ANTIMICROBIAL STEWARDSHIP | CELLULITIS | ENDOCARDITIS | HEALTHY AGEING

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The Antibiotic Issue

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Infective endocarditis is a relatively rare infection of the inner layer of the heart's valves and chambers. Approximately one-third of cases of endocarditis in New Zealand are caused by streptococci that are normal oral flora and are associated with plaque, dental caries, gingivitis and peri-odontitis. New Zealand guidelines for the prevention of infective endocarditis recommend good oral hygiene for people at higher risk because of a pre-disposing cardiac condition, and prophylactic oral antibiotics when undergoing specific dental procedures or tonsillectomy/adenoidectomy. The routine use of prophylactic antibiotics solely for endocarditis prevention for people who are not at high risk is not recommended. In this article we discuss the rationale for giving endocarditis prophylaxis, present the key points of the New Zealand 2008 Heart Foundation guidelines and provide an update on recent developments in this field.

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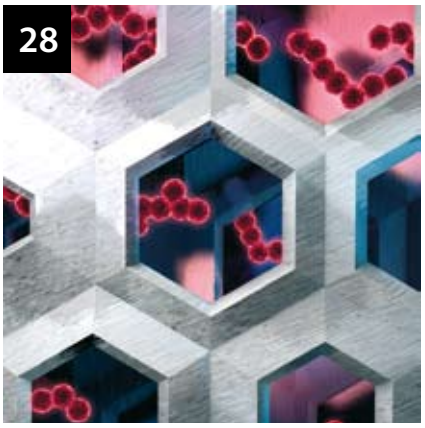

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Time to **reduce antibiotic prescribing – NOW**

Contributed by: Associate Professor Mark Thomas, Faculty of Medical and Health Sciences, University of Auckland.

New Zealand is awash with antibiotics. Each year, per head of population, we swallow more antibiotic syrups and pills, and smear more antibiotic creams on our skin, than people in most similar developed countries. A recent study of antimicrobial prescribing in Te Tairawhiti found that during a one year period, more than 50% of the population received at least one prescription for an antibiotic.[1] In 2012, across the whole of New Zealand, there were approximately 180 antibiotic prescriptions dispensed for every 100 children aged less than five years. In adults aged 25–29 years (the age group with the lowest level of antibiotic prescribing) there were more than 60 antibiotic prescriptions dispensed per 100 people.[2] In New Zealand, in every year since 2006, at least one person in 20 has been dispensed a tube of either Bactroban® or Fucidin® antibiotic ointment.[3] These levels of community antibiotic consumption greatly exceed those in the Netherlands, Sweden or Germany, and are slightly higher than those in Spain. Of the large European countries only Italy, France, Belgium and Greece have higher levels of antibiotic consumption than New Zealand.[2] Unfortunately, not enough attention has been focused on the excessive prescribing of antibiotics in New Zealand, and on developing strategies to reduce this prescribing.

The high level of antibiotic consumption in New Zealand will inevitably have a long-term environmental impact. The situation can be likened to other problems arising from excessive consumption, such as global warming secondary to excessive energy consumption, waterway pollution secondary to excessive deposition of nitrogenous fertilisers on farmland and depletion of marine fish reserves through overfishing. The common resource that we are depleting through our excessive antibiotic use is the ecosystem of antibiotic susceptible microbes that previously colonised our mouths, intestines and skin.

Each episode of antibiotic use may (or may not) hasten the resolution of the illness for which it was prescribed, but also will inevitably exert a selective pressure on the countless organisms colonising the patient. This selective pressure favours the survival and proliferation of antibiotic resistant microbes in the patient's mouth, intestines and skin, and these resistant organisms also colonise their close contacts. The change in the microbes colonising the patient, and their family, commonly persists for months to years. Because a high proportion of common infections arise from colonising microbes, infections that occur in the months after an antibiotic course are very likely to be due to antibiotic resistant bacteria. For example, the risk that a respiratory tract infection is due to an antibiotic resistant strain of *Streptococcus pneumoniae* remains elevated for at least six months following brief treatment with a macrolide antibiotic. Similarly the risk that a urinary tract infection is due to an antibiotic resistant strain of *Escherichia coli* remains elevated for up to twelve months following brief treatment with trimethoprim or amoxicillin.[4]

Most antibiotic consumption occurs in the community, and approximately 50–80% is for patients with self-limiting respiratory tract infections. The lack of evidence for a significant patient benefit from antibiotics in patients with self-limiting respiratory tract infections led the National Institute for Health and Care Excellence (NICE) in the United Kingdom to advise in 2008, that an antibiotic should not be prescribed for the overwhelming majority of patients with acute otitis media, a common cold, acute rhinosinusitis or acute cough/bronchitis.[5] Despite this advice, which is echoed by a variety of other similar advisory panels, surveys of general practitioners in New Zealand, Australia, the United Kingdom and elsewhere, indicate that a very high proportion of patients with these infections are unnecessarily prescribed an antibiotic.[6–8]

Doctors have a long history of prescribing medicines that turn out not to have been in the best interests of their patients: barbiturates, benzodiazepines and opiate analgesics are some well-recognised historic and recent examples.[9] Doctors commonly place the blame for such harmful prescribing on their patients – the patients "demand" the treatment and the doctors feel compelled to comply with these "demands". However, doctors have a much better understanding than their patients about the potential harms that may arise from unnecessary antibiotic prescribing and therefore are responsible to lead the changes in antibiotic consumption that our society needs. As with other harmful drugs, doctors need to have the strength to "just say no".[10]

We also need to lift our game in terms of our decisions about which antibiotics are sensible choices for the treatment of common infections. We all know that when a range of medicines are likely to be effective in treating a bacterial infection we should generally select the most narrow spectrum agent, but in practice this does not always occur. The reasons commonly given for selection of unnecessarily broad spectrum agents, e.g. convenience of dosing regimens, palatability of antibiotic syrups, need to be reconsidered in the light of the contribution that broad spectrum antibiotics make to encouraging the spread of antibiotic resistant bacteria.

Below are three simple changes in practice that all prescribers could, and should, consider:

1. Do not prescribe an antibiotic for patients with a sore throat who are not of Māori or Pacific ethnicity and not aged between 5 and 18 years
2. Do not prescribe amoxicillin clavulanate for skin infections caused by *Streptococcus pyogenes* or *Staphylococcus aureus*, but instead prescribe penicillin V or flucloxacillin
3. Do not prescribe ciprofloxacin or norfloxacin for patients with urinary tract infections, unless the infection has failed to respond to a more narrow spectrum agent such as nitrofurantoin or trimethoprim

It is not going to be easy to change our own established practices, and also our patients' expectations, but present and future generations will not look kindly on us if we continue to squander the utility of antibiotics and leave them with markedly fewer options for treating infections in the coming decades.

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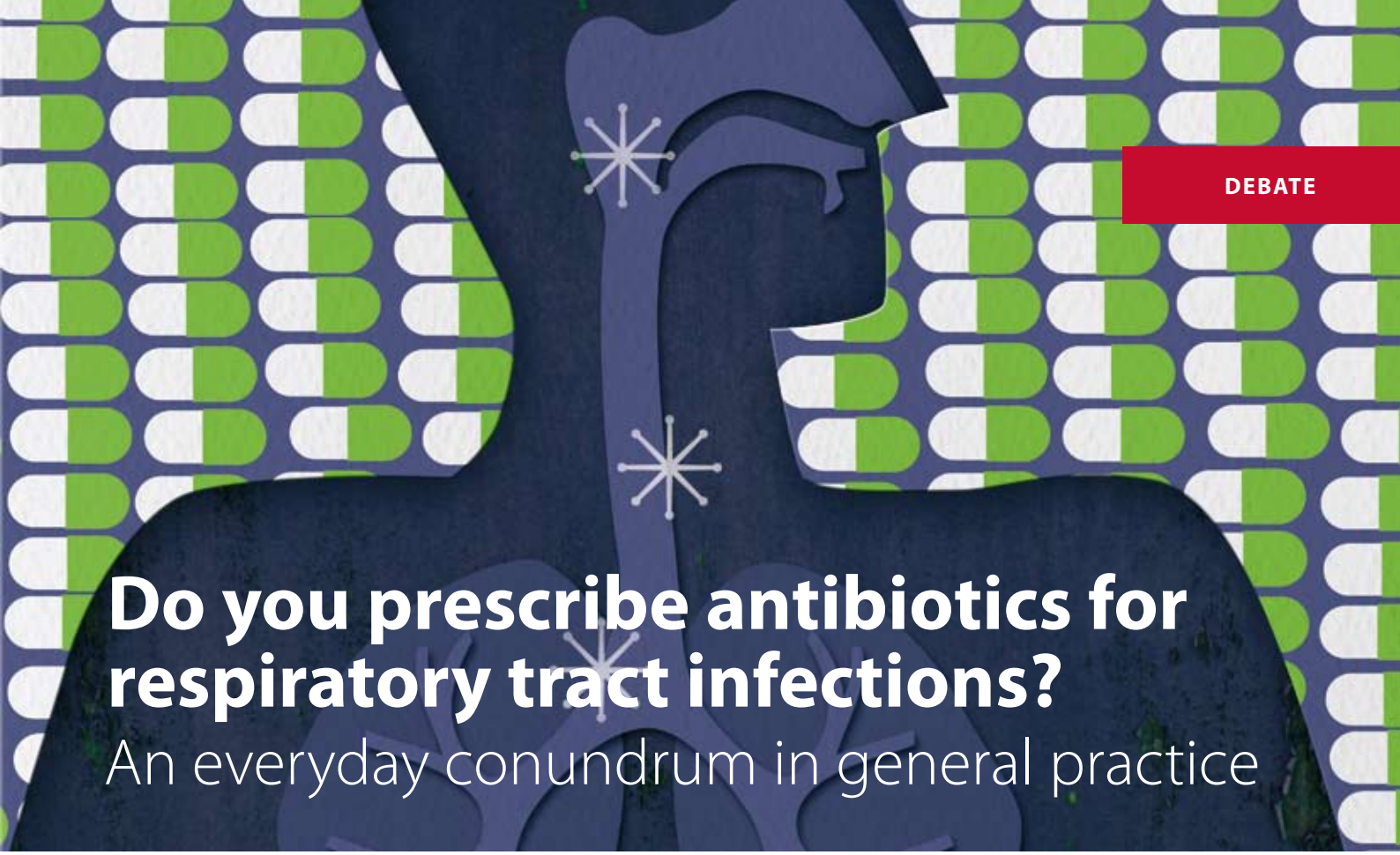

DEBATE

Do you prescribe antibiotics for respiratory tract infections?

An everyday conundrum in general practice

Appropriate prescribing of antibiotics for patients with respiratory tract infections (RTI) is a key component of improving antimicrobial stewardship in New Zealand. Most respiratory tract infections, particularly those affecting the upper respiratory tract, are viral in origin and self-limiting. Antibiotic treatment should ideally be reserved for specific subsets of patients with bacterial respiratory tract infections such as community acquired pneumonia, or used if the potential for complications for that person are high or if the infection is not resolving within an expected timeframe.

It would be assumed, therefore, that the management of people presenting with respiratory tract infections is relatively straight forward and the decision not to prescribe an antibiotic an easy one to make. However, every day, and often several times a day, primary care clinicians see a range of people with symptoms that are consistent with a number of possible respiratory tract infections, and many factors can influence their decision about whether or not to prescribe an antibiotic. It has been reported that approximately 60% of all antibiotic prescribing in primary care in the United Kingdom is for patients with respiratory tract symptoms,[1] and although there are no similar New Zealand figures, it is likely that comparable prescribing trends occur here.

Both clinical and non-clinical factors can influence treatment decisions for patients with respiratory tract infections. The initial clinical evaluation, i.e. history and examination, can provide information about the probable cause of the patient's symptoms but it is often difficult to distinguish clinically between viral and bacterial infections. A fear of not "missing" the diagnosis of a significant bacterial infection may mean that if there is clinical uncertainty, clinicians err on the side of caution and prescribe. This may be an appropriate response, particularly if the risk of not doing so is high, e.g. non-specific respiratory symptoms and signs in a patient who is immunosuppressed. In other situations, clinical guidance may recommend that an empiric antibiotic is appropriate, e.g. a child with a sore throat who has risk factors for rheumatic fever, or a student who has symptoms and signs that may suggest meningitis.

Non-clinical factors can also complicate management decisions. Often there is expectation and pressure from the patient for an antibiotic because they perceive that it will improve their symptoms – sometimes the clinician will assume that the patient wants an antibiotic. Other factors that may impact prescribing decisions include: the day of the week (the "Friday afternoon consultation"), important life events ("I'm flying tomorrow", "I have a major examination/singing competition"), and previous experiences affecting either the clinician or the patient, particularly any that have had bad outcomes.

Whatever decision is made, a key factor is to effectively communicate the reasons for this decision to the patient, and to provide advice about non-antibiotic strategies for the patient to manage their symptoms. Good clinician-patient communication has been shown to reduce the rates of

antibiotic prescribing for respiratory tract infections both at the initial consultation and during future consultations.[2]

To try to shed some light on what actually happens in consulting rooms around the country, we asked a number of health professionals for their thoughts and opinions on their approach to the management of people with respiratory tract infections.

Q: What key clinical and non-clinical factors do you take into account in the initial assessment of a patient with a respiratory tract infection and when deciding if a patient needs an antibiotic?

Duration, severity and progression of symptoms appear to be the key factors for primary care clinicians when deciding whether a patient with a RTI requires an antibiotic. Important signs on examination include chest sounds, temperature, respiratory rate and hydration status, along with characteristics of cough if present, and whether the patient appears systematically unwell. Other clinical factors which are taken into consideration include co-morbidities (e.g. if the patient has COPD), immune status and previous history of complications with a RTI.

The most frequently cited non-clinical factors which affect the decision to prescribe an antibiotic were the patient's living and social circumstances, including whether there are other vulnerable people present in the household, and the patient's ability to re-consult or access after-hours services if required. Important life events and patients concerns and expectations also factor into the decision to prescribe antibiotics for some clinicians.

"For a patient to need an antibiotic (rather than want or request one) I would need to have a bacterial diagnosis, such as pneumonia, or enough symptoms and delay to consider sinusitis or otitis media. I don't think there is such a thing as a secondary bacterial infection. Coloured sputum is not an indication for an antibiotic unless there are other signs and symptoms that make one think of pneumonia. A sick looking patient may make me err on the side of giving an antibiotic but then I should be thinking of admitting the patient."

What diagnostic tests, if any, would you perform and why?
There was general agreement that laboratory investigations are not routinely required for patients presenting with a non-complicated RTI. The exception to this was taking a throat swab in a patient presenting with a sore throat, with risk factors for rheumatic fever. If a patient was very unwell, if they had persistent symptoms or if there were significant concerns, investigations may include full blood count, CRP, referral for chest x-ray if indicated and occasionally sputum culture if cough is persistent.

Q: How do you manage patient expectations about antibiotics?

"Every upper RTI is an opportunity for education and re-enforcing key messages [about antibiotics]."

There is no standard approach to managing expectations, as patients have a variety of beliefs about antibiotics, ranging from those who have come from countries where receiving an antibiotic is standard to those who are concerned that taking an antibiotic will affect their immunity. It is a useful approach to ask the patient about their expectations regarding antibiotics early in the consultation.

Clinicians felt that it was important to explain the following key messages about antibiotics to patients:

- The majority of RTIs are viral and self-limiting and do not require antibiotic treatment
- Antibiotics usually do not alter the course of illness in a non-complicated RTI
- The over-prescribing of antibiotics contributes to antibiotic resistance, which means that antibiotics might not work when they are needed, which is not only bad for the individual but also for the community as a whole
- Antibiotics are associated with adverse effects, e.g. diarrhoea, nausea, and in rare cases more serious outcomes such as allergic reaction
- Being prescribed an antibiotic in the past for a RTI does not necessarily mean that one is required in this case

Patient leaflets were thought to be useful in managing patient expectations, improving health literacy and complementing a verbal discussion to help patients understand why an antibiotic is not required for a RTI.

