Antibiotic use in residential aged care facilities

Ching Jou Lim, Rhonda L Stuart, David CM Kong

Background

High infection burden among the residential aged care facility (RACF) population has long been recognised; however, existing infection prevention effort is often limited to infection surveillance activity. There is a scarcity of evidence to guide antimicrobial stewardship in the Australian RACF setting.

Objective

This review summarises the current trends in antibiotic use and multi-drug resistant (MDR) organisms, challenges related to antibiotic prescribing and areas of suboptimal antibiotic prescribing for further improvement, particularly in the Australian RACF setting.

Discussion

There is widespread antibiotic prescribing in RACF, which may lead to the emergence of antibiotic resistance. Accordingly, there is an immediate need for judicious antibiotic use in this high-risk population to curb the rapid emergence of MDR organisms and other adverse consequences associated with inappropriate antibiotic use, as well as to reduce healthcare costs.

Keywords

antimicrobial drug resistance; homes for the aged

Residential aged care facilities (RACFs) are an important part of the healthcare system. With the rapid growth in the elderly population, there is a growing demand for access to RACFs. It has been estimated that approximately 6% of those aged over 65 years, and 30% of individuals over 85 years of age live in RACFs. Most of the residents of RACFs are vulnerable to infections because of frailty, poor functional status, multiple comorbidities and compromised immune systems. In addition, the close living proximity and frequent nurse–resident or resident–resident contact will facilitate the spread of organisms in the RACF setting. This coupled with regular patient transfers between acute-care hospitals and RACFs further augments the infection burden among residents in RACFs, compared with community-dwellers.

The clinical diagnosis of infection syndromes among RACF residents is challenging, due in part to the residents’ atypical clinical presentation. The most common symptoms of infection among elderly residents are non-specific manifestations such as delirium, falls, functional decline and behavioural changes, in the absence of fever. These atypical presentations can lead to delayed diagnosis, late initiation of empirical antibiotic therapy and poorer clinical outcomes. Not surprisingly, early antibiotic therapy is often preferred ‘in case’ RACF residents deteriorate, which may lead to antibiotic initiation without confirmed infection. Difficulties in establishing symptoms, because of underlying resident cognitive impairment, language barriers and frequent turnover of nursing staff in RACFs, further complicate the decisions for antibiotic prescribing.

Occurrences of infectious syndromes in the absence of on-site diagnostic facilities or timely expert support have been reported to result in the frequent transfer of RACF residents to acute-care hospitals. A population-based study in Western Australia reported that one-quarter of RACF residents were transferred to hospital because of infection, incurring inpatient
costs of approximately $12.1 million over 2 years. Furthermore, the frequent referral of RACF residents to hospitals has also been shown to be associated with poorer clinical outcomes. Thus, these are reasons to encourage infection management within RACFs to avert hospital admission. Timely management of infectious syndromes, including prudent antibiotic prescribing, in the RACF setting is crucial to ensure optimal care of the residents. This article will provide a snapshot of surveillance of infections and MDR organisms in RACFs, antibiotic prescribing in RACFs, including areas of antibiotic prescribing that needed improvement, and the role of antimicrobial stewardship.

Surveillance of infections and MDR organisms in RACFs

In Australia, an integrated surveillance system for monitoring infections in RACFs, which would be useful to guide antibiotic prescribing and infection management, remains to be established. Prior to 2011, there was a scarcity of published data describing the trends of infections in the Australian RACF setting. In 2011, Forrest et al reported an average baseline infection rate of 3.2 infections/1000 occupied bed days (OBDs) over a 9-year period (2001–2009) in five RACFs in Sydney. A 6-month pilot study involving 30 RACFs in rural Victoria has shown a total reported infection rate of 3.6 infections/1000 OBDs, higher than the confirmed infection rate of 2.2 infections/1000 OBDs according to the McGeer criteria. The marked difference between the two rates and the variation in reporting between RACF nursing staff and infection control consultants warrants further investigation. Another local study by Lim et al reported that although the types and incidence rate of infection (3.2–4.6 infections/1000 OBDs) in Australian RACFs were comparable with overseas data (1.8–11.8 infections)/1000 OBDs), the patterns of antibiotic use in Australian RACFs, compared with those abroad were different. This highlights the importance of understanding local epidemiology of infections and antibiotic use in the RACF setting.

RACFs are potentially an important reservoir for MDR organism transmission in the community. Frequent patient transfers between RACFs and acute-care hospitals can be a source for organism transmission in both directions. In the literature, there seems to be a shift in the epidemiology of MDR organisms in RACFs over the last decades. Generally, studies conducted in the 1990s and early 2000s reported that MDR Gram-negative bacilli (GNB) colonisation was less commonly observed when compared with methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE). However, studies from the late 2000s have shown an emergence of MDR GNB; some studies highlight that MDR GNB colonisation rates far exceed those of MRSA and VRE. The emergence of MDR GNB was not limited to asymptomatic carriage but also in clinical cultures for presumed infections. Accordingly, there is a need to re-evaluate existing infection control strategies to focus on the emergence of MDR GNB in the RACF setting.

