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)	Interpretation of effect
	Assumed risk Control	Corresponding risk Intervention				
Health related quality of life (SF-36) at 7 days - Social functioning		MD **3.2 higher** (4.88 lower to 11.28 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions
Health related quality of life (SF-36) at 7 days - Emotional role		MD **1.7 higher** (10.52 lower to 13.92 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,m]	Could not differentiate between interventions
Health related quality of life (SF-36) at 7 days - Mental health		MD **1.7 lower** (8.05 lower to 4.65 higher)	-	202 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions
Health related quality of life (SF-36) at 30 days - Physical functioning		MD **4.7 higher** (1.95 lower to 11.35 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,l]	Could not differentiate between interventions
Health related quality of life (SF-36) at 30 days - Physical role		MD **7.1 higher** (3.75 lower to 17.95 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions
Health related quality of life (SF-36) at 30 days - Bodily pain		MD **1 lower** (7.75 lower to 5.75 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions
Health related quality of life (SF-36) at 30 days - General health		MD **4.3 higher** (1.93 lower to 10.53 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,l]	Could not differentiate between interventions
Health related quality of life (SF-36) at 30 days - Vitality		MD **3.4 higher** (2.96 lower to 9.76 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,j]	Could not differentiate between interventions
Health related quality of life (SF-36) at 30 days - Social functioning		MD **1.3 higher** (5.07 lower to 7.67 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)	Interpretation of effect
	Assumed risk Control	Corresponding risk Intervention				
Health related quality of life (SF-36) at 30 days - Emotional role		MD **5.7 higher** (3.12 lower to 14.52 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,n]	Could not differentiate between interventions
Health related quality of life (SF-36) at 30 days - Mental health		MD **3.3 lower** (8.78 lower to 2.18 higher)	-	203 (1 RCT)	⊕◯◯◯ Very low[a,b,k]	Could not differentiate between interventions
Satisfaction with overall care	791 per 1,000	**912 per 1,000** (810 to 962)	**OR 2.75** (1.13 to 6.70)	177 (1 RCT)	⊕◯◯◯ Very low[a,b,o]	Favours the intervention
Adverse drug reactions	96 per 1,000	**91 per 1,000** (39 to 197)	**OR 0.94** (0.38 to 2.30)	224 (1 RCT)	⊕◯◯◯ Very low[a,b,c]	Could not differentiate between interventions

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).
CI: confidence interval; MD: mean difference; OR: odds ratio
[1] Overall successful outcome is a composite measure defined in the paper as meeting all of 7 predefined criteria: cure of pneumonia, absence of adverse drug reactions, absence of medical complications during treatment, no need for additional visits, no changes in initial treatment with levofloxacin, absence of subsequent hospital admissions in 30 days after randomisation, and absence of death from any cause in 30 days after randomisation.

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

a. Downgraded once because participants and people delivering the interventions were not blinded, although this was not possible due to the trial design. No information was provided on intervention adherence, which may be important for patients adhering to medicines in the outpatient group. Outcome assessors were not blinded to treatment condition, but they did use a standard protocol with a checklist of items. Trial was retrospectively registered.
b. Downgraded once for inconsistency: single study
c. Downgraded twice as 95%CI crosses two clinical decision thresholds (0.8 and 1.25)
d. Downgraded twice as greater than 66.6% of the weight in the meta-analysis came from studies at moderate or high risk of bias.
e. Not downgraded because I^2 was <33.3% (I^2 = 8%)
f. Not downgraded because less than 33.3% of the weight in the meta-analysis was from partially indirect studies
g. Downgraded twice because 95%CI crosses 2 clinical decision thresholds (0.8 and 1.25)

h. Downgraded twice because the ED physician made the decision on whether patient was admitted for inpatient care or discharged for outpatient management; this may have been influenced by confounding variables that were not identified, measured or controlled for in analyses. 19% missing data. No information on blinding of outcome assessors.
i. Downgraded once for indirectness.
j. Downgraded twice as 95%CI crosses 2 clinical decision thresholds (-2.0 and +2.0)
k. Downgraded twice as 95%CI crosses 2 clinical decision thresholds (-3.0 and +3.0)
l. Downgraded once as 95%CI crosses one clinical decision threshold (+2.0)
m. Downgraded twice as 95%CI crosses 2 clinical decision thresholds (-4.0 and +4.0)
n. Downgraded once as 95%CI crosses one clinical decision-threshold (+4.0)
o. Downgraded once as 95%CI crosses one clinical decision threshold (1.25)

See appendix E for forest plots and appendix F for full GRADE tables.

1.1.6.2 Narrative summary of findings from the effectiveness evidence

Collins 2014 (RCT)

- There was 1 death in the ESDS arm (known palliative lung cancer) and 1 death in the SHC arm (aspiration pneumonia on readmission – possible underlying lung malignancy).
- The total length of stay was 3.4 (1–7) days in the ESDS arm and 8.33 (1–31) days in the SHC arm *[paper does not report whether this was mean or median length of stay].*
- One subject from the SHC arm developed a presumed hospital acquired infection (HAI).
- Patient and carer/next of kin satisfaction was generally good *[no data reported].*
- For health-related quality of life, 12 participants completed all SF-12 questionnaires on day 0, 2, 7 and 28. Overall mean increase of 0.4 points/subject was seen in the SHC arm, and 1 point/subject in the ESDS arm between day 0 and day 28.[a]
- For symptom improvement, measured using CAP-SYM questionnaires, % recovery at day 28 could only be calculated in 3 SHC and 6 ESDS patients; with 88% and 90% recovery seen respectively at 28 days.

Richards 2005 (RCT)

- The median number of days to discharge in the home group was 4 (range, 1–14), compared with 2 (range, 0–10) in the hospital group ($P = 0.004$).
- There was no significant difference in the number of days on IV antibiotics (3 v 2 days) or subsequent oral antibiotics (9 v 7 days) ($P = 0.22$ for both comparisons) *[paper does not report direction, but based on order of other results presented, could assume it is home vs hospital group]*.
- At 2 weeks, there was no significant difference in the patient-rated symptoms of fatigue, breathlessness, chest pain, cough, sputum production and loss of appetite. There was a significant difference in sleep disturbance, with a median of "never" among the hospital group and "occasional" among the home group ($P < 0.01$). This difference between groups did not persist at 6 weeks. There was no significant difference in the time to resolution of fever, tachycardia and tachypnoea.
- There was no significant difference between groups in either the physical or mental functioning components of the SF-12 at either 2 or 6 weeks (physical component at 2 weeks: home group mean 38.1, hospital group mean 40.2, $p = 0.45$; and at 6 weeks: home group mean 42.2, hospital group mean 45.8, $p = 0.18$. Mental component at 2 weeks: home group mean 48.3, hospital group mean 48.6, $p = 0.91$; and at 6 weeks: home group mean 50.4, hospital group mean 51.0, $p = 0.81$).

Adverse events

- There were no deaths in either group.
- 2 patients were transferred from the home care group to hospital. One had a legionella infection and developed empyema; the other failed to improve clinically

[a] Using the SF-36 (a similar questionnaire with 36 questions) a 20-point change in the scale is believed to represent a clinically meaningful change; using SF-12 at least a 6-point change is deemed necessary for clinical significance.

after antibiotics and developed bullous myringitis. There was one readmission to hospital from the hospital care group, with clinical deterioration after discharge.

- There were nine recorded extrapulmonary infections: five in the home care group and four in the hospital care group. These included urinary tract infections (2), upper respiratory tract infections including sinusitis and pharyngitis (4) and IV site infections (3).
- Including the patient with empyema, there were three recorded pulmonary complications (pleural effusions): two in the home group and one in the hospital group.
- Four patients (two in each group) reported antibiotic side effects of nausea and candidiasis.

Patient satisfaction

- Patient satisfaction with medical and nursing care was high in both groups, but significantly higher in the home group ($P = 0.001$). In the home care group, all patients reported that they were "very happy" with their care. In the hospital care group, 60% were "very happy", 32% "quite happy" and 8% "neither happy nor unhappy".
- Similarly, most patients were happy with the *location* of their care, but the home group were happier ($P < 0.001$). In the home care group, 92% of patients reported that they were "very happy" with the location of their care and 8% "quite happy". In the hospital care group, 32% were "very happy" with the location, 40% "quite happy", 20% "neither happy nor unhappy" and 8% "very unhappy".

<u>Atlas 1998 (before and after study)</u>

- 94 out of 166 (57%) patients were treated as outpatients during the intervention period compared with 61 out of 147 (42%) retrospective cohort control patients (relative increase, 36%, 95%CI 8% to 72%; $P = .01$; 15% absolute difference.
- This effect was seen across all 3 of the PSI risk classes eligible for the study (I, II and III), although the relative impact was greater in the higher risk classes II and III.
- Among patients initially treated at home, 8 intervention outpatients were admitted to the hospital within 4 weeks, compared with 0 control outpatients. As a result, the proportion of patients without admission to the hospital during the 4 week follow up period was 52% for the intervention cohort compared with 42% in the retrospective control cohort (relative increase 25%, 95%CI -2% to 59%; $P = .07$).
- Of the 8 late hospitalisations, 5 were considered to be related to the original diagnosis of pneumonia.
- During the 4 week follow-up period, no patient in either the intervention or control group was known to have died.
- The median length of stay for patients initially hospitalised was similar during the intervention and control periods (4 days in both groups; $P = 0.72$).
- 3 of 72 (4%) patients in the intervention group had an intensive care unit admission compared with 2 of 86 (2%) controls ($P = .66$).
- There were no significant differences in symptoms at 4 weeks between patients in the intervention cohort and control cohort after controlling for baseline values and initial location of care.

- 120 out of 130 (92%) patients in the intervention cohort had returned to their usual activities by 4 weeks, compared with 138 out of 162 (85%) of the control cohort.
- Patient satisfaction with care was high and comparable between patients in the intervention and control cohorts, regardless of their initial treatment location. However, patients in the intervention group initially treated at home were less frequently satisfied with this site of care than outpatients in the control group (41 out of 65 (71%) vs 28 out of 31 (90%); *P* = .04.

Llorens 2011 (prospective non-randomised trial)

- Patients admitted to alternative hospital care (AH) had shorter hospital stay than those in conventional hospital care (CH): 2.5 ± 1.3 days versus 9.6 ± 5.9; p < 0.001.
- In the multivariate analysis, hospital stay was independently associated with the presence of acidosis, hypoxemia, pleural effusion and especially the AH model of hospitalisation (R-squared 0.321%, *p* < 0.001).
- 5 out of 129 (3.9%) AH patients died, compared to 28 out of 251 (11.2%) in the CH model (*p* < 0.05); raw relative risk (RR) for the AH group was 0.3 95%CI (0.1-0.8).
- In multivariate analysis, AH remained independently and significantly associated with lower mortality: adjusted RR 0.12 (95%CI 0.03 to 0.39).

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 for the search strategy.

This search retrieved 3,201 studies. 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. Leaving no included studies for this review question. See Appendix G for the study selection process.

1.1.7.2 Excluded studies

See Appendix J for a list of excluded studies, with reason for exclusion.

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.

1.1.11 Evidence statements

Antibiotic duration

- 2 RCTs (1 directly applicable at moderate risk of bias and 1 partially applicable at low risk of bias) containing data from 273 patients attending hospital with pneumonia showed no significant difference in antibiotic duration for patients treated at home versus patients treated in hospital (MD 0.19 days; 95%CI -0.41 to 0.79 for Carratala 2005; 3 vs 2 days respectively for IV antibiotics and 9 vs 7 days respectively for oral antibiotics, $p = 0.22$ for Richards 2005).

Length of stay

- 1 RCT (partially applicable at low risk of bias) containing data from 14 patients attending hospital with pneumonia showed a lower average length of stay for patients treated at home (3.4 days; range 1-7) then patients treated in hospital (8.33 days; range 1-31), but the paper did not report whether this was mean or median number of days stay and did not report whether the difference was statistically significant.

- 1 RCT (directly applicable at moderate risk of bias) containing data from 224 patients attending hospital with pneumonia showed patients treated at home had a significantly longer stay (median 4 days; range 1-14) than patients treated in hospital (median 2 days; range 0-10 days); $p = 0.004$.

- 1 before and after study (partially applicable at serious risk of bias) containing data from 521 patients attending hospital with pneumonia showed no significant difference in length of stay between patients treated as outpatients and patients treated in hospital (median 4 days in both groups, $p = 0.72$).

- 1 non-randomised controlled trial (partially applicable at serious risk of bias) containing data from 382 patients attending hospital with pneumonia showed patients treated at home had a significantly shorter stay (mean 2.5 days; SD = 1.3) than patients treated in hospital (mean 9.6 days; SD = 5.9); $p < 0.001$.

Mortality within 30 days

- 2 studies (1 RCT: directly applicable at moderate risk of bias; and 1 before and after study: partially applicable at serious risk of bias) containing data from 745 patients with pneumonia did not report any deaths in either the intervention or control group.

- 1 non-randomised controlled trial (partially applicable at serious risk of bias) containing data from 382 patients attending hospital with pneumonia showed a significantly higher number of deaths in the standard hospital care arm (28/251; 11.2%) compared to the alternative hospital care arm (5/129; 3.9%); $p < 0.05$.

Health related quality of life

- 1 RCT (directly applicable at moderate risk of bias) containing data from 224 patients attending hospital with pneumonia showed no significant difference in either the physical or mental functioning components of the SF-12 at either 2 or 6 weeks for patients treated at home or in hospital (all *p*'s > 0.05).

1.1.12 The committee's discussion and interpretation of the evidence

1.1.12.1. The outcomes that matter most

The committee agreed that the main aim of this evidence review was to determine the safety of virtual wards for people with pneumonia, so the most important outcomes were mortality, need for readmission and adverse events. The committee also agreed that patient satisfaction is an important outcome because their clinical experience suggests that many patients, particularly frail elderly people, prefer to be treated in their own home. The committee acknowledged that length of stay, antibiotic duration, symptom improvement and health-related quality of life were all useful outcomes that indicate the efficacy of home-based care relative to hospitalisation, but that these outcomes were of secondary importance to safety related outcomes. There was no outcome data available for other indicators of downstream healthcare resource use such as time in ICU, number of GP presentations, or number of ED presentations.

1.1.12.2 The quality of the evidence

The committee concluded that overall, the evidence base was both sparse and weak. Most of the included studies were poor quality with methodological limitations, and when assessed using GRADE, all reported outcomes were rated as low or very low certainty. The committee noted that the studies were based on small samples and study populations that were not representative of what they see in practice on virtual wards or hospital at home because extensive inclusion and exclusion criteria had been used which resulted in very specific study populations that didn't reflect the broader patient population. They acknowledged the apparent difficulty of recruiting patients into the studies, with very small proportions of eligible patients participating. They noted that the requirement for participants to have capacity to give informed consent was one of the main barriers to participation, particularly due to dementia or delirium in elderly patients, and suggested that future studies would need to address this if they are to reflect current practice.

The committee discussed study applicability and noted that only 2 of the 5 studies were rated as directly applicable, with the other 3 rated as partially applicable: in 1 RCT the sample included a mixed population of patients with pneumonia and lower respiratory tract infection (LRTI) so was not specific to a population with pneumonia; 1 before and after study was a US-based study so differences in the healthcare systems impact applicability; and in 1 non-RCT the sample was not specifically 'intermediate risk' CAP patients – all pneumonia severity was included, including patients with a CURB-65 score of 0 or 1 (although patients admitted to ICU were excluded). The committee highlighted a further issue with applicability to UK context in 1 study that reported oral antibiotic durations of 7 to 9 days; this would not be current standard care in the UK.

The committee considered the study populations and noted that in all studies, extensive inclusion and exclusion criteria had been used. This resulted in findings based on a very specific population of patients with pneumonia, such that the study conclusions may only apply to a subset of patients in a specific risk category who have good oxygenation, stable vital signs, no unstable comorbid conditions, no complicated pleural effusions, no altered mental status and no social problems that precluded them from receiving care at home (e.g. homelessness, drug or alcohol misuse, or psychiatric illness). They reflected on their clinical experience with virtual wards and home-based care and highlighted that patients in these settings may have multiple comorbid conditions, a high degree of clinical complexity, and may be frail elderly patients, so they were concerned that the evidence did not reflect current practice. However, they also acknowledged that currently, virtual wards are used for mixed populations of patients with a range of conditions, particularly due to the recent rapid expansion of virtual wards and hospital at home services following NHS England policy, so the evidence specific to patients with pneumonia may not accurately match the types of patients who are currently being treated in these settings, but may nevertheless be useful for considering the efficacy of home-based care for people with moderate severity pneumonia.

The committee discussed the evidence from the 2 non-RCT studies where participants were not randomised to condition, but where the ED physician made the decision about the patients' place of care (home versus hospital). They agreed that there may have been numerous confounding factors that influenced both the place of care the patient was assigned to and their clinical progress (e.g. family support at home, presence of comorbidities, illness severity) so these studies were rated as at high risk of bias. The committee noted that in 1 of these studies, patients in the hospital arm were more seriously ill and had more complications than people treated at home, so the outcomes relating to length of stay and antibiotic duration were likely to have been impacted by this. However, the committee also recognised that this more accurately reflects the way decisions about place of care are made in practice, where more severely ill patients would be admitted to hospital and those with stable observations and no complications would be considered eligible for home treatment.

The committee noted that all the included interventions adopted a 'hospital at home' or outpatient management approach using nurse or clinician home visits and/or oral antibiotics at home, rather than a virtual ward approach that tends to rely more on the use of wearable technologies for remote monitoring of patients' vital signs and clinical condition.