An example of a patient leaflet for the common cold and other respiratory tract infections is available from: **http://m.patient.media/pdf/4459.pdf**

"Starting the conversation by discussing the symptoms presented including auscultation and ENT observations as well as repeating the symptoms back to the person that they have described is a good way of letting them know you have heard them and take all their concerns seriously. E.g. 'So I have found that your chest is clear, your ears are looking fine and your throat is not inflamed but I do understand this has been making you feel very unwell and you naturally are concerned'. Then stating that these

symptoms point to an URTI, which is almost always viral in nature and will resolve without exposure to antibiotics. Explaining that as a clinician you are negligent if you prescribe inappropriately and there are certain checks and balances you also need to follow. Explain that all antibiotics carry side-effects, just like all other medicines, and therefore the scales must be topped heavily toward obvious benefit."

If the patient specifically asks for an antibiotic, how do you respond to the request?

"My experience is that those people who are more demanding are the people that are less likely to need them."

If the decision why an antibiotic is, or is not, being prescribed is effectively explained and communicated, this will be satisfactory to the patient in most cases. Discussing the key messages listed above, along with giving a firm and clear opinion that the patient does not need an antibiotic, are pivotal in the process of changing the expectations of patients who arrive at the consultation anticipating that they will leave with an antibiotic prescription.

However, no matter how well these messages are conveyed to the patient, there will inevitably be occasions when conflict arises and a more in-depth discussion is needed. One general practitioner suggests using the REBELS communication approach (see below) to overcome any differences in opinion.

"I will generally start by asking why they feel antibiotics will be of benefit. Then move onto the reasons I think we should or why we shouldn't. I always re-enforce the problems with overprescribing and the fact the antibiotics won't make any difference if there is no indication. I find a conversation about resistance developing with overuse very useful in these circumstances."

For further information about REBELS, see: **www.rnzcgp.org.nz/assets/documents/Publications/Archive-NZFP/Aug-2008-NZFP-Vol-35-No-4/HawkenAug08.pdf**

Q: If you decide not to prescribe an antibiotic, what information do you give the patient to help them understand and accept your decision?

What advice do you offer the patient about managing symptoms?

Symptomatic management strategies are frequently based around the patient's preference and what has worked for them previously. A shared decision-making process, following the patient's lead if it was reasonable, was one suggested strategy. Useful questions to ask the patient included: What have you tried in the past? Would you like to be prescribed analgesics? Is there anything else you think would help?

Management strategies most often recommended to patients include: rest, hydration, analgesics (paracetamol and ibuprofen), short-term xylometazoline +/- ipratropium-based nasal drops/sprays (e.g. Otrivin), salbutamol inhaler (if indicated), saline gargle, throat lozenges, antiseptic mouthwashes, chest rubs, steam inhalation and lemon and honey drinks. Over-the-counter (OTC) cough medicines were considered by most to have limited benefit and while not actively discouraged, were not recommended. Some clinics offer patients printed information about symptomatic treatments.

What type of follow up do you usually put in place?

Most clinicians advise patients to come back, or to phone the practice, if their condition deteriorates or if their symptoms do not resolve (the exact timeframe for this is dependent on specific patient risk factors). There was, however, acknowledgement that some patients would be unable to afford the cost of re-consultation. Ensuring that the patient is aware of the likely duration of symptoms is important, e.g. it may take five to ten days before they start to feel better and cough might persist for four to six weeks. It is also important that patients (or caregivers) understand "red flag symptoms" to watch out for, e.g. fever, drowsiness, vomiting, diarrhoea, rash or breathing difficulties, and to know what to do if these occur, e.g. ensuring that the patient has access to after-hours medical treatment and Healthline.

"The trick is that you always want to say that people should come back if they do not improve but people can often not afford to do this. Providing ways like contacting the nurse if feeling worse or taking their own temperature at home and monitoring alongside the usual cares like rest, hydration, eating well, sleep are the 'medicines' most suited."

Q: Have you experienced any negative consequences of not prescribing an antibiotic? This could include, for example, patient dissatisfaction or a poor clinical outcome.

"Yes I had a patient recently who got pneumonia and he now sees a colleague who is a big prescriber of antibiotics."

The development of wheeze or lower RTI symptoms, especially in children, is one of the most frequent reasons for patients re-consulting, who were not originally prescribed antibiotics. Most clinicians reported that they had few negative outcomes of not prescribing an antibiotic to a patient with a RTI, most likely because the patient had returned when their condition deteriorated or they had used the "safety net" of giving the patient a prescription for an antibiotic to use later if necessary (also see: "Back pocket prescriptions").

In terms of patient dissatisfaction, one clinician noted that tourists were a particular patient group that were often unhappy to not be given an antibiotic if they have had to pay a large consultation fee to see the doctor. This was especially the case if they have had to visit another doctor, often in a different location, if their condition did not improve. Another clinician noted that patients seen in an after hours clinic are often much more dissatisfied with not receiving an antibiotic, and this may be attributed partly to not having an established patient-doctor relationship, as well as to the cost and perceived urgency of the consultation.

Q: Do you think the use of back pocket prescriptions (delayed prescribing) is a useful strategy?

"It is a useful first step in weaning patients of their 'false' belief in the need for antibiotic."

"Back pocket prescriptions can be a stepping stone (or perhaps trying to 'sow the seed') to changing health seeking behaviour."

Most clinicians expressed some support of the strategy of providing a patient with a RTI who did not require an immediate antibiotic, with a prescription for an antibiotic that they could fill at a later date if it became necessary. However, clear communication about when the antibiotic should, and should not, be used was essential. This strategy may not be useful for every patient, depending on individual circumstances. For example, for some patients, giving a delayed prescription would save them the time and cost of returning for a consultation, which they may be unlikely or unable to do. But for other patients, giving a back pocket prescription for an antibiotic after trying to explain why they do not currently require an antibiotic, can give a mixed message. It can also be challenging to effectively communicate how to appropriately use the prescription in people with lower levels of health literacy or English as a second language. Some patients will feel reassured knowing they have a prescription to use if they need it, but others will just use it anyway without fully understanding if it is appropriate.

"We do have to respect that it can be inconvenient and expensive for patients to come to the doctor so I think we should give them a prescription if it may be needed in the near future, and educate them when to take the antibiotics".

Under what circumstances would you consider writing a "back pocket" antibiotic prescription?

Back pocket prescriptions are most often considered for patients who have had symptoms for more than a few days or patients with co-morbidities which could increase their risk of developing complications. Travellers, non-registered patients and patients with unreliable living arrangements were more likely to given a back pocket prescription. These prescriptions were also more likely to be given later in the week, to cover the weekend. Some clinicians also admitted to using the strategy of a delayed prescription if they had difficulty convincing the patient they did not require an antibiotic. A delayed prescription could also be a safety net for the clinician too, when an initial diagnosis is unclear.

"At our practice I am trying to institute a policy of no antibiotics to start with if not felt to be clinically relevant, but give the patient the option of ringing the nurse back if deteriorating and a prescription is then generated for no cost".

"In patients who are culturally used to getting antibiotics (often those of Indian/Asian cultures who expect medicines from clinicians) – I try to use back pocket prescriptions to save debate – but generally they cash in the script anyway".

"Yes, I give a back pocket prescription where there is initial uncertainty and it is not unreasonable clinically. I would give an antibiotic with narrow spectrum/low side effect/low risk of increasing community resistance".

Acknowledgement: Thank you to the following primary care clinicians who contributed to this debate – **Professor Bruce Arroll** (General Practitioner), **Dr Roger Baillie** (General Practitioner), **Dr Bryan Betty** (General Practitioner), **Dr Rachel Davidson** (General Practitioner), **Dr Liz Scott** (General Practitioner), **Leanne Te Karu** (Pharmacist Prescriber), **Dr Neil Whittaker** (General Practitioner), **Rebecca Zonneveld** (Nurse Practitioner).

If you would like to have your say, you can contribute your responses to these questions at: **www.bpac.org.nz/bpj/2015/june/debate.aspx**

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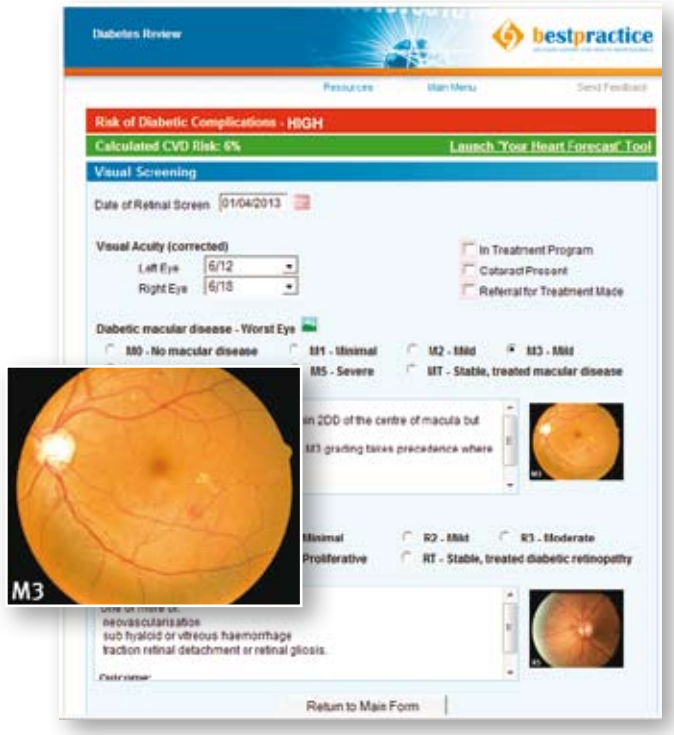

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Quickfire questions about antibiotics

Is it ok to stop antibiotics when symptoms resolve?

Traditionally, clinicians and health authorities advocate that patients should complete their full course of antibiotics as prescribed, even when their symptoms have improved, to prevent relapse of infection and the development of antibiotic resistance. A recent perspective in the Medical Journal of Australia has reignited debate on this guiding principle of antibiotic use.[1] The argument is that stopping antibiotic treatment once the patient's symptoms have resolved is a reasonable course of action in many situations, and is not likely to lead to relapse or promote antimicrobial resistance. Prescribers and patients are increasingly adopting this approach, in appropriate clinical situations.

> *"There is no risk – and every advantage – in stopping a course of an antibiotic immediately [after] a bacterial infection has been excluded or is unlikely; and minimal risk if signs and symptoms of a mild infection have resolved."*

—Professor Gwendolyn Gilbert, Clinical Professor in Medicine and Infectious Diseases, University of Sydney[1]

The most obvious circumstances in which it is appropriate to stop antibiotics when symptoms resolve are when the antibiotics were commenced without certainty of what infection is being treated, if any treatable bacterial infection is present at all, and for infections that are almost always self-limiting, e.g. conjunctivitis, bronchitis. Patient expectation often plays a role in the decision to start antibiotic treatment in these cases.

The debate around stopping antibiotics is essentially about ensuring that antibiotics are commenced appropriately in the first place. Important questions to consider include: is it more likely than not that the patient has a bacterial infection? Will prescribing an antibiotic result in a better clinical outcome? Will the infection resolve without treatment? Will the potential adverse effects of the antibiotics outweigh the benefits? Are laboratory investigations indicated? Can antibiotic treatment be delayed until infection is confirmed?

If antibiotics make little or no difference to clinical outcomes, it would seem logical that they could be stopped once symptoms have resolved – or ideally not be started in the first place. However, if an antibiotic is clearly beneficial, can it also be stopped if symptoms resolve? Although dependent on the individual clinical scenario, it has been suggested that stopping antibiotics earlier than a standard course might be considered for patients with moderate pneumonia, sinusitis, urinary tract infections, cellulitis or other substantial skin infections. For these patient groups, the main considerations for stopping antibiotics are whether the antibiotic course has been long enough for that particular bacterial infection, whether symptom resolution is a good marker of having taken enough antibiotic and whether stopping the antibiotic might increase the risk of relapse of infection and the development of antibiotic resistance.

There are many scenarios where stopping antibiotics upon resolution of symptoms is not appropriate, such as when eradication of the bacteria is the aim, e.g. treating group A streptococcal (GAS) pharyngitis in patients at risk of rheumatic fever, or in patients with more severe "deep-seated" or complex infections, e.g. osteomyelitis, endocarditis and tuberculosis, where small numbers of bacteria can persist despite a marked improvement in symptoms and signs. Early stopping of antibiotics in these conditions increases the risk of the patient experiencing a relapse. Antibiotic courses should also be completed for the full recommended duration in some cases where the patient has no symptoms, e.g. asymptomatic bacteriuria during pregnancy or the eradication of latent tuberculosis, and when the patient has severe immune deficiency.

Newer guidelines recommend shorter durations of antibiotics

Resolution of infection is dependent on a person's immune response and the ability of the antibiotic to target the site of infection and remain there for an adequate duration. The specific type of pathogen and tissue damage caused by the infection also affect resolution.[2] The optimal duration of a course of oral antibiotics should be sufficient to substantially reduce the patient's symptoms and prevent relapse, while minimising adverse effects and the development of antibiotic resistance. The choice and duration of antibiotic treatment should be based on the most up to date national or local antibiotic guidelines and local antibiotic susceptibility data, taking into account the patient's symptoms and signs, site of infection, co-morbidities, immune status and possible pathogens.

Newer treatment guidelines increasingly recommend shorter durations of antibiotic treatment, based on evidence that cure rates are similar to those with longer regimens, which have often been derived from original clinical trials. For example, three days of trimethoprim is sufficient to treat a woman with an uncomplicated UTI,[3,4] whereas, previously seven to 14 days of treatment was recommended.[5] A single dose of azithromycin (1 g) can be used to treat patients with chlamydia, as an alternative to seven days of doxycycline.[3,6] A 2011 systematic review concluded that shorter antibiotic courses (five to seven days) were as effective as longer courses (14 days or more) for patients with uncomplicated pyelonephritis or community-acquired pneumonia.[7] This finding was supported by a 2013 review which concluded that short courses of antibiotics (e.g. three days) were as effective as longer courses (e.g. ten days) in patients with mild to moderate community-acquired pneumonia.[8] Current New Zealand guidance for community-acquired pneumonia recommends five to seven days of treatment.[3,4]

Other examples of evidence for shorter durations of antibiotics include:

- 87 patients with uncomplicated cellulitis were randomised to five or ten days treatment with levofloxacin – no significant difference was found between groups in the rate of cure without recurrence at 28 days (98%)[9]
- 2000 children with mild pneumonia were randomised to three or five days treatment with amoxicillin – there were no difference in clinical outcomes between groups[10]
- A review of ten randomised controlled trials involving 652 children with lower urinary tract infection (UTI) randomised to two to four days or seven to 14 days antibiotic treatment – no difference was found between groups in positive urine cultures after treatment, resistant organisms or recurrent UTI[11]

Do the same antibiotic duration recommendations apply to all patients?

Guidelines on duration of antibiotic treatment reflect a regimen that is likely to be successful in most cases. This means that for some patients a shorter course is all that is needed and for others a longer course is required. The severity of infection often influences how long an antibiotic is given for, along with other factors such as the patient's immune status, co-morbidities and whether this is a recurrent infection. For example, in an analysis of optimal antibiotic treatment durations for UTI in children, some patients had resolution of symptoms after a single dose while others required up to ten days treatment.[12] The authors were able to conclude that for most children, two to four days treatment is sufficient,[12] but this recommendation will not apply to every patient that is treated.

Dose and compliance may be more important than duration of antibiotic treatment

Giving the right antibiotic at an adequate dose, along with good compliance with the daily regimen by the patient, i.e. taking the correct dose at the appropriate intervals, may be more important for treatment success than taking an antibiotic for a long period of time.

