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Seasonal influenza vaccination

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CONTENTS

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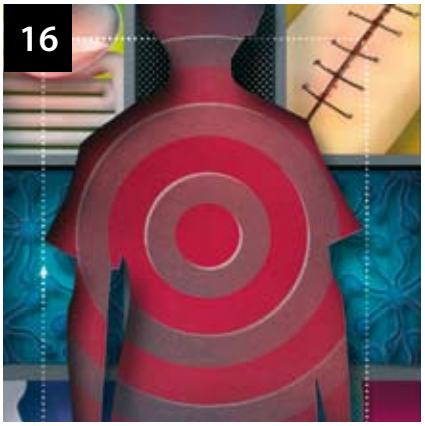
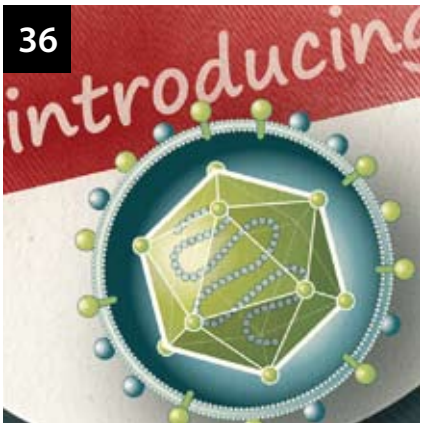


CONTENTS

Issue 59 March 2014



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Responding to the challenge of falls in older people

Contributed by the Health Quality & Safety Commission

Falls among older people present General Practitioners and other health professionals with both a challenge and an opportunity. As the likelihood of falling increases with age, do we respond by saying falls are inevitable? Or do we look at putting in place individualised interventions that reduce the risk of an older person falling?

Falls in older people are often categorised as accidents caused by identified hazards in the environment. However, the real cause of a fall is the interaction between the hazard and the person's age-related changes in functioning and disease processes.[1]

Both parts of this interaction can be addressed to prevent falls: removing hazards in the home or community environment, and better management of the person's age-related impairment or condition. This is an important role for primary care clinicians, who have a broad understanding of the health status and living situation for most people enrolled with their practice.

The **"Reducing Harm from Falls"** national programme, led by the Health Quality & Safety Commission (HQSC) in partnership with ACC and other key agencies, supports health professionals in managing older people's wellbeing. The programme aims to prevent falls and reduce harm related to falls (such as skin tears, fractures, head injuries or loss of confidence and independence).

Reducing the harm caused by falls has been the first focus area of the national patient safety campaign, **"Open for better care"**. The campaign is co-ordinated nationally by the HQSC and implemented locally by DHBs and other healthcare providers. In the Northern Region, "Open for better care" is partnered with the "First, Do No Harm" patient safety campaign.

"10 Topics on reducing harm from falls" is a set of learning activities offering up-to-date and evidence-based information for anyone involved in the care of older people at risk of falling. Links to articles published in Best Practice Journal are given in topics on hip fracture prevention and care (Topic 6), prescribing vitamin D (Topic 7), and medicine use in relation to falls risks (Topic 8).

Why assess falls risk?

One-third of people aged over 65 years living in the community have at least one fall a year, and the rate of falls increases with age.[1] Asking patients about falls is important because falls are the leading risk factor for injury in older age,[2] with fractures and head injuries the most serious injuries.

Hip fracture can be life-changing for older people and their families. Between 10 – 20% of older people will be admitted to residential care as a result of hip fracture; 27% will die within a year, and, of these people, almost two-thirds would not have died had they not fractured their hip.[3, 4, 5]

Even if older people are not physically injured in a fall, fear of further falls may cause them to unnecessarily restrict their physical and social activities, often reducing their fitness and quality of life.[1]

Older people living in the community tend to be unrealistically optimistic about falls, with most believing falls are a potential problem for their age group, but only a minority believing this risk applies to them.[6]

Current clinical guidelines on preventing falls in older people recommend routinely asking older patients if they have had a fall in the past year; many older people who have a fall do not talk about it.[7, 8]

The **"Ask, assess, act"** project is a key initiative in the national falls programme. A few simple screening questions can help identify which patients to target for in-depth, individualised, multi-factorial assessment and interventions.

The "ask" element suggests asking older patients the following questions:

- Have you slipped, tripped or fallen in the last year?
- Can you get out of a chair without using your hands?
- Have you avoided some activities because you are afraid you might lose your balance?
- Do you worry about falling?

