1 Background information

Quick info:

Scope of the care map
This care map covers the following aspects of care:

- Assessment and management of patients with community acquired pneumonia (CAP) in primary care as well as both secondary care outpatient and inpatient settings.
- CAP in individuals aged over 14 age and older.

Aspects of care not covered in this care map are:

- Diagnosis and management of CAP in:
  - Children age 14 years and younger.
  - Immunocompromised patients.
  - Transplant patients.
- Management of patients with:
  - Lower respiratory tract infection other than pneumonia (e.g. pleurisy, bronchitis etc).
  - Hospital-acquired pneumonia.
  - Aspiration pneumonia.

Definition
Community acquired pneumonia (CAP) is defined as an acute infection of the lung parenchyma acquired in the community [1].
Hospital-acquired pneumonia is defined as a pneumonia which develops 48 hours after hospital admission [2].

Infective organisms
*Streptococcus pneumoniae* and *Mycoplasma pneumoniae* are regarded as the commonest pathogens causing community acquired pneumonia in Qatar [3].

Other pathogens include [2-5]:

- *Haemophilus influenzae* and *Moraxella catarrhalis*, in patients with COPD.
- *Staphylococcus aureus* in patients with recent influenza infection.
- *Chlamydyphila psittaci* in patients exposed to birds.
- *Chlamydyphila pneumoniae*.
- *Legionella pneumophila*.
- Respiratory viruses including coronaviruses e.g. MERS-CoV.
- Other rare causes.

Prognosis
The key determinants of prognosis in the absence of treatment are the individual’s particular immune response and the virulence of the infective organism. The level of antimicrobial resistance of the infective organism is also a key determinant of prognosis in patients undergoing treatment.

In instances of infection involving virulent strains of bacteria, or individuals with impaired immune responses – an untreated community acquired pneumonia may progress to the development of complications including respiratory failure, sepsis and multi-organ failure (see Complications). Treatment therefore is aimed at providing antibiotics to patients according to the expected or proven sensitivities of the expected or proven pathogenic organism.

Complications
Possible complications of CAP include the following [2,4,5]:

- Sepsis.
- Hypotension.
- Arrhythmia.
- Multi-organ failure.
- Pleural effusion.
- Empyema.
- Lung abscess.
- Respiratory failure.
- Meningitis.
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• Heart failure.
• Arthritis.

**Higher risk groups**
Patients at higher risk of developing CAP include [2,4,5]:
• Patients aged 65 years and older.
• Smokers.
• Pregnant women.
• Patients with comorbidities including:
  • Chronic lung disease, e.g. chronic obstructive pulmonary disease (COPD).
  • Diabetes mellitus.
  • Cardiac or renal failure.
  • Immunosuppression (including post-splenectomy patients).
  • Recent infection with respiratory viruses, e.g. influenza.

References:
Please see the care map's Provenance.

2 Updates to this care map

Quick info:
Date of publication: 08-Dec-2016
Please see the care map's Provenance for additional information on references, contributors, and the editorial approach.

3 Key recommendations of the care map

Quick info:
The key recommendations of this care map are:

**Suspected lung cancer:**
• Lung cancer may present with pneumonia and physicians should retain a high index of suspicion for the presence of malignancy and refer appropriately for investigation [17][L2, RGA1].

**Venues of care:**
• Patients at low risk of mortality can be managed safely in the community by experienced primary care physicians working within the bounds of their competence and ensuring adequate and regular review and safety-netting [1,2,5,20][L1, RGA1].
• Care in an observation setting (emergency department or short-stay ward) may be appropriate for short periods of time, to determine whether inpatient admission is truly warranted [1,2,20,21][L1, RGA1].
• The decision on appropriate venues for care, should be made on the basis of clinical judgement in conjunction with risk assessment using a validated risk scoring system (CRB-65, CURB-65 or PSI score) [1,2,20,21][L1, RGA1].
• Inpatient admission should be reserved for those at higher risk of mortality or with a high risk of complications or poor social circumstances [1,2,20,21][L1, RGA1].
• When determining whether to refer or admit a patient to hospital, reference should be made to the specific admission criteria listed in the ‘Hospital management’ care point [11-15,22][L1, RGA1].

**Antimicrobial treatment:**
• Antibiotic recommendations in this care map (see “Management” care point) are based upon available antibiogram data on the sensitivities and resistance of known pneumonia pathogens in Qatar [2][L3].
• Recommended treatments should be adhered to where possible to minimise the emergence of drug-resistant bacteria in Qatar [R-GDG].