Prescribing an adequate dose of an antibiotic improves its clinical efficacy. Ideally, antibiotics should be dosed according to their pharmacokinetic and pharmacodynamic qualities to achieve the best clinical outcomes for the patient, as well as limiting the spread of antimicrobial resistance.[2] For example, fluoroquinolones (e.g. ciprofloxacin) have maximum bactericidal activity when their concentrations are high, even for a relatively short time; these are "concentration-dependent" antibiotics, and would be expected to be effective using shorter treatment courses. In contrast, beta lactam antibiotics (e.g. amoxicillin, cefalexin) are "time-dependent" antibiotics and the drug concentration needs to be above the minimum inhibitory concentration for the specific pathogen for a sufficient duration of time to achieve the greatest efficacy.[2]

Symptom resolution is often a good indicator of cure in mild to moderate infections

Resolution of symptoms is used as a criterion for treatment success in antibiotic trials and correlates very highly with microbiological cure. In a study involving 119 patients

admitted to hospital with community-acquired pneumonia in the Netherlands, it was found that stopping antibiotic treatment after symptom resolution did not adversely affect patient outcomes. All patients were treated for three days with IV amoxicillin. After this time, patients were rated on five-point scales which assessed four respiratory symptoms (dyspnoea, cough, sputum production and colour of sputum – worsening to complete recovery) and general improvement (not recovered to completely recovered). Those patients whose symptoms substantially improved after three days (improvement of two or more points on the scales and temperature < 38°C) were randomised to receive oral amoxicillin or placebo for five days. There were no differences in clinical or radiological outcomes between patient groups after 10 and 28 days.[13]

Shorter courses of antibiotics do not increase bacterial resistance

The association between antibiotic use and resistance is complex, however, longer courses of antibiotics have been associated with the greatest risk of antimicrobial resistance at both an individual and community level.[1, 14] Increased antibiotic use exerts a selective pressure for the development of resistance by eliminating antibiotic-susceptible bacteria and leaving antibiotic-resistant bacteria to multiply, making future treatment more challenging.[14] The concept of finishing the antibiotic course to prevent resistance may apply to infections for which treatment is expected to eradicate the causative bacteria entirely from the body (e.g. tuberculosis, gonorrhoea), but does not apply to infections caused by normal body flora (e.g. most infections of the skin, urinary tract, upper and lower respiratory tract and abdomen), in which the bacteria will persist long after the symptoms and signs of infection have resolved. Even if the bacteria causing the infection are eradicated, the antibiotic will exert resistance pressure on other natural bacterial flora – and the longer the course, the more resistance will develop.

It can be reasonably assumed, therefore, that stopping an antibiotic after a few days of treatment will be no more likely to contribute to antibiotic resistance than taking the full course. The systematic review that compared short vs. standard duration antibiotic treatment for UTI in children found no significant difference between treatment durations in the development of resistant bacteria.[12] Other studies on carriage of antibiotic-resistant *Streptococcus pneumoniae* and pneumococci have demonstrated that a high dose of antibiotic for a shorter duration results in less bacterial resistance than a lower dose for a longer duration.[15, 16]

In conclusion: patient education is most important

Stopping antibiotics when symptoms have substantially resolved appears to be effective and safe for many patients, especially those who are unlikely to have a bacterial infection or who have a self-limiting bacterial infection. The outcome of this approach in patients with moderate infections such as pneumonia, sinusitis, urinary tract infections or skin infections requires more study, but has the potential advantages of improved convenience, reduced adverse effects and less pressure on antibiotic resistance. Published evidence is increasingly supporting prompt treatment of bacterial infections, when appropriate, with higher doses of antibiotics, taken reliably and for shorter durations.

Clear expectations about duration of treatment, as well as daily adherence to a regimen, need to be agreed upon between the clinician and patient when antibiotic treatment is prescribed, ideally at the start of treatment. If an antibiotic is prescribed for a clear indication, and a minimum duration is supported by evidence-based guidance, patients should be advised not to stop treatment until the end of the course. For many other infections, where the optimal antibiotic treatment duration is less certain, the patient may be advised that it is acceptable to stop treatment when symptoms resolve. The decision to stop an antibiotic earlier than the agreed duration should ideally take place only after a follow-up discussion between the treating clinician (or designated clinical staff member, e.g. practice nurse) and the patient, to ensure that clinical features of infection have actually resolved and that there are no misunderstandings about the role of the antibiotic. This is also an opportunity to reinforce to the patient that the leftover antibiotic should be safely disposed of and not kept for future use or use by another family member.

A New Zealand-based randomised controlled trial is planned for the summer of 2015/16 to compare standard course antibiotic treatment versus stopping treatment once symptoms resolve in patients with skin, chest, sinus and urinary tract infections. It is hoped that this study will provide some definitive answers for this debate.

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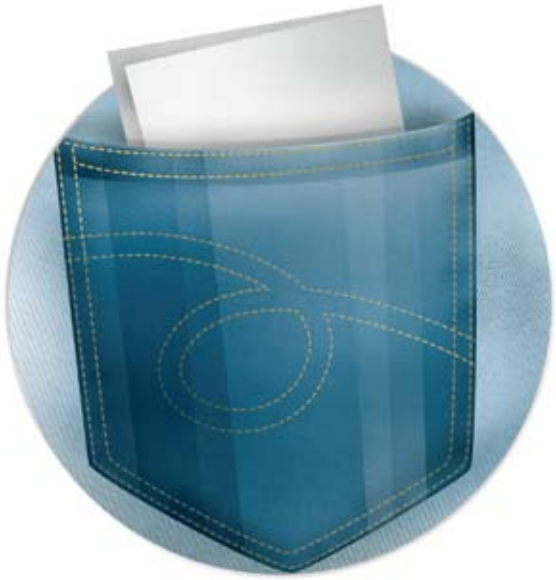

Delayed antibiotic prescriptions for respiratory tract infections: does the strategy work?

Delayed antibiotic prescribing, also known as a "back pocket prescription", is a strategy of providing a patient with a prescription for an antibiotic, but advising them not to fill it unless their symptoms persist or worsen, or if laboratory results (if requested) subsequently indicate a bacterial infection. Delayed antibiotic prescriptions are most often considered for patients with acute respiratory tract infections (RTIs), which is the focus of the following article.

Most patients with acute upper or lower RTI symptoms do not benefit from antibiotics and prescribing antibiotics inappropriately for these patients leads to unnecessary cost, adverse effects and the development of antibiotic resistance. Decades of observational and interventional studies involving thousands of patients have, however, identified subgroups of patients with conjunctivitis, sinusitis, sore throat and acute cough for whom antibiotics should be considered, based on the presence of key features in their history, examination or laboratory test results (see: "Antibiotics: choices for common infections", reference over page). These features may not be evident when the patient first presents to the general practice clinic, but may develop in the subsequent days to weeks. Options to capture this group of patients include immediate

prescription of antibiotics to all patients, a delayed prescription that can be used later if it becomes necessary, scheduling a follow-up consultation or phone call, and no prescription of antibiotics (the patient may return for reassessment later if new symptoms develop).

There are many factors that may contribute to the decision to offer a delayed prescription for a patient with a RTI, including concerns about the potential for symptoms to worsen significantly in a patient with co-morbidities, previous history of complications with RTIs, patient expectations and socioeconomic aspects such as the likelihood of the patient being able to return for a consultation if their condition deteriorates. Examples of the pros and cons of the delayed prescription strategy are listed in the box below.

The goals of delayed antibiotic prescription are to minimise antibiotic use for conditions in which an antibiotic has little or no benefit, to have no negative effect on symptom duration or rate of serious complications, to provide patient satisfaction and to positively influence patients' future expectations around antibiotic treatments. A number of studies have now evaluated delayed antibiotic strategy with these goals in mind.

For further information, see: "Antibiotics: choices for common infections", bpac^{nz} 2013, available from: **www.bpac.org.nz/Supplement/2013/July/antibiotics-guide.aspx**

What percentage of patients fill delayed antibiotic prescriptions?

It is estimated that up to 50% of patients given a delayed prescription for an antibiotic will collect their prescription.

A 2013 Cochrane systematic review compared delayed antibiotic prescribing versus immediate or no antibiotics in patients with a RTI.[2] Patients who were managed with a delayed prescribing strategy took fewer antibiotics (32%) than patients who were prescribed an antibiotic immediately (93%).[2] Patients who were not initially prescribed an antibiotic had the lowest level of subsequent antibiotic use (14%).[2]

Pros and cons of delayed antibiotic prescribing[1]

Pros	Cons
May reduce antibiotic use and therefore reduce adverse effects and antibiotic resistance (compared with receiving an immediate prescription)	May increase antibiotic use and therefore increase adverse effects and antibiotic resistance (if the antibiotic is used)
Safety net if more severe symptoms and signs develop	Risk that patient may fill the prescription regardless of their symptoms or for the wrong reasons
Fulfils expectations for some patients and maintains the clinician-patient relationship	Risk that patient may use the prescription inappropriately at a later date or for another family member
Empowers the patient to be actively involved in their treatment	May confuse messages about antibiotic stewardship
Reduces costs and time for the patient of having to re-consult	Instructions on using a delayed prescription may not be correctly understood or remembered by the patient if not communicated effectively by the prescriber
Allows control of factors such as the "Friday consultation", upcoming travel or important events	May result in negative perception of the clinician's competence
Reserves the use of antibiotics for more severe RTIs	Serious illness or complications may be missed at the first consultation, or patients who later develop serious illness or complications will collect the antibiotic prescription but might have been better re-consulting a doctor and receiving more comprehensive treatment, e.g. hospitalisation

A randomised controlled trial published after the Cochrane review found that 33 – 39% of patients given a delayed antibiotic prescription subsequently filled their prescription.[3] The study involved 889 patients who presented to primary care in the United Kingdom with an acute RTI. The 556 patients not judged to require immediate antibiotics were randomised to one of four delayed prescribing strategies ("re-contact" the practice by phone to request a prescription, "post-dated" prescription, placement of prescription at reception for "collection" and giving the patient a prescription with advice to delay – "patient led") or a "no prescribing" strategy. It is not clear what criteria the patients were advised for filling their prescription. No significant differences were found between the four delayed strategies in the percentage of patients who filled their prescription; 26% of patients who were not offered a prescription subsequently returned for re-consultation and filled an antibiotic prescription.[3]

A New Zealand study, which was included in the 2013 Cochrane review, found that just under half of patients given a delayed prescription took an antibiotic. The study randomised patients with an upper RTI presenting to a general practice clinic in Auckland, who requested antibiotics or were perceived to want antibiotics, to receive either an immediate prescription for an antibiotic or a delayed prescription with instructions to fill it after three days if their symptoms did not improve. It was found that 89% of the 62 patients who were given an immediate prescription used the antibiotic, compared to 48% of the 67 patients given a delayed prescription.[4]

Does delayed antibiotic prescribing lead to good clinical outcomes for patients?

Patients who take an antibiotic for a RTI are unlikely to shorten the duration of their symptoms, but they may be less likely to experience suppurative complications; however, the development of complications in a patient with an acute RTI, regardless of antibiotic use, is relatively uncommon.

It is probably not possible to demonstrate a difference in clinical outcome for antibiotic strategies in patient populations who are unlikely to benefit from antibiotics in the first place. It is not surprising, therefore, that there was no difference in symptom duration between patients randomised to delayed antibiotic prescribing versus no antibiotic in a population of patients with mostly upper respiratory tract infections and sore throats,[3] and in a population of patients with uncomplicated lower respiratory tract infections.[5] At least two studies, however, have detected a possible reduction in complications in patients assigned to delayed antibiotic prescription versus no antibiotic. In the primary care trial where patients were randomised to different antibiotic prescribing strategies, complications of RTI were experienced by 1.5% of patients who received a delayed prescription compared to 2.5% of patients who were given an antibiotic immediately and 2.5% of patients not given an antibiotic (not statistically significant).[3] In a non-randomised cohort study of 12677 patients with sore throat, the risk of complications was 0.58-fold in patients who used an antibiotic compared to those who did not (adjusted risk ratio 0.34-0.98).[6] The overall rate of suppurative complications observed among the patients in this study was 1.4%; otitis media (0.6%) quinsy (0.4%), sinusitis (0.3%), impetigo or cellulitis (0.2%).[6] Although the supportive evidence for this is not strong, prevention of late complications is a key goal of providing a delayed prescription to low-risk patients.

There was no measureable difference in adverse effects reported between patients using delayed and no antibiotic strategies.[3, 5] Antibiotic resistance rates were not measured.

Does delayed antibiotic prescribing help meet patient expectations and improve the clinician-patient relationship?

Patients who do not receive an antibiotic for a RTI are just as satisfied as those who do, provided that the reasons for not prescribing an antibiotic are effectively explained.

There is evidence that patients expect antibiotic prescriptions less often than physicians believe they do, and patient satisfaction is not reduced when the reasons for not prescribing an antibiotic are effectively communicated, including reassurance that an antibiotic is not always appropriate or effective.[7] It has also been reported that a patient's satisfaction scores are more strongly associated with receiving understandable information and reassurance than actually receiving an antibiotic prescription.[8]

This is supported by the findings of the Cochrane review. Overall, patient satisfaction was high with immediate (92%), delayed (87%) and no prescription (83%) strategies, with no significant differences in satisfaction between patients managed using the delayed or no antibiotic prescribing strategies.[2] In the primary care trial of antibiotic prescribing strategies, there were also no significant differences found in satisfaction between patients who did not receive an antibiotic (79% very satisfied) versus patients who were managed using the delayed antibiotic strategies (74 – 89%).[3]

In a New Zealand study of perceptions about delayed antibiotic prescriptions, it was found that patients were not as concerned about being involved in decision-making about their health care as their clinicians perceived them to be.[1] Most patients preferred their clinician to decide whether they needed an

antibiotic.[1] Some clinicians believed that offering a delayed antibiotic prescription would help the clinician to cope with the pressure to prescribe an antibiotic for a RTI and be favourably received by the patient, act to reassure the patient and prevent them from visiting another clinician for a prescription. However, the converse view was that by not making a decision about whether the patient needed an antibiotic, the patient may perceive the doctor to be incompetent.[1]

Patient satisfaction is strongly linked to patient expectations.[8] Patient expectations may be unreasonable, however, such as when a patient expects an antibiotic despite lack of evidence for benefit in that condition and in the face of increasing antibiotic resistance. Patient satisfaction should not be the only goal of the clinician-patient interaction but can hopefully be maintained in those not given an immediate antibiotic prescription by reassurance, positive advice on symptom-relief, and a strategy for identifying if a patient's condition is deteriorating.

Does delayed antibiotic prescribing help educate patients and improve future expectations?

Giving a delayed prescription, which is subsequently not required, can help to educate patients that in most cases, RTIs are self-limiting and can be managed with symptomatic treatment

There is some evidence that delayed prescriptions educate patients about the limitations of using antibiotics for RTIs and have a positive effect on future expectations about antibiotic prescribing for RTIs. A randomised controlled trial involving 807 primary care patients with an acute lower RTI, investigated the effectiveness of three antibiotic prescribing strategies (an immediate prescription for an antibiotic, a delayed prescription with advice to collect the prescription from reception if symptoms did not resolve after 14 days or no offer of antibiotics), with or without an information leaflet about antibiotics. Patients who received a delayed prescription were the least likely to believe in the effectiveness of antibiotics for RTI (40%), compared to those who did not receive a prescription (47%) and those who received an immediate prescription (75%).[5] Receiving the information leaflet did not have any effect on this outcome, possibly because all patients were also given verbal information about antibiotics.[5]

So, should a delayed antibiotic prescription be given to a patient with a RTI?

Yes…or no. It depends on the individual situation.

Taking all factors into consideration, it appears that patients can be effectively managed using a "no antibiotic" strategy rather than a delayed antibiotic strategy, when the prescriber judges that an immediate antibiotic is not required. The evidence suggests that not prescribing the patient an antibiotic initially, explaining why this decision has been made and ensuring that patients understand to contact the practice if symptoms do not resolve, is likely to reduce antibiotic use and result in similar clinical outcomes and patient satisfaction than using a delayed prescribing strategy. However, in practice there will always be exceptions to this.