The "assess" element recommends talking with patients and their families/whānau and caregivers to identify risk factors for falls. Clinical assessment covers known risk factors for falls, including muscle weakness, impaired balance, limited mobility, postural hypotension and impaired gait, vision or cognition. Other falls risk factors include the use of psychoactive medicines or multiple medicines, depression, dizziness, arthritis, diabetes mellitus, pain and urinary incontinence.[9] Osteoporosis or anticoagulant treatment increases the likelihood of harm from a fall.

The "act" element is the most critical - determining what support and interventions might be helpful, and taking specific actions to address the older person's particular risk factors. Many interventions that reduce falls risk are likely to be part of routine care of older people, such as managing medicines and addressing foot problems. A plan of action based on the older person's priorities and preferences is more likely to be considered manageable by family/whānau and caregivers

The suite of resources for the "Ask, assess, act" project, including a pocket card, can be downloaded from the Reducing Harm from Falls webpage: **www.hqsc.govt.nz/our-programmes/reducing-harm-from-falls/projects/ask-assess-act/**

Topic 2: Which older person is at risk of falling? (from "10 Topics on reducing harm from falls") provides background on the "Ask, assess, act" project in more detail, and can be found at: **www.hqsc.govt.nz/our-programmes/reducing-harm-from-falls/10-topics/topic-2/**

Supporting independence

Basic home safety is an important consideration for all older people. A helpful check-list, "How safe is your home", is available from the ACC website (ACC home safety checklist 5218, **www.acc.co.nz**). Referral to an occupational therapist for environmental safety assessment and modifications reduces falls in home settings for individuals identified as having a high risk of falling.[10]

Older people tend to view falls as a threat to their independence and sense of identity. In one study of older people's views, 80% of participants said they would rather be dead than be admitted to a rest home after a serious hip fracture.[11] It is important to try to keep conversations about falls positive, focusing on preserving independence and restoring their previous level of activity.

Ideally, identification and management of falls risk should be embedded in personal health assessment protocols within primary care; the Reducing Harm from Falls programme team is currently exploring how this might be achieved.

The role of vitamin D in reducing falls

Current international falls prevention guidelines recommend vitamin D supplements to reduce falls in older people, particularly those at higher risk of falling.[7, 8] Vitamin D deficiency may cause muscular impairment even before there are adverse effects on bones,[12] which increases the risk of falling. Low levels of vitamin D have been associated with reduced bone mineral density, high bone turnover and increased risk of hip fracture.

Vitamin D supplements may be prescribed without a blood test for older people who are likely to have a vitamin D deficiency, e.g. those who are housebound, require home support services, live in age-related care facilities, are frail or dark-skinned.[13, 14]

A Cochrane review of falls prevention interventions in older people living in the community found that vitamin D supplements did not reduce falls overall, although there was a 30% reduction in falls risk in the subgroup of trials that recruited only people with lower vitamin D levels.[10] Residents in age-related care facilities who take vitamin D supplements have 37% fewer falls than those not taking a supplement.[15]

ACC information sheets providing vitamin D prescribing advice for general practice teams and pharmacists can be found at: **www.acc.co.nz/preventing-injuries/at-home/older-people/information-for-older-people/PI00014**

The evidence base on the role of vitamin D in reducing falls and fractures is complex and evolving as clinical trials come to completion, such as the Auckland-based Vitamin D Assessment (ViDA) study. A brief discussion of current evidence is presented in **Topic 7: Vitamins D and falls: what you need to know**, which can be found at: **www.hqsc.govt.nz/our-programmes/reducing-harm-from-falls/10-topics/topic-7/**

Improving balance and strength

Certain exercise programmes have been found to be effective in reducing falls and fall-related injuries in older people living in the community. These interventions can also reduce health system costs by decreasing fall-related hospital admissions among older people living in the community by up to 10%.