Overall, the committee agreed that there were significant limitations in the evidence which meant that they were not able to make strong recommendations in this area, but they agreed that general recommendations about place of care including hospital at home were justified from the combination of limited evidence and the committee's clinical experience of virtual wards. There was no evidence identified for babies, children and young people, so the committee agreed that it was not possible to make recommendations about hospital at home for children. They acknowledged that they had made largely consensus-based recommendations for adults based on limited evidence, but agreed that they could not make consensus-based recommendations for children and young people because they had no evidence at all and did not have equivalent clinical experience of virtual wards for children or

approaches to managing young patients at home. They were also uncertain about the availability of these services for patients under the age of 18.

1.1.12.3 Benefits and harms

Almost all outcomes from the RCT evidence showed no difference between people treated in hospital and people treated in their homes, including 30-day hospital readmission, antibiotic duration, symptom improvement or return to usual activities, health-related quality of life, adverse events, and adverse drug reactions or antibiotic side effects. The quality of these findings was low or very low. There were mixed findings for length of stay, with 1 RCT showing a longer length of stay for patients treated at home, 1 before and after study showing no significant difference in length of stay, and 2 studies (1 RCT and 1 non-RCT) showing a shorter length of stay for patients treated at home, although findings from these latter 2 studies were compromised by methodological limitations and very small samples. The committee concluded that the impact of home-based care on length of stay is therefore uncertain.

The committee considered findings for mortality within 30 days. One RCT showed no significant difference in mortality, but this finding was rated as very low quality. Two studies (1 RCT and 1 before and after study) did not report any deaths in either the intervention or control group. One non-RCT showed a significantly higher number of deaths in the standard hospital care arm compared to the home-based care arm, but patients in the standard hospital care arm had a higher rate of complications and comorbid illness than patients treated at home which reduced certainty of this finding. The committee noted that many of the studies were not powered to detect differences in mortality, particularly because patients at low risk of mortality were selected to participate, so very large numbers of patients would be required to detect a significant difference in 30-day mortality. The committee therefore agreed that the impact of home-based care on mortality is uncertain.

The committee discussed that 2 RCTs reported that overall patient satisfaction with their care was significantly higher in patients treated at home compared to patients treated in hospital. One RCT also showed higher satisfaction with the location of their care in patients treated at home.

The committee discussed these findings with reference to the wider evidence base on virtual wards for other health conditions and their clinical expertise. They considered findings from a Cochrane review on Admission avoidance hospital at home (Shepperd 2016). This review was not included in the current review because it was based on studies of patients with a range of conditions (only 1 trial of 16 included patients with CAP; this trial was included in the current evidence review). The committee noted the similarity of the results from this Cochrane review and the current evidence review. They acknowledged the limitations of the evidence included in the current review, particularly with respect to methodological issues and inadequate study populations and agreed that there was insufficient certainty in the evidence, particularly in terms of mortality and adverse events, for them to be confident in the safety of home-based care.

Some committee members accepted that although the wider evidence and their professional experience indicates that hospital at home is suitable for certain populations, they maintained

that there was insufficient evidence to support the use of virtual wards for patients with intermediate risk pneumonia. However, others emphasised that the evidence showed that people do no worse at home, that people are significantly more satisfied when receiving care at home, and there are potential resource savings when treating patients at home, so it may be important to offer it as an option for pneumonia patients meeting specific criteria and who would prefer to be treated outside of hospital. The committee therefore concluded that clinicians should consider managing patients with non-severe CAP in hospital at home services where they are available. They stressed that this should be a shared decision between the clinician, the patient and their carer(s), particularly if they were likely to be involved in providing care at home.

The committee agreed that hospital at home is not suitable for patients with severe pneumonia who are very unwell. They considered low- and moderate-severity pneumonia patient populations and agreed that most people with low-severity pneumonia can be safely discharged home with antibiotics and safety netting advice, without requiring admission to a virtual ward. However, they acknowledged that other factors beyond their low-risk CRB65 or CURB65 score may influence their need for hospital at home services, such as their age, level of frailty, or availability of their support network, so they decided not to limit eligibility to moderate-risk patients only. There was some concern that including low-severity pneumonia patients may significantly increase the number of people being referred to virtual wards who would otherwise be discharged home, but ultimately agreed that CRB65 or CURB65 scores in isolation would not determine place of care, and clinician judgement would prevent the over-referral of low-severity patients that do not require it.

The committee considered possible harms of treating patients at home, noting the risk of people's condition worsening and this not being adequately monitored in the way it potentially would be if they were in hospital. They were particularly concerned about those who may deteriorate quickly, such as frail elderly patients, who may become delirious, or those who are generally unable to advocate for themselves. The committee described current practice and explained that these risks would be assessed and discussed during admission to any hospital at home services and this would be part of the shared decision-making conversation, where the patients' choice about escalation to hospital would also be documented. The committee discussed the importance of having procedures in place to escalate care if a patient's condition deteriorates, as well as reduce care for those who are improving. They acknowledged the likelihood of local variation in services, variation in the capacity to manage complex patients and those with frailty or comorbidities, and agreed that the decision to refer a patient to home-based care should take into account the level of local service available.

1.1.12.4 Cost effectiveness and resource use

There was no existing health economic evidence for this review question as virtual wards are relatively new and research is underway. The committee noted that there is currently a lot of investment in virtual wards by the NHS England.

The committee explained that maintaining virtual wards is less expensive than an inpatient hospital ward. However, setting up virtual wards can come at a significant cost. The

committee were aware of a recent costing study (Jalilian 2024), which showed that virtual wards reduced hospital stays in people with various conditions, with around 20% having pneumonia. However, saving one inpatient hospital day was costing £935, considering the costs of setting up virtual wards. This study also showed that if a patient was incorrectly assigned to a virtual ward and then got significantly worse, it cost more to treat them than if they had been admitted to an inpatient ward from the beginning. The study further indicated more readmissions after a virtual ward, which could reduce their cost-effectiveness. However, as only around 20% of people in the study had pneumonia this study is not directly applicable to this review and therefore the committee was unable to draw conclusions from this study.

The committee felt it was important to consider the patient's comorbidities and preferences. Generally, patients prefer to be at home if it is safe to do so, which may result in quality-adjusted life year gains due to an improvement in their quality of life. However, this is only true if the patient does not need increased care, that is, escalation of care and readmission.

The committee were unsure if virtual wards would be cost effective and, therefore could not make a strong recommendation. Due to the lack of robust effectiveness data, it was not possible to conduct de-novo economic modelling to explore the cost-effectiveness of virtual wards and support recommendations in this area. As a result, in their recommendation, the committee limited the patient population to those with low or moderate severity community acquired pneumonia. The committee explained that this sub-group is more likely to show improvement, less likely to require readmission, and therefore, virtual wards are likely to be most cost effective in this patient group.

Also, the committee discussed that virtual wards will reduce the demand for hospital beds and given the current pressures on the NHS this is invaluable. Overall, the committee were of a view that if virtual wards were already set up and the patients with low or moderate pneumonia were assigned to a virtual ward the recommendations would be cost effective or even cost-saving. This is due to patients who would have otherwise occupied limited hospital beds having the option to receive the necessary care at home, safely and conveniently, and potentially at a lower cost. Additionally, the committee explained that virtual ward equipment could be re-used on multiple patients as required, improving the cost-effectiveness of virtual wards.

1.1.12.5 Other factors the committee took into account

The committee noted existing NHS England guidance on Acute Respiratory Infection (ARI) virtual wards and NHS England Principles for Virtual Wards, and discussed these documents when drafting the recommendations They agreed that they did not need to duplicate the principles of care outlined in these pieces of guidance, and focused on making recommendations specific to virtual wards for people with pneumonia. These existing guidance documents gave the committee useful information about the wider context of virtual wards within the NHS.

The committee reflected on the limited evidence for adults and the absence of evidence for children and young people. They noted that a relatively large amount of evidence exists for

hospital at home services for a range of conditions other than pneumonia, including acute infections (e.g. cellulitis or UTI), exacerbations of chronic conditions (e.g. COPD or heart failure), post-operative care, falls, and other conditions associated with frailty. They considered the extent to which this wider evidence base was relevant to patients with pneumonia. The committee also discussed the large amount of ongoing research (and funding) into virtual wards and were aware of several studies in progress. For these reasons, the committee did not consider it necessary to make a recommendation for research on hospital at home for children and adults with pneumonia as they understood that this research is already underway.

1.1.13 Recommendations supported by this evidence review

This evidence review supports recommendations 1.2.2 and 1.2.7 to 1.2.9.

1.1.14 References – included studies

1.1.14.1 Effectiveness

Atlas, S J, Benzer, T I, Borowsky, L H et al. (1998) Safely increasing the proportion of patients with community-acquired pneumonia treated as outpatients: an interventional trial. Archives of internal medicine 158(12): 1350-6

Carratala, Jordi, Fernandez-Sabe, Nuria, Ortega, Lucia et al. (2005) Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. Annals of internal medicine 142(3): 165-72

Collins, Andrea M, Eneje, Odiri J, Hancock, Carole A et al. (2014) Feasibility study for early supported discharge in adults with respiratory infection in the UK. BMC pulmonary medicine 14: 25

Llorens, P., Murcia-Zaragoza, J., Sanchez-Paya, J. et al. (2011) Evaluation of a multidisciplinary alternative hospitalization model in comparison with conventional hospitalization for patients with community-acquired pneumoni. Emergencias 23(3): 167-174

Richards, Dee A, Toop, Les J, Epton, Michael J et al. (2005) Home management of mild to moderately severe community-acquired pneumonia: a randomised controlled trial. The Medical journal of Australia 183(5): 235-8

1.1.14.2 Economic

No studies included however the committee referred to:

Jalilian A, Sedda L, Unsworth A, et al. Length of stay and economic sustainability of virtual ward care in a medium-sized hospital of the UK: a retrospective longitudinal study. BMJ Open 2024;14:e081378. doi: 10.1136/bmjopen-2023-081378

1.1.14.3 Other

Shepperd S, Iliffe S, Doll HA, Clarke MJ, Kalra L, Wilson AD, Gonçalves-Bradley DC. Admission avoidance hospital at home. Cochrane Database Syst Rev. 2016 Sep 1;9(9):CD007491. doi: 10.1002/14651858.CD007491.pub2. Update in: Cochrane Database Syst Rev. 2024 Mar 5;3:CD007491. doi: 10.1002/14651858

Appendices

Appendix A – Review protocols

Review protocol for RQ3.1: What is the clinical and cost-effectiveness of care outside of the acute hospital setting (for example using intermediate care, hospital at home, virtual wards) for people with intermediate risk community-acquired pneumonia (CAP)?

ID	Field	Content
1.	Review title	The clinical and cost-effectiveness of care outside of the acute hospital inpatient setting for people with community-acquired pneumonia (CAP) as an alternative to inpatient care.
2.	Review question	What is the clinical and cost effectiveness of care outside of the acute hospital setting (for example using intermediate care, hospital at home, virtual wards) for people with community-acquired pneumonia who would otherwise be admitted to hospital?
3.	Objective	To understand the safety, efficacy and cost-effectiveness of providing care outside of the acute hospital setting for people with CAP.

4.	Searches	There will be separate searches for the effectiveness and cost effectiveness evidence. **Sources for effectiveness evidence** There will be a combined search for systematic reviews covering all review questions in this guideline. This 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. The following databases will be searched for the effectiveness evidence: • Cumulative Index to Nursing and Allied Health Literature (CINAHL) via EBSCOhost • Cochrane Central Register of Controlled Trials (CENTRAL) via Wiley • Embase via Ovid • Health Management Information Consortium (HMIC) 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. The following sources will be applied as required to ensure relevant records are not missed: • The reference lists of potentially relevant systematic reviews will be checked. • The references lists of any key potentially relevant publications will be checked where appropriate to the parameters set out in sections 6-10 below. • Later citations of any key trials or protocols identified in the search results could be checked where appropriate to the parameters set out in sections 6-10 below. • The guideline committee or other stakeholders could be asked if they are aware of any other relevant studies that could be considered. The searches for effectiveness evidence will not have any date limits applied. **Sources 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). **Managing 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. 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]). 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 acquired pneumonia

6.	Population	Inclusion: Adults (>18 years), babies (>28 days) children and young people (≤18 years) with community acquired pneumonia that would normally be managed as an inpatient, diagnosed in primary care or in hospital. • CAP is defined as pneumonia that is acquired outside hospital • people who would otherwise be treated as an acute inpatient hospital admission for example because they require oxygen, IV hydration or have moderate to severe work of breathing. • A CURB-65 score of >2 or PSI score >90 may be used to indicate intermediate risk patients, but these are not the only way of capturing this. • In studies where there is a mixed population of risk, a minimum of 75% of participants must be classed as intermediate risk for the study to be included. • In studies where there is a mixed population of ages, data will be extracted and analysed separately for adults (>18 years) and CYP (≤18 years) where possible. If not possible, the study will still be included but separate analyses will be conducted for mixed age population studies. 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.
7.	Intervention/Exposure/Test	Care outside of the acute hospital inpatient setting, including:

		• Hospital at home[2], including care at home led by: - Secondary care physicians - Primary care (GP and nurse) - Both • Rapid response schemes[3] • Virtual wards[4]

[2] Hospital-at-home care is generally defined as the community-based provision of services usually associated with acute inpatient care. “Hospital-at-home” programs are defined by the provision, in patients’ own homes and for a limited period, of a specific service that requires active participation by health care professionals. The care tends to be multidisciplinary and may include technical services, such as intravenous services. Many disparate models have been developed under the hospital-at-home label, leading to difficulties in evaluating their effectiveness. Key features of the Johns Hopkins “hospital-at-home” model:

- A substitutive model providing hospital-level care for patients living in a specified geographic catchment area delineated by 30 minute travel time.
- Eligible patients are those with certain acute illnesses that require hospital-level care who also meet previously validated medical eligibility criteria.
- Robust input from physicians (at least daily visits and 24 hour coverage) and nurses (initial continuous nursing care following by intermittent visits and 24 hour coverage).
- Patient retains inpatient status and the hospital or health system retains responsibility for the acute care episode.
- Care is provided in a coordinated manner similar to that in an inpatient ward.

[3] Rapid response schemes generally aim to support a user in their own home or other location either as a means of preventing admission or as a means of facilitating discharge from the acute hospital sector. Usually led by either a nurse or allied health professional, rapid response schemes can cover a wide range of interventions including administration of intravenous therapies, peg tube and catheter replacement, crisis psychiatric care and provide enhanced care to palliative care patients.

[4] Virtual wards are a form of preventive hospital-at-home for patients at high predicted risk of unplanned hospital admission. A model of home-based coordinated care with the aim of reducing hospital admissions in a relatively low-cost manner. The "virtual ward" program provides multidisciplinary case management services to people who have been identified, using a predictive model, as high risks for future emergency hospitalisation. Virtual wards use the systems, staffing and daily routine of a hospital ward to deliver preventive care to patients in their own homes. The Virtual Wards work just like a hospital ward, using the same staffing, systems and daily routines, except that the people being cared for stay in their own homes throughout.

		• Same day emergency care (SDEC) • Outpatient management
8.	Comparator/Reference standard/Confounding factors	Inpatient hospital-based care / services
9.	Types of study to be included	Systematic reviews (SRs) of RCTs, RCTs Observational studies will be included if insufficient relevant SRs or RCTs are identified (it is anticipated that 'insufficient RCTs' would be less than 3 good quality, directly relevant RCTs, but this will be discussed with the committee).
10.	Other exclusion criteria	
11.	Context	Since COVID, the NHS has begun to set up pathways for care that try to avoid acute hospital admissions, for example virtual wards and acute respiratory infection (ARI) hubs. These reduce the burden of respiratory infections on acute hospital bed use and may be preferred by some people who would prefer to be treated in their own home.
12.	Primary outcomes (critical outcomes)	At 28 days (or longest timepoint for shorter follow-up) • Mortality • Antibiotic use (broad and narrow spectrum [WHO classification]) • Length of hospital inpatient/intermediate care 'stay'

		At all reported timepoints • Downstream healthcare resource use (including number of admissions to hospital, time in ICU, number of GP presentations, number of ED presentations)
13.	Secondary outcomes (important outcomes)	At 28 days (or longest timepoint for shorter follow-up) • Adverse events (including *c.diff*) • Antibiotic resistance • HRQoL (measured using validated tools such as the EQ5D or SF-36; or using condition-specific measures of QoL such as the CAP Symptom Questionnaire or the St George's Respiratory Questionnaire) • Patient satisfaction
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.
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 RCTs, the Cochrane risk of bias (RoB) 2 tool 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	Where possible, meta-analyses of outcome data will be conducted for all comparators that are reported by more than one study, with reference to the Cochrane Handbook for Systematic Reviews of Interventions. Where data can be disambiguated it will be separated into the subgroups identified in section 17 (below).