Of local relevance is the emerging trend with MDR GNB in Australian RACFs as reported by Stuart et al and Lim et al. Indeed, it is of concern that a cluster of carbapenem-resistant Acinetobacter baumannii, which has not been reported in the RACF setting elsewhere, was identified by Lim et al who conducted their study in four RACFs in Victoria. Awareness of the emerging trend is pivotal to guide empirical antibiotic treatment among this high-risk population, and emphasises the importance of microbiological investigation to guide appropriate antibiotic use. Identifying risk factors for acquiring MDR organisms enables appropriate selection of empirical antibiotic therapy to optimise clinical outcomes. Knowledge of the risk factors will also guide targeted infection control interventions to minimise the emergence or spread of MDR organisms.

Recent hospitalisation has been recognised to be independently associated with acquisition of MRSA and VRE, but was less commonly associated with MDR GNB colonisation. Prior exposure to antibiotics, particularly broad-spectrum antibiotics such as fluoroquinolones, seems to be one of the most prominent risk factors associated with colonisation or infection with MDR Gram-positive and Gram-negative organisms in the RACF setting. In contrast to other age-related risk factors, such as presence of a wound or pressure ulcer and physical function deterioration (all of which are not modifiable to any great extent), reducing unnecessary or widespread use of antibiotics might be a more straightforward strategy to curb the rapid emergence of MDR organisms.

Antibiotic prescribing in RACFs

Widespread antibiotic prescribing is frequently reported in the RACF setting. Exposure to at least one course of antimicrobials occurs in 50–75% of RACF residents annually, and more than one in 10 residents receive an antimicrobial at any given time. Existing surveillance activities in Australian RACFs have focused mainly on monitoring infection rates; limited attention has been given to antibiotic use or resistance patterns. Two single day point prevalence studies reported prevalence rates of 8–9% for antibiotic use, whereas a longitudinal study has documented antibiotic use of 7.07 courses/1000 OBD in Australian RACFs. Interestingly, the patterns of antibiotic prescribing in RACFs vary across different countries, with prescribing patterns more comparable in studies conducted within the same country. For instance, the United States and Canadian RACFs commonly reported significant use of fluoroquinolones, whilst other countries such as Australia showed lower use of these antibiotics. The reduced prescribing of fluoroquinolones in Australia may be due to the reimbursement policy that restricts the indications for prescribing of these agents. Similarly, the use of intravenous (IV) antibiotics can also be influenced by the policy or healthcare model of an individual RACF.
Table 1. Antibiotic prescribing in RACFs – areas of concern