Delayed prescriptions are a good option for many patients who do not need antibiotics at the time of consultation but may need them later. This strategy leads to far fewer prescriptions being filled than immediate prescription of antibiotics and only a few more being filled than for patients not initially offered a prescription. Patients given a delayed antibiotic prescription may have fewer complications of RTI, and satisfaction may be higher, compared with no antibiotic prescription although neither of these has been proven with statistical significance, and satisfaction is largely dependent on effective communication regardless of prescribing strategy. Giving a delayed prescription may have a positive effect on a patient's future expectations for receiving an antibiotic for a RTI, especially if their symptoms resolve without filling the prescription. This may be a good strategy for "weaning" a patient from the idea that they always need an antibiotic.

There are several ways to offer a delayed prescription, e.g. collect from reception, post-dated prescription, phone call – none has yet shown to be a better strategy than another. More research is needed to determine whether patients who fill delayed prescriptions do so for the right reasons and how this might be improved. Delayed prescription strategies will not suit all patients – some will benefit most from a face-to-face or telephone follow up, but combined with careful history and examination, reassurance, symptom-control advice and clear instructions on when to fill the prescription, it can be a good option.

For further discussion on prescribing antibiotics for RTIs, see our GP debate (Page 5).

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Should I prescribe a topical antiseptic cream instead of a topical antibiotic for minor skin infections?

Increasing rates of resistance to topical antibiotics continues to change the use of these medicines in primary care. Topical antiseptics have been suggested as an alternative, but at present, there is little evidence to support their effectiveness in the treatment of minor skin infections.

Topical antibiotics are associated with high rates of antibiotic resistance

In October, 2014 we published an article outlining appropriate use of topical antibiotics in response to concerns over increasing rates of bacterial resistance, in particular to fusidic acid (See: "Topical antibiotics: very few indications for use", BPJ 64). In early 2015 we updated our advice on the management of eczema in children (See: "Treating childhood eczema: a topical solution for a topical problem", BPJ 67). It has become increasingly apparent in the intervening months that recommendations regarding the role of topical antibiotics, such as fusidic acid, in superficial skin infections have narrowed further. Expert opinion now suggests that topical fusidic acid should no longer be considered for use in the treatment of children with infected eczema. The preference is for oral antibiotic treatment, chosen based on local resistance patterns, and with appropriate coverage for *Staphylococcus aureus* and *Streptococcus pyogenes* (Group A ß haemolytic streptococcus). Fusidic acid may remain an effective treatment option for children with three or less localised areas of impetigo,[1] however, in many cases, as with infected eczema, an oral antibiotic is likely to be more appropriate. Topical mupirocin should only be considered instead of fusidic acid if the infection is known to be resistant to fusidic acid and sensitive to mupirocin. Topical antibiotics (chosen according to culture results) do continue to have a role in the management of patients with recurrent skin infections who require *S. aureus* nasal decolonisation. The role of combination antimicrobial/corticosteroid products, such as hydrocortisone, natamycin and neomycin cream and ointment (Pimafucort) and betamethasone and fusidic acid cream (Fucicort), is unclear due to a lack of quality research and concerns about increasing resistance rates. Currently is it suggested that they are only used short term for the treatment of small areas of localised skin infection (including fungal infection) in patients with underlying inflammatory skin conditions.[2]

In the majority of healthy patients, minor skin infections do not require antibiotic treatment at all. Other skin infections, such as furuncles and carbuncles, are usually more appropriately managed by incision and drainage.

Are topical antiseptics an acceptable alternative?

Topical antiseptic agents have been used for centuries in the management of wounds but their role and their effectiveness

has been debated in the literature.[3, 4] Most antiseptic agents are intended for use on intact skin, e.g. for hand hygiene or for skin preparation prior to a surgical procedure. Their use in these situations is widely accepted.[3] The role of antiseptic agents for the prevention of infection and as antimicrobial agents in established infections remains more controversial.[3, 5]

The use of topical antiseptics to treat patients with minor skin infections has been proposed as a potential solution to the problem of increasing resistance to topical antibiotics.[3, 4] However, because of a lack of randomised controlled trial data, most reviews and meta-analyses conclude only that further research is required.[3, 4, 6] In addition, much of the evidence surrounding the use of topical antiseptics relates to the prevention of infection in wound management rather than as treatment for established skin infections.[7]

Antiseptic agents have a broad-spectrum of antimicrobial activity and exert their effects on cellular metabolism through a variety of mechanisms, which means that they are associated with lower levels of resistance.[3, 8] Antibiotics in contrast exert a selective pressure, acting on susceptible bacteria but resulting in the survival of other strains of bacteria and leading to an increased risk of resistance developing.

Antiseptic agents act to reduce bacterial load, but the clinical significance of this in the management of wounds and the treatment of skin infections is not always clear.[5] Most open skin wounds and other lesions eventually become colonised with bacteria but this does not always result in infection or impaired healing.[5, 9] Wound healing can be affected by a number of factors including the bacterial species, bacterial load and the patient's co-morbidities and immune status.[9] Current evidence suggests that topical antiseptic agents may have a role in wound management where there is significant bacterial colonisation that can affect healing.[5, 10] In this situation, topical antiseptics may help to reduce the bio-burden and allow effective natural healing to occur.[9]

Do topical antiseptics have any adverse effects?

Topical antiseptics can cause both irritant and allergic reactions, e.g. an allergic contact dermatitis with iodine and rarely anaphylaxis with chlorhexidine.[11] The risks of a reaction are likely to be increased if the antiseptic agent is used in too high a concentration or in a person with eczematous skin.[12] However, when used appropriately they are regarded as having a lower allergenic potential than antibiotics. There is evidence that some antiseptic agents can be toxic towards human cells that have an important role in the healing process, e.g. fibroblasts, keratinocytes and leukocytes, however, the majority of these studies have relied on *in-vitro* models and the concentrations of antiseptics used were much higher than those that are in antiseptic agents intended for use on the skin.[3, 9]

"Antiseptic" terminology

A **disinfectant** is a substance used to kill or inhibit microorganisms on inanimate surfaces, e.g. benches and dressing trolleys. The concentration of the antiseptic agent is usually higher than in those products used on the skin.[9, 11]

An **antiseptic** is a substance used to kill or inhibit microorganisms on intact skin, e.g. iodine, or within a wound, e.g. hydrogen peroxide. Topical antiseptics, however, may also be referred to as **skin disinfectants**, particularly in the United States.[9, 11]

What products are available?

A number of antiseptic products are available in New Zealand for a variety of uses, depending largely on their concentration and properties (see "Antiseptic terminology").[11] Chlorhexidine and povidone-iodine are the most commonly used topical antiseptic agents for intact skin, e.g. for hand hygiene, surgical scrub or skin preparation prior to invasive surgical procedures. Hydrogen peroxide has a variety of uses depending on the concentration of the product (see: "Hydrogen peroxide antiseptic cream").[11] At low concentrations (1–5%) it can be used as an antiseptic, most often in wounds rather than on intact skin, and as a topical treatment for acne.[13]

Refer to the New Zealand Formulary for available antiseptics and subsidy details

So, should a topical antiseptic cream be used for minor skin infections?

It is important to note that most healthy patients with minor skin infections do not require treatment with either a topical antiseptic or a topical antibiotic. The use of topical antiseptic agents over topical antibiotics could help reduce antibiotic use if evidence emerges to suggest there are comparable outcomes. However, at present there is a shortage of quality evidence demonstrating any clear benefit for their use in minor skin infections. With the growing concern over rates of antibiotic resistance, it is hoped that future studies will clarify the role of topical antiseptic agents, but at present, their place in the treatment of minor skin infection remains uncertain.

Hydrogen peroxide antiseptic cream

Products containing hydrogen peroxide 1% are commonly marketed to both clinicians and the public in New Zealand. Currently, two brands of topical hydrogen peroxide 1% cream are available; one is fully subsidised (Crystaderm) and the other is available over-the-counter (Crystacide).[2] Manufacturer's information states that these products are indicated for acne and for the treatment and prevention of superficial skin infections in wounds, impetigo, insect bites, minor burns and body piercings.[14, 15, 16]

Topical hydrogen peroxide has been compared to fusidic acid for the treatment of impetigo in a single randomised controlled trial, published in 1994.[17] In this study, 256 participants with non-bullous impetigo were randomised to be treated with either topical fusidic acid or hydrogen peroxide. After three weeks of treatment, it was found that fusidic acid resulted in a cure rate of 82% and topical hydrogen peroxide produced a cure rate of 72%.[17] The difference between the products was not statistically significant and therefore this study has been used to promote the effectiveness of the topical antiseptic agent.[15] However, the trial was judged by a 2012 Cochrane review to have inadequate blinding.[6] The conclusion of the Cochrane review was that there was insufficient evidence to recommend the use of topical antiseptics in the treatment of impetigo and this has been reiterated in more recent review articles.[6, 18] It should be noted that although topical antibiotics continue to be recommended in much of the current literature for patients with limited areas of impetigo[6, 18], as discussed above, recent expert opinion in New Zealand now suggests this is not best practice.

Hydrogen peroxide cream 1% has been compared to topical benzoyl peroxide gel in an industry-sponsored study for use in people with mild to moderate acne and was shown to provide similar effectiveness with a lower rate of skin erythema.[19] A topical hydrogen peroxide 1% cream was funded on the National Pharmaceutical Schedule in 2006 to provide an alternative topical agent to be used in the treatment of acne.

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Is point-of-care CRP testing useful in guiding antibiotic prescribing in patients with respiratory tract infections?

Point-of-care CRP testing may help primary care clinicians to identify with more certainty which patients with features of respiratory tract infection do not require antibiotics, therefore reducing the use of antibiotics.

Key points:

Evidence suggests that with appropriate training, point-of-care CRP testing in patients with a respiratory tract infection (RTI) can reduce unnecessary antibiotic prescribing in two specific clinical scenarios:

1. Identifying patients with symptoms of a lower RTI who are unlikely to have pneumonia, i.e. where an antibiotic is not appropriate
2. Providing patients with an upper RTI who are convinced they "need" an antibiotic with reassurance that a prescription for an antibiotic is unlikely to be beneficial

The United Kingdom National Institute for Health and Care Excellence (NICE) recommended that point-of-care CRP testing may be useful to guide antibiotic prescribing for patients without a clinical diagnosis of pneumonia but with symptoms of a lower RTI, e.g. cough and at least one of: fever, sputum production, wheeze, or chest discomfort. In this clinical situation:

- Antibiotic treatment should not be routinely offered to patients if their CRP level is < 20 mg/L, as they are unlikely to have pneumonia
- Antibiotic treatment should be routinely offered to patients with symptoms of a lower RTI and a CRP level > 100 mg/L, as they are more likely to have pneumonia, assuming no underlying condition such as malignancy or autoimmune disease is present
- In patients with symptoms of a lower RTI of uncertain origin and a CRP level between 20 – 100 mg/L the need for antibiotics remains reliant on clinical judgment

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www.bpac.org.nz/bpj/2015/june/crp.aspx

Do probiotics provide effective and safe protection against antibiotic-associated adverse effects?

Sales of probiotic products in the community generate billions of dollars worldwide, yet many of the health claims made by the industry lack a rigorous scientific basis. Studies on the effectiveness of commercially prepared probiotic products have produced varying results and opinions are divided on the clinical benefits and risks of probiotics, which are likely to be significant in some vulnerable patient groups.

Key points:

- When ingested in sufficient quantities, probiotics appear to reduce the risk of antibiotic-associated diarrhoea in children and adults. This protective ability broadly extends across different types of antibiotic and different probiotics.
- There is evidence that probiotics are **not** protective against post-antibiotic vulvovaginal candidiasis.
- The range of bacteria that are included in probiotic products is vast. It is therefore not possible to comment conclusively on the safety of all probiotics.
- More extensive research, and consistent reporting of adverse reactions, would be expected to provide more robust information on the likelihood, nature and seriousness of adverse events with probiotics.

To read the full article, visit:
www.bpac.org.nz/bpj/2015/june/probiotics.aspx

When is an allergy to an antibiotic really an allergy?

Many patients report allergies to antibiotics but often this will be based on vague symptoms or a historical entry in the clinical notes, which the patient cannot recall, e.g. a suspected allergy to penicillin during childhood. This can be a dilemma when a clinician does not want the patient to be deprived of the best available treatment, but is concerned about the risk of giving an antibiotic if the patient does in fact have an allergy.

Key points:

Most people who report an antibiotic allergy, e.g. penicillin, will not have a true allergy. If the history of allergy is not definitive, the starting point is to consider whether the details of the reported allergic event give any clues as to the true nature of the reaction:

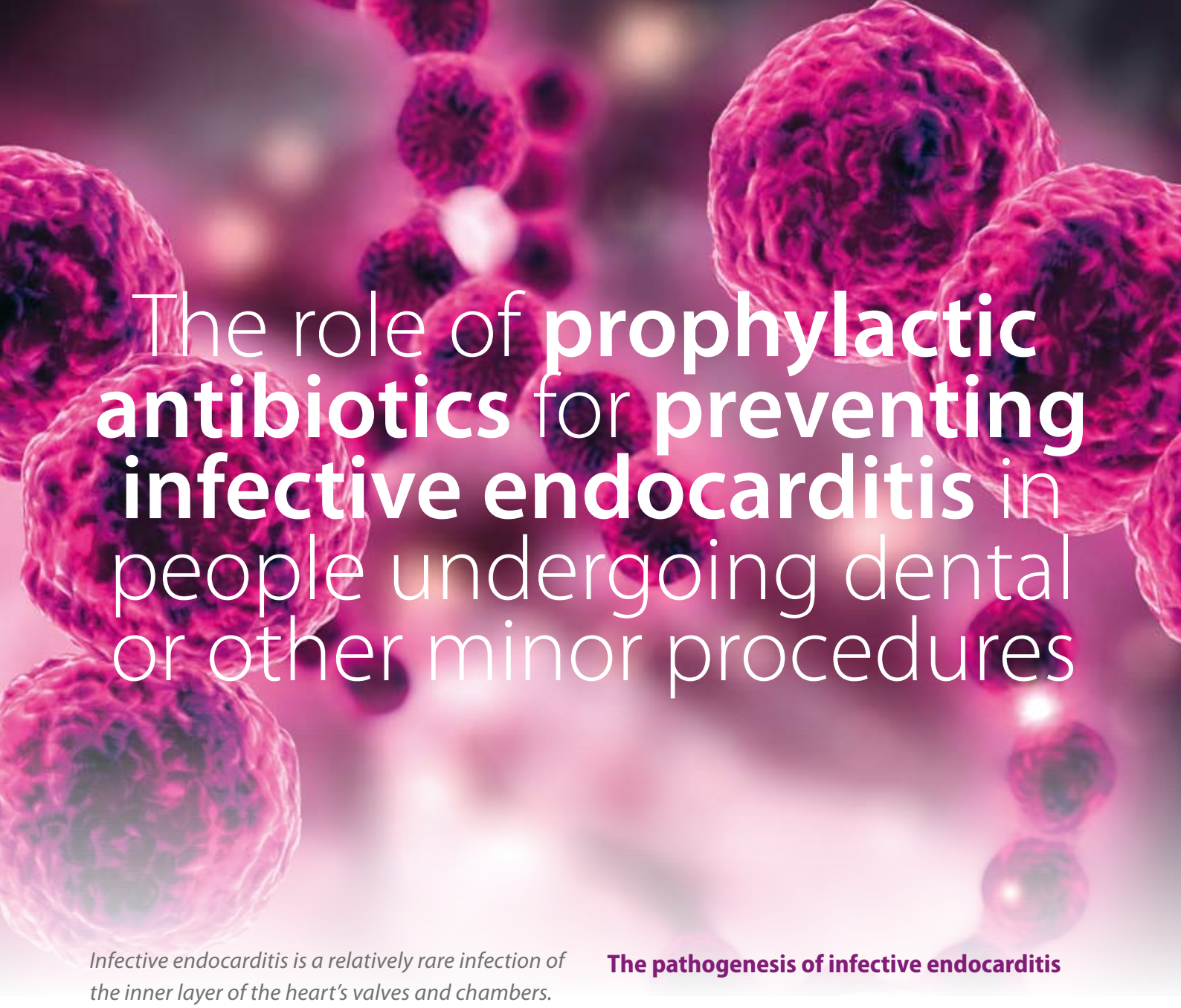
- An allergy is an immunological reaction (IgE-mediated hypersensitivity) to a medicine. Symptoms and signs usually occur within one to two hours, and can include urticaria, angioedema, bronchospasm and anaphylaxis.
- A delayed immune reaction (IgG-mediated) can occur several days after antibiotic treatment is begun, and is generally characterised by a macular, papular or morbilliform rash.
- Adverse effects are the undesirable but predictable symptoms and signs associated with the pharmacological action of a medicine, e.g. diarrhoea, nausea and vomiting
- Intolerance is a sensitivity reaction to a medicine (non-immune mediated). It can be loosely defined as an unusually low threshold for experiencing the adverse effects of a medicine or an exaggerated expression of the adverse effects of a medicine, e.g. severe diarrhoea resulting in colitis with amoxicillin.

