New guidance notes to drive rational prescription of antimicrobials for community settings in Hong Kong

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Background

Antimicrobial resistance (AMR) has caused significant mortality and morbidity globally, and Hong Kong is no exception. It has been estimated that from 2020 to 2030, AMR-related infections in Hong Kong will result in 18 433 excess deaths with a total economic cost of US$4.3 billion.[1] Antimicrobial resistance is not only a problem of resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA), carbapenem-resistant *Acinetobacter*, vancomycin-resistant *Enterococcus* and carbapenemase-producing Enterobacterales in hospitals; rising resistance to commonly used antibiotics has narrowed prescribing options, leading to treatment failure in community-acquired infections. The latest community laboratory surveillance, conducted in 2024 by the Centre for Health Protection (CHP) of the Department of Health, revealed that the urinary pathogen *Escherichia coli* was commonly resistant to ampicillin (67.2%), co-trimoxazole (32.2%), and levofloxacin (36.9%), with 16.9% of specimens testing positive for extended-spectrum beta-lactamase.[2] The same surveillance programme indicated that isolates of *Streptococcus pneumoniae* were resistant to erythromycin (75.0%) and penicillin (29.2%).[2] The local threat of AMR highlights the need for robust antibiotic stewardship. In a local study involving 19 primary care clinicians and 321 patients that investigated help-seeking behaviour and antibiotic prescribing for acute cough, there was a significant difference in antibiotic prescribing rates between private and public primary care clinicians (17.4% vs 1.6%).[3] In another local study of primary care physicians on the management of uncomplicated urinary tract infections, the proportion of *E coli* isolates matched (sensitive) to the prescribed antibiotic (amoxicillin, ampicillin, ciprofloxacin, co-trimoxazole, gentamicin, or nitrofurantoin) was 90.7% in the public sector and 59.2% in the private sector, indicating that there is room for improvement in the latter.[4]

The CHP has been tracking antimicrobial supply as a proxy for consumption through surveillance data collected from licensed wholesale traders. Over the past decade, about half of the antimicrobials prescribed each year have been prescribed by private doctors in the community (Fig 1). Interestingly, a significant 27.2% reduction in the overall defined daily dose per 1000 inhabitants per day was observed during the three pandemic years (2020-2022) compared with the pre–COVID-19 baseline, probably due to reduced respiratory infections.[5] Nevertheless, a rebound in defined daily dose was noted at the start of 2023, particularly in the private sector following the resumption of normalcy.[5] Antimicrobial consumption can be grouped according to the World Health Organization (WHO)'s AWaRe classification—Access, Watch and Reserve—based on resistance risk and medical importance, with the aim of improving appropriate antibiotic use.[6] According to the WHO, 'Access' antibiotics can be used freely, 'Watch' antibiotics require caution, and 'Reserve' antibiotics are reserved for last-resort cases. The WHO has advocated increasing the use of 'Access' antibiotics to at least 60% of total antibiotic