<table>
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<tr>
<th>Areas for potential antibiotic misuse</th>
<th>Evidence/reasons</th>
<th>Changes to be considered</th>
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<td>Antibiotic therapy for asymptomatic bacteriuria33,40,46</td>
<td>• Strong evidence from several RCTs for not treating asymptomatic bacteriuria in institutionalised elderly patients, given the lack of treatment benefit47 • Association with increased antibiotic resistance48 • Asymptomatic bacteriuria is widespread among RACF residents with chronic indwelling urinary catheters but antibiotic therapy does not prevent recurrent bacteriuria nor symptomatic infection49</td>
<td>• Urinalysis and/or urine cultures should not be collected from asymptomatic patients • Nearly all chronically catheterised patients are bacteriuric;50 thus, indwelling catheter should be changed prior to the initiation of antibiotic and a urine specimen collected from the newly placed catheter • Discontinuation of catheter use and proper aseptic technique in changing catheter are keys to prevent UTIs or other urinary complications49</td>
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<td>Widespread use of prophylactic antibiotics for UTI33,37,51</td>
<td>• Inconclusive evidence for long-term urinary prophylaxis among institutionalised elderly patients in RACFs.52 Prolonged antibiotic use in the absence of infection risk selecting for resistant organisms</td>
<td>• Other alternatives (eg cranberry products) could be considered before starting prophylactic antibiotic53 • Long-term antibiotic prophylaxis is only recommended for women experiencing ≥2 symptomatic UTIs over a 6-month period or ≥3 episodes over a 12-month period, after an existing infection is eradicated54</td>
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<td>Empirical antibiotic prescribing without microbiological investigation38,44,46</td>
<td>• Inappropriate empirical antibiotic prescribing is often associated with poorer clinical outcomes and may increase risk of mortality in some cases55 • Causative agents should be identified, especially in symptomatic UTIs, to guide empirical antibiotic therapy</td>
<td>• Initiate empirical antibiotic therapy if infectious symptoms are of sufficient intensity that a delay of 2–3 days while waiting for culture results is not appropriate7 • Proper documentation of previous antibiotic susceptibility results could guide empirical prescribing, when it is not possible to obtain a culture</td>
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<td>Widespread antibiotic prescribing for URTI or acute bronchitis46,56</td>
<td>• Among the institutionalised elderly, URTIs are usually due to viral pathogens, where empiric antibiotic treatment is seldom necessary, unless these involve prolonged symptoms, or patients with pre-existing underlying lung diseases7</td>
<td>• Differentiation between viral and bacterial origin of presumed RTI is critical to reduce inappropriate antibiotic use • A minimum set of criteria regarding patient assessment and investigation should be followed prior to decisions on antibiotic therapy7</td>
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<td>Prolonged duration of antibiotic treatment57,58</td>
<td>• Evidence that antibiotic courses of ≤7 days are as effective as longer treatment duration for most common bacterial infections50 • Unnecessarily prolonged antibiotic treatments increase the risks for antibiotic resistance and side effects</td>
<td>• Prescribers to have access to aged care evidence-based antibiotic treatment guidelines (with recommendations about appropriate dosages and duration of therapy)60 • All antibiotic treatment plans, particularly those via phone orders, should be properly documented in antibiotic ordering form with clear treatment indications and planned duration of treatment/cessation date61</td>
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<td>Widespread prescribing of quinolones as empirical treatment for UTIs42,43,62</td>
<td>• Excessive use of quinolones is mainly due to their excellent bioavailability, long half-life and broad-spectrum activities which are suited for treatment of lower respiratory tract infection, as well as complicated UTIs.51 • High rates of quinolone-resistant Gram-negative organisms have been reported in RACFs with high quinolone use64</td>
<td>• Avoid quinolones as first-line empirical therapy7,60 • If a quinolone is prescribed, microbiological culture and sensitivity should be performed and treatment re-assessed</td>
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<td>Broad-spectrum or parenteral antibiotic treatment for elderly residents with advanced dementia or end stage of illness65,66</td>
<td>• Some evidence indicating antibiotic therapy may be futile (ie did not prolong survival or reduce discomfort) for the end stages of life67 • Other studies have reported that antibiotics relieve discomfort among dying patients60,63</td>
<td>• Aggressive antibiotic therapy for pneumonia in RACF residents with advanced dementia is contentious and may be best guided by advance care directives</td>
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RCTs, randomised controlled trials; RTI, respiratory tract infection; UTI, urinary tract infection; URTI, upper respiratory tract infection
Some facilities reported that 7–9% of antibiotics are administered parenterally, whereas others showed <1% usage of IV therapy. In Australia, administration of IV antibiotics is normally provided by specialised support from hospitals.

There has been little research exploring the factors responsible for the variation in antibiotic prescribing. Importantly, a population-based study involving 363 RACFs in Canada showed that variation in antibiotic prescribing did not seem to be driven by resident (clinical characteristics, infection burden, etc) nor facility-associated (size of RACF, institutional antibiotic policy, etc) factors; instead, it was influenced by the prescriber’s preference. These findings suggest that interventions to improve antibiotic use should focus on influencing antibiotic prescribing behaviour.

### Appropriateness of antibiotic use and antimicrobial stewardship (AMS) in RACFs

About 40–75% of antibiotic use in RACFs has been considered inappropriate. Indeed, two Australian studies reported that up to 40% of antibiotics prescribed are for episodes that did not meet the McGeer criteria. It should be noted, however, that the McGeer criteria were developed for surveillance rather than as definitions to assist clinical decision making. Thus, the criteria should be considered as conservative guidelines for assessing antibiotic use, and the data pertaining to ‘inappropriate’ antibiotic use based on these criteria should be interpreted with caution.

Identifying antibiotic prescribing patterns, particularly the areas of potential antibiotic misuse/overuse, is imperative to prioritise the allocation of resources for further AMS interventions in the RACF setting. Some areas of concern that warrant further investigation are highlighted in Table 1.

A recent Australian study has suggested that AMS interventions are needed to improve antibiotic use and deemed useful by all key stakeholder groups, including GPs, nursing staff and pharmacists. Although there are practical organisational challenges to be overcome, feasible AMS interventions applicable to the Australian setting have been proposed. Fundamentally, AMS initiatives should commence with the least costly and intrusive approach, and more advanced measures should be added incrementally on the basis of available resources and institutional needs, with an aim to promote prudent antibiotic prescribing practices.

### Conclusions and future directions

The need to optimise antibiotic use and prescribing through AMS programs in Australian RACFs is becoming critical given the increasing evidence of inappropriate antibiotic prescribing and the emergence of antibiotic resistance in this setting. Indeed, curbing widespread antibiotic prescribing will also prevent other adverse consequences associated with inappropriate antibiotic use such as development of *Clostridium difficile* infection, potential drug–drug interactions and side effects, and may possibly reduce healthcare costs. In the Australian setting, establishing clearer guidelines and models for AMS programs specifically targeting RACFs should be considered. Although there have been successful AMS initiatives from overseas settings, these have not been sufficiently explored within the Australian RACFs and should be trialled.

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### References