Both group and home-based multiple-component exercise programmes have been shown to reduce falls by approximately 30%,[10] and it is likely that there is better value for money and more benefit among people at higher risk, e.g. those who have had a fall in the past year. Attendance at Tai chi classes has been shown to reduce falls by 28%, although classes are more effective for participants who are not at high risk of falling.[10]

Older people may be reluctant to participate in exercise programmes for reasons such as fatalism, fear of falling, no previous history of exercise, poor health and functional ability, low health expectations and the stigma associated with programmes targeting older people.[16]

As many older people do not consider themselves at risk of falling, it is important to promote exercise classes by emphasising their positive benefits for health, wellbeing and independence.[17]

Many older people enjoy the social aspect of group classes, but home-based programmes are also valuable because some people dislike joining groups or find them difficult to attend. Older people are more likely to participate if they are encouraged by a health professional and are offered a choice of programme types and settings.

To match patients with exercise programmes, contact local Green Prescription coordinators or ACC community injury prevention consultants at: **information@acc.co.nz**

Topic 9: Improving balance and strength to prevent falls, discusses the effectiveness of exercise programmes designed to prevent falls, including a summary of the evidence on effective components, exercise 'dose' and duration. It can be found at: **www.hqsc.govt.nz/our-programmes/reducing-harm-from-falls/10-topics/topic-9/**

Falls are everybody's business

A key message of the falls focus of the "Open for better care" campaign is that falls are everybody's business. Taking action to reduce the harm caused by falls is an important part of helping older people to maintain their health, wellbeing and quality of life.

Falls prevention efforts aim to see falls risk identification protocols and falls prevention programmes increasingly in place across all care settings, particularly primary care, and a corresponding reduction in falls-related hospital and ED admissions.

For further information on falls, see: **www.hqsc.govt.nz/our-programmes/reducing-harm-from-falls/**

For further information on the Open for better care national patient safety campaign, see: **www.open.hqsc.govt.nz**

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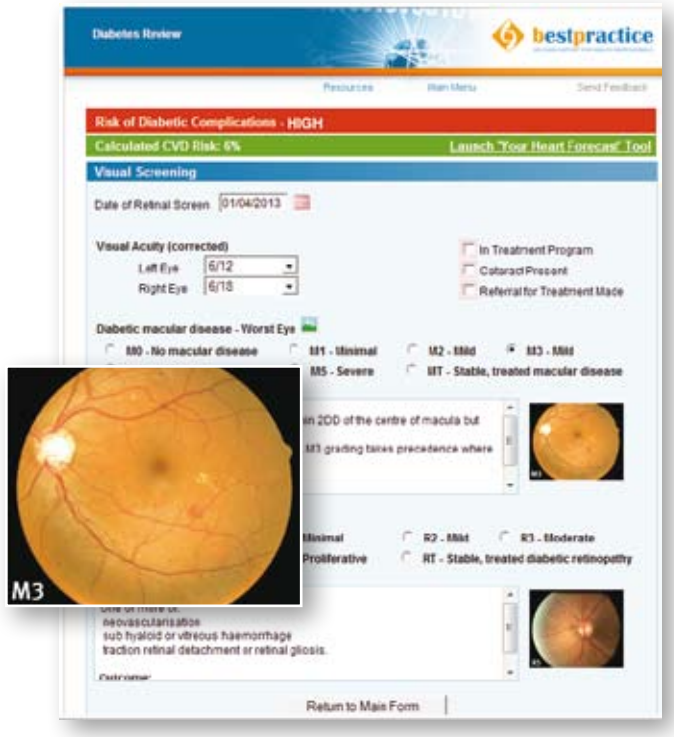