		Continuous outcomes will be analysed as mean differences, unless multiple scales are used to measure the same factor. In these cases, standardised mean differences will be used instead. Pooled relative risks will be calculated for dichotomous outcomes (using the Mantel–Haenszel method) reporting numbers of people having an event. Absolute risks will be presented where possible. Fixed- and random-effects models (der Simonian and Laird) will be fitted for all comparators, with the presented analysis dependent on the degree of heterogeneity in the assembled evidence. Fixed-effects models will be deemed to be inappropriate if one or both of the following conditions is met: • Significant between study heterogeneity in methodology, population, intervention or comparator was identified by the reviewer in advance of data analysis. • The presence of significant statistical heterogeneity in the meta-analysis, defined as $I^2 \geq 50\%$. In any meta-analyses where some (but not all) of the data comes from studies at high risk of bias, a sensitivity analysis will be conducted, excluding those studies

		from the analysis. Results from both the full and restricted meta-analyses will be reported. Similarly, in any meta-analyses where some (but not all) of the data comes from indirect studies, a sensitivity analysis will be conducted, excluding those studies from the analysis. GRADE will be used to assess the quality of the outcomes. All outcomes in this review will be rated as high quality initially and downgraded from this point. Where 10 or more studies are included as part of a single meta-analysis, a funnel plot will be produced to graphically (visually) assess the potential for publication bias. Minimally important differences (MIDs) will be discussed with the committee and if established MIDs are not identified, default MIDs will be used. These are 0.80 and 1.25 for dichotomous outcomes, and 0.5 times the control group SD for continuous outcomes.
17.	Analysis of sub-groups	Where data is available and can be disambiguated, pre-planned analysis of subgroups will be conducted for: • Age: <2, 2-5, 5-12, 13-17, 19 – 65, >65 • Presence of co-morbidities (eg asthma, COPD) • Frailty

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		
	Stage of review at time of this submission	**Review stage**	**Started**	**Completed**

23.		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 Adviser • Hannah Stockton, Technical Analyst • Steph Armstrong, Senior Health Economist • Eric Slade, Health Economic Adviser • 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, intermediate care, hospital at home, virtual wards, same day emergency care, step up/step down care.
33.	Details of existing review of same topic by same authors	
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

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 base sets 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 (Part 2) were run on 11 December 2023 and re-run on 21 October 2024.

- 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. All translated search strategies were peer reviewed by another SIS to ensure their accuracy. Both 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).

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.

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 Effectiveness (Part 2) and Cost Effectiveness (Part 3) searches, the validated NICE OECD filters were used in MEDLINE and Embase to remove references 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 filter was not applied to the Systematic Review (Part 1) 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 (Part 2) were not date limited as this was a new question that had not been covered in the earlier guidelines.

Study-type filters

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

The Effectiveness (Part 2) searches had no filters, as the protocol required reviews, trials and observational studies.

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 containing systematic reviews needed to be searched, as these strategies are sufficiently sensitive with much higher precision that using systematic review study-type search filters in general databases. Testing during scoping showed that other sources 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. We now, therefore, have 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.

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.

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

Part 2: Effectiveness evidence searches

The strategies are in the structure:

Pneumonia AND ((Emergencies AND Outpatient Management) OR (Virtual Wards OR Hospital at Home OR SDEC OR Rapid Response Schemes))

The intervention terms developed for this review took into consideration the searches developed for:

- Review 12 - Alternatives to hospital care Emergency and acute medical care in over 16s: service delivery and organisation part of Emergency and acute medical care in over 16s: service delivery and organisation (2018) NICE guideline NG94.
- Early Value Assessment External Assessment Group Report Appendix A for Virtual ward platform technologies for acute respiratory infections (2013) NICE health technology evaluation 13
- Gonçalves-Bradley DC et al. (2017) Early discharge hospital at home. *Cochrane Database of Systematic Reviews*, Issue 6. Art. No.: CD000356.

The Health Management Information Consortium (HMIC) strategy was translated using the standard NICE methods set out in the following paper:

> Finnegan A & Levay P (2022) A method for translating search strategies efficiently into HMIC and SPP. *Health Information and Libraries Journal*, 39(3), 225–243.

There was a deviation from the protocol when Emcare (via Ovid) was substituted for CINAHL (via EBSCOhost). This followed an update to standard NICE practice for searches where coverage of the nursing literature was required. There is unique content in both sources but the substantial overlap means that searching one of them is adequate. Emcare is available on the same Ovid platform as Embase and so the search strategy can be used with minimal adjustment. This improvement in the workflow meant that Emcare was prioritized for these searches.

The re-run searches were identical to the main search strategies. Re-runs are date limited to the first day of the month in which the main search was run to the current date. In MEDLINE the create date (.dt) and entry date (.ed) fields were used. In Embase the date created (.dc) field was used. In CENTRAL, Emcare and HMIC no date limits were used and all search results were downloaded. An additional search of the Cochrane Database of Systematic Reviews was undertaken during the re-runs as the committee had requested consideration of Edgar et al. (2024) Admission avoidance hospital at home.

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*))

Searches
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))
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"

Searches
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 (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)	11/12/2023	Wiley	Cochrane Central Register of Controlled Trials Issue 11 of 12, November 2023	223
Embase	11/12/2023	Ovid	Embase 1974 to 2023 December 08	2149

Emcare	11/12/2023	Ovid	Ovid Emcare 1995 to 2023 Week 48	836
Health Management Information Consortium (HMIC)	11/12/2023	Ovid	HMIC Health Management Information Consortium 1979 to September 2023	38
MEDLINE ALL	11/12/2023	Ovid	Ovid MEDLINE(R) ALL 1946 to December 07, 2023	1834

Re-run results

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded
Cochrane Central Register of Controlled Trials (CENTRAL)	21/10/2024	Wiley	Cochrane Central Register of Controlled Trials Issue 9 of 12, September 2024	202
Cochrane Database of Systematic Reviews	21/10/2024	Wiley	Cochrane Database of Systematic Reviews Issue 10 of 12, October 2024	12
Embase	21/10/2024	Ovid	Embase 1974 to 2024 October 18	157
Emcare	21/10/2024	Ovid	Ovid Emcare <1995 to 2024 Week 41>	1086
Health Management Information Consortium (HMIC)	21/10/2024	Ovid	HMIC Health Management Information Consortium 1979 to July 2024	57
MEDLINE ALL	21/10/2024	Ovid	Ovid MEDLINE(R) ALL 1946 to October 18, 2024	86

Additional search techniques

Databases	Date searched	Database platform	Database segment or version	No. of results downloaded

Forward citation searching	07/12/2023	Web of Science (WOS) Core Collection (1990-present)	Data updated 2023-12-04	61
Forward citation searching update	21/10/2024	Web of Science (WOS) Core Collection (1990-present)	Data updated 2024-10-18	221
Reference list checking	07/12/2023	Web of Science (WOS) Core Collection (1990-present)	Data updated 2023-12-04	9
Reference list checking update	21/10/2024	Web of Science (WOS) Core Collection (1990-present)	Data updated 2024-10-18	66

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, 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"] 4483
#2	(pneumonia or pneumonias or bronchopneumon* or pleuropneumon*):ti,ab 16339
#3	#1 or #2 17595
#4	[mh "hospitalization"] 20711
#5	[mh ^"Emergency Medical Services"] 1516
#6	[mh ^"Emergency Service, Hospital"] 3749
#7	[mh ^triage] 483
#8	{or #4-#7} 25035
#9	(outpatient* NEAR/2 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or discharg* or postsdischarg* or home* or house* or ambulatory* or community*)):ti,ab 13506
#10	#8 and #9 738
#11	#3 and #10 22
#12	[mh ^"home care services, hospital-based"] 286
#13	[mh ^"home health nursing"] 11
#14	[mh ^"Home Infusion Therapy"] 23
#15	[mh ^"Home Nursing"] 325
#16	[mh ^"home care services"] 2407
#17	[mh ^"Hospital to Home Transition"] 9

#18 [mh ^"transitional care"] 150

#19 [mh ^"Intermediate Care Facilities"] 18

#20 [mh ^"ambulatory care facilities"] 807

#21 [mh ^"House calls"] 767

#22 [mh ^"Outpatient Clinics, Hospital"] 642

#23 (Vward or Vwards or "V ward" or "V wards"):ti,ab 2

#24 ((virtual* or home* or inhome* or house* or intermediate* or domiciliary* or domestic*) NEAR/2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital*)):ti,ab 3550

#25 ((homebased* or (home NEXT based*) or (in NEXT home*) or inhome*) NEAR/2 (inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or care* or healthcare* or intervention* or treatment* or therap* or infusion* or intravenous* or support*)):ti,ab 4494

#26 (((step* NEXT down) or (step* NEXT up)) NEAR/3 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital* or inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or care* or healthcare* or intervention* or treatment* or therap* or support* or candidate* or select* or criteria* or decision*)):ti,ab 973

#27 ((intermediate* or domiciliary* or domestic*) NEAR/2 (pathway* or scheme* or service* or setting* or care* or healthcare*)):ti,ab 520

#28 ((early* or earlier* or support* or assist* or facilitat*) NEAR/2 discharg*):ti,ab 2483

#29 ((patient* or outpatient* or inpatient*) NEAR/3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*) NEAR/3 (avoid* or alternative* or prevent* or avert* or unnecessar* or block* or discourag*)):ti,ab 395

#30 ((discharg* or postdisharg* or postpneumon* or posthospital* or admission* or postadmission* or readmission* or treatment* or care* or healthcare* or intervention* or admit* or readmit*) NEAR/3 (followup* or (follow NEXT up*) or transition* or disposition* or transfer*) NEAR/3 (house* or home*)):ti,ab 360

#31 ((low* or intermediate*) NEAR/1 risk* NEAR/3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*)):ti,ab 188

#32 (hospital* NEAR/3 home*):ti,ab 2652

#33 ((home* or house*) NEAR/1 (call* or visit* or monitor* or care* or healthcare* or inpatient*)):ti,ab 9937

#34 ((home* or (home NEXT health*)) NEXT nursing*):ti,ab 219

#35 (nursing* NEAR/1 (call* or visit*)):ti,ab 130

#36 (outpatient* NEAR/3 (visit* or monitor* or nurse* or nursing* or candidate* or select* or criteria* or triage* or triaging*)):ti,ab 4897

#37 SDEC:ti,ab 11

#38 (((same NEXT day*) or home* or house*) NEAR/3 ((acute NEXT care*) or (emergenc* NEXT care*) or (crisis NEXT care*) or (urgent NEXT care*))):ti,ab 80

#39 ((ambulatory* or community* or outpatient*) NEAR/2 (acute* or emergenc* or crisis* or urgent*) NEAR/2 (pathway* or scheme* or service* or setting* or approach* or management* or care* or healthcare* or intervention* or treatment* or therap* or nursing* or response* or rapid*)):ti,ab 225

#40 (rapid* NEAR/2 (response* or diagnos* or decision*) NEAR/2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or approach* or management* or framework* or

model* or care* or healthcare* or intervention* or treatment* or therap* or team*)):ti,ab 288
#41 {or #12-#40} 28706
#42 #3 and #41 433
#43 #11 or #42 449
#44 #11 or #42 in Trials 438
#45 ((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 539399
#46 #44 not #45 253
#47 "conference":pt 248848
#48 #46 not #47 202
Note: no date limit applied to the re-run and all results downloaded.

Database name: Cochrane Database of Systematic Reviews (CDSR)

Searches
#1 [mh "hospitalization"] 20711
#2 [mh ^"Emergency Medical Services"] 1516
#3 [mh ^"Emergency Service, Hospital"] 3749
#4 [mh ^triage] 483
#5 {or #1-#4} 25035
#6 (outpatient* NEAR/2 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or discharg* or postsdischarg* or home* or house* or ambulatory* or community*)):ti,ab 13506
#7 #5 and #6 738
#8 [mh ^"home care services, hospital-based"] 286
#9 [mh ^"home health nursing"] 11
#10 [mh ^"Home Infusion Therapy"] 23
#11 [mh ^"Home Nursing"] 325
#12 [mh ^"home care services"] 2407
#13 [mh ^"Hospital to Home Transition"] 9
#14 [mh ^"transitional care"] 150
#15 [mh ^"Intermediate Care Facilities"] 18
#16 [mh ^"ambulatory care facilities"] 807
#17 [mh ^"House calls"] 767
#18 [mh ^"Outpatient Clinics, Hospital"] 642
#19 (Vward or Vwards or "V ward" or "V wards"):ti,ab 2
#20 ((virtual* or home* or inhome* or house* or intermediate* or domiciliary* or domestic*) NEAR/2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital*)):ti,ab 3550
#21 ((homebased* or (home NEXT based*) or (in NEXT home*) or inhome*) NEAR/2 (inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team*

or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or care* or healthcare* or intervention* or treatment* or therap* or infusion* or intravenous* or support*)):ti,ab 4494

#22 (((step* NEXT down) or (step* NEXT up)) NEAR/3 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital* or inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or care* or healthcare* or intervention* or treatment* or therap* or support* or candidate* or select* or criteria* or decision*)):ti,ab 973

#23 ((intermediate* or domiciliary* or domestic*) NEAR/2 (pathway* or scheme* or service* or setting* or care* or healthcare*)):ti,ab 520

#24 ((early* or earlier* or support* or assist* or facilitat*) NEAR/2 discharg*):ti,ab 2483

#25 ((patient* or outpatient* or inpatient*) NEAR/3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*) NEAR/3 (avoid* or alternative* or prevent* or avert* or unnecessar* or block* or discourag*)):ti,ab 395

#26 ((discharg* or postdisharg* or postpneumon* or posthospital* or admission* or postadmission* or readmission* or treatment* or care* or healthcare* or intervention* or admit* or readmit*) NEAR/3 (followup* or (follow NEXT up*) or transition* or disposition* or transfer*) NEAR/3 (house* or home*)):ti,ab 360

#27 ((low* or intermediate*) NEAR/1 risk* NEAR/3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*)):ti,ab 188

#28 (hospital* NEAR/3 home*):ti,ab 2652

#29 ((home* or house*) NEAR/1 (call* or visit* or monitor* or care* or healthcare* or inpatient*)):ti,ab 9937

#30 ((home* or (home NEXT health*)) NEXT nursing*):ti,ab 219

#31 (nursing* NEAR/1 (call* or visit*)):ti,ab 130

#32 (outpatient* NEAR/3 (visit* or monitor* or nurse* or nursing* or candidate* or select* or criteria* or triage* or triaging*)):ti,ab 4897

#33 SDEC:ti,ab 11

#34 (((same NEXT day*) or home* or house*) NEAR/3 ((acute NEXT care*) or (emergenc* NEXT care*) or (crisis NEXT care*) or (urgent NEXT care*))):ti,ab 80

#35 ((ambulatory* or community* or outpatient*) NEAR/2 (acute* or emergenc* or crisis* or urgent*) NEAR/2 (pathway* or scheme* or service* or setting* or approach* or management* or care* or healthcare* or intervention* or treatment* or therap* or nursing* or response* or rapid*)):ti,ab 225

#36 (rapid* NEAR/2 (response* or diagnos* or decision*) NEAR/2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or approach* or management* or framework* or model* or care* or healthcare* or intervention* or treatment* or therap* or team*)):ti,ab 288

#37 {or #8-#36} 28706

#38 #7 or #37 29194

#39 #7 or #37 in Cochrane Reviews 316

#40 #7 or #37 with Cochrane Library publication date Between Nov 2023 and Oct 2024, in Cochrane Reviews 12

Note: only required for the re-run following committee request to check a recent review.

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/ 316313
2	(pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab. 233653
3	1 or 2 397650
4	hospitalization/ 543155
5	emergency health service/ 116654
6	hospital emergency service/ 10085
7	patient triage/ 4994
8	or/4-7 665384
9	(outpatient* adj2 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or discharg* or postsdischarg* or home* or house* or ambulatory* or community*)).ti,ab. 93797
10	8 and 9 13119
11	3 and 10 698
12	*home care/ 35495
13	home intravenous therapy/ 60
14	hospital to home transition/ 166
15	transitional care/ 5792
16	*outpatient department/ 14843
17	home visit/ 5230
18	visiting nursing service/ 254
19	home monitoring/ 5817
20	home respiratory care/ 121
21	emergency outpatient clinic/ 11
22	(Vward or Vwards or "V ward" or "V wards").ti,ab. 14
23	((virtual* or home* or inhome* or house* or intermediate* or domiciliary* or domestic*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital*)).ti,ab. 25572
24	((homebased* or "home based*" or "in home*" or inhome*) adj2 (inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or infusion* or intravenous* or support*)).ti,ab. 16297
25	(((step* adj down) or (step* adj up)) adj3 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital* or inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or support* or candidate* or select* or criteria* or decision*)).ti,ab. 4938

26 ((intermediate* or domiciliary* or domestic*) adj2 (pathway* or scheme* or service* or setting* or care* or healthcare*)).ti,ab. 8645

27 ((early* or earlier* or support* or assist* or facilitat*) adj2 discharg*).ti,ab. 13673

28 ((patient* or outpatient* or inpatient*) adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*) adj3 (avoid* or alternative* or prevent* or avert* or unnecessar* or block* or discourag*)).ti,ab. 3380

29 ((discharg* or postdisharg* or postpneumon* or posthospital* or admission* or postadmission* or readmission* or treatment* or care* or healthcare* or intervention* or admit* or readmit*) adj3 (followup* or follow up* or transition* or disposition* or transfer*) adj3 (house* or home*)).ti,ab. 2291

30 ((low* or intermediate*) adj1 risk* adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*)).ti,ab.2211

31 (hospital* adj3 home*).ti,ab. 19667

32 ((home* or house*) adj1 (call* or visit* or monitor* or care* or healthcare* or inpatient*)).ti,ab. 55724

33 ((home* or "home health*") adj nursing*).ti,ab. 1842

34 (nursing* adj1 (call* or visit*)).ti,ab. 1035

35 (outpatient* adj3 (visit* or monitor* or nurse* or nursing* or candidate* or select* or criteria* or triage* or triaging*)).ti,ab. 32038

36 SDEC.ti,ab. 121

37 (("same day*" or home* or house*) adj3 ("acute care*" or "emergenc* care*" or "crisis care*" or "urgent care*")).ti,ab. 780

38 ((ambulatory* or community* or outpatient*) adj2 (acute* or emergenc* or crisis* or urgent*) adj2 (pathway* or scheme* or service* or setting* or approach* or management* or care* or healthcare* or intervention* or treatment* or therap* or nursing* or response* or rapid*)).ti,ab. 2931

39 (rapid* adj2 (response* or diagnos* or decision*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or approach* or management* or framework* or model* or care* or healthcare* or intervention* or treatment* or therap* or team*)).ti,ab. 5864

40 or/12-39 205508

41 3 and 40 4113

42 11 or 41 4633

43 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/ 1722286
44 exp "organisation for economic co-operation and development"/ 2787
45 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/ 3810586
46 european union/ 31573
47 developed country/ 35817
48 or/44-47 3844472
49 43 not 48 1567619
50 42 not 49 4197
51 limit 50 to english language 3944
52 (letter or editorial).pt. 2087651
53 51 not 52 3883
54 Case report/ 2945650
55 53 not 54 3423
56 nonhuman/ not human/ 5341721
57 55 not 56 3412
58 (conference abstract* or conference review or conference paper or conference proceeding).db,pt,su. 5766700
59 57 not 58 2149
Note: in the re-run Line 60 was added to: limit 59 to dc=20231201-20241021.