**Discharge and follow-up:**
• Patients should be followed up promptly by their primary care physician following an inpatient admission for community acquired pneumonia [R-GDG].
• An appropriately detailed discharge summary should be sent from secondary care to the patient’s primary care physician [R-GDG].
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References:
Please see the care map's Provenance.

4 Abbreviations used in this care map

Quick info:
The abbreviations used in this care map are as follows:

- **AIDS**: Acquired immunodeficiency syndrome
- **AMT**: Abbreviated mental test
- **BP**: Blood pressure
- **CAP**: Community acquired pneumonia
- **CBC**: Complete blood count
- **COPD**: Chronic obstructive pulmonary disease
- **CRP**: C-reactive protein
- **CT**: Computed tomography
- **HIV**: Human immunodeficiency virus
- **IV**: Intravenous route
- **MERS-CoV**: Middle East respiratory syndrome coronavirus
- **PCR**: Polymerase chain reaction
- **PSI**: Pneumonia severity index
- **RSV**: Respiratory syncytial virus
- **TB**: Tuberculosis
- **USC**: Urgent suspected cancer form

5 CAP - clinical presentation

Quick info:
The typical presenting features of a patient with CAP are [2,5-7]:

- Cough.
- Sputum, which may be:
  - Increased in volume and purulence.
  - Rust-coloured, in *Strep. pneumoniae* infection.
  - Frank haemoptysis – can be attributed to pneumonia only after excluding other diseases e.g. TB, lung cancer or pulmonary embolism.
- Dyspnoea.
Community-acquired pneumonia

Medicine > Thoracic medicine > Community-acquired pneumonia

• Wheeze:
  • More commonly associated with asthma, COPD, or bronchiectasis.

• Pleuritic chest pain.

• Systemic features, which may include:
  • Fever.
  • Sweats.
  • Myalgia.

• Extrapulmonary symptoms such as gastrointestinal symptoms.

Elderly patients with CAP more commonly present with fewer specific symptoms, are less likely to have a fever than younger patients and are more likely to have co-morbid disease and aspiration pneumonia [2].

References:
Please see the care map's Provenance.

6 History

Quick info:
Important aspects of the patient history, include [6,7]:
• Symptoms and their duration.
• Age.
• Co-morbidity.
• Risk factors for unrecognised immunocompromised status, such as HIV/AIDS.
• Previous antibiotic use.
• Social history including smoking and alcohol history.
• Travel history.
• Contact with sick patients (e.g. TB cases).
• Contact with animals, especially birds and camels.

References:
Please see the care map's Provenance.

7 Examination

Quick info:
Signs indicative of CAP include [2,5,6]:
• Fever.
• Tachycardia.
• Tachypnoea or signs of respiratory distress.
• Hypotension.
• Reduced oxygen saturation:
  • In the absence of chronic lung disease an oxygen saturation level (SpO₂) of less than 94%, is an adverse prognostic feature.
• Reduced consciousness level – especially in the elderly.
• Cyanosis.
• Dehydration.
• Focal chest signs (may be absent in the elderly):
  • Dullness to percussion.
  • Crepitations.
  • Reduced air entry.

References:
Please see the care map's Provenance.
8 Investigations

Quick info:
In a primary, community, outpatient or emergency department setting, investigations may include the following but should be used according to the severity of the presentation and local availability of investigations [2,6,8-16][L2, RGA1]:

- Chest radiograph.
- CBC with differential.
- Pre-antibiotic blood cultures.
- Sputum Gram stain, culture.
- Chemistry including renal function and blood glucose.
- CRP (use for diagnosis and re-evaluate the diagnosis if CRP does not fall by more than 50% after two days of treatment).
- Procalcitonin.
- Urinary pneumococcal antigen test.
- Rapid influenza test.
- Mycoplasma PCR.

References:
Please see the care map's Provenance.

9 Suspected lung cancer

Quick info:
Cancer is an important differential diagnosis to be considered in patients suspected of community acquired pneumonia, especially in patients with a history of smoking [17][L2, RGA1].

If cancer is suspected, refer urgently, to be seen within 48 hours, using the USC referral form, available from www.ncp.qa [19][R-GDG].

Features suggestive of cancer may include the following [17,19]:

- Recurrent or persistent chest infection.
- Finger clubbing.
- Supraclavicular lymphadenopathy or persistent cervical lymphadenopathy.
- Chest signs consistent with lung cancer.
- Thrombocytosis.
- Has chest radiograph findings suggestive of cancer; or
- Is aged 40 years and older with unexplained haemoptysis.
- Persistent pneumonia, despite appropriate treatment.