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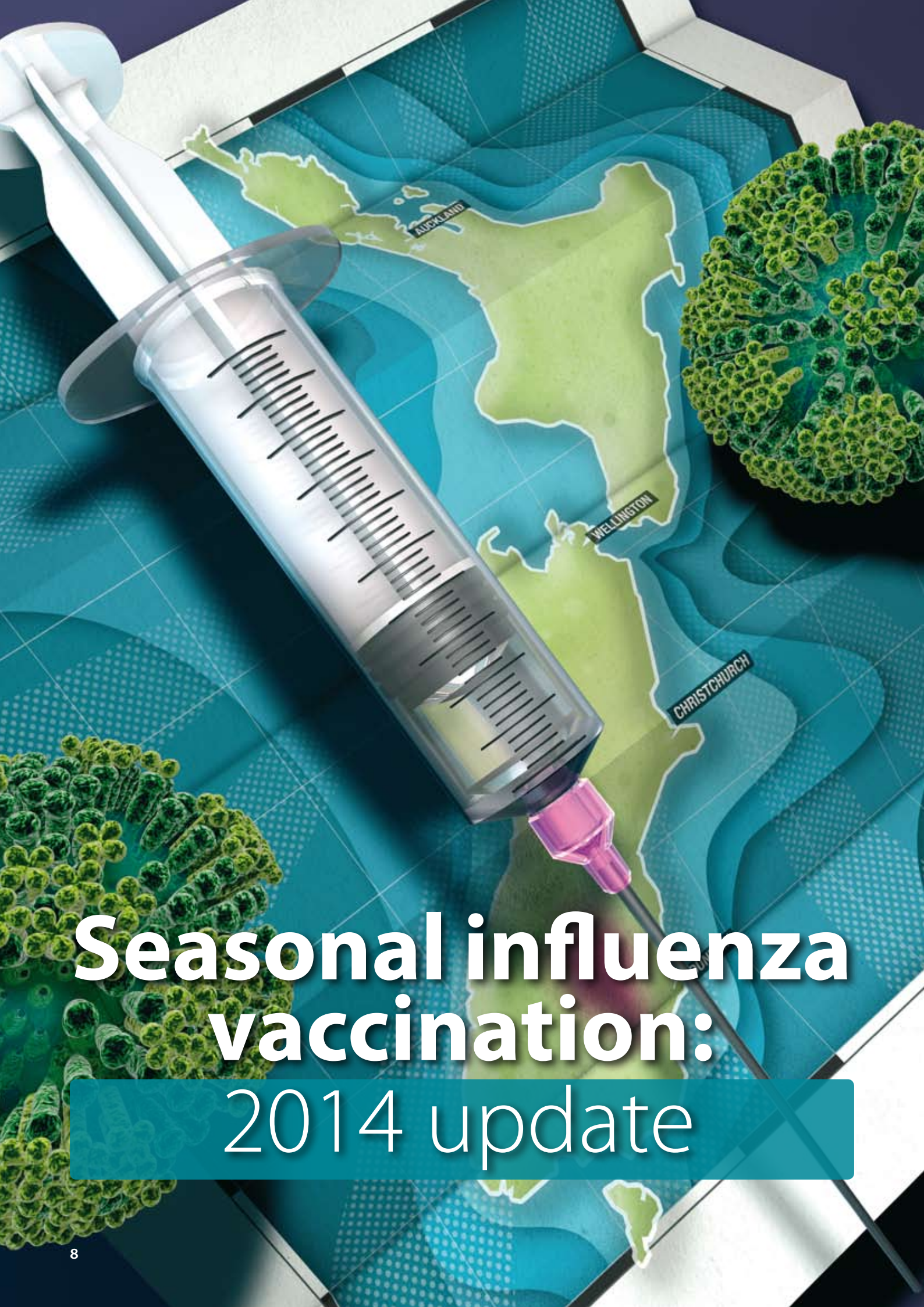


Seasonal influenza vaccination:

2014 update

The vaccine for the 2014 influenza season is now available. This year, the vaccine has been updated with two new strains, as well as the previously included A(H1N1)-like virus. The three strains will provide cover for the variants of influenza currently circulating globally and likely to affect New Zealand in winter 2014. The group of people eligible for a subsidised vaccine is unchanged from 2013. All patients can be encouraged to receive the vaccine, but older people, immunocompromised people, women who are pregnant and young children will benefit the most from vaccination. In addition, it is strongly recommended that healthcare workers receive the vaccine in order to protect themselves and their patients.

New influenza vaccines for a new year

Vaccination is the most effective means of protecting against influenza. Receiving an influenza vaccine annually is important, as different strains are generally in circulation each year (which is reflected in the strains selected for the vaccine) and because the immunity provided by influenza vaccination is only expected to last one to two years.[1] This loss of immunity is more rapid in older and immunocompromised people, and annual vaccination is therefore particularly important in these groups, as well as in younger children (aged six months to five years) who are particularly vulnerable to the complications of influenza.[2] People at increased risk of being exposed to and spreading the infection, such as healthcare workers and childcare providers, should also ideally be vaccinated.

There are two funded influenza vaccines in 2014: Influvac and Fluarix. Both are indicated for adults and children aged six months and older. The vaccines should ideally be administered intramuscularly, although both can be used subcutaneously if there is a contraindication to intramuscular administration, such as a bleeding disorder.