Database name: Emcare

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/ 44321
2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab. 45741
3 1 or 2 69016
4 hospitalization/ 90072
5 emergency health service/ 35439

6	hospital emergency service/ 224
7	patient triage/ 694
8	or/4-7 124476
9	(outpatient* adj2 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or discharg* or postsdischarg* or home* or house* or ambulatory* or community*)).ti,ab. 30930
10	8 and 9 2484
11	3 and 10 112
12	*home care/ 10454
13	home intravenous therapy/ 30
14	hospital to home transition/ 30
15	transitional care/ 1363
16	*outpatient department/ 6029
17	home visit/ 1851
18	visiting nursing service/ 151
19	home monitoring/ 1456
20	home respiratory care/ 26
21	emergency outpatient clinic/ 2
22	(Vward or Vwards or "V ward" or "V wards").ti,ab. 4
23	((virtual* or home* or inhome* or house* or intermediate* or domiciliary* or domestic*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital*)).ti,ab. 9634
24	((homebased* or "home based*" or "in home*" or inhome*) adj2 (inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or infusion* or intravenous* or support*)).ti,ab. 8863
25	(((step* adj down) or (step* adj up)) adj3 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital* or inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or support* or candidate* or select* or criteria* or decision*)).ti,ab. 1178
26	((intermediate* or domiciliary* or domestic*) adj2 (pathway* or scheme* or service* or setting* or care* or healthcare*)).ti,ab. 2820
27	((early* or earlier* or support* or assist* or facilitat*) adj2 discharg*).ti,ab. 4046
28	((patient* or outpatient* or inpatient*) adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*) adj3 (avoid* or alternative* or prevent* or avert* or unnecessar* or block* or discourag*)).ti,ab. 1018
29	((discharg* or postdisharg* or postpneumon* or posthospital* or admission* or postadmission* or readmission* or treatment* or care* or healthcare* or intervention* or admit* or readmit*) adj3 (followup* or follow up* or transition* or disposition* or transfer*) adj3 (house* or home*)).ti,ab. 868
30	((low* or intermediate*) adj1 risk* adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*)).ti,ab. 650
31	(hospital* adj3 home*).ti,ab. 8081

32 ((home* or house*) adj1 (call* or visit* or monitor* or care* or healthcare* or inpatient*)).ti,ab. 29586

33 ((home* or "home health*") adj nursing*).ti,ab. 810

34 (nursing* adj1 (call* or visit*)).ti,ab. 507

35 (outpatient* adj3 (visit* or monitor* or nurse* or nursing* or candidate* or select* or criteria* or triage* or triaging*)).ti,ab. 8554

36 SDEC.ti,ab. 28

37 (("same day*" or home* or house*) adj3 ("acute care*" or "emergenc care*" or "crisis care*" or "urgent care*")).ti,ab. 325

38 ((ambulatory* or community* or outpatient*) adj2 (acute* or emergenc* or crisis* or urgent*) adj2 (pathway* or scheme* or service* or setting* or approach* or management* or care* or healthcare* or intervention* or treatment* or therap* or nursing* or response* or rapid*)).ti,ab. 1197

39 (rapid* adj2 (response* or diagnos* or decision*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or approach* or management* or framework* or model* or care* or healthcare* or intervention* or treatment* or therap* or team*)).ti,ab. 1891

40 or/12-39 76303

41 3 and 40 952

42 11 or 41 1032

43 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/ 343991

44 exp "organisation for economic co-operation and development"/ 566

45 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/		829374
46	european union/	7356
47	developed country/	6417
48	or/44-47	837119
49	43 not 48	309175
50	42 not 49	949
51	limit 50 to english language	902
52	(letter or editorial).pt.	746308
53	51 not 52	890
54	Case report/	391662
55	53 not 54	848
56	nonhuman/ not human/	365207
57	55 not 56	847
58	conference*.pt,su,so.	179296
59	57 not 58	836
Note: no date limit applied to the re-run and all results downloaded.		

Database name: Health Management Information Consortium (HMIC)

Searches		
1	(pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab,hw.	622
2	outpatient*.ti,ab,hw.	3430
3	(Vward or Vwards or "V ward" or "V wards").ti,ab,hw.	3
4	((virtual* or home* or inhome* or house* or intermediate* or domiciliary* or domestic*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital*)).ti,ab.	1445
5	((virtual* or home* or inhome* or house* or intermediate* or domiciliary* or domestic*) and (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital*)).hw.	1202
6	((homebased* or "home based*" or "in home*" or inhome*) adj2 (inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or infusion* or intravenous* or support*)).ti,ab.	470
7	((homebased* or "home based*" or "in home*" or inhome*) and (inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or infusion* or intravenous* or support*)).hw.	0
8	((step* adj down) or (step* adj up)).ti,ab.	178
9	((step* and down) or (step* and up)).hw.	0
10	((intermediate* or domiciliary* or domestic*) adj2 (pathway* or scheme* or service* or setting* or care* or healthcare*)).ti,ab.	1306
11	((intermediate* or domiciliary* or domestic*) and (pathway* or scheme* or service* or setting* or care* or healthcare*)).hw.	969
12	((early* or earlier* or support* or assist* or facilitat*) adj2 discharg*).ti,ab.	448

13 discharg*.hw. 2427

14 ((patient* or outpatient* or inpatient*) adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*) adj3 (avoid* or alternative* or prevent* or avert* or unnecessar* or block* or discourag*)).ti,ab. 80

15 ((admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*) and (avoid* or alternative* or prevent* or avert* or unnecessar* or block* or discourag*)).hw. 432

16 ((discharg* or postdisharg* or postpneumon* or posthospital* or admission* or postadmission* or readmission* or treatment* or care* or healthcare* or intervention* or admit* or readmit*) adj3 (followup* or follow up* or transition* or disposition* or transfer*) adj3 (house* or home*)).ti,ab. 51

17 ((followup* or follow up* or transition* or disposition* or transfer*) and (house* or home*)).hw. 37

18 ((low* or intermediate*) adj1 risk* adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*)).ti,ab.23

19 ((low* or intermediate*) and risk* and (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*)).hw. 0

20 (hospital* adj3 home*).ti,ab. 1372

21 (hospital* and home*).hw. 789

22 ((home* or house*) adj1 (call* or visit* or monitor* or care* or healthcare* or inpatient*)).ti,ab. 4605

23 ((home* or house*) and (call* or visit* or monitor* or care* or healthcare* or inpatient*)).hw. 7988

24 ((home* or "home health*") adj nursing*).ti,ab. 114

25 ((home* or "home health*") and nursing*).hw. 2218

26 (nursing* adj1 (call* or visit*)).ti,ab. 40

27 (nursing* and (call* or visit*)).hw. 608

28 SDEC.ti,ab,hw. 5

29 (("same day*" or home* or house*) adj3 ("acute care*" or "emergenc* care*" or "crisis care*" or "urgent care*")).ti,ab. 42

30 ("acute care" or "emergency care" or "emergencies care" or "crisis care" or "urgent care").hw. 832

31 ((ambulatory* or community* or outpatient*) adj2 (acute* or emergenc* or crisis* or urgent*) adj2 (pathway* or scheme* or service* or setting* or approach* or management* or care* or healthcare* or intervention* or treatment* or therap* or nursing* or response* or rapid*)).ti,ab. 216

32 ambulatory*.hw.326

33 (community* and (acute* or emergenc* or crisis* or urgent*)).hw. 468

34 (rapid* adj2 (response* or diagnos* or decision*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or approach* or management* or framework* or model* or care* or healthcare* or intervention* or treatment* or therap* or team*)).ti,ab. 88

35 (rapid* and (response* or diagnos* or decision*)).hw. 51

36 or/2-35 21364

37 1 and 36 57

Note: no date limit applied to the re-run and all results downloaded.

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/ 125314
2 (pneumonia or pneumonias or bronchopneumon* or pleuropneumon*).ti,ab. 159867
3 or/1-2 229873
4 exp hospitalization/ 296221
5 Emergency Medical Services/ 49178
6 Emergency Service, Hospital/ 88651
7 triage/ 15165
8 or/4-7 415974
9 (outpatient* adj2 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or discharg* or postsdischarg* or home* or house* or ambulatory* or community*)).ti,ab. 58607
10 8 and 9 8016
11 3 and 10 318
12 home care services, hospital-based/ 1979
13 home health nursing/ 378
14 Home Infusion Therapy/ 711
15 Home Nursing/ 8668
16 home care services/ 36569
17 Hospital to Home Transition/ 60
18 transitional care/ 1298
19 Intermediate Care Facilities/ 718
20 ambulatory care facilities/ 22562
21 House calls/ 4200
22 Outpatient Clinics, Hospital/ 15849
23 (Vward or Vwards or "V ward" or "V wards").ti,ab. 11
24 ((virtual* or home* or inhome* or house* or intermediate* or domiciliary* or domestic*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital*)).ti,ab. 17006
25 ((homebased* or "home based*" or "in home*" or inhome*) adj2 (inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or infusion* or intravenous* or support*)).ti,ab. 12640
26 (((step* adj down) or (step* adj up)) adj3 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or hospital* or inpatient* or outpatient* or patient* or pathway* or scheme* or service* or setting* or team* or approach* or management* or institution* or organisation* or organization* or framework* or model* or acute* or emergenc* or urgent* or crisis* or care* or healthcare* or intervention* or treatment* or therap* or support* or candidate* or select* or criteria* or decision*)).ti,ab. 2648

27 ((intermediate* or domiciliary* or domestic*) adj2 (pathway* or scheme* or service* or setting* or care* or healthcare*)).ti,ab. 6530

28 ((early* or earlier* or support* or assist* or facilitat*) adj2 discharg*).ti,ab. 8172

29 ((patient* or outpatient* or inpatient*) adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*) adj3 (avoid* or alternative* or prevent* or avert* or unnecessar* or block* or discourag*)).ti,ab. 1814

30 ((discharg* or postdisharg* or postpneumon* or posthospital* or admission* or postadmission* or readmission* or treatment* or care* or healthcare* or intervention* or admit* or readmit*) adj3 (followup* or follow up* or transition* or disposition* or transfer*) adj3 (house* or home*)).ti,ab. 1268

31 ((low* or intermediate*) adj1 risk* adj3 (admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer*)).ti,ab. 1310

32 (hospital* adj3 home*).ti,ab. 13577

33 ((home* or house*) adj1 (call* or visit* or monitor* or care* or healthcare* or inpatient*)).ti,ab. 43915

34 ((home* or "home health*") adj nursing*).ti,ab. 1630

35 (nursing* adj1 (call* or visit*)).ti,ab. 797

36 (outpatient* adj3 (visit* or monitor* or nurse* or nursing* or candidate* or select* or criteria* or triage* or triaging*)).ti,ab. 17987

37 SDEC.ti,ab. 79

38 (("same day*" or home* or house*) adj3 ("acute care*" or "emergenc* care*" or "crisis care*" or "urgent care*")).ti,ab. 500

39 ((ambulatory* or community* or outpatient*) adj2 (acute* or emergenc* or crisis* or urgent*) adj2 (pathway* or scheme* or service* or setting* or approach* or management* or care* or healthcare* or intervention* or treatment* or therap* or nursing* or response* or rapid*)).ti,ab. 1896

40 (rapid* adj2 (response* or diagnos* or decision*) adj2 (ward or wards or unit or units or hub or hubs or facility* or facilities* or clinic or clinics or admission* or readmission* or hospitali* or admit* or readmit* or transition* or disposition* or transfer* or pathway* or scheme* or service* or setting* or approach* or management* or framework* or model* or care* or healthcare* or intervention* or treatment* or therap* or team*)).ti,ab. 3773

41 or/12-40 178393

42 3 and 41 2445

43 11 or 42 2668

44 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/ 1315725
45 "organisation for economic co-operation and development"/ 579
46 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/ 3519084
47 european union/ 17834
48 developed countries/ 21447
49 or/45-48 3535216
50 44 not 49 1225571
51 43 not 50 2304
52 limit 51 to english language 2060
53 limit 52 to (letter or historical article or comment or editorial or news or case reports) 215
54 52 not 53 1845
55 Animals/ not (Animals/ and Humans/) 5142169
56 54 not 55 1834
Note: in the re-run the following lines were used:
56 54 not 55
57 limit 56 to ed=20231201-20241021
58 limit 56 to dt=20231201-20241021
59 57 or 58

Additional search techniques

Forward citation searching and reference list checking

Date of search	12/12/2023
How the searches were managed	Forwards citation searching and reference checking were done separately as two separate operations using the same base set and decision-making criteria and so they are reported in a single table here.
How the seed references were identified	Montalto was identified during the December 2022 scoping searches. The other three papers were from reviewing "Table 2: Summary of studies included in the review" of "Review 12 - Alternatives to hospital care Emergency and acute medical care in over 16s: service delivery and organisation" that was done for "Emergency

	and acute medical care in over 16s: service delivery and organisation NICE guideline NG94. The table was checked for any papers referring to pneumonia.
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 (2015-present)
Date of last update	04/12/2023
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	Reviewed on screen in WOS for potential relevance after excluding methods guides, background info and epidemiology. Only included pneumonia i.e. excluded COVID-19 and other conditions listed in the protocol as out of scope. Only included OECD countries.
List of seed references used	Caplan GA et al. (1999) Hospital in the home: a randomised controlled trial. Medical Journal of Australia, 170(4), 156-60. UI: 10078179 Caplan GA et al. (2005) Effect of hospital in the home treatment on physical and cognitive function: a randomized controlled trial. Journals of Gerontology Series A-Biological Sciences & Medical Sciences, 60(8), 1035-8. UI: 16127109 Richards DA et al. (2005) Home management of mild to moderately severe community-acquired pneumonia: a randomised controlled trial. Medical Journal of Australia, 183(5), 235-8. UI: 16138795
No. of forward citation searching results	61
No. of reference list checking results	9

Forward citation searching update

Date of search	21/10/24
How the seed references were identified	In line with recommendation 4 of the TARCiS statement (doi:10.1136/bmj-2023-

	078384), that citation searching should be based on seed references meeting the inclusion criteria of the review after full-text screening of the primary search results, the included studies were identified from the draft evidence reviews presented to the committee at the same time as the database searches were re-run. There were 5 included studies in the draft.
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 2024-10-18
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	Reviewed on screen in WOS for potential relevance after excluding methods guides, background info and epidemiology. Only included pneumonia i.e. excluded COVID-19 and other conditions listed in the protocol as out of scope. Only included OECD countries.
List of seed references used	Atlas SJ et al. (1998) Safely increasing the proportion of patients with community-acquired pneumonia treated as outpatients: an interventional trial. Archives of Internal Medicine, 158(12), 1350-6. Carratala J et al. (2005) Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. Annals of Internal Medicine, 142(3), 165-72. Collins AM et al. (2014) Feasibility study for early supported discharge in adults with respiratory infection in the UK. BMC Pulmonary Medicine, 14, 25. Llorens P et al. (2011) Evaluation of a multidisciplinary alternative hospitalization model in comparison with conventional hospitalization for patients with community-

	acquired pneumonia. Emergencias, 23(3), 167-174. Richards DA et al. (2005) Home management of mild to moderately severe community-acquired pneumonia: a randomised controlled trial. The Medical Journal of Australia, 183(5), 235-8.
No. of forward citation searching results	221

Reference list checking update

Date of search	18/10/24
How the seed references were identified	In line with recommendation 4 of the TARCiS statement (doi:10.1136/bmj-2023-078384), that citation searching should be based on seed references meeting the inclusion criteria of the review after full-text screening of the primary search results, the included studies were identified from the draft evidence reviews presented to the committee at the same time as the database searches were re-run. There were 5 included studies and Nagy et al. was not included as its references had been checked during the main search in January 2024.
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 2024-10-18
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. There were 5 included studies in the draft but it was not necessary to include Richards et al. in this update as it had been used for reference list checking in the main search.
How the results were selected	Reviewed on screen in WOS for potential relevance after excluding methods guides, background info and epidemiology. Only included pneumonia i.e. excluded COVID-19 and other conditions listed in the protocol as out of scope. Only included OECD countries.