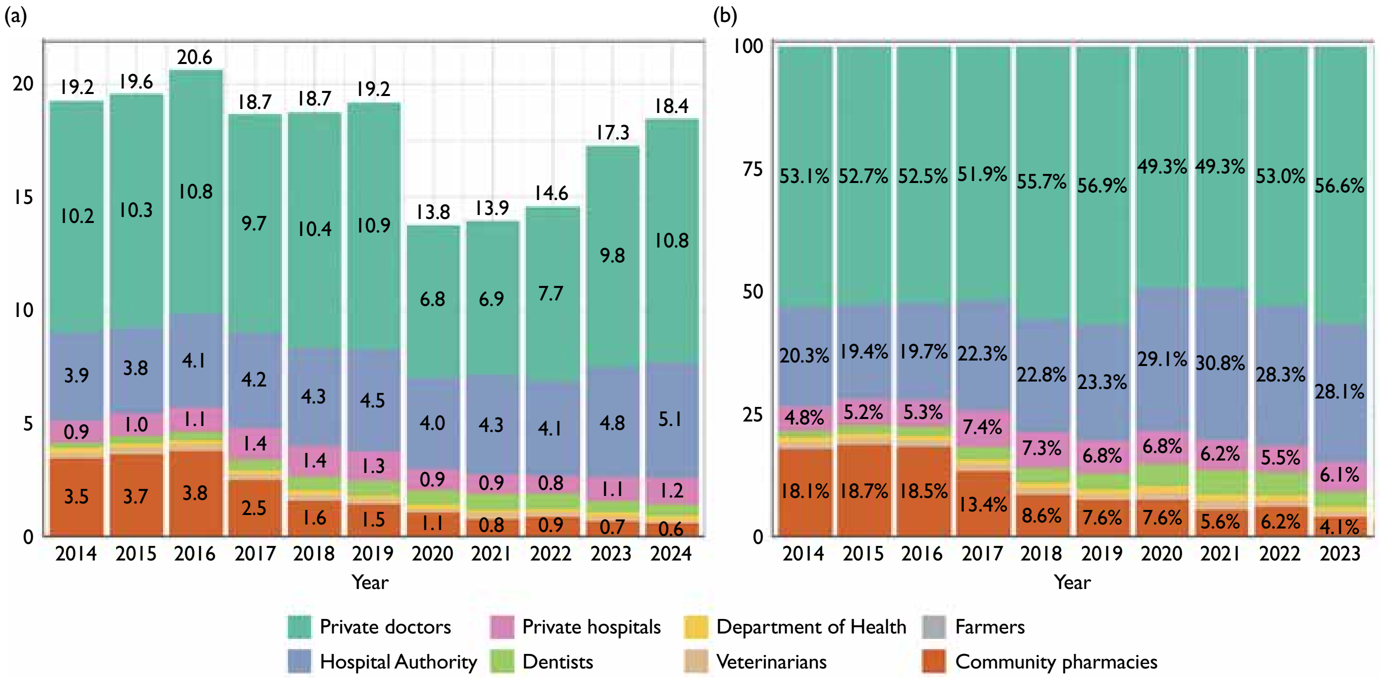

FIG 1. Distribution of antimicrobial utilisation by different sectors in Hong Kong in defined daily dose per 1000 inhabitant days (a) and percentage (b)
Source: The Government of the Hong Kong Special Administrative Region

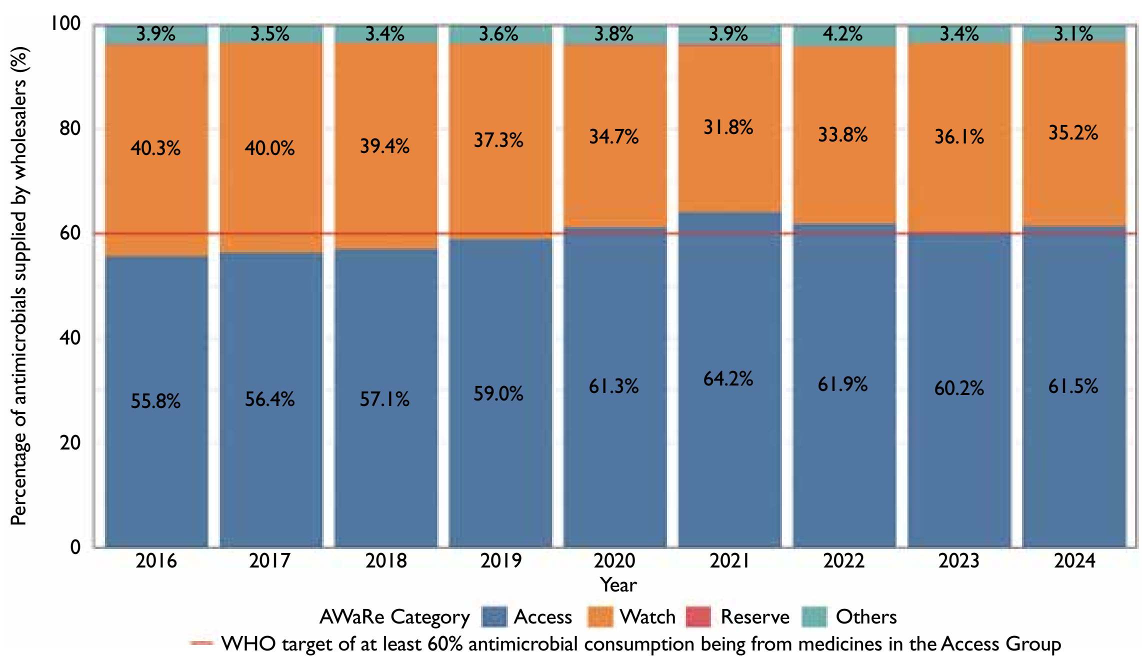

FIG 2. Distribution of antimicrobial utilisation by World Health Organization AWaRe category*
Source: The Government of the Hong Kong Special Administrative Region
Abbreviation: WHO = World Health Organization
* Supply to veterinarians and farmers were excluded from analysis

consumption, while preserving 'Watch' and 'Reserve' antibiotics for conditions in which they are truly indicated.[6] In Hong Kong, since 2020, the proportion of antimicrobial use within the 'Access' group has met the WHO target of 60% of total consumption (Fig 2). It is noteworthy that the proportion of 'Access' antibiotics prescribed is the lowest among private doctors in the community compared with