If the patient has a history of an acute IgE-mediated hypersensitivity reaction after taking an antibiotic, it can be assumed that this reaction is likely to occur again on re-exposure. Deliberate re-exposure to the antibiotic is not recommended unless the benefits of treatment outweigh the risks. In most cases alternative classes of antibiotics will be available and can be used instead.

If the patient has a history of a delayed hypersensitivity reaction after taking an antibiotic, re-challenge may be possible, depending on the nature of the reaction.

If the patient has a history of intolerance or adverse effects after taking an antibiotic, it depends on the severity of the symptoms or signs as to whether this is a contraindication for taking the medicine in the future.

To read the full article, visit:
www.bpac.org.nz/bpj/2015/june/allergy.aspx



The role of **prophylactic antibiotics** for **preventing infective endocarditis** in people undergoing dental or other minor procedures

Infective endocarditis is a relatively rare infection of the inner layer of the heart's valves and chambers. Approximately one-third of cases of endocarditis in New Zealand are caused by streptococci that are normal oral flora and are associated with plaque, dental caries, gingivitis and peri-odontitis. New Zealand guidelines for the prevention of infective endocarditis recommend good oral hygiene for people at higher risk because of a pre-disposing cardiac condition, and prophylactic oral antibiotics when undergoing specific dental procedures or tonsillectomy/adenoidectomy. The routine use of prophylactic antibiotics solely for endocarditis prevention for people who are not at high risk is not recommended. In this article we discuss the rationale for giving endocarditis prophylaxis, present the key points of the New Zealand 2008 Heart Foundation guidelines and provide an update on recent developments in this field.

The pathogenesis of infective endocarditis

Infective endocarditis is an infection of the inner layer of the heart's valves and chambers, which can damage cardiac structures and spread to other areas of the body.[1] The condition generally begins around an abnormal valve (e.g. degenerative, rheumatic, prosthetic or damaged from previous endocarditis) or where turbulent blood flow damages the cardiac endothelium.[1] An initial non-infected platelet-fibrin thrombus is colonised by microorganisms transiently circulating in the blood.[1] Deposition of more fibrin, platelet aggregation and microorganism proliferation then combine to form an infected outgrowth, referred to as a vegetation.[1] The infective process may cause damage to the valve and surrounding structures or infection and/or infarction in other areas of the body due to embolism of vegetation fragments.[1] Infective endocarditis is always fatal unless treated,[2] and even with appropriate treatment it is associated with a one-year mortality rate of nearly 40%.[3]

Are prophylactic antibiotics indicated to prevent endocarditis associated with dental procedures?

Approximately one-third of cases of infective endocarditis in New Zealand are caused by streptococci that occur normally in the oral cavity,[4] and are associated with plaque, dental caries, gingivitis and peri-odontitis. Microorganisms generally need to enter the blood stream for infective endocarditis to develop.

Oral streptococci most often enter the blood stream due to routine activities such as teeth brushing, flossing or chewing, especially if the peri-odontium is unhealthy. This spontaneous bacteraemia is low-grade and brief but very frequent and is thought to cause most cases of oral streptococcal endocarditis.[5]

Streptococci also enter the blood stream during and after invasive dental procedures involving manipulation of gingival tissue or perforation of the oral mucosa, or gastrointestinal procedures such as oesophageal dilation.[3] The magnitude and duration of procedure-associated bacteraemia are greater than with spontaneous bacteraemia and the hypothesis that this can lead to endocarditis has driven the use of antibiotic prophylaxis with dental procedures for decades. Although there are indirect data in animals and humans suggesting a likely benefit of prophylaxis, the data are somewhat contradictory and there is currently no high quality evidence that antibiotic prophylaxis is either effective or ineffective.[6] However, in the absence of good data supporting one strategy or the other, New Zealand and most international guidelines continue to recommend antibiotic prophylaxis for selected dental and other procedures in high risk people.

What do the New Zealand guidelines recommend for prophylactic antibiotics?

The New Zealand guidelines for the prevention of infective endocarditis emphasise that all people who are at risk of developing this infection need to take particular care to remain free of dental disease.[7] This is best achieved by regular visits to professionally trained dental staff and the appropriate use of toothbrushes, dental floss and other plaque-control products, e.g. antibacterial mouthwashes.[7] New Zealand has a disproportionately high number of young Māori and Pacific peoples affected by rheumatic valvular heart disease as well as dental and periodontal disease.[7] It is therefore of added importance that optimal oral health is maintained within Māori and Pacific communities.

People with high risk cardiac conditions

In New Zealand, people with any of the following are clinically considered to be at high risk of developing infective endocarditis:[7]

- A prosthetic heart valve, either biological or mechanical
- Rheumatic valvular heart disease
- Previous endocarditis
- Unrepaired cyanotic congenital heart disease or a repair procedure within the last six months
- Cardiac shunts or conduits for palliation

It is estimated that a person with a prosthetic heart valve has a risk of developing infective endocarditis that is 50 times higher than a person in the general population; this risk is highest in the 6 – 12 months following valve replacement.[3] For an unknown reason, infective endocarditis occurs twice as often in males as females, although females are more likely to have a worse prognosis.[5]

A New Zealand study of 336 patients (266 with definite infective endocarditis and 70 with probable endocarditis) found that almost one-third of all patients had prosthetic valve endocarditis, 10% had a previous episode of endocarditis and 4% had underlying rheumatic heart disease. Traditionally rheumatic heart disease has been considered a major risk factor for infective endocarditis and this result was less than might have been expected given the high incidence of rheumatic fever among Māori and Pacific communities.[4]

High risk dental procedures

Prophylactic antibiotics are recommended in New Zealand for people at high risk of developing infective endocarditis who are undergoing dental procedures involving manipulation of either gingival tissue or tooth root region or perforation of the oral mucosa, or tonsillectomy/adenoidectomy.[7]

People at high-risk who are undergoing the following routine dental procedures do NOT require prophylactic antibiotics:[7]

- Routine dental anaesthetic injections through non-infected tissue
- Dental x-rays
- Placement of removable prosthodontic or orthodontic appliances
- Adjustment of orthodontic appliances
- Placement of orthodontic brackets
- Losing deciduous teeth
- Treatment of bleeding due to trauma to the lips or oral mucosa

Prophylactic antibiotics are also not recommended in people at high risk of developing infective endocarditis who are undergoing non-dental invasive procedures (other than tonsillectomy/adenoidectomy) unless they require surgery at an anatomical location where there is already established infection, e.g. respiratory or gastrointestinal infection.

Choosing the prophylactic antibiotic regimen

Amoxicillin is the first-line prophylactic antibiotic for people undergoing invasive dental procedures who are at high risk of developing endocarditis.[7] Clindamycin or clarithromycin are possible alternatives for people in whom amoxicillin treatment is inappropriate or potentially ineffective (Table 1).[7] To ensure that levels in the blood are maximal at the time of procedure, the antibiotic should be given in the following timeframes:[7]

- Orally, one hour before the procedure
- Intramuscularly (IM), 30 minutes before the procedure
- Intravenously (IV), immediately before the procedure

If the patient inadvertently does not receive an antibiotic prior to the dental procedure, it may be administered up to two hours later, although the effectiveness of the prophylaxis may be reduced.[7]

People requiring surgery at sites where there is established infection

In addition to when invasive dental procedures are performed, people who are at high risk of developing infective endocarditis also require prophylactic antibiotics if they undergo surgery at an anatomical site that is actively infected; if major surgery is planned, a prophylactic antibiotic is likely to be administered anyway. The choice of antibiotic for these patients is dependent on the site of the infected tissue. For example:[7]

- Upper respiratory tract infections – amoxicillin is preferred with clindamycin or clarithromycin as alternatives
- Gastrointestinal, hepatobiliary, genitourinary, obstetric or gynaecological infections – amoxicillin is preferred with vancomycin as an alternative
- Skin or musculoskeletal infections – flucloxacillin is preferred. A cephalosporin, e.g. cefazolin, is an alternative for patients with a mild penicillin allergy, e.g. simple rash, and clindamycin for patients with a severe penicillin allergy, e.g. anaphylaxis, or if methicillin-resistant *Staphylococcus aureus* (MRSA) is suspected or present.

Table 1: Antibiotic regimens for the prophylaxis of infective endocarditis for high risk people undergoing invasive dental procedures[7]

	Adults	Children
First-line	Amoxicillin 2 g, single dose, orally, IV or IM	Amoxicillin 50 mg/kg (maximum 2 g), single dose, orally, IV or IM
Alternatives for patients who: 1. Have a penicillin allergy 2. Are taking long-term penicillin, e.g. for rheumatic fever prevention 3. Have taken a penicillin or cephalosporin in the previous month	Clindamycin, 600 mg, single dose, orally, IV or IM; or Clarithromycin* 500 mg, single dose, orally.	Clindamycin, 15 mg/kg (maximum 600 mg), single dose, orally, IV or IM; or Clarithromycin* 15 mg/kg (maximum 500 mg), single dose, orally.

* Clarithromycin has a number of potentially serious interactions with other medicines – see NZF for details

Have changes in prescribing affected the incidence of endocarditis?

The routine use of prophylactic antibiotics for infective endocarditis prevention began in the 1950s. In 2007, there was a change in thinking when the American Heart Foundation (AHA) produced guidance recommending that antibiotics should be limited to patients who had the highest lifetime risk of infective endocarditis and specifically only prior to invasive dental procedures.[8] The National Heart Foundation of New Zealand produced similar guidelines in 2008,[7] as did the European Society of Cardiology in 2009.[5]

The principle reason for the reduction in antibiotic use was that the risk of a person developing infective endocarditis following a dental procedure is very low, even for those with a high lifetime risk. For example, it is estimated that the likelihood of a person with a previous episode of infective endocarditis having a repeat occurrence following a dental procedure is 1 in 95 000 procedures.[8] It has also been estimated that the sum of spontaneous bacteraemia from twice daily tooth brushing for one year is over 150,000 times that of one dental extraction procedure.[9] Based on these estimates it was argued that the use of prophylactic antibiotics for people other than those at the highest lifetime risk of infective endocarditis would prevent very few cases of infective endocarditis. In addition, widespread use of antibiotics would result in an increased number of adverse reactions as well as contributing to the growing problem of antimicrobial resistance.[3]

NICE guidelines recommend against prophylactic antibiotics for any patients

In 2008, the United Kingdom National Institute for Health and Care Excellence (NICE) went one step further than other groups and recommended that antibiotics should no longer be prescribed solely for the prevention of infective endocarditis, regardless of the patient's risk.[10] The NICE recommendation was based on clinical evidence as well as cost-effectiveness, but was also strongly influenced by the possibility that the use of antibiotics for infective endocarditis prevention may result in a net loss of life due to adverse effects associated with antibiotic use.[10]

Have the NICE guidelines gone too far?

A study two years after the introduction of the 2008 NICE guidelines failed to detect a significant increase in the incidence of infective endocarditis in England compared with before the guidelines, however, there was some concern that a clinically significant difference would not be detected within this time frame.[11,12] A further study by the same authors in 2015 examined the number of antibiotic prescriptions dispensed for the prevention of infective endocarditis and the incidence of infective endocarditis in England from 2000 to 2013. It was found that the number of prescriptions fell sharply after the 2008 NICE guidelines were released and that there has subsequently been an increase in the incidence of infective endocarditis in both high and lower risk people.[12] Unfortunately, the authors do not say whether these extra cases of endocarditis were caused by oral streptococci or related to dental procedures. The finding that the incidence of infective endocarditis increased in people considered low risk, i.e. who would not have been prescribed antibiotics anyway, suggests that reduced antibiotic prescribing may not be the reason for the observed increase in morbidity. For example, it may be possible that improvements in the diagnosis of infective endocarditis or an increase in invasive staphylococcal disease has resulted in an increasing incidence across the entire population. Although a causal relationship has not been established between a reduction in prophylactic antibiotic prescribing and an increase in the incidence of infective endocarditis in England, this finding has prompted NICE to review its 2008 guideline;[13] the outcome of this review is still to be announced.

The study from England was not the first to examine the relationship between antibiotic prescribing and rates of infective endocarditis. Four studies conducted in America following the introduction of the modified 2007 AHA guidelines (which recommended prophylaxis for less people and for fewer invasive procedures) also did not detect an increase in the incidence of infective endocarditis, including streptococcal infections.[14–17] However, the cohort size of several of the American studies was relatively small compared to the English study and one study was conducted only nine months after the AHA guidelines were introduced.[16] Another study demonstrated no increase in oral streptococcal endocarditis in France in the six years following a guideline change in 2002 to reduced antibiotic prophylaxis.[18]

Keep calm and carry on

Over 60 years of published data still do not provide evidence on which to make strong recommendations for antibiotic prophylaxis against endocarditis at the time of dental procedures. The 2008 New Zealand guidelines represent a conservative consensus of local expert opinions and seven years after they were written there does not seem to be a good reason to change these recommendations.

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Cellulitis:
skin deep and spreading across New Zealand

Adults and children with uncomplicated cellulitis can usually be managed in the community if they are clinically stable. Oral flucloxacillin is the first-line treatment for the majority of patients with mild to moderate cellulitis; broader spectrum oral antibiotics should only be considered if flucloxacillin is not tolerated, has not been effective or there is reason to believe the infection is caused by bacteria that are not normally commensal on the skin. Intravenous (IV) cefazolin with probenecid is the recommended community-based treatment for patients with cellulitis who have not responded to oral flucloxacillin or for patients with more developed cellulitis. Generally, patients with severe cellulitis should be referred to hospital for rest, elevation and IV antibiotic treatment.

Identifying cellulitis in primary care

Cellulitis is an acute, spreading bacterial infection of the lower dermis and subcutaneous tissue.[1] It most often affects lower limbs but may affect other areas depending on the cause, e.g. upper limb, periorbital, perianal, abdominal wall in patients who are obese, or any part of the body where surgery has recently been performed.[1, 2]

Cellulitis is characterised by localised pain, swelling, erythema and heat and patients may also present with fever, malaise and in severe cases oedema, blisters, ulcers and lymphangitis (infection within the lymph vessels).[1] Erysipelas is a superficial form of cellulitis affecting the upper dermis, that may coexist with cellulitis and is treated in the same way.[3] Erysipelas is often fiery red and can be identified by its elevation above the level of the surrounding skin and a clear demarcation between involved and uninvolved tissue.[3]

Co-morbidities recognised as risk factors for cellulitis include: eczema, obesity, tinea pedis, diabetes, pregnancy, venous insufficiency, peripheral artery disease, ulcers and lymphoedema.[1] People who have previously had cellulitis are more likely to have a repeat episode and reported recurrence rates for cellulitis and erysipelas range from 12% over six months to 34% over 3.3 years.[4]

Causes of cellulitis

Cellulitis generally begins with a breach in the protective layer of the skin allowing bacterial entry, although the breach may be minor and hard to locate. Many conditions, events or procedures can cause this, including cracked skin due to dryness, eczema or tinea pedis, cuts or penetrating wounds, burns, insect bites or stings, surgery and IV cannulation.