Administration to patients can begin as soon as the vaccine is available at the general practice. Subsidy for eligible groups is available up until 31 July, 2014 (see: "The subsidised group has not changed from 2013"). Funded vaccine claims need to be submitted within eight months from the date of administration (see over page). Vaccination is also available from selected accredited Pharmacists, however, this is not subsidised.

New strains are included in the 2014 vaccine

This year the vaccine includes two new strains, plus one strain from previous years. The vaccine components for the 2014 influenza season in New Zealand and Australia are:[3, 4]

- A/California/7/2009 (H1N1)-like virus
- A/Texas/50/2012 (H3N2)-like virus
- B/Massachusetts/2/2012-like virus

The A/California/7/2009 (H1N1)-like virus component of the influenza vaccine has been unchanged since 2010. It should provide good protection against this strain of influenza which has been prevalent in some Northern hemisphere countries during the 2013/14 winter.[3] Similarly, the A/Texas/50/2012(H3N2)-like virus component should provide good protection against the H3N2 strains also circulating and which were the predominant virus during the Christchurch severe influenza outbreak in 2012. B/Massachusetts/2/2012, which belong to the Yamagata lineage of B viruses, are now the dominant influenza B virus circulating.

These strains were recommended by the World Health Organisation and accepted by the Australian Influenza Vaccine committee as appropriate for New Zealand and Australia in 2014.[3, 4]

How many doses are required?

Adults and children aged over nine years require one dose of the vaccine to achieve immunity for the season.

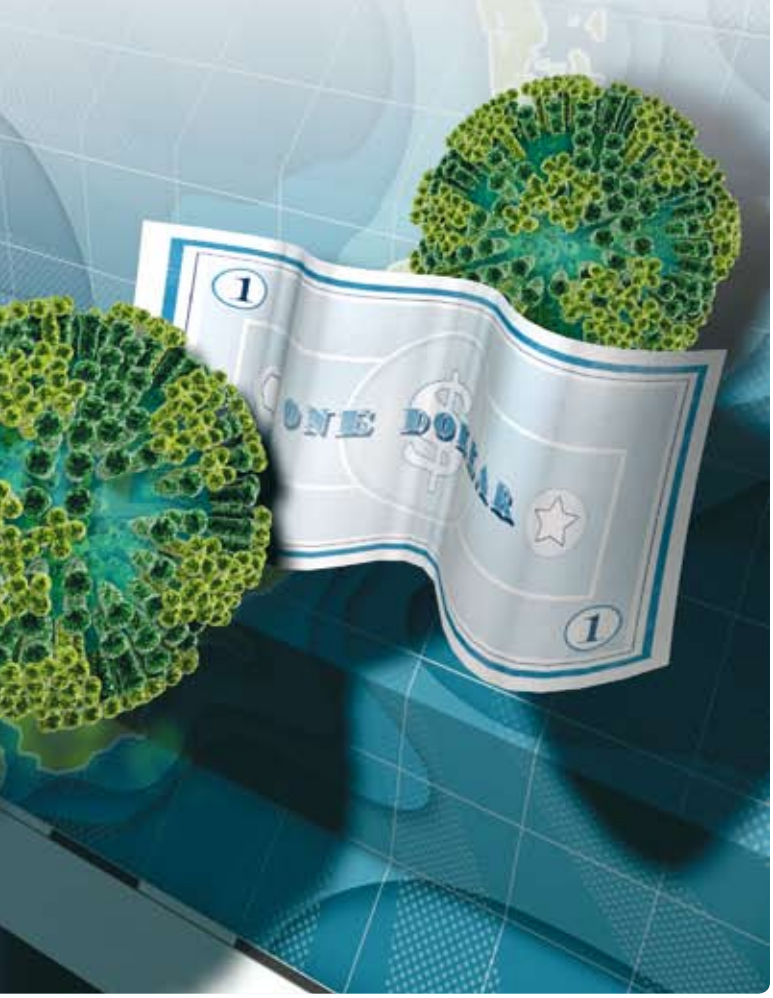
Claiming funding for the vaccine

The vaccine costs $9.00 (excluding GST) per dose. The cost of vaccines administered to patients who are eligible for subsidy can be claimed in full by the practice. The cost of administration of the vaccine to the eligible group can also be claimed, and the administration subsidy is set at $19.59 (excluding GST) per person.

The vaccine has been available for order since February. Orders are subject to a minimum order size, starting at a minimum of 50 doses in February, and reducing to a minimum of ten doses over the course of the season.