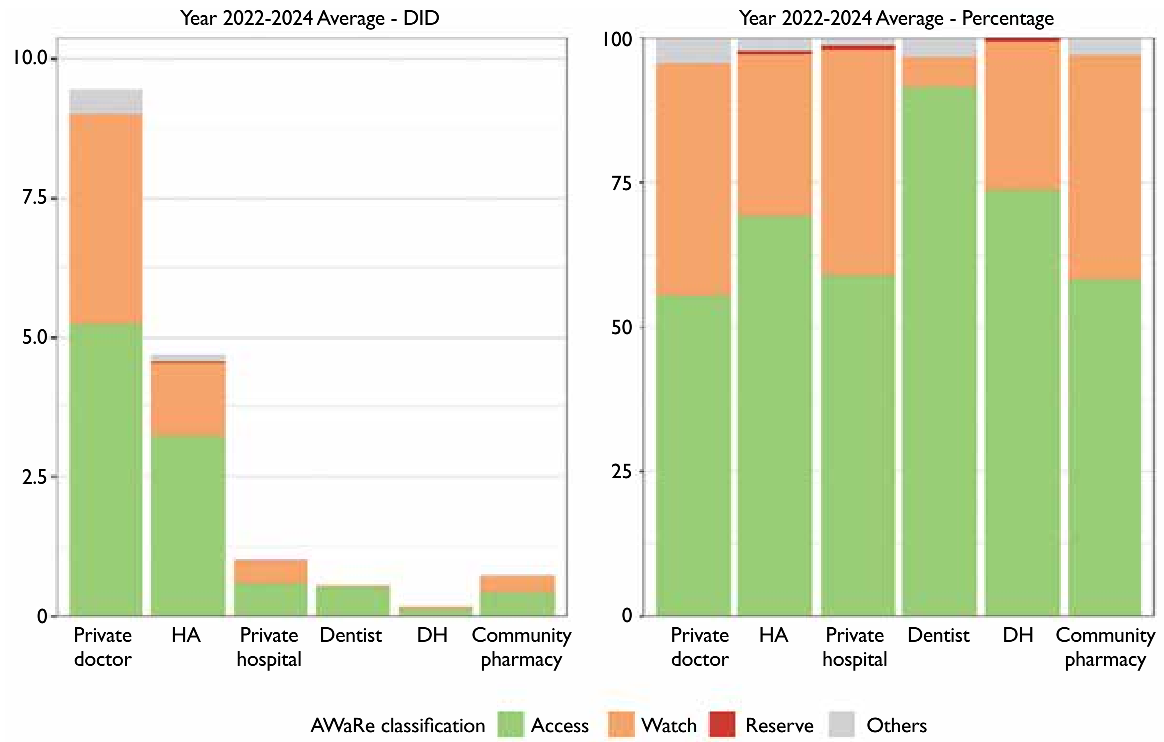

FIG 3. Antimicrobial utilisation surveillance by World Health Organization AWaRe classification of antimicrobials among different sectors*

Source: The Government of the Hong Kong Special Administrative Region

Abbreviations: DH = Department of Health; HA = Hospital Authority

* Supply to veterinarians and farmers were excluded from analysis

other sectors, such as the Hospital Authority and private hospitals (Fig 3). Overuse of broad-spectrum antibiotics is one of the main drivers of AMR and calls for coordinated efforts to address the resistance problem.

The second Hong Kong Strategy and Action Plan on Antimicrobial Resistance (2023-2027) was launched in 2022 to address the issue of AMR under a One Health approach.[7] Among the six key areas, optimising the use of antimicrobials in humans is one of the main strategic actions. In 2017 and 2018, the CHP issued guidance notes on the use of antimicrobials for seven common conditions in a community setting, under the leadership of an Advisory Group on Antibiotic Guidance Notes in Primary Care, covering acute rhinosinusitis (ARS), acute pharyngitis, acute otitis media (AOM), acute uncomplicated cystitis in women, community-acquired pneumonia (CAP), acute exacerbations of chronic obstructive pulmonary disease (COPD), and simple (uncomplicated) skin and soft tissue infections. With the changing epidemiology of infectious diseases, evolving bacterial resistance patterns, and the latest scientific evidence for the management of different conditions, the Advisory Group has recently reviewed and updated its guidance notes. The Advisory Group has also been renamed the Advisory Group on Antibiotic Guidance Notes in a Community Setting and includes new representatives from the Hong Kong College of Paediatricians, the Hong Kong College of Physicians, the Hong Kong College of Otorhinolaryngologists, and the Hong Kong Chinese Medical Association. Similar to the previous group, the Advisory Group also includes members from the Hong Kong Medical Association, Hong Kong Academy of Medicine, private medical groups, The Hong Kong Society for Infectious Diseases, Hong Kong Doctors Union, a representative from the Coordinating Committee in Family Medicine of the Hospital Authority, Chief Pharmacist's Office of the Hospital Authority, The Hong Kong Private Hospitals Association, and representatives of the CHP. Five meetings were held to deliberate on the content, from July 2024 to August 2025. In this latest edition, the Advisory Group has revised the content of the guidance notes with reference to international guidelines, up-to-date scientific research, local disease epidemiology, the latest susceptibility data from the local surveillance network, and the availability of antibiotics in the local market. These notes serve as a key reference to optimise the use of antibiotics in the treatment of infections across both public and private sectors in the community. We have extracted the relevant content on aetiology, clinical features, and the latest recommendations on antibiotic use for these seven conditions. The recommended choice of antibiotics, including first- and second-line drugs for each condition, can be found in the online supplementary Tables 1-11. The full version of the guidance notes is available on the CHP website: https://www.chp.gov.hk/en/features/49811.html.

Acute rhinosinusitis

Aetiology and clinical features

Rhinosinusitis refers to inflammation of the mucosal lining of the nasal cavity, nasopharynx, and paranasal sinuses. Acute rhinosinusitis is clinically defined as lasting fewer than 12 weeks, whereas rhinosinusitis that persists for 12 weeks or longer without complete resolution of symptoms is defined as chronic rhinosinusitis.[8] Acute rhinosinusitis is caused predominantly by viral infection, termed acute viral rhinosinusitis or the common cold. Adults experience approximately two to five episodes per year, and schoolchildren seven to ten.[8] When secondary bacterial infection occurs, acute bacterial rhinosinusitis (ABRS) develops. It is more frequent in children than in adults.[9-11] The majority of ARS cases are caused by viral infection, with only about 2% complicated by bacterial infection.[12,13] *Streptococcus pneumoniae*, *Haemophilus influenzae* (non-typeable), and *Moraxella catarrhalis* are the main causes of ABRS.[14] *Staphylococcus aureus*, streptococcal species, and anaerobes (from odontogenic infections) may occasionally be found.[15]