List of seed references used	Atlas SJ et al. (1998) Safely increasing the proportion of patients with community-acquired pneumonia treated as outpatients: an interventional trial. Archives of Internal Medicine, 158(12), 1350-6. Carratala J et al. (2005) Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients. Annals of Internal Medicine, 142(3), 165-72. Collins AM et al. (2014) Feasibility study for early supported discharge in adults with respiratory infection in the UK. BMC Pulmonary Medicine, 14, 25. Llorens P et al. (2011) Evaluation of a multidisciplinary alternative hospitalization model in comparison with conventional hospitalization for patients with community-acquired pneumonia. Emergencias, 23(3), 167-174.
No. of reference list checking results	66

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 October 11, 2024	157

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

Searches
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
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

Searches
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
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

Searches
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
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

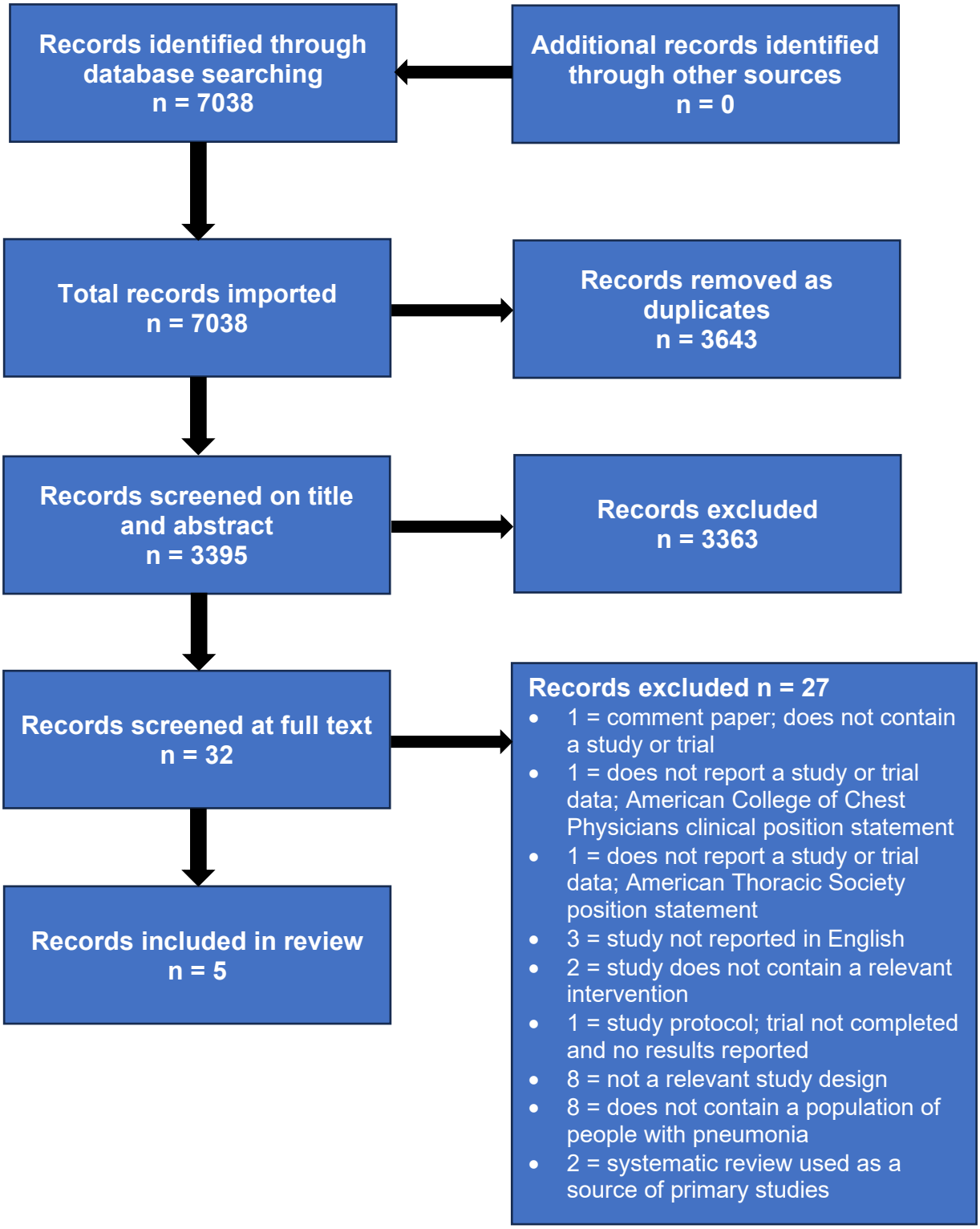
Searches
27 "organisation for economic co-operation and development"/ 565
28 australasia/ or exp australia/ or austria/ or baltic states/ or belgium/ or exp canada/ or chile/ or colombia/ or costa rica/ or czech republic/ or exp denmark/ or estonia/ or europe/ or finland/ or exp france/ or exp germany/ 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
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

Searches
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

Atlas, 1998

Bibliographic Reference	Atlas, S J; Benzer, T I; Borowsky, L H; Chang, Y; Burnham, D C; Metlay, J P; Halm, E A; Singer, D E; Safely increasing the proportion of patients with community-acquired pneumonia treated as outpatients: an interventional trial.; Archives of internal medicine; 1998; vol. 158 (no. 12); 1350-6

Study details

Secondary publication of another included study- see primary study for details	N/A
Other publications associated with this study included in review	N/A
Trial registration number and/or trial name	Not reported
Study location	Massachusetts General Hospital, Boston
Study setting	Boston, USA
Study dates	Intervention phase: 1st April 1996 to 28th Feb 1997
Sources of funding	The research was financially supported by Abbott Laboratories Inc, Abbott Park, Ill.
Inclusion criteria	People age 18 to 84 years; pulmonary infiltrate on chest radiograph not known to be old; and symptoms consistent with pneumonia (cough, dyspnea, change in sputum, pleuritic chest pain, myalgias, or fatigue). Patients with a PSI score of 90 or lower were eligible.
Exclusion criteria	Patients known to be positive for HIV; chronically immunosuppressed; hospitalised within the past 10 days; residing in a nursing home; recently using illicit injection drugs; diagnosed as having a severe muscular disorder; pregnant; homeless, without a telephone, or had other social or psychiatric problems that compromise medication adherence or follow-up; unable to take oral medication and nourishment; receiving long term oxygen therapy; or had an oxygen saturation lower than 90% on room air.
Intervention(s)	The intervention consisted of the following: a study nurse was present in the ED and identified eligible low-risk patients with CAP. The patient's PSI score was calculated by either the evaluating physician or study staff. Corresponding mortality risk information was presented on the PSI scoring sheet and provided to the physician. In general, the site of care decision was made by the evaluating physician in consultation with the patient's primary care

	physician, if available. The intervention supported outpatient management by providing enhanced visiting nurse services, an antibiotic (clarithromycin), and access to a primary care physician. The outpatient care consisted of 2 visits, the first within 24 hours of the ED visit, and the second between 24 and 48 hours. The nurse visit included assessment of vital signs and symptoms, review of medications, and measurement of oxygen saturation by pulse oximetry. If the patient was stable or improving, a standardised form was faxed to the study centre and the physician's office. If the visiting nurse thought the patient's condition was worsening, direct contact was made with the physician. The intervention was provided as an aid to clinician decision making, but all aspects of patient management remained under the control of the patient's physician.
Comparator	**Retrospective cohort controls:** Comparable low-risk patients with CAP presenting to the ED in the 12 months immediately preceding the prospective intervention period served as the primary control group. They met the same eligibility criteria as patients in the intervention cohort. They received standard hospital care. **Pneumonia Patient Outcomes Research Team (PORT) cohort controls:** The medical records of the retrospective cohort controls could not provide adequate information on patient-reported symptoms, functional status, and satisfaction with care, so a second control group was assembled from the Pneumonia PORT study database using the same eligibility criteria as the current study (of 618 patients enrolled in the Pneumonia PORT study. 208 (34%) met inclusion criteria for the current study so served as control patients). They received standard hospital care.
Outcome measures	Subsequent hospital admission Overall mortality within 30 days Satisfaction with overall care Length of stay Self-rated symptom severity Proportion treated as outpatients
Number of participants	During the study intervention period, 826 consecutive ED patients met screening criteria for pneumonia. Of these, 576 (70%%) were excluded, mainly due to hypoxia (n=220), age older than 84 years (n=123), inability to take oral medications (n=119) and hospitalisation within the preceding 10 days (n=98). Of the

	remaining 250 patients, 166 (66%) had PSI scores of 90 or lower, making them eligible for the intervention. During the retrospective cohort period, 11,684 patients with pneumonia were identified, of whom 1171 had chest radiograph findings consistent with pneumonia. 147 of these patients met the same eligibility criteria as patients in the intervention cohort. For the Pneumonia PORT study cohort, of 618 patients enrolled, 208 (34%) met eligibility criteria for this study. Total number of participants = 521
Duration of follow-up	Review of medical records was used to identify primary outcomes within 4 weeks of presentation. Patients were also surveyed in person or by telephone at 1-, 2-. and 4-weeks follow up.
Loss to follow-up	134 (81%) of the 166 patients in the intervention group consented to the follow-up survey. Patients who completed the follow-up were similar to those who did not on baseline characteristics, PSI scores and comorbid conditions.
Methods of analysis	Sample size calculations and power analyses conducted; confirmed approximately 150 patients per group were required. Baseline characteristics and outcomes were compared among groups using Fisher exact test for dichotomous outcomes and *t* tests for continuous variables. For the proportion of patients hospitalised and for 4-week mortality rate, 95%CIs were calculated. Comparisons of patient-reported symptoms and functional status at 4 weeks were analysed using logistic regression models that controlled for baseline score, study group, and initial treatment location.
Additional comments	The authors noted that the hospital used for the Pneumonia PORT comparison cohort has shown shorter lengths of hospital stay for patients with pneumonia when compared to similar hospitals in other geographic areas, suggesting a more parsimonious use of the hospital for CAP patients at this study site. This may have made further reductions in hospitalisation difficult. The timing of the cohorts (intervention vs comparison) may have had an impact, with the reduction in hospitalisations seen in the more recent (intervention) period simply reflecting a generally more restrictive use of hospital admission over time (although general admission rates of all patients presenting to the ED (not just pneumonia) during the study period was 22%, compared to 23% in the 12 months immediately preceding, suggesting that overall admission rates did not change).

Study arms

Enhanced outpatient services (N = 166)

Usual care (N = 147)

Characteristics

Arm-level characteristics

Characteristic	Enhanced outpatient services (N = 166)	Usual care (N = 147)
% Female Sample size	n = 83 ; % = 50	n = 76; % = 52
Mean age (SD) Mean (SD)	53 (NR)	52 (NR)
Mean age (SD) Median (IQR)	55 (NR to NR)	53 (NR to NR)
Smoking status No of events	n = 43 ; % = 26	n = 53 ; % = 36
COPD No of events	n = 18 ; % = 11	n = 22 ; % = 15
Asthma No of events	n = 20 ; % = 12	n = 13 ; % = 9
Coronary artery disease No of events	n = 22 ; % = 13	n = 19 ; % = 13
Diabetes mellitus No of events	n = 8 ; % = 5	n = 15 ; % = 10
Alcohol dependence No of events	n = 7 ; % = 4	n = 4 ; % = 3
PSI score Mean (SD)	55 (NR)	53 (NR)
PSI score Median (IQR)	58 (NR to NR)	56 (NR to NR)
Class I, <=50 No of events	n = 75 ; % = 45	n = 66 ; % = 45
Class II, 51-70 No of events	n = 40 ; % = 24	n = 47 ; % = 32

Characteristic	Enhanced outpatient services (N = 166)	Usual care (N = 147)
Class III, 71-90 No of events	n = 51 ; % = 31	n = 34 ; % = 23

Critical appraisal - ROBINS-I: a tool for non-randomised studies of interventions

Section	Question	Answer
Overall bias	Risk of bias judgement	Serious *(The ED physician made the ultimate decision on whether to admit the patient or discharge them to outpatient management, so there may be many other confounding factors that influenced the intervention the patient was assigned to and their outcome. These confounding variables were not identified or measured, so could not be controlled for in the analyses. 19% missing data, although missingness the same across conditions. Not clear whether people collecting outcome data were blinded to condition, but likely that information in their medical record about site of care identified which condition participants had been in.)*
Overall bias	Directness	Partially Applicable *(Study based in US; differences in healthcare systems between US and NHS settings reduces applicability.*

Carratala, 2005

Bibliographic Reference	Carratala, Jordi; Fernandez-Sabe, Nuria; Ortega, Lucia; Castellsague, Xavier; Roson, Beatriz; Dorca, Jordi; Fernandez-Aguera, Ana; Verdaguer, Ricard; Martinez, Joaquin; Manresa, Frederic; Gudiol, Francesc; Outpatient care compared with hospitalization for community-acquired pneumonia: a randomized trial in low-risk patients.; Annals of internal medicine; 2005; vol. 142 (no. 3); 165-72

Study details

Secondary publication of another included study- see primary study for details	N/A
Other publications associated with this study included in review	N/A
Trial registration number and/or trial name	Trial ISRCTN41238928
Study type	Randomised controlled trial (RCT)

Study location	Barcelona, Spain
Study setting	2 tertiary care hospitals
Study dates	1st October 2000 to 31st October 2002
Sources of funding	Research grants from the Spanish National Health Service (FIS00/0438) and from Aventis, Madrid, Spain. Dr Fernandez-Sabe is the recipient of a fellowship grant from the University of Barcelona, Spain.
Inclusion criteria	Immunocompetent patients, at least 18 years old, who had received a diagnosis of community-acquired pneumonia in the emergency department. CAP was defined as the presence of a new infiltrate on chest radiography plus at least 1 of the following: fever or hypothermia, new cough with or without sputum production, pleuritic chest pain, dyspnea, or altered breath sounds on auscultation. Patients with CAP were stratified into risk classes using PSI scores; only patients in risk classes II and III (PSI scores </= 90) were eligible.
Exclusion criteria	Patients with neutropenia, HIV infection, transplantation, or splenectomy, or who were taking immunosuppressive drugs were not eligible. Patients in PSI risk classes I, IV or V were excluded. Patients were also excluded if they met 1 or more of the following criteria: pregnancy or breastfeeding, allergy to quinolones, receipt of quinolones in the preceding 3 months, respiratory failure , concomitant unstable comorbid conditions necessitating hospitalisation for treatment, complicated pleural effusion, shock, lung abscess, metastatic infection, severe social problems precluding adequate outpatient treatment, cognitive or psychiatric impairment, or inability to maintain oral intake.
Intervention(s)	Patients assigned to outpatient care were given oral levofloxacin (500mg/d). They were visited at home by a nurse 48 hours after discharge from the ED, who assessed vital signs and measured oxygen saturation by pulse oximetry. If the nurse thought a patient's condition was not improving or there was a worsening of vital signs / oxygen saturation, one of the investigators made an additional visit. All patients (intervention and control) received detailed information about their pneumonia diagnosis and their treatment plan, as well as emergency contact phone numbers for a nurse or investigator physician.
Comparator	Hospitalised patients received sequential intravenous and oral levofloxacin (500mg/d). They were seen daily during their hospital stay by attending physicians and by at least 1 of the investigators. Criteria for switching from IV to oral levofloxacin were respiratory rate of 24 breaths/min or less, pulse rate of 100 bpm or less, temperature of 37.8*C or less on 2 occasions at least 8 hours apart, and maintenance of adequate oral intake. Physicians were advised to discharge patients after their clinical condition stabilised, in accordance with recommended criteria.

	All patients (intervention and control) received detailed information about their pneumonia diagnosis and their treatment plan, as well as emergency contact phone numbers for a nurse or investigator physician.
Outcome measures	Length of antibiotic therapy Overall successful outcome (as defined in paper: Meeting all of 7 predefined criteria: cure of pneumonia, absence of adverse drug reactions, absence of medical complications during treatment, no need for additional visits, no changes in initial treatment with levofloxacin, absence of subsequent hospital admissions in 30 days after randomisation, and absence of death from any cause in 30 days after randomisation.) Subsequent hospital admission Cure of pneumonia Overall mortality within 30 days Health related quality of life (SF-36) Satisfaction with overall care Adverse drug reactions Medical complications
Number of participants	N = 224 Outpatient group n = 110 Hospitalised group n = 114
Duration of follow-up	Follow-up assessments were conducted 7- and 30-days after diagnosis of pneumonia in the ED
Loss to follow-up	224 patients were randomised, but 21 patients were excluded after enrolment (17 did not have pneumonia and 4 were immunocompromised) so 203 patients completed the trial
Methods of analysis	Power analysis calculations resulted in a target sample size for randomisation of approximately 110 patients per treatment group. For assessing differences in the frequency of outcomes by treatment group, Fisher exact test was used. Percentage differences and mean differences between the two groups, with corresponding 95% CIs, were also computed. To rule out the effect of residual confounding, multivariate analyses were performed using unconditional logistic regression to estimate odds ratios and 95%CIs. Covariates included hospital site, sex, age (19-67 yrs or

	68-92 yrs), presence of comorbid conditions, and PSI score in tertiles (34-61, 62-74, or 75-90). Data were analysed on an intention-to-treat and per-protocol basis. Since both analyses produced virtually the same results, only the ITT analysis is presented.
Additional comments	Patients in PSI risk class I, who were younger than 50 years, and did not have comorbid conditions, poor vital signs, or altered mental status, were not included because outpatient care is generally considered acceptable for this group. However, this means the study conclusions only apply to a subset of patients in PSI risk class II or III who have good oxygenation and no unstable comorbid conditions, complicated pleural effusions, or severe social problems.