References:
Please see the care map's Provenance.

11 Diagnosis

Quick info:
CAP is diagnosed by the presence of the following [2,6,14]:

- Acute cough (less than 2 weeks) with at least one other lower respiratory tract symptom:
  - Sputum.
  - Wheeze.
  - Shortness of breath.
  - Pleuritic pain.
- New focal chest signs on examination.
- A temperature of 38°C (100.4°F) or higher (however normal temperature does not exclude pneumonia).
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- There is no other explanation for the illness e.g. TB or post-obstructive pneumonia secondary to lung cancer.

NB: Consider risk factors for unrecognised immunocompromised status, and co-morbid conditions (refer to the ‘Background information’ care point).

References:
Please see the care map's Provenance.

12 Differential diagnosis

Quick info:
Ruling out other diagnoses is necessary before reaching a diagnosis of CAP [2,6].
Differential diagnoses include [2,5,6,14,17,18]:

- Underlying lung cancer (see the ‘Suspected lung cancer’ care point), which often presents as a lower respiratory tract infection.
- TB.
- Pulmonary embolism or infarction.
- Cardiac failure – consider especially if fever is not present.
- Acute exacerbation of:
  - COPD.
  - Asthma.
  - Bronchiectasis.
  - Influenza.
  - MERS-CoV.
  - Acute bronchitis.
- Post-infectious cough.
- Whooping cough.
- Post-nasal drip.

References:
Please see the care map's Provenance.

13 Assessment of severity

Quick info:
Assess severity using the CRB-65, CURB-65 or Pneumonia Severity Index (PSI), in conjunction with clinical judgement [2,20,21][L1, RGA1]. The choice of whether to use CRB-65 or CURB-65 is dependent on whether measurement of urea level is available within the facility in which the patient is being assessed [2,20,21].

References:
Please see the care map's Provenance.

14 CRB-65 Scoring system

Quick info:
The CRB-65 scoring system assesses the following clinical factors [2,20,21]:

- Confusion:
  - An AMT score of 8 or less; or
  - New disorientation in person, place, or time.
- Respiratory rate:
  - ≥ 30 breaths per minute.
- Blood pressure:
  - Systolic BP ≤ 90mmHg; and/or
  - Diastolic BP ≤ 60mmHg
Community-acquired pneumonia

• 65 years and older.

Each clinical factor attracts a score of 1 point if criteria are met, to a maximum of 4. Patients are stratified for risk of death using both the scoring system and clinical judgement [2,20,21]:

- **Low risk:**
  - Indicated by a CRB65 score of 0 or 1.
  - Treat the patient as an outpatient.

- **Intermediate risk:**
  - Indicated by a CRB65 score of 2.
  - Refer to hospital for assessment.
  - Consider outpatient management, with close follow-up, in patients aged over 65 with no other CRB criteria.

- **High risk:**
  - Indicated by a CRB65 score of 3 or more.
  - Refer for admission to an acute secondary care setting.

**CRB-65 should not be used to replace clinical judgement when deciding if a person should be referred for hospital admission** [2,20,21][L1, RGA1].

Always take into account [2,20,21][L1, RGA1]:

- Co-morbidities # pneumonia may result in a worsening of co-morbid illness that warrants hospital inpatient or critical care management, irrespective of the severity of pneumonia.
- Social circumstances # morbidity associated with CAP may negatively impact the extent that the patient is able to manage at home.
- General frailty.
- Pregnancy.
- Patient choice

References:
Please see the care map's Provenance.

15 CURB-65 Scoring system

Quick info:
If measurement of blood urea nitrogen is available, then the CURB-65 scoring system should be used for assessment of severity of the illness, in conjunction with clinical judgement [2,20,21][L1, RGA1].

The CURB-65 scoring system, assesses the following clinical factors [2,20,21]:

- **Confusion:**
  - An AMT score of 8 or less; or
  - New disorientation in person, place, or time.

- **Urea:**
  - Blood urea nitrogen level >7mmol/L or 19mg/dL.

- **Respiratory rate:**
  - ≥ 30 breaths per minute.