Clinical features of rhinosinusitis include cough, nasal symptoms, fever, halitosis, headache, facial pain, and swelling. Cough is worse at night due to postnasal drip. The appearance of nasal discharge ranges from watery to purulent and cannot reliably distinguish between bacterial and viral infection. Fever usually resolves within 48 hours. Facial tenderness may occur when the upper molars are percussed or the cheekbones are pressed; this is less common in children than in adults. Acute viral rhinosinusitis is mostly self-limiting, typically lasting no longer than 7 to 10 days.[8,16]

Management

Most ARS symptoms start to improve after 5 days, and the majority of uncomplicated ARS cases resolve within 2 to 3 weeks. Antibiotics are generally not needed. Symptomatic management, such as paracetamol, nonsteroidal anti-inflammatory drugs, nasal decongestants, intranasal normal saline irrigation and intranasal corticosteroids, can be considered where appropriate.[8,12,17-20] Antibiotic treatment for ABRS is only slightly beneficial. A Cochrane review found that, out of 100 patients treated with antibiotics, only five experienced faster cure between days 7 and 14.[20] The number needed to benefit is 18, while the number needed to harm is about eight.[18] Antibiotic treatment causes more adverse effects than placebo in the treatment of ABRS.[19] In addition, the use of antibiotics does not prevent complications.[21] For uncomplicated ABRS cases, watchful waiting can be considered after shared decision making and education about when to return for follow-up or initiate antibiotics (eg, if symptoms do not improve within the next 3 days or worsen rapidly or significantly at any time).[12,22] Antibiotic treatment should be reserved for cases with features suggestive of ABRS; however, careful patient selection is recommended to avoid unnecessary antibiotic use and potential side-effects.[8,12]

Recommended antibiotics

The recommended antibiotics for the treatment of ABRS in adults and paediatric patients are detailed in online supplementary Tables 1 and 2, respectively. The first-line antibiotic is usually amoxicillin or amoxicillin-clavulanate. The latter is a beta-lactam/beta-lactamase inhibitor combination and is therefore active against beta-lactamase-producing bacteria, including most *H influenzae*, *M catarrhalis* and methicillin-sensitive *S aureus*. It has no added advantage against *S pneumoniae*, whose beta-lactam resistance does not rely on enzyme production. For patients with type I hypersensitivity to penicillin, antibiotics from a completely different class should be used, such as doxycycline or macrolides. If macrolides (eg, clarithromycin, erythromycin) are prescribed, follow-up after the initial course of treatment is recommended because of the relatively high rate of antibiotic resistance. A 7-day course of antibiotics is sufficient to treat acute sinusitis in both adults and children. This takes into account the overall evidence on efficacy and safety, as well as the risk of AMR.[12] A meta-analysis comparing short-course treatment (3-7 days) with long-course treatment (6-10 days) found no significant difference in cure rate or symptom improvement.[23]

Acute pharyngitis

Aetiology and clinical features

Acute pharyngitis, or acute sore throat, is a mostly self-limiting disease and usually lasts for around 1 week. Although its aetiology can be viral or bacterial, most cases are viral and antibiotics are inappropriate. Viral pharyngitis can be caused by enterovirus, rhinovirus, influenza or parainfluenza virus, coronavirus (including severe acute respiratory syndrome coronavirus 2), adenovirus, respiratory syncytial virus, Epstein–Barr virus, herpes simplex virus, metapneumovirus, cytomegalovirus, and human immunodeficiency virus. Patients with acute sore throat and associated signs and symptoms such as conjunctivitis, coryza, cough, diarrhoea, hoarseness, discrete ulcerative stomatitis and/or viral exanthema are more likely to have a viral illness.[24,25] Conversely, symptoms such as sudden-onset sore throat, fever, and/or pain on swallowing, and physical examination findings such as pharyngeal and tonsillar erythema, an erythematous sandpaper-like rash, tonsillar hypertrophy with or without exudates, palatal petechiae, and/or anterior cervical lymphadenopathy are more suggestive of a bacterial cause.[25,26] Group A streptococcus (GAS) is the most common bacterial cause of acute pharyngitis, accounting for about 80% of bacterial cases, with the remainder usually caused by group C or group G streptococci. Group A streptococcus is responsible for 5% to 15% of sore throat consultations in adults and 20% to 30% in children.[27-29] Although symptoms of GAS pharyngitis resolve without antibiotic treatment, complications can arise and may be suppurative (eg, cervical lymphadenitis, peritonsillar abscess, mastoiditis, and retropharyngeal abscess) or non-suppurative (eg, scarlet fever, acute rheumatic fever, and post-streptococcal glomerulonephritis).[25]

Management and antibiotic treatment

Although GAS pharyngitis is mostly self-limiting, antibiotics are prescribed to relieve acute symptoms, prevention of acute and subacute complications, and reduce transmission. Antibiotic treatment can prevent suppurative complications and acute rheumatic fever, and may offer protection against the subsequent development of post-infectious glomerulonephritis.[30] Group A streptococcus is generally sensitive to penicillin and other members of the beta-lactam group of antibiotics, but shows high resistance (42.3% to 60.0% from 2016 to 2020) to erythromycin locally.[31]