Streptococcus pyogenes and other related streptococci (especially Group C and Group G streptococci) are reported to cause approximately two-thirds of cases of cellulitis or erysipelas and *Staphylococcus aureus* the majority of the remaining cases.[5] However, a wide variety of causative organisms can be responsible if the bacteria that has breached the skin originated from a source that was external to the patient, e.g. a mammalian bite, or the infection occurs in the pelvic or perianal regions.[1, 2]

Cellulitis in New Zealand

In New Zealand there was a significant increase in *S. aureus* skin and soft tissue infections (SSTIs) reported for the 12 years until 2011: the incidence increased from 81 to 140 people per 100 000 or approximately a 5% increase per year during this time.[6] The rates of *S. aureus* SSTIs in northern and central regions of New Zealand were approximately three times the rates in the south.[6] Although not specifically reported, cellulitis infections are expected to account for a substantial portion of these figures.

Māori and Pacific peoples and people from low socioeconomic areas are known to be at increased risk of serious skin infections, which is likely to be due to a range of factors, including overcrowding and reduced access to primary healthcare; children are often affected.[7]

The diagnosis of cellulitis

Cellulitis can usually be diagnosed clinically by the presence of localised pain, swelling, erythema and heat. Table 1 includes a number of differential diagnoses that may be appropriate to consider in some patients.

Furuncles (boils) or carbuncles (multiple headed lesions) are easily misdiagnosed as cellulitis due to a rim of about 1 to 2 cm of tender erythema surrounding the central focus of the staphylococcal infection. This erythema, however, represents inflammatory change and not extension of infection into the tissues; patients with focal staphylococcal infections should not be treated as if they have cellulitis. The use of systemic antibiotics in patients with furuncles or carbuncles is usually unnecessary unless there is extensive surrounding cellulitis or the patient develops a fever.[3]

Investigations for cellulitis

Investigations are not normally required in patients with suspected cellulitis, but testing may be useful in some situations, e.g. differentiating infection from gout, or in patients who are systemically unwell, e.g. heart rate > 100 beats/min or systolic blood pressure < 90 mmHg or 20 mmHg below the patient's normal level.[3]

The white blood cell count can be expected to be elevated in almost half of patients with cellulitis, and approximately two-thirds of patients can be expected to have an elevated CRP.[8] Neither marker is sensitive or specific enough to be used diagnostically for cellulitis, although an elevated CRP is a more reliable indicator of bacterial infection than an elevated white blood cell count.[8] Blood cultures may be considered in patients who are systemically unwell, but these are negative in most patients with cellulitis.[1] If the patient is at risk of acute kidney injury through dehydration, e.g. an older patient with chronic kidney disease, then a serum creatinine measurement may be useful in order to monitor renal function and to potentially guide dosing of antibiotics.

Taking a swab for microscopy and culture is not routinely recommended, unless:

- There is a lesion present that is deteriorating, increasing in size or failing to heal[9]
- There is reason to suspect the cellulitis is caused by organisms that are not normally commensal on the skin, e.g. the patient has recently had surgery or is living in an area or a residential care facility where there is an increased prevalence of methicillin-resistant *S. aureus* (MRSA)
- Empiric antibiotic treatment has failed

Table 1: Alternative diagnoses to cellulitis with differential characteristics[1]

Condition	Major characteristics
Varicose eczema (stasis dermatitis)	Generally a long-term condition. Absence of pain or fever, usually bilateral with inflammation going right around the leg.
Gout	Joint pain often associated with the metatarsal-phalangeal joint
Deep vein thrombosis	May be associated with a period of inactivity or major surgery. Tenderness and erythema may be localised to an affected vein. With extensive thrombosis the limb may be purplish in colouration.
Hypersensitivity reaction	Pruritus and an absence of pain or fever, history may uncover a recent exposure, e.g. an allergen or medicine
Necrotising fasciitis	Severe pain, swelling and fever progressing rapidly, severe systemic toxicity, skin crepitus, ecchymosis (bleeding into the skin). See: "Necrotising fasciitis: a rare but important differential diagnosis"
Arthritis	Joint pain often occurring with movement and a lack of erythema unless there is septic joint involvement
Pyoderma gangrenosum	Ulcerations of the leg and a history of inflammatory bowel disease (IBD)

Managing patients with cellulitis in the community

Assess the patient for signs of systemic toxicity, e.g. unresolved or worsening fever, hypotension, tachycardia and vomiting. Patients with red flags should be referred to hospital.

Red flags for hospital admission

It is recommended that patients with cellulitis and any of the following features should be referred to hospital; a lower threshold for referral is appropriate for young children, e.g. aged less than one year, and frail older people:[13]

- Signs of systemic involvement or haemodynamic instability, e.g. tachycardia, hypotension, severe dehydration
- A progressing infection despite prior antibiotic treatment, e.g. spreading margins or worsening lymphangitis
- Pain suggestive of necrotising fasciitis, e.g. the patient appears in severe pain or describes their pain as rapidly and dramatically worsening
- Unstable co-morbidities that may complicate the patient's condition, e.g. diabetes, vascular disease or heart failure
- Immunosuppression, e.g. a history of immunodeficiency illness, currently undergoing chemotherapy or taking immunosuppressant medicines such as prednisone, methotrexate, ciclosporin
- An animal or human bite wound requiring surgical debridement
- A large abscess formation requiring general surgical drainage
- Orbital involvement unless cellulitis is very mild

All patients with cellulitis should rest and elevate any affected limb. Antibiotics and elevation will generally reduce any discomfort the patient is experiencing. If analgesia is required, paracetamol is preferred over non-steroidal anti-inflammatory drugs (NSAIDs) (see: "Necrotising fasciitis").[10] A line drawn around the leading edge of the erythematous area allows the progress of the cellulitis to be easily monitored.

Antibiotics with an appropriate spectrum of antimicrobial activity are the mainstay of treatment; these need to penetrate soft tissue and be prescribed in doses that are sufficient and frequent enough to achieve a sustained therapeutic concentration at the site of infection. Intravenous antibiotic treatment may be required initially to achieve a response, and may be available via a DHB community-based programme.

Necrotising fasciitis: a rare but important differential diagnosis

Necrotising fasciitis is a rapidly progressing soft tissue infection with a high mortality rate; it is often referred to as a "flesh eating" disease in the media. Necrotising fasciitis is characterised by extensive and progressive necrosis of the subcutaneous tissue and fascia.[10] As in patients with cellulitis, infection may be present in the absence of visible trauma. When patients with necrotising fasciitis are examined erythema and oedema may be noticed. However, extreme tenderness of the infected area and severity of the patient's illness with the presence of hypotension, tachycardia and high fever helps to differentiate necrotising fasciitis from cellulitis.[11] If the patient is not treated their skin develops blue-gray patches after 36 hours and cutaneous bullae and necrosis after three to five days.[11]

From 1990 – 2006 there were 247 people hospitalised in New Zealand with confirmed necrotising fasciitis.[10] Approximately 33% of cases were precipitated by accidental trauma, with skin ulcers (16%) and surgery (11%) being the next most common causes.[10] Diabetes, NSAID use in the previous seven days and obesity are predisposing characteristics for necrotising fasciitis.[10] It is not known why NSAIDs increase the risk of necrotising fasciitis; an impaired immune response or delayed diagnosis due to symptoms being masked are possibilities.[12] Māori and Pacific peoples in New Zealand are more likely to be affected by necrotising fasciitis compared with the general population.[10]

Patients who are suspected of having necrotising fasciitis should be referred to hospital immediately and will often be admitted to an intensive care unit. Surgical excision of the affected tissues and intravenous antibiotic treatment are the mainstays of treatment.

If a cut, bite or abrasion is suspected to be the cause of the cellulitis the patient's tetanus status should be checked and a booster given if necessary. If a patient presents to general practice with cellulitis that is secondary to an injury then it may be appropriate for an Accident Compensation Corporation (ACC) claim to be lodged.

Trial oral antibiotics first in patients with mild to moderate cellulitis

Flucloxacillin has traditionally been the first-line oral antibiotic for patients with cellulitis because all *S. pyogenes* and other related streptococci are susceptible to treatment with flucloxacillin, as are approximately 90% of strains of *S. aureus* (i.e. all *S. aureus* except for MRSA), and because it is a narrow spectrum antibiotic that penetrates skin and soft tissue well.[1, 4] The importance of treatment adherence should be discussed, and patients advised to take oral flucloxacillin at least 30 minutes before eating.[14] Microbiological swabbing of patients with cellulitis is not generally required before beginning treatment unless there are risk factors for MRSA. Due to a lack of trials there is uncertainty as to the optimal duration of antibiotic treatment for cellulitis;[15] treatment recommendations provided may range from five to ten days.

It is recommended not to prescribe oral amoxicillin clavulanate in primary care for patients with cellulitis. Patients with cellulitis in the facial or periorbital region should be referred to secondary care due to the risk of vision loss.

Antibiotic treatment regimens for children with cellulitis

A child with early and mild cellulitis can be trialled on oral antibiotics for five days with review by a general practitioner after 24–48 hours.[16]

Flucloxacillin is recommended first-line. The Starship Children's Health recommended regimen for oral flucloxacillin for children with cellulitis is:[16]

- Flucloxacillin 10–25 mg/kg/dose, orally, three times daily, for five days (maximum 500 mg/dose) (some regimens recommended dosing four times daily)

Flucloxacillin syrup may be unpalatable to some children therefore capsules are recommended in preference to syrup for children who are able to swallow them.

Erythromycin can be prescribed as an alternative for children with a confirmed significant allergy to flucloxacillin. The Starship recommended regimen is:[16]

- Erythromycin 20 mg/kg/dose, orally, twice daily, or 10 mg/kg/dose, orally, four times daily for five days (maximum 500 mg/dose)

If neither flucloxacillin syrup nor erythromycin are tolerated then cefalexin oral liquid, a broader spectrum antibiotic, is an alternative for children. The Starship recommended regimen is:[16]

- Cefalexin 20 mg/kg/dose, orally, twice daily, for five days (maximum 500 mg/dose)

N.B. An alternative regimen is cefalexin 12.5 mg/kg/dose, four times daily.[17]

Antibiotic treatment regimens for adults with cellulitis

Flucloxacillin is also the first-line recommended oral antibiotic treatment for cellulitis in adults. The recommended regimen from the Auckland DHB Adult Empirical Antibiotic Treatment Guidelines is:[18]

- Flucloxacillin 500 mg, orally, four times daily, for five days

Several protocols suggest that flucloxacillin up to 1 g, orally, four times daily, for five days may be more appropriate for some adult patients, e.g. those with moderate to severe cellulitis, patients who may not respond to lower doses of antibiotics due to vascular co-morbidities, e.g. diabetes or peripheral vascular disease, or patients in whom the complications of infection may be severe, e.g. those who are immunosuppressed.[19] In some patients, e.g. an older patient with low body weight and reduced renal function, it may be appropriate to initiate treatment at a reduced dose, e.g. flucloxacillin 250 mg, four times, daily.

Erythromycin can be prescribed as an alternative for adults with a confirmed significant allergy to flucloxacillin:[17]

- Erythromycin 800 mg, orally, twice daily, or 400 mg, orally, four times daily, for five days

Managing patients who have not responded to treatment

The natural history of cellulitis means that patients may experience an increase in erythema and swelling within the first 48 hours of treatment. In most patients a reduction in pain in the affected skin and an improvement in appetite and level of energy are clear signs that the infection is being brought under control despite the area of erythema remaining unchanged or enlarging.

Treatment adherence, including the need to rest and elevate affected limbs, should be assessed in all patients who are not responding as well as expected; the four times daily dosing of flucloxacillin can be hard for some patients to remember or patients who have been instructed to take the antibiotic

before eating may skip doses if they miss a meal. It may be appropriate to reconsider the diagnosis in a patient who is adhering with treatment, but is not responding. If their overall condition deteriorates, e.g. fever or tachycardia increases, referral to hospital or a change in antibiotic treatment may be appropriate. Patients should be discussed with a paediatrician or infectious diseases physician.

Patients with mild cellulitis who are adhering to antibiotic treatment but not responding sufficiently after 48 hours may be candidates for community-based IV treatment (see below) or an adjustment of the dosing regimen may be an alternative option. For example, a higher oral dose taken less often may be effective, e.g. flucloxacillin 1 g, three times daily may maintain therapeutic levels of antibiotic.

The possibility that infection is due to MRSA or another organism resistant to standard treatment should also be considered if the patient's condition is not improving; microbiological swab and culture may be beneficial in this situation; if performed, details of current antibiotic treatment should be provided to the laboratory. If MRSA is isolated from swabs co-trimoxazole is the preferred antibiotic, unless susceptibility results suggest otherwise, at the following doses:[16, 17, 18]

- Children aged over six weeks: co-trimoxazole 0.5 mL/kg oral liquid (40+200 mg/5 mL), twice daily, for five to seven days (maximum 20 mL/dose)
- Adults and children aged over 12 years: co-trimoxazole 160+800 mg (two tablets), twice daily, for five to seven days

N.B. Co-trimoxazole should be avoided in infants aged under six weeks due to the risk of hyperbilirubinaemia.[17]

If a patient has moderate cellulitis that is not responding to oral antibiotic treatment, referral to hospital should be considered. In some situations hospital staff may decide the community-based IV antibiotic treatment is appropriate for the patient.

When to consider community-based intravenous treatment

If a patient presents with severe cellulitis or has not responded satisfactorily to oral antibiotics then community-based IV antibiotic treatment may be appropriate, if red flags are absent. This involves a cannula being inserted and left *in situ* until the patient has completed the IV course of antibiotics. DHB protocols vary as to who is responsible for the day-to-day care of patients with cellulitis receiving IV treatment, which includes: prescribing, administering the IV antibiotic (and probenecid if indicated), IV line and cannula care, monitoring

Probenecid is not routinely recommended in combination with oral antibiotics

Probenecid is indicated as an adjunct to beta-lactam antibiotics, e.g. cephalosporins and penicillin derivatives, because it reduces the renal excretion of these antibiotics and lengthens the time that they maintain a therapeutic level.[14] Probenecid tablets are recommended as an adjunctive treatment in patients treated with once daily IV cefazolin to prolong the duration of effective cefazolin tissue levels.

At present there is only a theoretical benefit in the combination of oral flucloxacillin with probenecid as there is no published evidence that treatment with this combination is more effective than treatment with flucloxacillin alone.

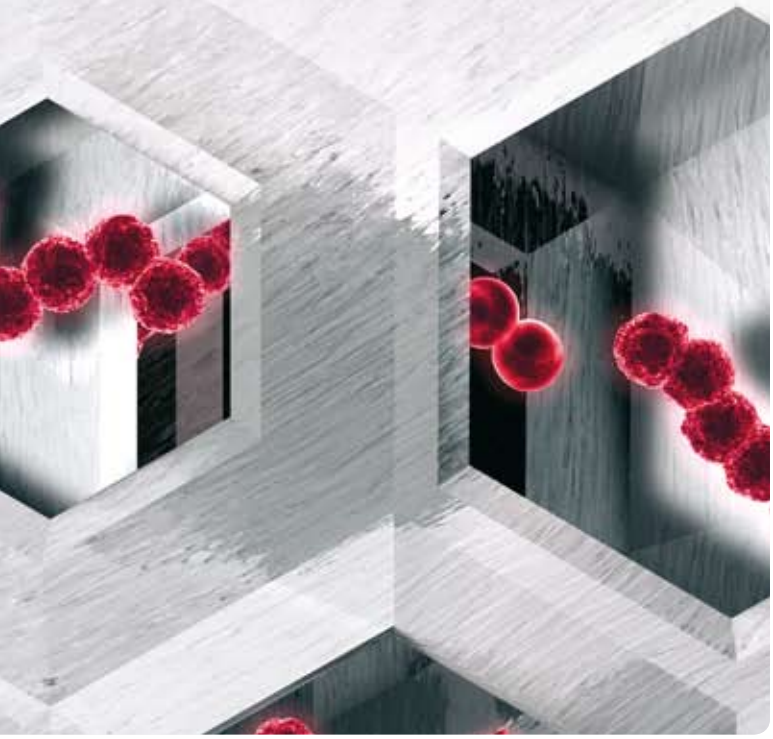
Probenecid is prohibited at all times by the World Anti-Doping Agency and should not be prescribed to elite athletes as it may be used as a masking agent.[20]

Local protocols may differ for cellulitis treatment

Currently a national framework for funding community-based administration of IV antibiotics does not exist. Therefore individual DHBs have established their own arrangements in order for patients to qualify for funded treatment with IV cefazolin in their homes. For example, in the Auckland, Counties Manukau and Waitemata DHBs Primary Options for Acute Care (POAC) provide general practitioners with funds to manage patients in the community who may otherwise be admitted to hospital. In the Waikato DHB the first IV dose of cefazolin is given in general practice and subsequent doses are given by a district nurse. In the Southern DHB patients who are referred to hospital with cellulitis may have an IV cannula inserted and a first dose of treatment given in the Emergency Department and then treatment continued in their home by a district nurse.