Study arms

Outpatient care (N = 110)

Hospitalisation (N = 114)

Characteristics

Arm-level characteristics

Characteristic	Outpatient care (N = 110)	Hospitalisation (N = 114)
% Female Sample size	n = 41 ; % = 37.3	n = 48 ; % = 42.1
Mean age (SD) Mean (SD)	67.5 (11.8)	64.9 (13.4)
Smoking status No of events	n = 21 ; % = 19.8	n = 24 ; % = 21.8
Comorbidities No of events	n = 71 ; % = 64.5	n = 78 ; % = 68.4
19-49 years Sample size	n = 6 ; % = 5.5	n = 9 ; % = 7.9
50-69 years Sample size	n = 54 ; % = 49.1	n = 55 ; % = 48.2
70-92 years Sample size	n = 50 ; % = 45.5	n = 50 ; % = 43.9

Characteristic	Outpatient care (N = 110)	Hospitalisation (N = 114)
Mean oxygen saturation with room air (%) Mean (SD)	94.5 (2)	94.5 (1.8)
II Sample size	n = 55 ; % = 50	n = 63 ; % = 55.3
III Sample size	n = 55 ; % = 50	n = 51 ; % = 44.7
Mean PSI score Mean (SD)	70 (11.6)	66.9 (12.5)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Moderate *(Participants and people delivering the interventions were not blinded, but this was not possible due to the trial design. No information provided on intervention adherence, which may be important for patients adhering to medicines in the outpatient group. Outcome assessors were not blinded to treatment condition, but they did use a standard protocol with a checklist of items. Trial was retrospectively registered.)*
Overall bias and Directness	Overall Directness	Directly applicable *(Although the paper describes them as low-risk patients, their PSI scores (II or III) suggest they are actually intermediate risk. Low risk patients were excluded.)*

Collins, 2014

Bibliographic Reference	Collins, Andrea M; Eneje, Odiri J; Hancock, Carole A; Wootton, Daniel G; Gordon, Stephen B; Feasibility study for early supported discharge in adults with respiratory infection in the UK.; BMC pulmonary medicine; 2014; vol. 14; 25

Study details

Secondary publication of another included study- see primary study for details	N/A

Other publications associated with this study included in review	N/A
Trial registration number and/or trial name	ISRCTN25542492 HOME Followed-up with Infection Respiratory Support Team (HOME FIRST)
Study type	Randomised controlled trial (RCT)
Study location	Liverpool, UK
Study setting	Two University Teaching Hospitals; one city-centre, one suburban
Study dates	January to April 2012
Sources of funding	The study was sponsored by Royal Liverpool and Broadgreen Hospital Trust (RLBUHT) and University Hospital Aintree (UHA). This work received financial support from The Bill and Melinda Gates Foundation (Grand Challenge Exploration programme), the National Institute of Health Research (NIHR) and the Biomedical Research Centre (BRC) in Microbial Diseases.
Inclusion criteria	Patients >=18 years old, admitted to hospital for pneumonia (CAP or HAP) or LRTI during the eligible study period. Only patients who would have required “at least one more night of hospitalisation before discharge”; were considered. Early warning score ≤2 AND SBP > 90 AND mild confusion only (Abbreviated mini-mental test score [AMTS] ≥ 7). All observations must be stable for 12-24hrs. If CURB-65 >=3, must have had at least 24 hours of inpatient observation before recruitment. Stable/improving inflammatory markers (WCC/CRP) and U&Es. Patient can manage activities of daily living with current support
Exclusion criteria	Patients who were well enough for home discharge without home care support were excluded. Patients with no fixed abode, or those unable to manage at home even with maximal support (e.g. IV drug users, alcohol excess or mental health problems) were excluded. Features of instability on examination: SBP <90 mmHg, for patients with chronic respiratory illness: saturations <88% on air, for patients without chronic respiratory illness, saturations <92% on air. Features of diagnosis indicating cause for concern: Suspected MI / raised TnI/T consistent with NSTEMI within 5 days of discharge; empyema or complicated parapneumonic effusion, TB suspected, neutropenia, acute exacerbation of COPD, serious comorbidities requiring hospital treatment (e.g. CKD, CCF) or deemed unstable (significant AKD).
Intervention(s)	Patients assigned to the Early Supported Discharge Scheme (ESDS) received specialist respiratory care in their own home to substitute acute hospital care. This care was provided by an experienced hospital respiratory doctor and nurse team who provided up to twice daily direct care and were able to perform blood tests, observations and clinical examinations. Oxygen [O2] (if

	not already receiving domiciliary O2), intravenous (IV) fluids and IV antibiotics were not provided. The patient was followed by the same study doctor until stable for discharge from the ESDS, after this, care was provided by their general practitioner as usual. Fast-access to discharge medications, a disease-specific patient information leaflet and a ready-made food delivery service were provided as required. Subjects in the ESDS arm were transferred home the same day with appropriate medications, an emergency 24 hr contact telephone number, a list of symptoms to prompt healthcare contact (fever > 38° Celsius, increasing drowsiness, worsening cough or sputum and/or increasingly unwell) and an observations machine capable of recording temperature, BP, HR and O2 saturations. If the discharge was before 3 pm the subject was reviewed at home later that evening by the team; if after 3 pm the review was the next morning. The frequency and duration of home visits was determined by communication between the medical team, patient and carer/next of kin. Telephone calls were used instead of home visits where the study team felt this suitable. Each visit lasted between 10-30mins. During home visits the following were recorded - BP, HR, O2 saturations and temperature (on an observations form), clinical symptoms and examination findings, ability to eat/drink and appetite, bowel habit, and current mobility/exercise tolerance. Ability to cope at home and medication concordance were assessed. Any evidence of confusion was thoroughly assessed using the AMTS. Smoking advice was offered and new issues, problems and symptoms were addressed. The case report form provided a guide for recognising patients who needed consideration for readmission, using a simple set of clinical and functional questions. Fast-tracked re-admission was arranged if deemed necessary.
Comparator	Patients received standard hospital care, including both systematic and as required medical review
Outcome measures	Subsequent hospital admission Overall mortality within 30 days Health related quality of life (SF-36) Length of stay Symptom improvement (CAP-SYM) Adverse event - HAI
Number of participants	14
Duration of follow-up	30 days

Loss to follow-up	During the 4-month study period 200 potentially eligible patients were screened. 158 were ineligible, most commonly because of the inability to give informed consent. Reasons for non-recruitment could broadly be categorised into medical reasons (66%), social reasons (19%) and other reasons ['missed' or declined] (15%). Of the 42 eligible patients, 18 declined consent and 14 were randomised to either SHC (n = 6) or ESDS (n = 8). Follow-up data was available for all randomised patients.
Methods of analysis	This was a feasibility study with a primary outcome of patient acceptability to randomisation. For secondary outcomes, no analyses were performed; frequencies were reported only.
Additional comments	Patient recruitment was difficult - 200 screened for a final sample of 14. Main obstacle to eligibility was lack of capacity to give informed consent

Study arms

Early Supported Discharge Scheme (ESDS) (N = 8)

Standard Hospital Care (SHC) (N = 6)

Characteristics

Arm-level characteristics

Characteristic	Early Supported Discharge Scheme (ESDS) (N = 8)	Standard Hospital Care (SHC) (N = 6)
% Female No of events	n = 3 ; % = 37.5	n = 4 ; % = 66.7
Mean age (SD) Range	29 to 82	52 to 90
Mean age (SD) Mean (SD)	61 (NR)	70 (NR)
Ex-smoker No of events	n = 3	n = 3
Current smoker No of events	n = 2	n = 2
Never smoked No of events	n = 3	n = 1
CURB-65 Score Range	0 to 2	1 to 3

Characteristic	Early Supported Discharge Scheme (ESDS) (N = 8)	Standard Hospital Care (SHC) (N = 6)
CURB-65 Score Median (IQR)	1 (NR)	2 (NR)
Live alone No of events	n = 1	n = 3
Live with spouse No of events	n = 5	n = 2
Live with family No of events	n = 2	n = 1

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Partially applicable *(Sample included patients with pneumonia and LRTI)*

Llorens, 2011

Bibliographic Reference	Llorens, P.; Murcia-Zaragoza, J.; Sanchez-Paya, J.; Laghzaoui, F.; Reus, S.; Carratala-Perales, J.M.; Merino, E.; Gomez, R.; Portilla, J.; Evaluation of a multidisciplinary alternative hospitalization model in comparison with conventional hospitalization for patients with community-acquired pneumoni; Emergencias; 2011; vol. 23 (no. 3); 167-174

Study details

Secondary publication of another included study- see primary study for details	N/A
Other publications associated with this study included in review	N/A
Trial registration number and/or trial name	Not reported

Study type	Non-randomised controlled trial Prospective cohort study
Study location	Hospital emergency department
Study setting	Alicante, Spain
Study dates	1st January 2006 to 31st December 2006
Sources of funding	The present work was funded by a grant from the Escuela Valenciana de Estudios de la Salud (EVES), Conselleria de Sanidad de la Comunidad Valenciana.
Inclusion criteria	All patients over 18 years who attended the ED and were diagnosed with CAP according to commonly accepted criteria (new infiltrate on chest X-ray, associated with respiratory symptoms and infectious syndrome in the absence of alternative diagnoses).
Exclusion criteria	Excluded patients who were admitted to the ICU, nephrology, oncology and haematology. Only included patients admitted to pulmonology, infectious diseases or internal medicine.
Intervention(s)	The alternative hospital care model is a multidisciplinary model consisting of admission to the ED-dependent short stay unit (SSU) with early discharge and outpatient monitoring in the day hospital or at home by the home hospitalisation staff. The model is organised to allow continuing care activity where only the physical setting changes but the same therapeutic measures are adopted. An important objective of the AH model is to prevent further functional decline, with nursing staff focusing on holistic care (e.g. early mobilisation programs, nutrition, prevention of pressure ulcers, chest physiotherapy etc). The protocol for SSU admission includes patients with a clinical situation requiring hospitalisation and an expected maximum stay of less than 3 days. The protocol for assignment to home care includes patients with greater functional dependence or greater degree of clinical fragility where prolonged hospitalisation is deemed to risk worsening both the functional status and prognosis. Both criteria were used for patients with CAP who first attended the ED. Patients were admitted to the SSU and, after a stabilisation period, were referred to the home care unit when needing continued intravenous antibiotic therapy under medical supervision, or to the day hospital, in which case direct venous access was established for use on appointments at 48 hours after discharge.
Comparator	Patients admitted to conventional hospitalisation underwent the normal process of hospitalisation and discharge when the attending physician considered it timely, with monitoring in primary care or outpatient visits.
Outcome measures	Overall mortality within 30 days Length of stay
Number of participants	623 patients diagnosed with CAP in the ED were identified, but 73 were excluded because the diagnosis of CAP was subsequently

	ruled out. Of the 550 patients with confirmed final diagnosis of CAP, 425 (77%) required hospitalisation. Of these, 130 were admitted to alternative hospital care (intervention), 252 were admitted to conventional hospitalisation, and 43 were admitted to other destinations that were excluded (ICU, oncology, nephrology etc). Final study sample was N=382
Duration of follow-up	30 days after diagnosis of CAP
Loss to follow-up	Follow-up data we obtained for 380 / 382 patients (99.4%).
Methods of analysis	Mean and SD were used to describe quantitative variables. For comparisons between groups, Student's t-test was used. For the study of association between variables, Chi square test or Fisher's exact test were used when necessary. The homogeneity of patients admitted to the AH model and CH was tested. For the outcome variable 30-day mortality, we performed a nonconditioned multivariate logistic regression analysis that incorporated all the variables that proved statistically significant in the bivariate analysis as well as those that proved significant in the study of homogeneity. For the outcome variable hospital stay we performed a multivariate linear regression analysis incorporating, as before, all the variables that proved statistically significant in the bivariate analysis as well as those that proved significant in the study of homogeneity. Differences with a p value < 0.05 were considered statistically significant. All statistical analyses were performed with the program SPSS v.10.0.
Additional comments	In the present study, patients with CAP admitted to AH were older, had greater functional dependence and a higher percentage of high-risk CAP. There was a higher percentage of patients with pleural effusion, multi-lobar infiltrate and HIV co-infection in the conventional hospitalisation group, which could explain the greater number of complementary tests and diagnostic procedures with a greater number of complications directly related to CAP, and may further explain the more prolonged hospital stay in the CH group. The decision to admit patients to an AH or CH model was not randomised, and was taken by the ED physician responsible; it is likely that the AH model was selected more often for patients with better family/social support which favours the continuity of ambulatory care after early discharge.

Study arms

Alternative hospital care (N = 130)

Conventional hospitalisation (N = 252)

Characteristics

Arm-level characteristics

Characteristic	Alternative hospital care (N = 130)	Conventional hospitalisation (N = 252)
% Female No of events	n = 37 ; % = 28.5	n = 85 ; % = 33.5
Mean age (SD) Mean (SD)	69 (18.7)	62.7 (19.6)
Smoking status Sample size	n = 23 ; % = 17.7	n = 114 ; % = 45.2
PSI >= IV Sample size	n = 80 ; % = 61.5	n = 93 ; % = 36.9
CURB-65 > 2 Sample size	n = 46 ; % = 35.7	n = 57 ; % = 23.3
Functional deficit (Barthel < 80) Sample size	n = 62 ; % = 47.7	n = 60 ; % = 23.8
COPD Sample size	n = 37 ; % = 28.5	n = 73 ; % = 29
Heart failure Sample size	n = 31 ; % = 23.8	n = 63 ; % = 25
Diabetes mellitus Sample size	n = 37 ; % = 28.5	n = 58 ; % = 23
HIV infection Sample size	n = 0 ; % = 0	n = 24 ; % = 9.5
Neoplasia Sample size	n = 13 ; % = 10	n = 22 ; % = 8.7
Kidney disease Sample size	n = 10 ; % = 7.7	n = 30 ; % = 11.9
Alcohol intake Sample size	n = 10 ; % = 7.7	n = 44 ; % = 17.5

Characteristic	Alternative hospital care (N = 130)	Conventional hospitalisation (N = 252)
Injection drug use Sample size	n = 0 ; % = 0	n = 14 ; % = 5.6
Multi-lobar infiltrate Sample size	n = 14 ; % = 10.8	n = 55 ; % = 21.8
Pleural effusion Sample size	n = 12 ; % = 9.2	n = 59 ; % = 23.4
Temperature Mean (SD)	37.8 (0.9)	37.6 (1)
Heart rate (bpm) Mean (SD)	99.3 (19.8)	95.8 (19.1)
Respiratory rate (rpm) Mean (SD)	22 (6.2)	21.8 (16.3)
Oxygen saturation Mean (SD)	91.3 (5)	91.1 (6.4)

Critical appraisal - ROBINS-I: a tool for non-randomised studies of interventions

Section	Question	Answer
Overall bias	Risk of bias judgement	Serious *(Allocation to condition was not random and was decided by the admitting clinician. Confounding factors such as family/support at home, presence of comorbidities, and pneumonia severity may all have influenced the decision over place of care (home or hospital) and could also impact the outcome. The study provides limited information on outcome measurement: unclear how length of hospital stay and 30-day mortality were obtained and verified; appears to be self-reported by patients at follow-up contact. Unclear whether outcome assessors were blinded.)*
Overall bias	Directness	Partially Applicable *(Not specifically 'intermediate risk' pneumonia patients. All pneumonia severity included, although patients admitted to ICU were excluded. Rates of high risk (CURB-65 >2) were 36% in intervention group and 23% in control group.)*

Richards, 2005

Bibliographic Reference	Richards, Dee A; Toop, Les J; Epton, Michael J; McGeoch, Graham R B; Town, G Ian; Wynn-Thomas, Simon M H; Dawson, Robin D; Hlavac, Michael C; Werno, Anja M; Abernethy, Paul D; Home management of mild to moderately severe community-acquired pneumonia: a randomised controlled trial.; The Medical journal of Australia; 2005; vol. 183 (no. 5); 235-8

Study details

Secondary publication of another included study- see primary study for details	N/A
Other publications associated with this study included in review	N/A
Trial registration number and/or trial name	Not reported
Study type	Randomised controlled trial (RCT)
Study location	ED of Christchurch Hospital
Study setting	Christchurch, New Zealand
Study dates	July 2002 to October 2003
Sources of funding	Not reported
Inclusion criteria	All patients attending the study ED with a clinical diagnosis of CAP and a CURB-65 score of 0-2 were eligible.
Exclusion criteria	People living outside the Christchurch metropolitan area; in hospital-level accommodation or of no fixed abode; living alone with no alternative accommodation; serious comorbidity requiring hospital treatment; pneumonia was not the primary cause of hospital admission; pneumonia distal to bronchial obstruction or associated with pleural effusion; and expected death. Patients with TB, bronchiectasis, HIV or were immunocompromised were also excluded, along with patients who had been in hospital within the previous 14 days, had pulse oximetry oxygen saturation <92% on air, or had previously entered the study.
Intervention(s)	The 'Extended Care At Home' Service (ECAH) provides medical and nursing care to patients in their homes, and is provided by a GP Medical Director and experienced primary care nurses in conjunction with the patients' own primary care team. It covers a similar range of activities to hospital at home, providing an IV antibiotic service using standard cannulae, home support services, short-term home nursing care and mobile diagnostic testing. Initially, patients randomised to home care had a daily visit from a GP and at least twice-daily visits by a nurse. Initial chest xrays of community patients were reviewed by a respiratory

	physician, and any requiring follow-up were highlighted. Home care patients were given a 24-hour emergency contact number and a list of symptoms that should prompt contact.
Comparator	The control group received standard hospital treatment
Outcome measures	Length of antibiotic therapy Health related quality of life (SF-36) Satisfaction with overall care Medical complications Length of stay Self-rated symptom severity
Number of participants	49
Duration of follow-up	2- and 6-weeks after initial presentation
Loss to follow-up	55 patients met the inclusion criteria and were randomised. There were 6 exclusions after randomisation: 2 diagnosis not CAP, 2 withdrew consent, 1 had multiple antibiotic allergies, and 1 patient showed confusion and was excluded. All 49 included patients completed outcome assessments and 2-weeks and 6-weeks.
Methods of analysis	With 25 per group, assuming a log-normal distribution, 0.70 coefficient of variation, the study had 90% power to show a 1.5-day difference in time to discharge (α= 0.05) and duration of IV antibiotics, and 80% power (α= 0.05) to show a clinically significant difference in general functioning of 7 or more units in the SF-12 physical or mental component scores. Data were compared between groups using Mann–Whitney U tests, independent t tests (SF-12) and the Fisher exact test (satisfaction).
Additional comments	The study was not powered to show differences in mortality. Very large numbers would be required for such a study, as patients at low risk of mortality were selected.