Penicillin V or amoxicillin is the recommended drug of choice for patients who are not allergic to these agents (online supplementary Tables 3 and 4). Group A streptococcus resistant to penicillins and other beta-lactams has not been reported. All *Streptococcus pyogenes* isolates tested by the CHP from 2008 to 2020 were sensitive to penicillin.[31] First-generation cephalosporins (eg, cephalexin) are the first-line agents for penicillin-allergic individuals (ie, those without anaphylactic reactions). Other cephalosporins (eg, cefaclor, cefuroxime) are alternatives but are not favoured as first-line agents because of their broader spectrum of activity. As GAS resistance to macrolides (eg, erythromycin, azithromycin, and clarithromycin) is known to be common in Hong Kong, macrolides are not an appropriate first-choice antibiotic treatment.[31] Regarding the duration of antibiotics, a 10-day course is recommended by the Infectious Diseases Society of America and the United States Centers for Disease Control and Prevention to achieve maximal eradication of GAS from the pharynx for the primary prevention of acute rheumatic fever.[25] The National Institute for Health and Care Excellence guideline recommends treatment for 5 to 10 days but recognises that microbiological cure may be better with a 10-day course of phenoxymethylpenicillin compared with a 5- or 7-day course, although there were no differences in relapse or recurrence.[32] Since routine rapid antigen detection testing for GAS is not recommended and microbiological cure is the goal, a 10-day course is recommended to maximise treatment effectiveness.

Acute otitis media

Aetiology and clinical features

Acute otitis media is the acute inflammation of the middle ear. It is a common paediatric condition with peak prevalence at 6 to 18 months, while AOM in adults is rare.[33] It has been reported that 27% of infants and 37% of children with upper respiratory tract infections develop AOM.[34,35] After the introduction of pneumococcal vaccination, overseas studies showed that the incidence of AOM decreased significantly.[36,37] Acute otitis media can be caused by viruses or bacteria, but it is often difficult to distinguish between them as both can co-exist. Viruses that cause upper respiratory tract infections (eg, respiratory syncytial virus, adenovirus and influenza viruses) are present in up to two-thirds of cases.[38] The average global distribution of causative bacterial pathogens of AOM is as follows: *S pneumoniae* (30%), *H influenzae* (non-typeable) [23%], and *M catarrhalis* (5%).[39] The remaining cases are caused by other bacteria (eg, GAS). There is usually a single bacterial cause, but coinfection with other pathogens is known to occur.[40] Typical symptoms of AOM include otalgia that interferes with normal activity or sleep, new-onset ear discharge, fever, loss of appetite and difficulty hearing. It may present as ear tugging or irritability in infants and young children.

Management

Viral AOM is a mostly self-limiting infection, with symptoms (ie, otalgia) typically lasting about 3 to 7 days.[41] Most children and young people recover within 3 days without antibiotics. In a Cochrane review, 60% of children not treated with antibiotics showed improvement in symptoms within 24 hours, and over 80% had symptoms that resolved spontaneously within 3 days.[42] When determining whether to prescribe antibiotics, healthcare providers should consider the patient's general health, the severity of the disease, the risk of complications, and the expected benefits of antibiotic therapy:

- If the patient is not improving within 48 to 72 hours and has acute, worsening symptoms; is systemically very unwell; has signs and symptoms of a more serious illness or condition; or is at high risk of complications, clinicians should offer immediate antibiotics. The patient should be referred to hospital if there is severe systemic infection or complication (eg, mastoiditis, meningitis, or facial nerve paralysis).
- Red flag signs and symptoms include a fever of 39°C or above, drowsiness, rapid breathing, rapid heart rate, severe ear pain, and signs or symptoms of intracranial complications (eg, neck stiffness, altered mental status, seizures, or focal neurological deficits).
- Children under 2 years of age with bilateral AOM, and children and young people with AOM and otorrhoea, are more likely to benefit from antibiotics.[41]

Antibiotic treatment has no early effect on pain, a slight effect over the following days, and only a modest effect on the number of children with tympanic perforations, contralateral otitis episodes and abnormal tympanometry findings in subsequent weeks, with no difference in the rare occurrence of severe complications.[42] A Cochrane review found that for patients with respiratory infections (including AOM) in whom clinicians considered it safe not to prescribe antibiotics immediately, a non-prescribing approach with advice to return if symptoms did not resolve (delayed antibiotics) resulted in the least antibiotic use, while maintaining similar patient satisfaction and clinical outcomes compared with immediate antibiotics.[43] The recommended choice of antibiotic regimen is detailed in online supplementary Table 5. Regardless of whether antibiotics are prescribed, patients and caregivers should be informed about red flag symptoms and advised to seek medical attention if symptoms worsen rapidly.

Community-acquired pneumonia

Aetiology and clinical features

Community-acquired pneumonia refers to an acute infection of the lung parenchyma in a patient who has acquired the infection outside a healthcare setting and has developed symptoms and signs in the community. Community-acquired pneumonia can be caused by a variety of pathogens, including viruses and bacteria. There is increasing recognition of viral pathogens in CAP[4] of which the most common include influenza virus, rhinovirus and parainfluenza virus. The most frequently detected bacterial pathogens are *S pneumoniae*, *H influenzae*, *S aureus*, and *Mycoplasma pneumoniae*.[44-47] Group A streptococcus and *S aureus* may cause secondary bacterial pneumonia following influenza virus infection. Common clinical features of CAP include cough, fever, pleuritic chest pain, dyspnoea, and sputum production. On physical examination, many patients are febrile, although this finding is frequently absent in older patients. Tachypnoea and tachycardia are also common. Chest examination may reveal audible crackles. Signs of consolidation, such as decreased or bronchial breath sounds and dullness to percussion, may be present.