It is suggested that primary care staff contact their local DHB to see what local protocols are in place. In some situations it may be helpful to discuss cellulitis management with local pharmacies as they may be able to stock IV cellulitis kits.

For further information see: "Community-based IV administration: primary care reducing hospital admissions", BPJ 38 (Sep, 2011).



response to treatment (see: "Local protocols may differ"). In some DHBs practices are supplied with "cellulitis kits" and the primary care team has responsibility for care, in other areas IV antibiotic treatment is initiated in primary care and then continued by a district nurse, while in other DHBs a district nurse may be responsible for care following a hospital referral from general practice. Regardless of local protocols, the patient's individual circumstances are always important when considering if community-based IV antibiotic treatment is appropriate:

- Is the patient mentally and socially able to receive community-based treatment?
- Are there contraindications to providing the patient with readily accessible intravenous access – is the patient at risk of using the IV line for recreational drug use?
- Does the patient have family members at home to assist them?
- Can the patient be monitored at least daily?
- Can the patient return to the practice if their condition deteriorates, e.g. do they have ready access to a car?
- Can the patient easily contact medical services, e.g. do they have a phone?

Cefazolin, 2 g IV, once daily, with probenecid, 500 mg orally, twice daily, is recommended by many DHBs as the most appropriate community-based IV treatment for adult patients with cellulitis.[13, 19] This regimen is preferred as it is the most studied and it is a once daily injection whereas intravenous flucloxacillin requires either four times daily IV administration or the use of a central line and a pump or infusor device to enable continuous infusion. Cefazolin is subsidised for the treatment of cellulitis, but only when it is prescribed in accordance with an approved DHB protocol and is endorsed by a general practitioner or secondary care prescriber for this purpose.

The dose of cefazolin may need to be reduced in patients with renal impairment, e.g. a creatinine clearance < 55 mL/min.[21]

Probenecid is given as a 500 mg tablet, twice daily, as an adjunctive treatment in the management of cellulitis with IV antibiotics.[13] Probenecid is contraindicated in patients with a history of blood disorders, eGFR < 30 mL/min/1.73m^2, nephrolithiasis and during an acute attack of gout.[14] Because of its mechanism of action, probenecid has a number of significant drug interactions:

- Any patients taking methotrexate should be monitored closely for symptoms of toxicity; methotrexate dose reductions may required

- Low dose aspirin for cardiovascular indications is not likely to be affected by probenecid, but patients should not use aspirin in analgesic doses
- Carbapenem antibiotics, that may be used in hospital, may require dose adjustment

Probenecid should be avoided in patients with an eGFR < 30 mL/min/1.73m^2.[14] Patients taking probenecid should be advised to ensure they are drinking 2 – 3 L of fluid daily to prevent the formation of urinary stones.[14]

Patients receiving IV antibiotics for cellulitis can be expected to show significant clinical improvement after two to three days;[22] at which time they can be switched to oral antibiotics, e.g. flucloxacillin. If the patient has not shown any clinical improvement after this time then it is recommended that they be referred to hospital for further assessment or discussed with an infectious disease consultant.

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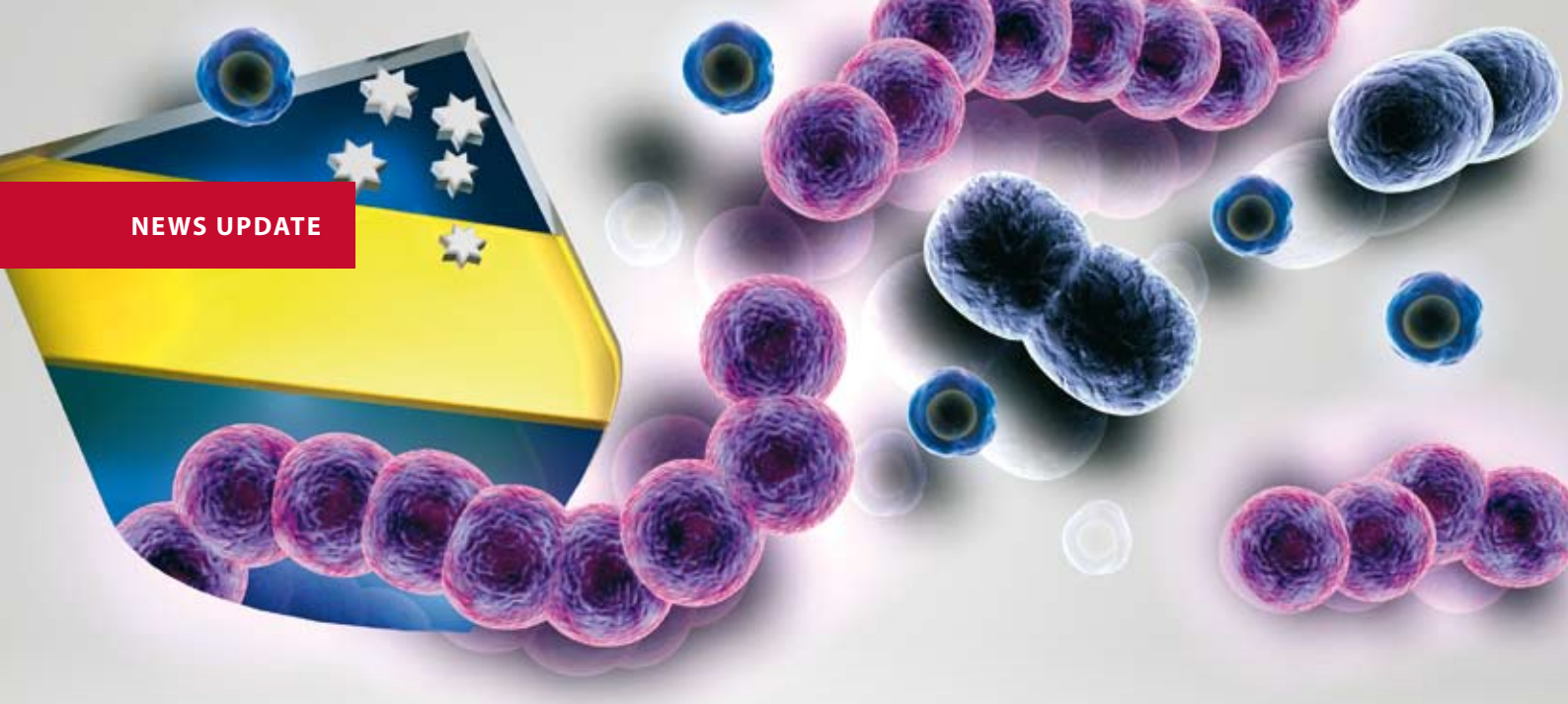

NEWS UPDATE

The **Australasian Society of Infectious Diseases** conference

The Australasian Society of Infectious Diseases (ASID) annual scientific meeting was held in Auckland from 18 – 21 March, 2015. A wide range of topics were discussed, many of which have relevance for primary care in New Zealand.

Invasive pneumococcal disease rates have dropped following introduction of routine pneumococcal vaccination

Dr Helen Petousis-Harris from the Immunisation Advisory Centre at the University of Auckland presented data linking falling hospitalisations from pneumococcal disease targeted by pneumococcal vaccines across all age groups with the introduction of routine vaccinations for infants.

The study is yet to be published in full, but preliminary figures indicate that:

- The rate of hospitalisation from invasive pneumococcal disease (meningitis or bacteraemia) in children aged six years and under has halved
- The greatest reductions in hospitalisations from invasive pneumococcal disease were among Māori and Pacific children, and children from low socioeconomic backgrounds, where a reduction of 70% has occurred
- There has been a decrease in hospitalisations for pneumonia in children aged six years and under, particularly Māori and Pacific children where reductions of 41% and 37% were observed
- Herd immunity effects have been observed, with rates of hospitalisation from pneumococcal disease caused by serotypes covered by the vaccine halved in people aged five to 64 years, and decreased by 76% in people aged 65 years and over
- In 2013, in children aged five years and under there was just one case of invasive pneumococcal disease caused by a serotype covered by the PCV-7 vaccine

Otitis media rates have fallen following introduction of the PCV-10 pneumococcal vaccine

Data presented at the ASID conference indicate that:

- A decline in hospitalisations for otitis media occurred during 2011–2014, the period of use of the PCV-10 vaccine. This was observed particularly in Māori children: hospitalisations and procedures for otitis media in Māori children aged six years or under were 40% lower in 2013 compared to 2006, the year prior to routine vaccination.
- During the time that both PCV-7 and PCV-10 vaccines were in use, children who received at least one dose of the PCV-10 vaccine were less likely to be admitted to hospital with otitis media than children receiving only the PCV-7 vaccine.

Fusidic acid resistance and MRSA

Dr Deborah Williamson, from the University of Otago, Wellington, presented research showing a rise in fusidic acid resistance in *Staphylococcus aureus* in New Zealand and explained how this is linked to an increase in methicillin-resistant *S. aureus* (MRSA).

New Zealand now has one of the highest prevalence of *S. aureus* resistance to fusidic acid in the world. Genetic analyses of MRSA samples has shown that a "home grown" strain of MRSA has risen to become the dominant strain of MRSA, making up 34.7% of all MRSA clones isolated from clinical specimens in New Zealand in 2011. This strain is almost always fusidic acid resistant, and the gene which gives this strain resistance to fusidic acid is located near to the gene which confers methicillin resistance. Therefore, selection pressure for fusidic acid resistance in this strain is also selecting for methicillin resistance as these genes tend to be inherited together.

The most recent data from ESR, using *S. aureus* samples collected in March 2014, show that 8.9% were methicillin resistant (MRSA). Resistance to fusidic acid was found in 57.6% of methicillin resistant *S. aureus* isolates, as well as 21.8% of methicillin-susceptible *S. aureus* isolates. Among MRSA isolates, resistance rates to erythromycin were 25.3% and ciprofloxacin 16.1%.

Current restrictions are in place for a maximum of 15 g of fusidic acid cream or ointment per prescription. For many patients this is likely to be more than necessary to complete their course of topical treatment. In order to reduce inappropriate use, patients should be advised to see their doctor for any future skin infections and not to reinitiate fusidic acid treatment of their own accord.

To read the full article, visit:
www.bpac.org.nz/bpj/2015/june/asid.aspx

Discontinuation of topical erythromycin

Topical erythromycin gel (Eryacne) was discontinued in New Zealand on 1 April, 2015. This product was previously indicated for the treatment of patients with mild to moderate acne vulgaris, however, there have been concerns for some time about the emergence of resistant forms of *Propionibacterium acnes* on a worldwide level. The decision to permanently discontinue the supply of topical erythromycin was taken on a voluntary basis by the manufacturer of erythromycin gel in an effort to help reduce rates of bacterial resistance.

It is widely accepted in international guidelines that topical antibacterial agents should not be used as monotherapy for patients with acne and that if they are used, this should only be alongside benzoyl peroxide or a topical retinoid. This approach is favoured because topical antibiotics have been shown to be more effective when used in combination and also because of the high risk of inducing resistance.

Topical clindamycin 1% remains available in New Zealand; indications include the treatment of acne vulgaris.

For further information, see: "Managing acne in primary care", BPJ 51 (Mar, 2013). Available from: **www.bpac.org.nz/BPJ/2013/March/managing-acne.aspx**

Prevention is better than cure:

five tips for keeping older people healthy and out of hospital during winter

With winter upon us it is a timely reminder of the importance of implementing strategies to keep older people healthy, independent and out of hospital. In the primary care setting this can include performing medicine reviews, assessing and reducing falls risk and encouraging influenza and pneumococcal vaccinations.

In countries with seasonal climates such as New Zealand, hospital admissions increase greatly over winter, particularly among older people with acute respiratory infections or chronic obstructive pulmonary disease.[1] In many cases, interventions in primary care can help to reduce these acute hospital admissions; known as ambulatory-sensitive hospitalisations, a term used for a condition that is reducible with primary care intervention.[2] For example, the risk of a patient being admitted to hospital with complications of influenza can be been reduced by administering influenza vaccination in primary care. Ambulatory-sensitive hospitalisations account for 20 – 25% of all medical and surgical discharges in people aged 65 years or older in New Zealand.[2, 3] The annual rates of ambulatory-sensitive hospitalisations in New Zealand are approximately 45 per 1000 people aged 65 – 74 years and 92 per 1000 people aged 75 – 84 years.[2, 3]

An integrated approach that includes all members of the primary care team in combination with secondary care, allied health services, social services and other support agencies is essential to provide the best care and keep older people out of hospital. There are a number of interventions that can be carried out in primary care to help achieve this, including encouraging influenza and pneumococcal vaccination, strategies for preventing falls and regularly reviewing medicine use to reduce potential harms from inappropriate prescribing.

Five tips for maintaining the health of older people in your practice:

1. **Know your patient**
2. **Encourage preventive measures**
3. **Encourage and support independence**
4. **Perform regular medicine reviews**
5. **Know what help is available and co-ordinate care**

The Health Quality & Safety Commission's Atlas of Healthcare Variation includes data on adult and older adult ambulatory sensitive hospitalisations, available from: **www.hqsc.govt.nz/our-programmes/health-quality-evaluation/projects/atlas-of-healthcare-variation/older-adult-ambulatory-sensitive-hospitalisations/**

1. Know your patient: taking a social history

Health professionals working in primary care have the luxury of continuity – they often have many years of accumulated knowledge of patients in their practice. This will include information about the patient's family (including extended family), home circumstances, activities and social supports, in addition to a comprehensive knowledge of their medical conditions.

It can be useful to ask older people about how they manage in the winter, e.g. what regular activities do they do (if any)? How do they manage to do their shopping? Is their home warm enough? Who checks on them regularly? Do they become socially isolated when the weather gets cold? Do they find they get a bit depressed over winter? This type of knowledge, often gleaned from the conversational moments of a consultation, is essential in helping to prevent problems occurring or in managing difficulties when they arise.

A key outcome is to take responsibility for monitoring an elderly patient's overall health, promote and enable continuity of care between providers and encourage "mobilisation and socialisation" for the patient.

Regularly update the patient's clinical record when their social circumstances change. This can help with continuity of care if the patient sees different providers within the practice.