- **Blood pressure:**
  - Systolic BP ≤ 90mmHg; and/or
  - Diastolic BP ≤ 60mmHg

- **65 years and older.**

Each clinical factor attracts a score of 1 point, if criteria are met, to a maximum of 5. Patients are stratified for risk of death using both the scoring system and clinical judgement [2,20,21]:

- **Low risk:**
  - Indicated by a CURB-65 score of 0 or 1.
  - Treat the patient as an outpatient.
• Intermediate risk:
  • Indicated by a CURB-65 score of 2.
  • Refer to hospital for assessment.
  • Consider outpatient management, with close follow-up, in patients aged over 65 with no other CURB criteria.

• High risk:
  • Indicated by a CURB-65 score of 3 or more.
  • Refer for admission to an acute secondary care setting.

CURB-65 should not be used to replace clinical judgement when deciding if a person should be admitted [2,20,21][L1, RGA1].

Always take into account [2,20,21][L1, RGA1]:
• Co-morbidities # pneumonia may result in a worsening of co-morbid illness that warrants hospital inpatient or critical care management, irrespective of the severity of pneumonia.
• Social circumstances # morbidity associated with CAP may negatively impact the extent that the patient is able to manage at home.
• General frailty.
• Pregnancy.
• Patient choice.

References:
Please see the care map's Provenance.

16 Pneumonia Severity Index

Quick info:
The PSI is an alternative scoring system that can be applied in any patient to determine whether outpatient, or inpatient management should be followed [1].

Reference:
Please see the care map's Provenance.

17 Management

Quick info:
Hamad Medical Corporation antibiogram data from 2014 demonstrates *Strep pneumoniae* is 90% sensitive to penicillin but only 62% sensitive to erythromycin (i.e. 38% resistant) [3][L3]. Based on this data, the treatments outlined in the following sections, have been recommended by the Guideline Development Group, for use in Qatar.

References:
Please see the care map's Provenance.

18 High severity

Quick info:
Patients with:
• CRB-65 or CURB-65 score of 2 or greater.
• PSI Class III, IV or V.

References:
Please see the care map's Provenance.

19 Medium severity

Quick info:
Patients with: 
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- CRB-65 or CURB-65 score of 2.
- PSI Class III.

References:
Please see the care map's Provenance.

20 Low severity

Quick info:
Patients with:
- CRB-65 or CURB-65 score of 0 or 1.
- PSI Class I-II.

References:
Please see the care map's Provenance.

21 Indications for immediate hospital referral

Quick info:
Hospital admission should be considered for all patients with a CRB-65 or CURB-65 score of 2 or greater [2,20,21][L1, RGA1] and in patients classified as Class III, IV or V on the Pneumonia Severity Index [1] [L1, RGA1] – refer to 'Consider management in an Emergency Department' and 'Consider inpatient admission to hospital' care points.

References:
Please see the care map's Provenance.

23 Consider outpatient management

Quick info:
For patients with a CRB-65 or CURB-65 score of 0 or 1; or a PSI score of Class I-II, treatment will usually occur in the community, unless other considerations warrant admission [1,2,20,21].

References:
Please see the care map's Provenance.

24 Outpatient management

Quick info:

First line empirical antibiotic treatment
The recommended first-line empirical treatment of CAP in immunocompetent patients without significant comorbidities, is as follows [R-GDG]:
- Amoxicillin - as monotherapy for 5-7 days.
- If the patient is allergic to penicillin, use either clarithromycin, azithromycin or doxycycline as monotherapy.
- If an atypical pneumonia (i.e. pneumonia caused by an atypical pathogen e.g. Mycoplasma pneumoniae) is strongly suspected, consider using a macrolide either as monotherapy or in combination with amoxicillin.

In patients with significant comorbidities, commence empirical treatment with the antimicrobial regimen listed below [R-GDG]:

Second line empirical antibiotic treatment
If the patient is not responding to monotherapy after 48-72 hours of compliance with treatment (i.e. fever remains high, CRP has not fallen by 50%, or symptoms are deteriorating), reassess the patient's severity score and consider the following [R-GDG]:
- Whether the patient has a penicillin-resistant Strep. pneumoniae infection.
- Whether the patient has an infection with atypical pathogens.
- Whether the patient has developed complications; and
- Whether admission to hospital is appropriate.

If outpatient management is still warranted, use the following combination therapy [R-GDG]:

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Community-acquired pneumonia

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- Oral co-amoxiclav with a macrolide (e.g. clarithromycin or azithromycin).

References:
Please see the care map's Provenance.