Antibiotic therapy

Antibiotic therapy should be started as soon as CAP is suspected or established[48-53] (online supplementary Tables 6 and 7). When considering the choice of antibiotic, clinicians are advised to take into account the severity of the infection and the risk of developing complications (eg, co-morbidities such as severe lung disease or immunosuppression), local AMR patterns and prevalence, as well as any recent antibiotic use and microbiological results, if available.[54]

Streptococcus pneumoniae is one of the most common pathogens identified in local CAP.[44] In Hong Kong, there is reduced susceptibility of *S pneumoniae* to penicillin (23% to 51% resistance) and to macrolides (82% resistance to erythromycin) in the community.[55,56] Risk factors include age over 65 years, beta-lactam therapy within the last 3 months, alcoholism, multiple medical co-morbidities, and exposure to a child in a day-care centre. Amoxicillin-clavulanate is therefore recommended as the first-line empirical treatment. Doxycycline can be added if macrolide-resistant *M pneumoniae* infection is suspected. For patients with co-morbidities or those at risk of *Legionella* pneumonia, a macrolide can be added. Due to poor intrinsic activity against *S pneumoniae* and/or low oral bioavailability, certain oral cephalosporins (first-generation agents, cefaclor, cefuroxime, ceftibuten, cefixime and loracarbef) are not recommended.

Mycoplasma pneumoniae is common in children and is also seen in adults in Hong Kong.[44,57] The infection is often self-limiting without specific antibiotic therapy. Initial empirical therapy covering *M pneumoniae* is considered optional for outpatients with mild CAP. It may be indicated if the first-line agent has failed, if outpatients have severe CAP, or if the patient is a child aged over 5 years or an adolescent. Up to 40% of CAP in children aged 5 years or above has been attributed to *M pneumoniae*.[57] In Hong Kong, the macrolide resistance rate among *M pneumoniae* is high in the community, with an increasing trend from 28.2% in 2018 to 61.3% in 2024.[58] Doxycycline is recommended for the treatment of macrolide-resistant *M pneumoniae*–

associated CAP in adults and children (regardless of age or duration of therapy).[59]

Fluoroquinolones may be considered in the treatment of CAP when the first-line agent has failed, when an outpatient is allergic to first-line agents, or when there is documented infection with *S pneumoniae* with a penicillin minimum inhibitory concentration (MIC) of 4 μg/mL or above (intermediate susceptibility to penicillin). Nonetheless, excessive use of respiratory fluoroquinolones in CAP may lead to delayed diagnosis of tuberculosis and increased fluoroquinolone resistance in *Mycobacterium tuberculosis*. Fluoroquinolones should be reserved for use in outpatients who have no other treatment options. Patients should be warned of the risk of severe adverse effects, including aortic dissection or rupture of an aortic aneurysm, significant decreases in blood sugar, and disabling side-effects involving the tendons, muscles, joints, nerves, central nervous system, and mental health.[60-62]

Duration of antibiotic therapy

Most outpatients with CAP will show an adequate clinical response within 72 hours. For most patients, appropriately chosen initial antibiotic therapy should not be changed within the first 72 hours unless there is marked clinical deterioration. Clinical judgement is required when determining the duration of antibiotic therapy. Factors to consider include the patient's clinical response, severity of infection, causative pathogen, in vitro susceptibility of the pathogen, and the presence of complications and side-effects. In adults and children, a 5-day course of antibiotics (except for doxycycline) is usually effective for mild CAP in the outpatient setting.[54,63-66] Clinicians may consider stopping treatment after 5 days unless the patient fails to improve clinically or the microbiological results suggest the need for a longer course.[67]

Acute exacerbations of chronic obstructive pulmonary disease

Clinical features and causes of exacerbation

Chronic obstructive pulmonary disease is a heterogeneous lung condition characterised by chronic respiratory symptoms due to airway and/or alveolar abnormalities. It is caused by a combination of environmental (eg, passive smoking, outdoor and indoor air pollution, occupational exposure to airborne pollutants) and host factors (eg, smoking and advancing age).[68,69] In Hong Kong, the prevalence of COPD is 0.5% among individuals aged 15 years or above.[70] It is most common among those aged 75 to 84 years (2.2%), with a male predominance.[70] The most common respiratory symptoms include dyspnoea, cough, and/or sputum production. Chronic obstructive pulmonary disease is diagnosed by spirometry demonstrating a post-bronchodilator ratio of FEV_1/FVC (forced expiratory volume in 1 second to forced vital capacity) of <0.7. The disease is associated with co-morbidities such as cardiovascular disease, hypertension, and lung cancer.[71-73] It may be punctuated by acute exacerbations, defined as acute episodes of worsening respiratory symptoms within 14 days that may be accompanied by tachypnoea and/or tachycardia, and are often associated with local and systemic inflammation.[74] Acute exacerbations of COPD are mainly triggered by respiratory viral infection (eg, influenza A and rhinovirus), although bacterial infection and air pollution can also precipitate these events.[74-77] Common bacterial isolates in patients hospitalised with a COPD exacerbation include *H influenzae*, *S pneumoniae*, *Pseudomonas aeruginosa*, and *M catarrhalis*.[76,78-80]