2. Encourage preventive measures: influenza and pneumococcal vaccination

Influenza can be particularly severe in older people and result in serious secondary events, e.g. myocardial infarction. In New Zealand influenza is more prevalent during the "flu season" from March to September. Influenza is often under-reported as a contributor to morbidity and mortality, however, mathematical modelling estimates that it is associated with more than 400 deaths in New Zealand each year; 86% of which occur in people aged 65 years and older.[4]

Annual vaccination against influenza can reduce the health burden placed on patients and primary and secondary care providers during winter. During the New Zealand 2013 influenza season in the Auckland region, the trivalent influenza vaccine was estimated to provide patients with 56% protection against presentation to general practice with influenza and 52% protection against hospitalisation due to laboratory-confirmed influenza.[5] This study was unable to provide accurate estimates for vaccine effectiveness in older people. However, a study from the United States reported that over three influenza seasons, influenza vaccination prevented approximately 61% of all respiratory hospitalisations in people aged over 50 years.[6]

Encouraging older people to be immunised annually against influenza may be one of the most effective strategies primary care has for reducing hospital admissions during winter as there are a substantial number of older people who do not receive their free vaccination each year. The influenza vaccination coverage rate for people aged 65 years or older was approximately 67% in 2013, up slightly from approximately 64% in 2012.[7]

Influenza vaccination is subsidised for all people aged 65 years or older prior to or during the influenza season.[8] The two subsidised seasonal influenza vaccines for 2015 are Influvac and Fluarix, which are funded until 31 July, 2015. All people aged nine years or older, require only a single dose of the vaccine each year.[9]

Pneumococcal vaccination is also recommended

Invasive pneumococcal disease caused by *Streptococcus pneumoniae* occurs throughout the year but is most frequent during autumn and winter.[10] *S. pneumoniae* is the most commonly identified pathogen in older patients with community-acquired pneumonia;[11] this bacteria can also cause life-threatening meningitis and septicaemia. The mortality rate for people hospitalised due to community-acquired pneumonia is reported to range from 10 – 25%, with older people and people with co-morbidities most severely affected.[11] Approximately 43% of the 513 cases of invasive pneumococcal disease in New Zealand occurred in people aged over 65 years or older in the 12 months ending December, 2014.[12] Pneumococcal vaccination is not subsidised for people aged over 65 years (unless they meet specific high-risk criteria), but is recommended. Adults aged 65 years or over who have not previously had a pneumococcal vaccination are recommended to receive one dose of 23-PPV, ideally preceded eight weeks earlier with one dose of PCV-13. Most older people will not require a further dose of 23-PPV, but those at high risk may be given another dose five years later, e.g. those with chronic obstructive pulmonary disease, diabetes or immunodeficiency.[10, 13]

Patients can be advised that pneumococcal vaccination is effective against invasive pneumococcal disease and provides relatively long-lasting protection. Recently, a large study of more than 84 000 adults aged ≥ 65 years found that vaccination with PCV-13 was 75% effective at protecting against invasive pneumococcal disease for the entire follow-up period of the four year study.[14]

For further information on vaccination regimens for influenza and pneumococcal disease, subsidies and high-risk groups, see, the New Zealand Immunisation Handbook, available from: **www.health.govt.nz/publication/immunisation-handbook-2014**

3. Encourage and support independence: falls prevention and other lifestyle factors

Falls are the number one cause of injury in older people in New Zealand.[15] Up to 60% of people aged 65 years and over are estimated to fall each year, and 10 – 15% have a serious injury as a result of a fall.[15] Falls account for 75% of injury-related hospital admissions in people aged 65 years and over.[15]

Falls tend to occur more frequently in winter, particularly when footpaths are wet, icy or slippery, and the risk of morbidity and mortality will be increased, e.g. an older person who falls in their home and sustains a hip fracture is more likely to become hypothermic overnight if not found. There are many interventions that primary care can discuss with patients to help keep them active, reduce their risk of falling and maintain their independence.

Older people with an increased risk or history of falls can be encouraged to carry a mobile phone with them, or rent a medical alarm (funding may be available for some people, e.g. via disability allowance or Veterans Affairs). Information

for primary care clinicians about St John medical alarms is available from: **www.stjohn.org.nz/Medical-Alarms/For-GP/**

Assess risk of falls

There are a number of tools that can be used in a primary care setting to assess an older person's risk of falling, e.g. "Ask, assess, act" promoted by the Health Quality & Safety Commission (HQSC).[16] This involves asking the patient about previous falls, assessing their individual risk factors for falls, including mobility, underlying conditions, vision, hearing and safety of the home environment, and acting to implement an individualised plan for preventing falls.[16]

For further information on "Ask, assess, act" and other falls risk assessment and prevention resources, see: **www.hqsc.govt.nz/our-programmes/reducing-harm-from-falls/**

N.B. bpac^{nz}, in conjunction with the HQSC, has adapted the US Centers for Disease Control and Prevention (CDC) Stopping Elderly Accidents, Deaths and Injuries (STEADI) toolkit for the New Zealand context. This suite of resources is expected to be released later in 2015.

Vitamin D supplements for older people at risk of deficiency

The main source of vitamin D for the majority of people is exposure to sunlight, specifically ultraviolet B (UVB).[18] Dietary sources, e.g. oily fish such as salmon and tuna, can contribute to the total vitamin D intake but are not sufficient to provide adequate daily requirements.

Seasonal differences in levels of UVB in New Zealand means that vitamin D deficiency is more likely in late winter and early spring (August to October).[18] This seasonal difference is more pronounced for people living in the South Island (excluding Nelson Marlborough).[18]

Groups at high risk of vitamin D deficiency include:[18]

- People who are frail or with limited mobility, e.g. older people who are housebound in the community or living in residential care
- People with naturally very dark skin (due to high melanin levels in the skin which decreases UVB absorption)
- People who have minimal exposure to the sun due to a history of sun-damaged skin or skin cancer, cultural reasons or who are taking medicines that cause photosensitivity

Vitamin D supplements are recommended for people who are considered to be at risk of vitamin D deficiency.[18]

There is no need to measure vitamin D levels prior to initiating or during treatment.[18]

Vitamin D and falls risk

Insufficient levels of vitamin D decreases muscle strength, therefore in theory increases the risk of falls. There is mixed evidence whether vitamin D supplementation (with or without supplementary calcium) decreases the number of falls in older people. The current thinking is that vitamin D is beneficial in terms of falls risk for elderly people who are considered at risk of deficiency (e.g. in residential care with limited sun exposure), but should not be given solely for the reason of decreasing falls if there is no reason to suspect deficiency.[19, 20, 21]

Māori and Pacific adults have lower levels of vitamin D than European New Zealanders,[22] however, it is unknown what effect this has on outcomes such as falls; Pacific adults have higher bone mineral content and lower fracture rates than European New Zealanders.[22] Unless Māori and Pacific peoples have other risk factors for vitamin D deficiency, supplementation is not necessary.[18]

Exercise remains the intervention with the strongest and most consistent evidence for prevention of falls.

Exercise can reduce the risk of falls

Physical activity can increase muscle strength, flexibility, balance and coordination, therefore reducing the risk and harm from falls.[17] All adults should be encouraged to undertake moderate intensity aerobic activity for at least 30 minutes per day, on most days of the week.[17] Older people should also aim for their weekly exercise to include at least three sessions of flexibility and balance activities and two sessions of muscle-strengthening (resistance) activities.[17] Exercises that combine more than one type of physical activity are ideal, e.g. Tai Chi (resistance, flexibility, balance), swimming/aqua aerobics (aerobic, resistance), bowls (flexibility, balance) or golf (aerobic, resistance, flexibility, balance).[17]

For frail older people, any level of physical activity and reduction in sedentary behaviour is beneficial. Low-intensity resistance exercises such as "chairobics" and repeated sit-to-stand exercises can be suggested.[17]

Exercise programmes specifically tailored for falls prevention such as the Otago Exercise Programme, and group exercise classes for older people, e.g. modified Tai Chi, are offered by various providers throughout New Zealand. Funding is available in some areas - check with your local DHB for more information. Older people can also be referred to a "Green prescription" provider, who can facilitate and encourage physical activity via phone calls and face-to-face or group meetings.[17] There are currently 18 green prescription providers nationwide covering all DHB districts.

Further information on green prescriptions is available from: **www.health.govt.nz/our-work/preventative-health-wellness/physical-activity/green-prescriptions**

Assessing nutritional status

Although not directly related to falls prevention, maintaining a healthy body weight and adequate nutrition underpins all health targets for older people.

Poor nutrition can be defined as under-nutrition, over-nutrition or deficiencies of specific nutrients. In older people, the term malnutrition is generally used to describe under-nutrition as a result of insufficient macro and/or micronutrient intake from the diet, and is often more of a concern than obesity in this age group. Malnutrition is associated with a number of negative health outcomes including increased infection rates, muscle wasting, impaired wound healing, longer hospital stays and increased morbidity and mortality.

Strategies for detecting poor nutrition in older people include:

- Routinely ask patients what their usual diet is like, what they have eaten in the past few days and if they have any concerns about their food intake
- Ask patients if they have noticed any change in their bodyweight and regularly weigh patients to detect changes over time
- Ask about appetite and consider underlying causes for poor appetite, e.g. pain, depression, social isolation, reduced sense of taste or smell, adverse effects from medicines
- Ask about any oral health issues which may be affecting eating, e.g. poorly fitting dentures, tooth ache, gum disease, ulcers
- Consider other reasons for difficulties in eating, e.g. weakness or arthritis in the hands or arms, confusion, dementia, COPD
- If there is any uncertainty about a patient's nutritional status, consider using a formal assessment such as the Malnutrition Universal Screening Tool (MUST)
- Laboratory investigation is not required for diagnosing malnutrition, however, testing may be indicated in some patients to detect specific deficiencies, e.g. iron, folate, vitamin B12

The following advice can be given to patients with BMI <20 kg/m^2 or any patients with unintentional weight or muscle loss:

1. "Food First": maximise nutritional intake from the diet
   - Eat three small high energy meals per day, e.g. containing protein and fat
   - Snack between meals
   - Include dietary sources of calcium
   - Consume six to eight drinks per day; the recommended daily total fluid intake is approximately 2.1 L for older females and 2.6 L for older males.[23]
   - Limit alcohol intake
   - If possible, eat regularly with family or friends
   - Offer referral to a "Meals-on-wheels" or a similar service

2. Oral nutritional supplements: can be considered as an adjunct to the "food first" strategy in patients with a BMI <20 kg/m^2 or in any patients who continue to experience unintentional weight or muscle loss despite optimising dietary intake.

Refer to the New Zealand Formulary for prescribing and subsidy information for oral supplements: **http://nzf.org.nz/nzf_5107**

Many older people derive more of their total daily fluid intake from hot drinks, i.e. tea and coffee, than cold drinks. Recent research suggests that caffeine has less of a diuretic effect than previously thought, particularly in people who are accustomed to drinking multiple caffeine-containing drinks per day.[24] Any fluid loss associated with the caffeine in tea or coffee is generally offset by the water content of the drink.[25]

For further information, see: "Strategies to improve nutrition in elderly people" Prescription Foods Special Edition (May, 2011).

4. Perform regular medicine reviews

In an older population the proportion of people who are taking multiple medicines is inevitably increased. While much of this polypharmacy may be appropriate and result in substantial net health benefits, in older patients polypharmacy is also associated with falls, acute kidney injury, delirium, hypoglycaemia, malnutrition, hospitalisation and mortality.[26] This association has led to the terms inappropriate or problematic polypharmacy being used to describe patients who are receiving multiple medicines, where one or more of these medicines has potential harms that outweigh the benefits of treatment.[27] Patients may experience inappropriate polypharmacy because some of the medicines may interact adversely, a medicine may no longer be needed, or they may simply not receive the intended benefit of multiple treatments.

The single biggest predictor of inappropriate polypharmacy in older patients is the number of prescribed medicines.[28] Patients taking ten or more medicines continuously are considered to be at high risk of inappropriate polypharmacy.[27] Regular medicine reviews of patients taking multiple medicines increases the likelihood that clinicians will identify medicines that are no longer providing the patient with optimal benefit and will also ensure that prescribers are aware of all the medicines and over the-counter-products (OTC) that a patient might be taking. A medicine review is also an opportunity to discuss any concerns a patient has about their care.

A systematic approach to medicine reviews is recommended, including:

1. Record all known medicine intolerances and previous treatment withdrawals
2. Ask the patient to bring all their medicines, including over-the-counter and alternative products, to the consultation. Establish which ones are being taken, and list each medicine with the regimen, route of administration and strength of the last dose.
3. Discuss each medicine with the patient and the need for continued treatment; agreement should be reached via a shared-decision making approach. Frame this discussion as an attempt to optimise care and improve quality of life, otherwise the patient may feel abandoned by the withdrawal of treatments.

Following discharge from hospital is an excellent time to perform a medicine review as this transfer of care is associated with an increased risk of prescribing errors.

Community pharmacists with special training are available in some areas to provide Medicine Use Reviews that focus on improving treatment adherence and patient knowledge about medicines. Comprehensive Medicine Therapy Assessments involving clinical pharmacists have also been trialled in the Hawke's Bay DHB, with positive feedback from patients and general practitioners as well as resulting in fewer falls in the community and substantial cost savings.[29]

For further information see: "Polypharmacy in primary care: Managing a clinical conundrum", BPJ 64.

5. Know what help is available: co-ordinate referral to geriatricians, allied health and social services

Older people often have multiple complex medical co-morbidities, and an integrated team approach may be required to manage their care. Ideally, the general practitioner should be the central point for co-ordinating this care, and be aware of what other providers are currently involved in a patient's care, including who else is prescribing medicines or recommending interventions.

Discussion with a geriatrician is encouraged for many aspects of care for elderly people, e.g.:

- Making adjustments to medicine regimens in a patient who has experienced adverse effects, or is taking multiple medicines
- Assessment of a patient with acute confusion or slow onset cognitive impairment
- Assessment of a patient being considered for residential care

- Rehabilitation after an illness, disability, injury or surgery
- Assistance with managing incontinence

Many geriatric units offer both inpatient and outpatient care, with a multi-disciplinary team including doctors, nurses, occupational therapists, physiotherapists, pharmacists, speech language therapists, dietitians and social workers.

The aim of care is to support older people in maintaining their independence and quality of life. Assistance is available for personal care (e.g. showering, dressing, medicine management), household support (e.g. preparing meals, housework) and equipment to make the home safer, as well as support for carers. To access some of these services, the person must be a New Zealand citizen or resident who is eligible for publicly funded health or disability services and must undergo an assessment performed by the DHBs Needs Assessment Service (NASC) agency. Referral to the NASC agency can be initiated by anyone involved in a patients care, including the person themselves, family members/friends or a clinician.

Some older people will also be eligible for additional financial assistance from Work and Income New Zealand, e.g. financial help with accommodation, house modifications and household bills. Older people may also quality for a Disability Allowance if they have a disability that is likely to last at least six months and result in ongoing costs not fully covered by another agency. Age Concern provides many services and support for elderly people in the community. "Warm Up New Zealand: Healthy Homes" provides free ceiling and underfloor insulation for people with health needs related to cold, damp housing. People with a Community Services Card living in a house that has occupants aged <18 or >65 years are eligible to apply, however, funding is limited and not all areas of New Zealand are covered.

For further information on eligibility, access and availability of these services, see:

www.health.govt.nz/your-health/services-and-support/health-care-services/services-older-people/support-services-older-people

www.workandincome.govt.nz/individuals/a-z-benefits/disability-allowance.html

www.workandincome.govt.nz/individuals/65-years-or-older/#Helpwithhousingandlivingcosts

www.energywise.govt.nz/free-insulation

www.ageconcern.org.nz/

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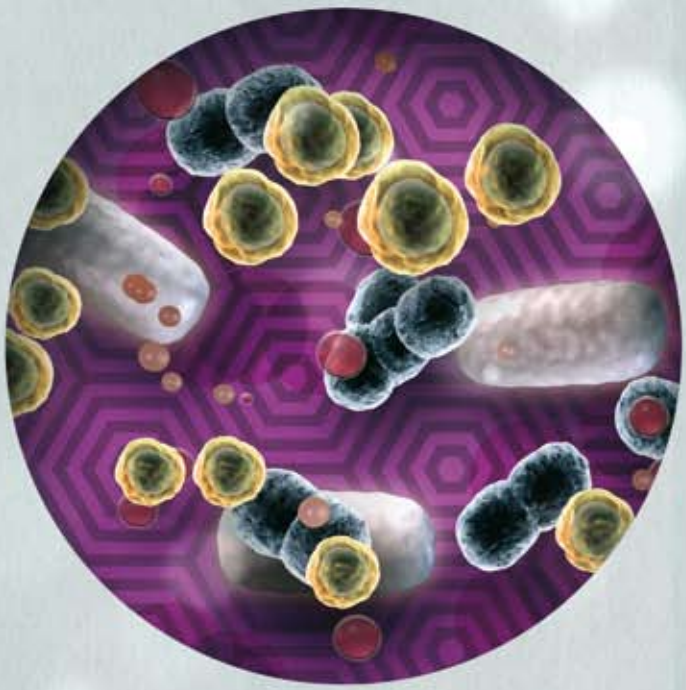

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