25 Antibiotic treatment prior to immediate referral

Quick info:
**Antibiotic treatment prior to immediate referral to hospital in severe CAP**
Administration of antibiotics prior to hospital admission, should be considered for patients with severe CAP, if there are likely to be delays of over 6 hours until admission [2,20][L2, RGA1]. Recommended antibiotics for pre-referral treatment are [R-GDG]:

- First choice:
  - IV ceftriaxone with a macrolide (e.g. clarithromycin or azithromycin); or
  - IV co-amoxiclav with a macrolide.

- If IV drugs are unavailable and oral drugs are likely to be tolerated, consider using:
  - Oral co-amoxiclav (high dose) with a macrolide.

References:
Please see the care map's Provenance.

26 Inadequate response

Quick info:
If the patient is not responding to treatment begin investigations if available, otherwise refer to hospital for further assessment [R-GDG].

References:
Please see the care map's Provenance.

29 Consider management in an Emergency Department

Quick info:
**Criteria for management in an Emergency Department or Short-Stay Ward:**
Observation care in the Emergency Department or on a short-stay ward, may be appropriate for patient with any of the of the following [11-14,22-26][L1, RGA1]:

- Response to, or adherence to, outpatient therapy is uncertain.
- Patient with **ALL** of the following:
  - Intermediate-risk category patient (e.g. Pneumonia Severity Index Class III; CRB-65 or CURB-65 score of 2).
  - Absence of risk factors for a poor outcome (e.g. hypoxia, gross haemoptysis, cavitary infiltrate, immunocompromised, neuromuscular weakness, cystic fibrosis or TB).

References:
Please see the care map's Provenance.

30 Consider inpatient admission to hospital

Quick info:
**Criteria for inpatient admission to hospital:**
Inpatient admission to a hospital ward, is indicated for 1 or more of the following [11-15,22][L1, RGA1]:

- Hypoxia as indicated by either:
  - Oxygen saturation less than 90% while breathing room air.
  - PO2 less than 8.0 kPa (60mmHg) while breathing room air.
  - Chronic lung disease with significant deterioration from baseline oxygenation.
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Outpatient treatment failure as indicated by either:
- Failure to respond to antibiotic treatment (e.g. resistant organism).
- Clinically significant adverse effects from medication (e.g. vomiting).
- Complications of pneumonia (e.g. empyema, bacteraemia).
- Significant worsening of comorbid conditions necessitating inpatient care (e.g. chronic heart failure).
- Appropriate diagnostic testing and treatment is unavailable in an outpatient facility (e.g. testing or infection control measures are unavailable).
- Significant pleural effusions.
- Hemodynamic instability.
- Intermediate-risk category patient who does not improve with initial therapy and observation (e.g. Pneumonia Severity Index Class III, CRB-65 or CURB65 score of 2).
- Moderate-risk or High-risk category patient (Pneumonia Severity Index Class IV or V, or CURB65 score of 3 or greater).
- Immunocompromised patient (e.g. patients on immunosuppressive therapies, AIDS).

Admission to ICU, is indicated by [11-15,22,27][L1, RGA1]:
- A patient with acute respiratory failure.
- Haemodynamic instability not responding to fluid resuscitation.
- Any 3 of the following severity factors:
  - Respiratory rate 30 breaths per minute or greater.
  - PaO$_2$/FiO$_2$ ratio of 250 or less.
  - Multi-lobar infiltrates.
  - Confusion.
  - Blood Urea Nitrogen of 20 mg/dL (7.1 mmol/L) or greater.
  - WBC count less than 4000/mm$^3$ (4 x10$^9$/L).
  - Platelet count less than 100,000/mm$^3$ (100 x10$^9$/L).
  - Hypotension requiring aggressive fluid resuscitation.
  - Temperature less than 36$^\circ$C (96.8$^\circ$F).

Other criteria which may suggest the need for ICU admission include [1,2,14,20,21,27,28][L1, RGA1]:
- PSI Class IV or V.
- CRB-65 or CURB-65 of 4 or more.
- Lactate >4 mmol/L (36 mg/dL).
- Arterial pH <7.3.
- Sodium <130 mmol/L.

References:
Please see the care map's Provenance.