When to prescribe antibiotics and choice of antibiotics

Appropriately prescribed antibiotics may shorten recovery time and reduce the risk of early relapse, treatment failure, and duration of hospitalisation. Antibiotics can be prescribed when there are clinical signs of bacterial infection. Evidence suggests that sputum colour and purulence can predict the presence of bacterial infection. In a pooled analysis, green or yellow sputum showed a sensitivity of 94.7% and a specificity of 15% for the presence of bacteria.[81] Studies have also shown that a positive bacterial culture was obtained in 77% to 84% of patients with purulent sputum.[82,83] According to the 2024 Global Strategy for Prevention, Diagnosis and Management of COPD report, antibiotics should be given to patients in the community if they: (a) have three cardinal symptoms, namely increased dyspnoea, increased sputum volume, and increased sputum purulence; (b) have increased sputum purulence and one other cardinal symptom; or (c) require mechanical ventilation.[74]

Empirical antibiotic therapy (online supplementary Table 8) targets likely bacterial pathogens responsible for acute exacerbations of COPD and takes into account local patterns of antibiotic resistance.[56] *Pseudomonas aeruginosa* and/or Enterobacterales infection may occur in outpatients with advanced COPD. Risk factors for *P aeruginosa* infection include chronic colonisation or previous isolation of *P aeruginosa* from sputum, very severe COPD (forced expiratory volume in 1 second <30% predicted), bronchiectasis on chest imaging, broad-spectrum antibiotic use within the past 3 months, and chronic systemic glucocorticoid use.[84-87] Amoxicillin and macrolides are not recommended because of the high resistance rates in Hong Kong. Local community data show reduced susceptibility of *S pneumoniae* to penicillin (23%-

51% resistance) and to macrolides (82% resistance to erythromycin).[55,56] In addition, 50% of *H influenzae* isolates were resistant to ampicillin, and nearly all (99%) *M catarrhalis* isolates produced beta-lactamase.[56] Amoxicillin-clavulanate or a respiratory fluoroquinolone (eg, levofloxacin) is recommended. In patients for whom amoxicillin-clavulanate is contraindicated because of non-type I penicillin allergy, a cephalosporin such as cefpodoxime or cefuroxime may be considered. Fluoroquinolones should be reserved for outpatients who have no other treatment options for acute bacterial exacerbation of chronic bronchitis because of the risk of severe adverse effects, including aortic dissection or rupture of an aortic aneurysm, significant decreases in blood sugar, or disabling side-effects involving the tendons, muscles, joints, nerves, central nervous system and mental health.[60-62] Regarding treatment duration, a systematic review of outpatients with COPD exacerbations indicated that short-course antibiotic treatment (≤5 days) did not differ significantly from long-course treatment (≥6 days) in terms of clinical cure or bacterial eradication.[88] These results concurred with those of another systematic review and meta-analysis comparing short-course (<6 days) with long-course antibiotics (>7 days).[89] In addition, there were significantly fewer adverse events with short-course antibiotics.[88-90] Based on the evidence, a 5-day course of antibiotics will generally be adequate to treat a mild-to-moderate acute exacerbation of COPD due to bacterial infection.

Acute uncomplicated cystitis in women

Aetiology and clinical features

Acute uncomplicated cystitis is characterised by local bladder signs and symptoms such as dysuria, urgency, frequency and suprapubic pain. There should be no signs or symptoms suggestive of infection spreading beyond the bladder (eg, fever, chills, rigors, unstable vital signs, flank pain or costovertebral angle tenderness). Individuals with urinary catheters are excluded from this definition.[91-97] Cystitis usually occurs when bacteria from the gastrointestinal tract enter the urethra and ascend to the bladder.[98] *Escherichia coli* is the most commonly isolated pathogen (~52%) in midstream urine samples collected in the outpatient setting of the Hospital Authority, followed by *Klebsiella pneumoniae* (~9%), *Proteus mirabilis* (~5%), and *Streptococcus agalactiae* (~3%) [unpublished data from CHP].

Antibiotic therapy

Given the very high probability of urinary tract infection based on typical symptoms, clinicians can consider empirical treatment without urine culture or dipstick urinalysis. The choice of antibiotics should take into account the symptoms, potential complications, previous urine culture results, and local antibiotic susceptibility patterns.[98] Among the *E coli* isolated from urine samples in outpatient settings of the Department of Health[56] and Hospital Authority (unpublished data), 64% to 67% were resistant to ampicillin, 36% to 46% to levofloxacin, 20% to cefpodoxime, 39% to cefuroxime, 31% to 32% to co-trimoxazole, 6% to 16% to amoxicillin-clavulanate, 2% to fosfomycin and 1% to 2% to nitrofurantoin. In the same settings, 99% to 100% of *Klebsiella pneumoniae* were resistant to ampicillin, 23% to 42% to nitrofurantoin, 12% to cefpodoxime, 35% to cefuroxime, 15% to 20% to co-trimoxazole, 10% to 17% to levofloxacin, and 8% to 14% to amoxicillin-clavulanate.[56] Judicious use of antibiotics is recommended to minimise potential collateral damage (ecological adverse effects of antimicrobial therapy, such as colonisation or infection with multidrug-resistant organisms), particularly with broad-spectrum cephalosporins and fluoroquinolones.[97]