Study arms

Home care (N = 24)

Standard hospital care (N = 25)

Characteristics

Arm-level characteristics

Characteristic	Home care (N = 24)	Standard hospital care (N = 25)
% Female No of events	n = 11 ; % = 45.8	n = 12 ; % = 48

Characteristic	Home care (N = 24)	Standard hospital care (N = 25)
Mean age (SD) Mean (SD)	50.1 (NR)	49.8 (NR)
Never No of events	n = 10 ; % = 41.7	n = 10 ; % = 40
Current smoker No of events	n = 4 ; % = 16.7	n = 7 ; % = 28
Ex-smoker No of events	n = 10 ; % = 41.7	n = 8 ; % = 32
Smoking history (Number of pack years smoked) Mean (SD)	18.9 (NR)	20.4 (NR)
CURB-65 score = 0 No of events	n = 13 ; % = 54	n = 14 ; % = 56
CURB-65 score = 1 No of events	n = 6 ; % = 25	n = 8 ; % = 32
CURB-65 score = 2 No of events	n = 5 ; % = 21	n = 3 ; % = 12
Specific bacterial diagnosis made No of events	n = 9 ; % = 37.5	n = 13 ; % = 52
Amoxycillin No of events	n = 7 ; % = 29	n = 3 ; % = 12
Amoxycillin/clavulanate No of events	n = 11 ; % = 46	n = 8 ; % = 32
Penicillin and a macrolide No of events	n = 5 ; % = 21	n = 8 ; % = 32
Clarithromycin alone No of events	n = 1 ; % = 4	n = 1 ; % = 4

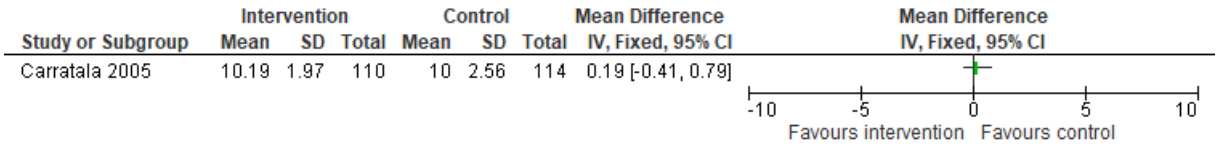
Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Moderate *(Patients provided self-reported ratings of symptom severity and general functioning, which may have been influenced by their knowledge of the intervention received (although this is unlikely). Trial not registered.)*
Overall bias and Directness	Overall Directness	Directly applicable

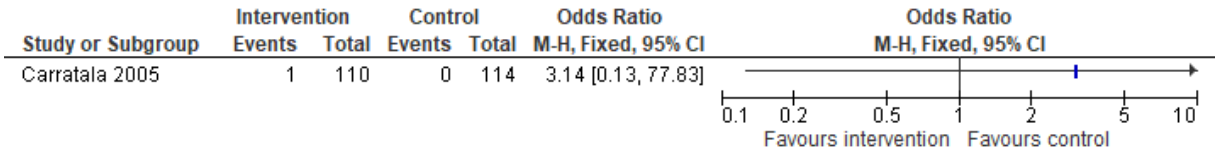
Appendix E – Forest plots

E.1 Outpatient antibiotic treatment versus inpatient hospital care

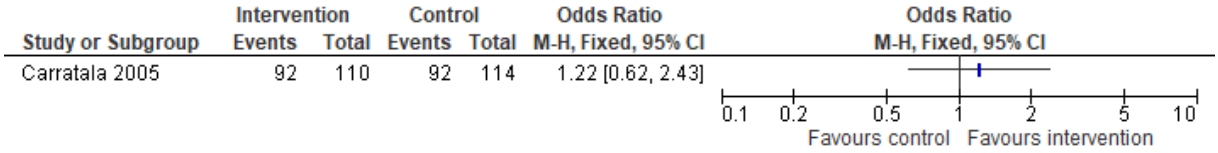
Antibiotic duration (days; lower is better)



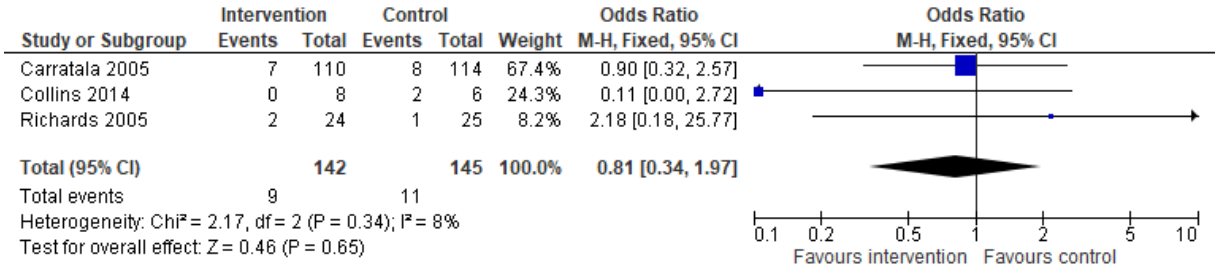
Overall mortality within 30 days (lower is better)



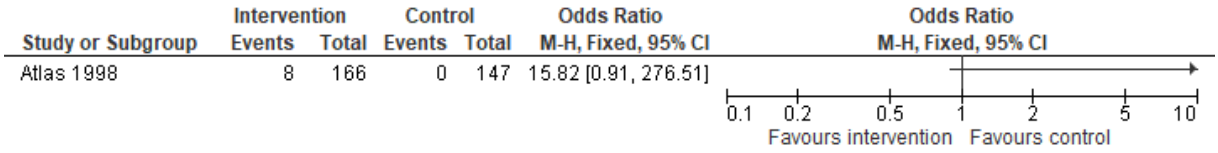
Overall successful outcome (composite measure; higher is better)



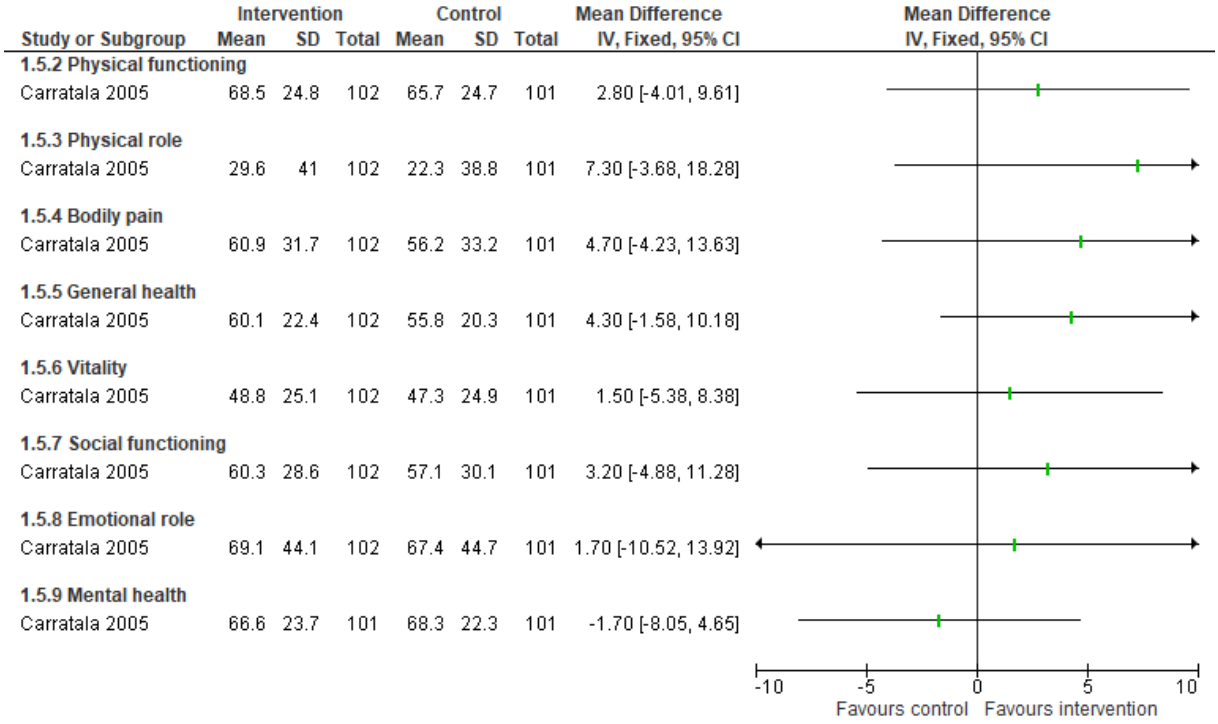
Subsequent hospital admission within 30 days; RCTs (lower is better)



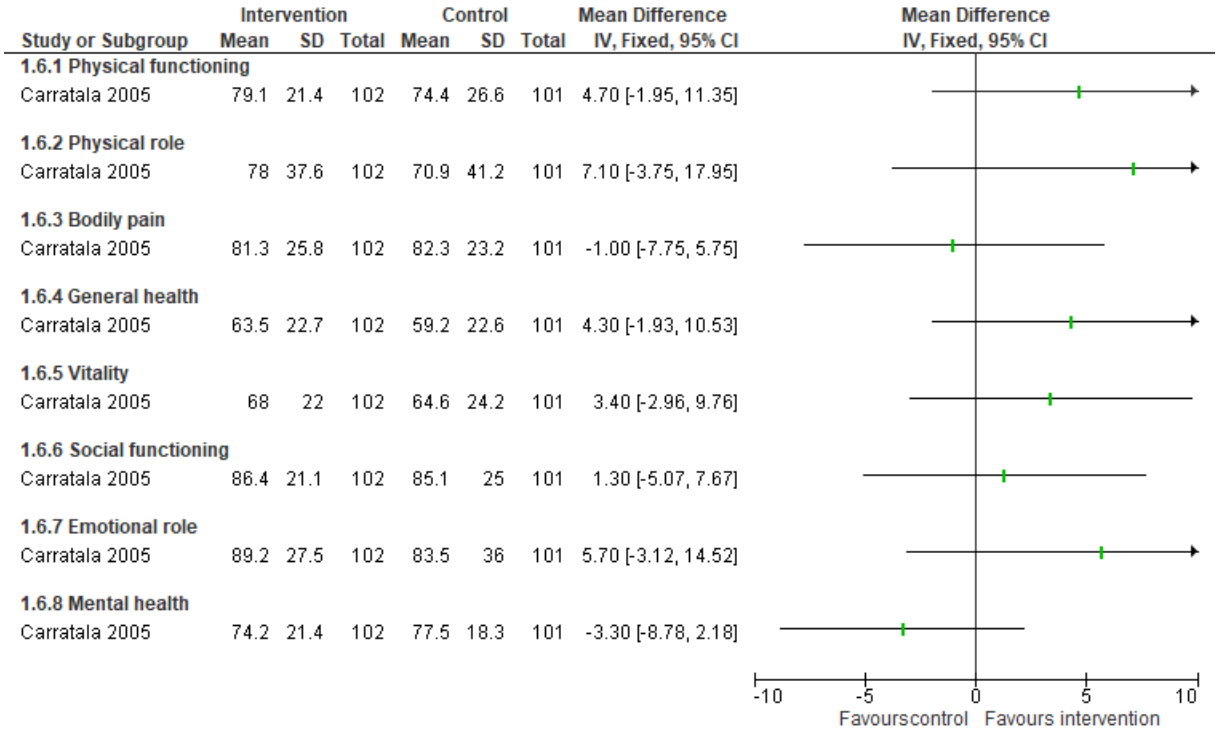
Subsequent hospital admission within 30 days; before and after study (lower is better)



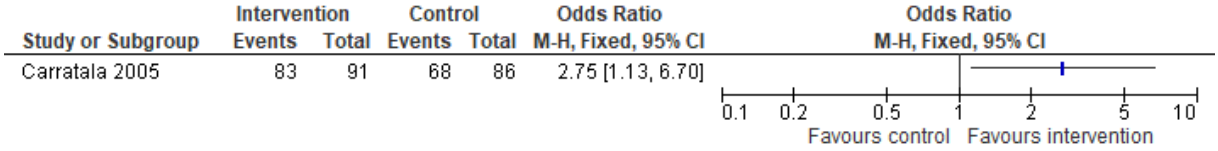
Health related quality of life at 7 days (SF-36; higher is better)



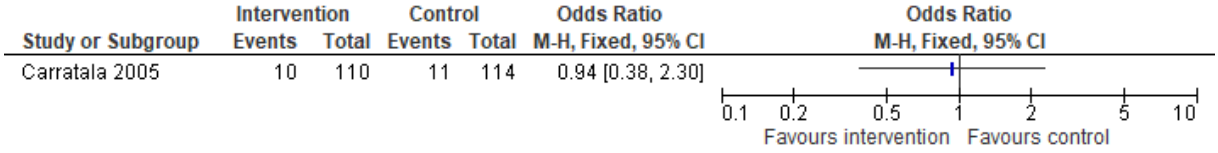
Health related quality of life at 30 days (SF-36, higher is better)



Satisfaction with overall care (higher is better)



Adverse drug reactions* (lower is better)



*Phlebitis, skin rash, vomiting, diarrhoea, insomnia.

Appendix F – GRADE tables

Home-based care versus inpatient hospital treatment

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Home based care	Inpatient hospital treatment	Relative (95% CI)	Absolute		
Antibiotic duration (days; lower is better) MID = 1.28												
1[1]	randomised trials	serious[a]	serious[b]	not serious	not serious	none	110	114	-	MD **0.19 higher** (0.41 lower to 0.79 higher)	⊕⊕◯◯ LOW	CRITICAL
Overall mortality within 30 days (lower is better)												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[c]	none	1/110 (0.9%)	0/114 (0.0%)	**OR 3.14** (0.13 to 77.83)	**0 fewer per 1,000** (from 0 fewer to 0 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
Overall successful outcome (composite measure; higher is better)												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[c]	none	92/110 (83.6%)	92/114 (80.7%)	**OR 1.22** (0.62 to 2.43)	**29 more per 1,000** (from 85 fewer to 103 more)	⊕◯◯◯ VERY LOW	CRITICAL
Subsequent hospital admission within 30 days; RCTs only (lower is better)												
3[2]	randomised trials	very serious[d]	not serious[e]	not serious[f]	very serious[g]	none	9/142 (6.3%)	11/145 (7.6%)	**OR 0.81** (0.34 to 1.97)	**14 fewer per 1,000** (from 49 fewer to 63 more)	⊕◯◯◯ VERY LOW	CRITICIAL
Subsequent hospital admission within 30 days; before and after study (lower is better)												
1[3]	before and after study	very serious[h]	serious[b]	serious[i]	very serious[c]	none	8/166 (4.8%)	0/147 (0%)	**OR 15.82** (0.91 to 276.51)	**0 fewer per 1,000** (from 0 fewer to 0 fewer)	⊕◯◯◯ VERY LOW	CRITICIAL
Health related quality of life (SF-36) at 7 days - Physical functioning (higher is better) MID = 2.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[j]	none	102	101	-	MD **2.8 higher** (4.01 lower to 9.61 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 7 days - Physical role (higher is better) MID = 3.0												