31 Investigations

Quick info:
In an inpatient setting, investigations will include all of the above. The following investigations may also be considered, according to the clinical presentation [2,6-16][L2, RGA1]:
- Endotracheal tube, sputum or flocked nasopharyngeal swab for influenza.
- Endotracheal tube, sputum or flocked nasopharyngeal swab for respiratory viral PCR panel (includes the following: RSV, human metapneumovirus, parainfluenza virus 1-3, influenza A and B, adenovirus).
- Endotracheal tube, sputum or flocked nasopharyngeal swab for Mycoplasma pneumoniae PCR.
- Urinary antigen tests (e.g. for Streptococcus pneumoniae and Legionella bacteria).
- Arterial blood gases.
- Lactic acid levels.
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• Other investigations that may be necessary to exclude other differential diagnoses or complications, according to the presentation, include:
  • Lung ventilation-perfusion scan.
  • Bronchoscopy.
  • Chest CT scan.
  • Echocardiogram.

References:
Please see the care map's Provenance.

32 Antiviral management

Quick info:
Antiviral management in observation care or on an inpatient ward:
If viral pneumonia is suspected, start treatment within 48 hours of onset with the following [58][L1, RGA2]:
• Oral oseltamivir.

References:
Please see the care map's Provenance.

33 IV antibiotic management

Quick info:
Antibiotic management in observation care or on an inpatient ward:
If the patient is to be treated empirically in an observation care setting (emergency department or short-stay ward), then the following empirical antimicrobial treatments are recommended [R-GDG]:
• IV co-amoxiclav with a macrolide (IV clarithromycin or azithromycin); or
• IV ceftriaxone with a macrolide (IV clarithromycin or azithromycin).
If the patient is allergic to penicillin, use the following regimen [R-GDG]:
• A respiratory fluoroquinolone e.g. IV moxifloxacin; or IV levofloxacin.
In all cases, treatment should be de-escalated where possible and in accordance with the results of microbiological investigations or according to clinical presentation and comorbidities. Consider a staphylococcal pneumonia in severely ill patients with a history of influenza [1,2,5,20][L1, RGA1].

Antibiotic management in the Intensive Care Unit (ICU):
The following antibiotic treatment is recommended as empirical first-line treatment in patients admitted to an ICU [R-GDG]:
• IV tazobactam and piperacillin, with a respiratory fluoroquinolone (e.g. IV moxifloxacin or IV levofloxacin); or
• IV meropenem with IV azithromycin.
If the patient is allergic to penicillin, use the following regimen [R-GDG]:
• IV aztreonam with a respiratory fluoroquinolone (e.g. IV moxifloxacin or IV levofloxacin) or
• IV tigecycline.
If the patient is at risk of infection with pseudomonas, consider adding an aminoglycoside (e.g. gentamicin). If the patient is at risk of MRSA infection, consider adding either linezolid or vancomycin [R-GDG].
In all cases, treatment should be de-escalated where possible and in accordance with the results of microbiological investigations or according to clinical presentation and comorbidities [1,2,5,20][L1, RGA1].

References:
Please see the care map's Provenance.

34 Pseudomonas treatment

Quick info:
Pseudomonas risk and treatment:
The following risk factors increase the probability of an infection with pseudomonas:
Community-acquired pneumonia
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- Structural lung disease (e.g. COPD, bronchiectasis).
- Oral prednisolone therapy of >10mg/day.
- Malnutrition.
- Recent hospitalisation and antibiotic therapy for community acquired pneumonia.

If *pseudomonas* infection is suspected, treat empirically with the following treatment [R-GDG]:

- Use an anti-pseudomonal beta-lactam together with the following antimicrobials:
  - IV ciprofloxacin; or
  - IV respiratory fluoroquinolone (e.g. moxifloxacin or levofloxacin) and an IV aminoglycoside (e.g. gentamicin); or
  - IV macrolide (e.g. clarithromycin or azithromycin) and an IV aminoglycoside (e.g. gentamicin).

- Anti-pseudomonal beta-lactamse include:
  - Tazobactam and piperacillin.
  - Meropenem or imipenem.
  - Cefepime.

If the patient has a history of allergy to penicillin, use:

- Aztreonam with either: moxifloxacin or tigecycline.

In all cases, treatment should be de-escalated where possible and in accordance with the results of microbiological investigations or according to clinical presentation and comorbidities [1,2,5,20][L1, RGA1].

References:
Please see the care map's Provenance.

35 Conversion to oral antibiotics

Quick info:
The patient should be converted from intravenous to oral antibiotics, as soon as possible but only if the following patient factors apply [2,20][L1, RGA1]:

- The patient has been fever free for 24 hours.
- The patient is:
  - Oxygenating well.
  - Haemodynamically stable.
  - Tolerating oral intake.

References:
Please see the care map's Provenance.