For the choice of antibiotic therapy (online supplementary Table 9), nitrofurantoin is appropriate because of the low local resistance rate and is less likely to select for drug-resistant organisms (the preserved in vitro susceptibility of *E coli* to nitrofurantoin over many years of use suggests that it causes only minor collateral damage). Beta-lactam agents, including amoxicillin-clavulanate, are appropriate choices for therapy even in cases of intermediate susceptibility because they achieve high urinary concentrations. In view of disabling and potentially long-lasting or irreversible side-effects, fluoroquinolones should be used only when other commonly prescribed antibiotics are considered inappropriate. Co-trimoxazole is not recommended as a first-line agent given the high local resistance.[56] Antibiotic treatment is not required for asymptomatic bacteriuria except during pregnancy or prior to urological procedures associated with mucosal trauma.[91,95,99,100]

Simple (uncomplicated) skin and soft tissue infections

Aetiology and clinical features

The term ‘skin and soft-tissue infections (SSTIs)’ describes a wide variety of clinical conditions. Simple, or uncomplicated, SSTIs refer to superficial infections such as cellulitis, simple abscesses, impetigo and furuncles, and require antibiotics or surgical incision and drainage. Complicated SSTIs include deep soft-tissue infections (eg, deep abscesses and necrotising fasciitis) that require significant surgical intervention. When classifying patients with SSTIs, the necrotising or non-necrotising nature of the infection, the anatomical extent, the characteristics of the infection (purulent or non-purulent), and the clinical condition of the patient should always be assessed independently.[101,102] Simple SSTIs usually present with localised clinical findings such as erythema, warmth, oedema and pain over the affected site. They are not associated with systemic signs or symptoms that indicate spread (eg, fever, tachycardia, diaphoresis, fatigue, anorexia and vomiting) or uncontrolled co-morbidities that may complicate treatment. Simple SSTIs are usually monomicrobial, mainly caused by *S aureus* and beta-haemolytic streptococci such as *S pyogenes*. In diabetic foot infection, polymicrobial infection is more likely. *Vibrio vulnificus* infection is associated with injuries related to seawater or seafood exposure. Impetigo is usually caused by *S aureus*, whereas cellulitis is usually caused by beta-haemolytic streptococci. Nonetheless, both pathogens may occur in combination in simple SSTIs.

Antibiotic therapy

Simple SSTIs are amenable to outpatient management with topical or oral antibiotics. When choosing an empirical antibiotic (online supplementary Tables 10 and 11), clinicians should consider the severity of symptoms, site of infection, risk of uncommon pathogens, previous microbiological results, MRSA status, and local resistance patterns.[103] In mild and localised impetigo, topical antibiotics are adequate treatment.[104,105] In other cases of simple SSTIs, oral antibiotics are indicated. Based on data from outpatient settings of the Hospital Authority, resistance of *S pyogenes* to penicillins and other beta-lactams has not been reported in Hong Kong; nonetheless, 37% of isolates were resistant to erythromycin (unpublished data from CHP). Coverage for community-associated MRSA (CA-MRSA) should be considered if risk factors are present (eg, history of direct contact with CA-MRSA–infected wounds, discharge or soiled areas, close contact with carriers, presence of skin lesions, poor personal hygiene, and sharing of personal items), or if the patient does not respond to first-line treatment.[106,107] Co-trimoxazole, doxycycline/minocycline, and clindamycin can be considered if CA-MRSA is suspected or confirmed. Locally, 24% to 26% of *S aureus* isolates are MRSA.[56] In addition, patients with CA-MRSA and their close contacts should receive topical decolonisation therapy.[107]

Superficial and small abscesses usually respond well to incision and drainage and seldom require antibiotics, except when they are associated with systemic signs of infection, extensive cellulitis, rapid progression or poor response to initial drainage; involve sites that are difficult to drain (eg, face, hands, and genitalia); or occur in children, older adults, or those with significant co-morbid illness or immunosuppression.[102] A 5- to 7-day course of antibiotic treatment is recommended for simple SSTIs, but this may be extended to up to 10 days at the clinician's discretion if the infection does not improve after completion of the initial course.[103,106,108-111] Since the skin requires time to return to its normal condition, full resolution should not be expected within 5 to 7 days.[103]

Conclusion

Rational prescription of antimicrobials is vital to curb the rise of resistant pathogens. At the 79th United Nations General Assembly High-Level Meeting on AMR held in September 2024, global leaders approved a political declaration committing to a clear set of targets and actions, including a 10% reduction in the estimated 4.95 million annual human deaths associated with bacterial AMR by 2030.[112] The declaration also aims for at least 70% of antibiotics used in human health worldwide to belong to the WHO Access group.[112] A territory-wide survey was conducted in 2023 to examine the awareness and practices of the general public regarding AMR in Hong Kong.[113] The results showed that when a doctor's initial assessment indicated that antibiotics were not needed, the vast majority of respondents (94.7%) accepted the doctor's advice to observe for a few more days or to wait for diagnostic test results before deciding whether to prescribe antibiotics.[113] In addition, about half (49.5%) of respondents wanted doctors to share decision making with them regarding antibiotic prescriptions.[113] We urge all doctors in both the public and private sectors to prescribe antibiotics only when clinically indicated and to refer to clinical guidelines and the current guidance notes when selecting an appropriate agent. Whenever possible, narrow-spectrum antibiotics should be used at optimal doses and for the shortest effective duration.

Author contributions

All authors contributed to the editorial, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

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Supplementary material

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