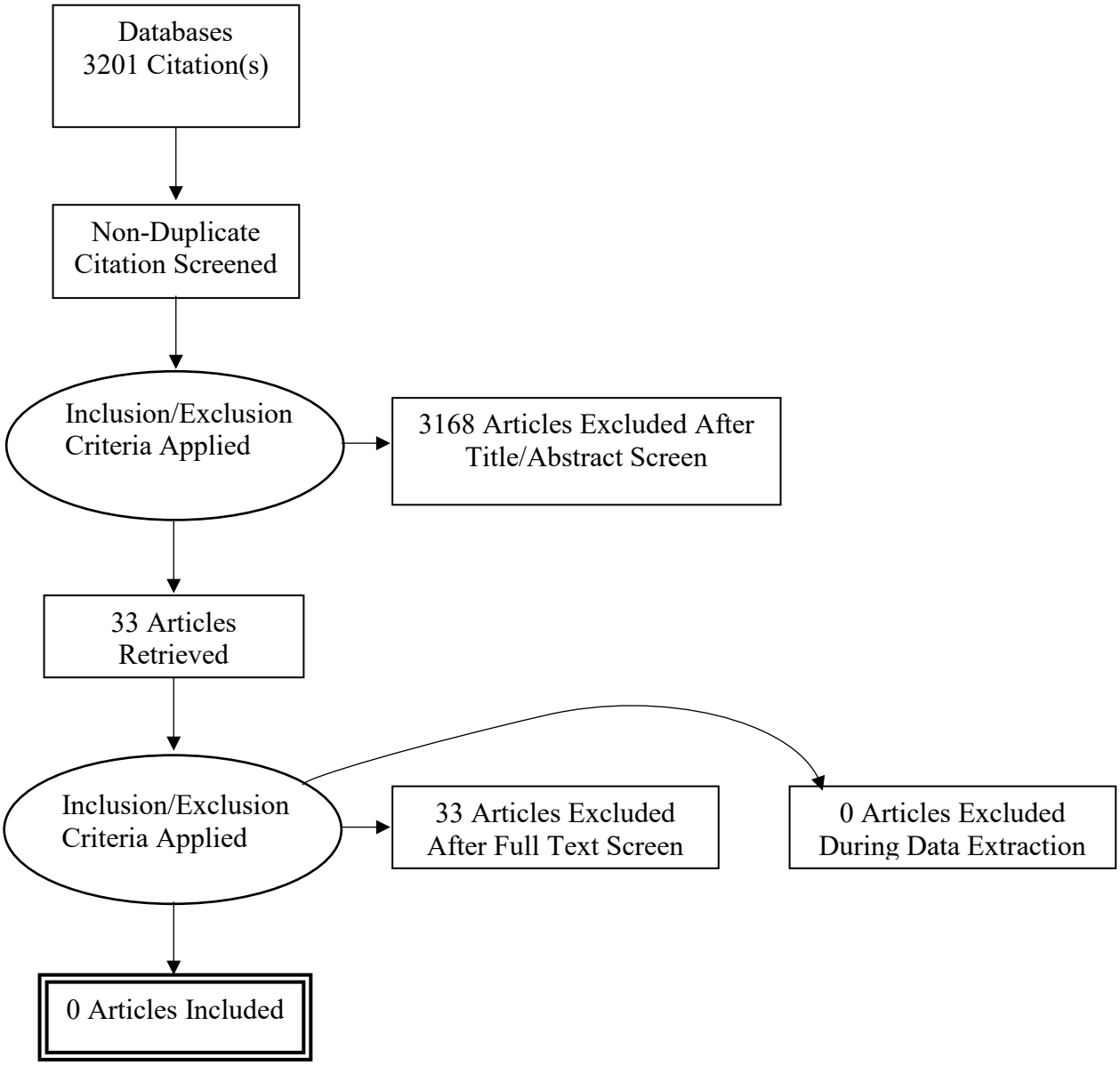
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	102	101	-	MD **7.3 higher** (3.68 lower to 18.28 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 7 days - Bodily pain (higher is better) MID = 3.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	102	101	-	MD **4.7 higher** (4.23 lower to 13.63 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 7 days - General health (higher is better) MID = 2.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	serious[l]	none	102	101	-	MD **4.3 higher** (1.58 lower to 10.18 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 7 days – Vitality (higher is better) MID = 2.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[j]	none	102	101	-	MD **1.5 higher** (5.38 lower to 8.38 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 7 days - Social functioning (higher is better) MID = 3.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	102	101	-	MD **3.2 higher** (4.88 lower to 11.28 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 7 days - Emotional role (higher is better) MID = 4.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[m]	none	102	101	-	MD **1.7 higher** (10.52 lower to 13.92 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 7 days - Mental health (higher is better) MID = 3.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	101	101	-	MD **1.7 lower** (8.05 lower to 4.65 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 30 days - Physical functioning (higher is better) MID = 2.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	serious[l]	none	102	101	-	MD **4.7 higher** (1.95 lower to 11.35 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 30 days - Physical role (higher is better) MID = 3.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	102	101	-	MD **7.1 higher** (3.75 lower to 17.95 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 30 days - Bodily pain (higher is better) MID = 3.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	102	101	-	MD **1 lower** (7.75 lower to 5.75 higher)	⊕◯◯◯ VERY LOW	IMPORTANT

Health related quality of life (SF-36) at 30 days - General health (higher is better) MID = 2.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	serious[l]	none	102	101	-	MD **4.3 higher** (1.93 lower to 10.53 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 30 days – Vitality (higher is better) MID = 2.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[j]	none	102	101	-	MD **3.4 higher** (2.96 lower to 9.76 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 30 days - Social functioning (higher is better) MID = 3.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	102	101	-	MD **1.3 higher** (5.07 lower to 7.67 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 30 days - Emotional role (higher is better) MID = 4.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	serious[n]	none	102	101	-	MD **5.7 higher** (3.12 lower to 14.52 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Health related quality of life (SF-36) at 30 days - Mental health (higher is better) MID = 3.0												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[k]	none	102	101	-	MD **3.3 lower** (8.78 lower to 2.18 higher)	⊕◯◯◯ VERY LOW	IMPORTANT
Satisfaction with overall care												
1[1]	randomised trials	serious[a]	serious[b]	not serious	serious[o]	none	83/91 (91.2%)	68/86 (79.1%)	**OR 2.75** (1.13 to 6.70)	**121 more per 1,000** (from 20 more to 171 more)	⊕◯◯◯ VERY LOW	IMPORTANT
Adverse drug reactions												
1[1]	randomised trials	serious[a]	serious[b]	not serious	very serious[c]	none	10/110 (9.1%)	11/114 (9.6%)	**OR 0.94** (0.38 to 2.30)	**5 fewer per 1,000** (from 57 fewer to 101 more)	⊕◯◯◯ VERY LOW	IMPORTANT

[1] Carratala 2005
[2] Carratala 2005, Collins 2014, Richards 2005
[3] Atlas 1998
a. Downgraded once because participants and people delivering the interventions were not blinded, although this was not possible due to the trial design. No information was provided on intervention adherence, which may be important for patients adhering to medicines in the outpatient group. Outcome assessors were not blinded to treatment condition, but they did use a standard protocol with a checklist of items. Trial was retrospectively registered.
b. Downgraded once for inconsistency: single study
c. Downgraded twice as 95%CI crosses two clinical decision thresholds (0.8 and 1.25)
d. Downgraded twice as greater than 66.6% of the weight in the meta-analysis came from studies at moderate or high risk of bias.

e. Not downgraded because I^2 was <33.3% (I^2 = 8%)
f. Not downgraded because less than 33.3% of the weight in the meta-analysis was from partially indirect studies
g. Downgraded twice because 95%CI crosses 2 clinical decision thresholds (0.8 and 1.25)
h. Downgraded twice because the ED physician made the decision on whether patient was admitted for inpatient care or discharged for outpatient management; this may have been influenced by confounding variables that were not identified, measured or controlled for in analyses. 19% missing data. No information on blinding of outcome assessors.
i. Downgraded once for indirectness.
j. Downgraded twice as 95%CI crosses 2 clinical decision thresholds (-2.0 and +2.0)
k. Downgraded twice as 95%CI crosses 2 clinical decision thresholds (-3.0 and +3.0)
l. Downgraded once as 95%CI crosses one clinical decision threshold (+2.0)
m. Downgraded twice as 95%CI crosses 2 clinical decision thresholds (-4.0 and +4.0)
n. Downgraded once as 95%CI crosses one clinical decision threshold (+4.0)
o. Downgraded once as 95%CI crosses one clinical decision threshold (1.25)

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 health economic modelling was undertaken for this evidence review.

Appendix J – Excluded studies

Effectiveness studies

Study	Reason
Anonymous. (2008) Home treatment of pneumonia safe and effective, finds study. Indian journal of medical sciences 62(1): 32-33	- Comment paper - does not contain a study or trial
Anonymous. (2005) Statement on home care for patients with respiratory disorders. American Journal of Respiratory and Critical Care Medicine 171(12): 1443-1464	- Does not report on a study or trial - American Thoracic Society position statement
Anonymous. (2005) Initial hospitalisation of nursing home residents with pneumonia is not cost effective. Evidence-Based Healthcare and Public Health 9(2): 125-126	- Not a relevant study design *Cost-effectiveness study that is not eligible for inclusion in cost-effectiveness review (US costings; costings from 1997-1998 so out of date)*
Board, N.; Brennan, N.; Caplan, G.A. (2000) A randomised controlled trial of the costs of hospital as compared with hospital in the home for acute medical patients. Australian and New Zealand Journal of Public Health 24(3): 305-311	- Not a relevant study design *Cost effectiveness study but not eligible for inclusion in cost effectiveness review*
Caplan, GA Sulaiman, NS Mangin, DA Ricauda, NA Wilson, AD Barclay, L (2012) A meta-analysis of "hospital in the home". MEDICAL JOURNAL OF AUSTRALIA 197(9): 512 - 519	- Systematic review used as source of primary studies *SR of HaH for a range of medical conditions; results not presented separately for pneumonia. References checked for possible primary studies.*
Caplan, GA Ward, JA Brennan, NJ Coconis, J Board, N Brown, A (1999) Hospital in the home: a randomised controlled trial. MEDICAL JOURNAL OF AUSTRALIA 170(4): 156 - 160	- Does not contain a population of people with pneumonia *Mixed population of frail elderly patients; proportion with pneumonia is low and separate results by diagnosis not reported*
de los Cobos, JR Barandiaran, FA Barrutieta, EO Rodríguez, MD Ruiz, LA Basurto, EA de Mendarozqueta, MGR López-Picado, A Ruiz, JMC (2010) Efficacy of hospital at home (HaH) in the treatment of community-acquired pneumonia (CAP) with different degrees of severity. MEDICINA CLINICA 135(2): 47 - 51	- Study not reported in English *Full text is in Spanish*
Elsener, Michelle, Santana Felipes, Rachel C, Sege, Jonathan et al. (2023) Telehealth-based transitional care management programme to improve access to care. BMJ open quality 12(4)	- Study does not contain a relevant intervention *This intervention does not provide an alternative to inpatient hospital care. It is a readmission prevention intervention*

Study	Reason
	designed to support people after hospital discharge. No clinical care is delivered.
Frick, Kevin D, Burton, Lynda C, Clark, Rebecca et al. (2009) Substitutive Hospital at Home for older persons: effects on costs. The American journal of managed care 15(1): 49-56	- Not a relevant study design *Health economic study rather than effectiveness; not eligible for inclusion in cost-effectiveness review because it is a US based analysis and the costs for that healthcare system would not be relevant to the NHS*
Gonzalez Barcala, F J, Pose Reino, A, Paz Esquete, J J et al. (2006) Hospital at home for acute respiratory patients. European journal of internal medicine 17(6): 402-7	- Does not contain a population of people with pneumonia *Case-control study and includes all acute respiratory patients combined (exacerbations of COPD, pulmonary insufficiency, respiratory infection); results not reported separately for pneumonia*
Granata, D.; Kendra, M.; Chiu, S.H. (2023) A Case Manager-Led Pneumonia Care Bundle in a Subacute Rehabilitation Facility. Professional Case Management 28(2): 55-59	- Not a relevant study design *Retrospective cohort study. Also the paper does not report any sample characteristics or information about the patients. Only relevant outcome is 30 day readmission and this is not reported in a useable format.*
Leff, Bruce, Burton, Lynda, Mader, Scott L et al. (2005) Hospital at home: feasibility and outcomes of a program to provide hospital-level care at home for acutely ill older patients. Annals of internal medicine 143(11): 798-808	- Does not contain a population of people with pneumonia. *Mixed population of elderly patients requiring hospitalisation for a range of conditions; only ~30% of sample had pneumonia, results not presented by condition.*
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 *Full text is in Spanish*
Montalto, Michael (2003) The admission of patients with pneumonia directly from the Emergency Department to Hospital in the Home. Primary care respiratory journal : journal of the General Practice Airways Group 12(1): 12-15	- Not a relevant study design *Retrospective clinical audit; no comparison group.*
Naylor, Mary D, Hirschman, Karen B, McCauley, Kathleen et al. (2022) MIRROR-TCM: Multisite Replication of a Randomized Controlled Trial - Transitional Care Model. Contemporary clinical trials 112: 106620	- Detailed study protocol; trial not yet complete and no results reported

Study	Reason
Nogues, Xavier, Sanchez-Martinez, Francisca, Castells, Xavier et al. (2021) Hospital-at-Home Expands Hospital Capacity During COVID-19 Pandemic. Journal of the American Medical Directors Association 22(5): 939-942	- Does not contain a population of people with pneumonia *Patients had COVID pneumonia which is excluded*
Norman, G Bennett, P Vardy, ERLC (2023) Virtual wards: a rapid evidence synthesis and implications for the care of older people. AGE AND AGEING 52(1)	- Does not contain a population of people with pneumonia *Mix of clinical conditions (predominantly older age with chronic conditions / frailty); results not presented separately for people with pneumonia.*
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	- Study does not contain a relevant intervention *Intervention is essentially early discharge - patients did not receive an 'inpatient' treatment at home so not equivalent to hospital care.*
Paulson, Margaret R, Shulman, Eliza P, Dunn, Ajani N et al. (2023) Implementation of a virtual and in-person hybrid hospital-at-home model in two geographically separate regions utilizing a single command center: a descriptive cohort study. BMC health services research 23(1): 139	- Not a relevant study design *Descriptive, retrospective chart review study with no control or comparison group. Also a mixed population of patients; only 27% had pneumonia.*
Ramsdell, Joe, Narsavage, Georgia L, Fink, James B et al. (2005) Management of community-acquired pneumonia in the home: an American College of Chest Physicians clinical position statement. Chest 127(5): 1752-63	- Does not report on a study or trial - American College of Chest Physicians clinical position statement
Richards, SH Coast, J Gunnell, DJ Peters, TJ Pounsford, J Darlow, MA (1998) Randomised controlled trial comparing effectiveness and acceptability of an early discharge, hospital at home scheme with acute hospital care. BRITISH MEDICAL JOURNAL 316(7147): 1796 - 1801	- Does not contain a population of people with pneumonia *Population is mixed acute patients; mainly patients admitted for elective orthopaedic procedures (68%). 22% were 'miscellaneous reasons such as chest infections or falls without fractures' so very small proportion of people with pneumonia and results not reported by condition.*
Roldán, R Torres, ME Gallardo, D Arias, M Saldías, F (2015) Respiratory day hospital care for immunocompetent adult patients with community-acquired pneumonia. REVISTA MEDICA DE CHILE 143(4): 467 - 474	- Study not reported in English *Article is reported in Spanish*

Study	Reason
Salazar, Albert, Estrada, Cristina, Porta, Ramon et al. (2009) Home hospitalization unit: an alternative to standard inpatient hospitalization from the emergency department. European journal of emergency medicine : official journal of the European Society for Emergency Medicine 16(3): 121-3	- Does not contain a population of people with pneumonia *Mixed population and proportion of pneumonia patients too low: most common diagnoses were acute exacerbation of COPD (50.8%), acute exacerbation of chronic heart failure (12.8%), pneumonia (9.6%), UTI (8%), and DVT (5.6%). Also a descriptive retrospective study with no control or comparison*
Shepperd, S., Iliffe, S., Doll, H.A. et al. (2016) Admission avoidance hospital at home. Cochrane Database of Systematic Reviews 2016(9): cd007491	- Systematic review used as source of primary studies
Theocharis, G, Rafailidis, P I, Rodis, D et al. (2012) Outpatient parenteral antibiotic therapy (OPAT) at home in Attica, Greece. European journal of clinical microbiology & infectious diseases : official publication of the European Society of Clinical Microbiology 31(11): 2957-61	- Not a relevant study design *Retrospective evaluation of an OPAT service; no control cases for comparison. Only 50% patients had pneumonia and results not reported separately by condition*
Tsilimingras, D.; Zhang, L.; Chukmaitov, A. (2019) Postdischarge Adverse Events Among Patients Who Received Home Health Care Services. Home Health Care Management and Practice 31(4): 257-262	- Not a relevant study design *Study of patient health records to identify the rate and types of post-discharge adverse events in patients who had previously received home health care after discharge from hospital*
Wolter, J.M.; Cagney, R.A.; McCormack, J.G. (2004) A randomised trial of home vs hospital intravenous antibiotic therapy in adults with infectious diseases. Journal of Infection 48(3): 263-268	- Does not contain a population of people with pneumonia *Patients were mixed population of adults requiring IV antibiotics; only 4 admissions were due to pneumonia. Sample mainly included cellulitis, CF, UTI and wide range of other infections.*

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 Pneumonia. Turkish thoracic journal 16(3): 107-113	- Study does not contain a relevant intervention *Costing study, does not compare interventions*

Study	Code [Reason]
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 prescriptions in primary care. The European journal of health economics : HEPAC : health economics in prevention and care	- setting in primary care whereas the review was in secondary care

Study	Code [Reason]
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 checked 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 community-acquired and healthcare-associated pneumonia. Yonsei medical journal 55(4): 967-74	- Not a relevant study design *Not a health economic study*

Study	Code [Reason]
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
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

Study	Code [Reason]
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 systematic review of literature. PloS one 14(10): e0224170	- Study does not contain a relevant intervention *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	- Non OECD country *Ethiopia*

Study	Code [Reason]
for diagnosing severe pneumonia. PLOS global public health 2(7): e0000757	
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*