36 Duration of treatment

Quick info:
If admitted to hospital, patients should, in general, be treated for 7-10 days in total. A longer duration of treatment is usually necessary in complicated cases or where a *pseudomonas* or *legionella* infection is suspected [R-GDG].

References:
Please see the care map's Provenance.

37 Goal Length of Stay

Quick info:
Patients should ideally be managed on an outpatient basis or in Observation care. However, if admission is indicated, the optimal length of stay for admission is 2 days [29][L3].

References:
Please see the care map's Provenance.
38 Readmission risk factors

Quick info:
Risk of readmission is increased by presence of 1 or more of the following [41-57][L1]:

- Hospitalisation (non-elective) in past 3 months.
- 2 or more emergency department visits in past 6 months.
- Admission from a long-term care facility (e.g. nursing home).
- Prescribed antibiotics within 30 days of admission.
- Immunosuppression (e.g. malignancy, chemotherapy, systemic corticosteroids, AIDS).
- No source of outpatient care other than emergency department (e.g. no primary care provider).
- Severe care transition barriers (e.g. no caregiver, homeless).
- Severe or endstage renal disease (on dialysis or GFR less than 30 mL/min/1.73m2 (0.5 mL/sec/1.73m2)).

References:
Please see the care map's Provenance.

39 Extended stay criteria

Quick info:
Extended stay is classified below as:

- Minimal stay (a few hours to 1 day).
- Brief (1 to 3 days).
- Moderate (4 to 7 days).
- Prolonged (more than 7 days).

Extended stay beyond goal length of stay may be needed for [11,12,22,28-40][L1]:

- Clinically active diabetes.
  - Patient with Clinically active diabetes may require adjustment of glucose control regimen and frequent serum glucose checks.
  - Anticipate conversion of inpatient glucose control regimen to suitable outpatient dosing.
  - Expect brief stay extension.
- Clinically active heart failure.
  - Patient with Clinically active heart failure may require regular or intermittent dosing of diuretics and frequent monitoring of cardiorespiratory status.
  - Anticipate conversion of inpatient heart failure treatment to suitable outpatient dosing.
  - Expect brief stay extension.
- Severe renal failure.
  - Patient with Severe renal failure may require careful monitoring and management of electrolyte and volume status.
  - Anticipate arrangements for inpatient treatments (e.g., dialysis, medication) to be available in outpatient setting.
  - Expect brief stay extension.
- Unclear diagnosis.
  - Patient with negative cultures who is not recovering (e.g., persistent signs and symptoms) on empiric antibiotics may require bronchoscopy, open lung biopsy, pleural biopsy, or changed antibiotic regimen.
  - Expect brief stay extension.
- Pleural disease.
  - Large pleural effusions or empyema may require repetitive drainage after diagnostic thoracentesis, chest tube drainage, or videoassisted thoracoscopy.
  - Expect brief stay extension.
- Severe pneumonia or treatment failure.
  - Non-responsiveness to initial therapy has been associated with higher initial severity of infection (e.g., high Pneumonia Severity Index or CURB65 scores).
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- Patient with necrotizing pneumonia or lung abscess may require longer hospital stay for recovery.
- Patient with extension of x-ray infiltrates, multilobar disease, or ongoing hypoxemia may require longer hospital stay for recovery.
- Expect brief to moderate stay extension.
- Culture identified Gram-negative or antibiotic-resistant organism (e.g., Pseudomonas, methicillin-resistant Staphylococcus aureus).
  - Patient with Gram-negative or antibiotic-resistant organisms may require multiple antibiotics and more prolonged antibiotic course.
  - Expect brief stay extension.
- Respiratory failure.
  - Anticipate invasive or non-invasive ventilatory support.
  - Expect moderate stay extension.
  - New onset hyponatremia (serum sodium concentration less than 135 mEq/L (mmol/L)).
  - Anticipate close monitoring for signs and symptoms and of serum electrolytes.
  - Expect brief stay extension.
- Other clinically significant comorbid illness (e.g. atrial fibrillation with rapid heart rate, alcohol withdrawal, moderate renal insufficiency).
  - Anticipate evaluation and treatment of specific comorbidity.
  - Expect brief stay extension.
- Comorbid acute exacerbation of COPD.
  - COPD is associated with higher mortality, higher rates of ventilator-dependent respiratory failure, and Pseudomonas infection.
  - Expect brief stay extension.
- Concomitant diagnosis of malignancy.
  - Malignancy may be associated with malnutrition, immunologic impairment, or bronchial obstruction.
  - Expect brief to moderate stay extension.
  - Concomitant altered mental status.
  - Altered mental status disease may delay mobilization and recovery.
  - Expect brief stay extension.

References:
Please see the care map's Provenance.

40 Criteria for discharge from inpatient care

Quick info:
Patients may be considered for discharge from hospital if the following conditions have been met in the preceding 24 hours of admission [2,20][L1, RGA1]:
- Temperature less than 37.5°C.
- Respiratory rate less than 24 breaths per minute.
- Heart rate less than 100 beats per minute.
- Systolic blood pressure greater than 90 mmHg.
- Oxygen saturation greater than 90% on room air.
- Mental status within normal limits or at baseline.
- Able to eat without assistance.

References:
Please see the care map's Provenance.

41 Follow-up in primary care

Quick info:
All patients should be reviewed by their primary care physician within one week of an episode of CAP, in which hospital admission was indicated. Specialist supervision is indicated in cases where comorbidities or complications are present [R-GDG].

An appropriately detailed discharge summary should be sent from the admitting hospital to the primary care physician in all cases of emergency department attendance, admission to observation care or admission to an inpatient ward or ICU [R-GDG].

At the follow-up appointment, consider the following:

- A repeat chest radiograph 4-6 weeks after discharge, in patients at high risk of malignancy, e.g. heavy smokers [17][L2].
- Administration of the pneumococcal vaccine in all patients where inpatient admission for pneumonia was deemed to be necessary [R-GDG].

References:
Please see the care map's Provenance.
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Provenance Certificate

Overview

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

This care map was approved on 08 Dec 2016.

For information on changes in the last update, see the information point entitled 'Updates to this care map' on each page of the care map.

Editorial approach

This care map has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The care map will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this care map, has involved the following critical steps:

- Extensive literature search for well reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising physicians and subject matter experts from across provider organisations in Qatar.
- Independent review of the guideline by the Clinical Governance body appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Explicit review of the care map by patient groups was not undertaken.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

Sources of evidence

The professional literature published in the English language has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a clinical editor and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals (i.e. journals that are read and cited most often within their field).
3. Address an aspect of specific importance to the guideline in question.
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Where included, the ‘goal length of stay’ stated within this guideline is supported by and validated through utilisation analysis of various international health insurance databases. The purpose of database analysis is to confirm the reasonability and clinical appropriateness of the goal, as an achievable benchmark for optimal duration of inpatient admission.

Evidence grading and recommendations

Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
  - Meta-analyses.
  - Randomised controlled trials with meta-analysis.
  - Randomised controlled trials.
  - Systematic reviews.

- **Level 2 (L2):**
  - Observational studies, examples include:
    - Cohort studies with statistical adjustment for potential confounders.
    - Cohort studies without adjustment.
    - Case series with historical or literature controls.
    - Uncontrolled case series.
  - Statements in published articles or textbooks.

- **Level 3 (L3):**
  - Expert opinion.
  - Unpublished data, examples include:
    - Large database analyses.
    - Written protocols or outcomes reports from large practices.

In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A1 (RGA1):** Evidence demonstrates at least moderate certainty of at least moderate net benefit.
- **Recommendation Grade A2 (RGA2):** Evidence demonstrates a net benefit, but of less than moderate certainty, and may consist of a consensus opinion of experts, case studies, and common standard care.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C1 (RGC1):** Evidence demonstrates a lack of net benefit; additional research is recommended.
- **Recommendation Grade C2 (RGC2):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.
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References


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29. US National Hospital Discharge Database Analysis, all payers, all applicable states, 2011-2012.


43. MarketScan Database, 2011-2012 (Copyright @2012-2013 Truven Health Analytics Inc. All Rights Reserved.); proprietary health insurance data sources (2012-2013); and Medicare 100% Standard Analytical File (2012).
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**Guideline Development Group members**

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the Clinical Governance Group. The GDG members have reviewed and provided feedback on the draft guideline relating to the topic. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

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¹ Mr Ahmed Babiker attended the MOPH in his capacity as a Clinical Pharmacist and advisor on the availability of medications in Qatar.
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Responsibilities of healthcare professionals

This care map has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.

The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or carers and should consider the individual risks and benefits of any intervention that is contemplated in the patient’s care.

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Healthcare Quality Management and Patient Safety Department of the MOPH:

- Ms Huda Amer Al-Katheeri, Acting Director & Project Executive.
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- Ms Maricel Balagtas Garcia, Guideline Standardisation Coordinator.
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