A limited refund of unused vaccines is available up until 31 August, 2014. Only 10 stock units can be refunded from any one account.

For further information on receiving the vaccine, submitting claims and returning unused vaccines, see: **http://influenza.org.nz/?t=888**



Children aged between six months and nine years who have not previously received an influenza vaccine should be given two doses, with the second dose given at least four weeks after the first. Children in this age group who have received an influenza vaccine at any time in the past require only one dose.

Who should not receive an influenza vaccine

At present there is no influenza vaccine available for **infants aged under six months**. Protection of young infants can be partially achieved through vaccinating the mother during pregnancy, and via "cocooning", i.e. immunising adults (e.g. parents and grandparents) and older children who will have contact with the infant in order to reduce the likelihood of exposure to the viruses. For most people, these vaccinations will not be subsidised.

People with an **acute illness or fever** over 38°C should delay having the vaccine until they are well.

Fluarix pre-filled syringes have a needle shield that contains latex.[1] As such, Fluarix is considered inappropriate for **people with a latex allergy**; Influvac can be used.

The influenza vaccines used in New Zealand are produced using hens' eggs and contain trace amounts of egg protein. People who have a **confirmed anaphylactic reaction to egg protein may still be given the vaccine**, however, this should be done under the supervision of an Allergy specialist or Paediatrician.[5] This is generally only recommended if the benefits of vaccination outweigh the increased risk of an adverse reaction.[5] People who have had mild reactions or hypersensitivity to egg protein may receive the vaccine with additional safety precautions, such as a 30 minute observation period following administration (the normal recommended observation period is 20 minutes).[5]

The subsidy group has not changed from 2013

The groups of people that are eligible for subsidy for influenza vaccination are unchanged from 2013. Most people at increased risk from the complications associated with influenza are able to receive a funded vaccine. The eligible groups in 2014 are:

- People aged 65 years and over
- Women who are pregnant
- Children aged under five years with a previous history of hospitalisation or significant respiratory illness

- People aged under 65 years with long-term health conditions, such as:
  - Coronary heart disease
  - Chronic kidney disease
  - Chronic respiratory conditions
  - Diabetes, types 1 and 2
  - Immune suppression
  - Cancer
  - Epilepsy
  - Rheumatoid arthritis

Practices can provide subsidised doses of the influenza vaccination until July 31, 2014, after which time, patients will have to pay the full cost of the vaccine and administration.

The full list of conditions that qualify a patient for subsidised vaccination is available from: **http://influenza.org.nz/site_resources/Influenza/Influenza 2013/Eligibility_Criteria_(2).pdf**

Healthcare providers should receive the influenza vaccine

It is recommended that all healthcare providers and non-clinical practice staff be immunised annually against influenza. Influenza vaccination among healthcare providers improves patient safety,[6, 7] and is consistent with professional ethics. Vaccination should form part of an overall practice effort to reduce influenza transmission, which includes hand washing and exclusion of all staff with influenza-like illness.

All District Health Boards in New Zealand offer free influenza vaccination to healthcare staff. Since 2010, data has been available on the uptake of this free immunisation. In 2013, approximately 58% of all employees received an influenza vaccination.[8] This rate was a significant improvement from 2012 (48%), 2011 (46%) and 2010 (45%).[8] Rates were highest among doctors (64%) and lowest among midwives (46%).[8] Nurses (55%), allied staff (56%) and other employees (60%) all had similar rates of influenza vaccination.[8] Immunisation rates also differed among DHBs, with the highest rates achieved in 2013 in Tairawhiti and Canterbury DHBs (77% and 76% respectively) and the lowest rates in West Coast DHB (36%).[8]

Healthcare workers have one of the highest exposure rates for influenza in the community, and a substantial proportion become infected with the influenza virus each season.[7] Once infected, the virus is shed before the onset of symptoms, during subclinical or clinical illness and once symptoms have resolved, meaning that healthcare workers, even when they appear well, can spread the influenza virus to patients.[7]

There is moderately strong evidence that immunisation in healthcare workers reduces patient mortality from influenza.[7] Healthcare worker immunisations are also likely to reduce the number of influenza cases in patients.[7] Overall, the benefits of healthcare worker influenza vaccination, which include reductions in morbidity and mortality among patients and reduction in illness among the workers themselves, outweigh any potential harms.[7]

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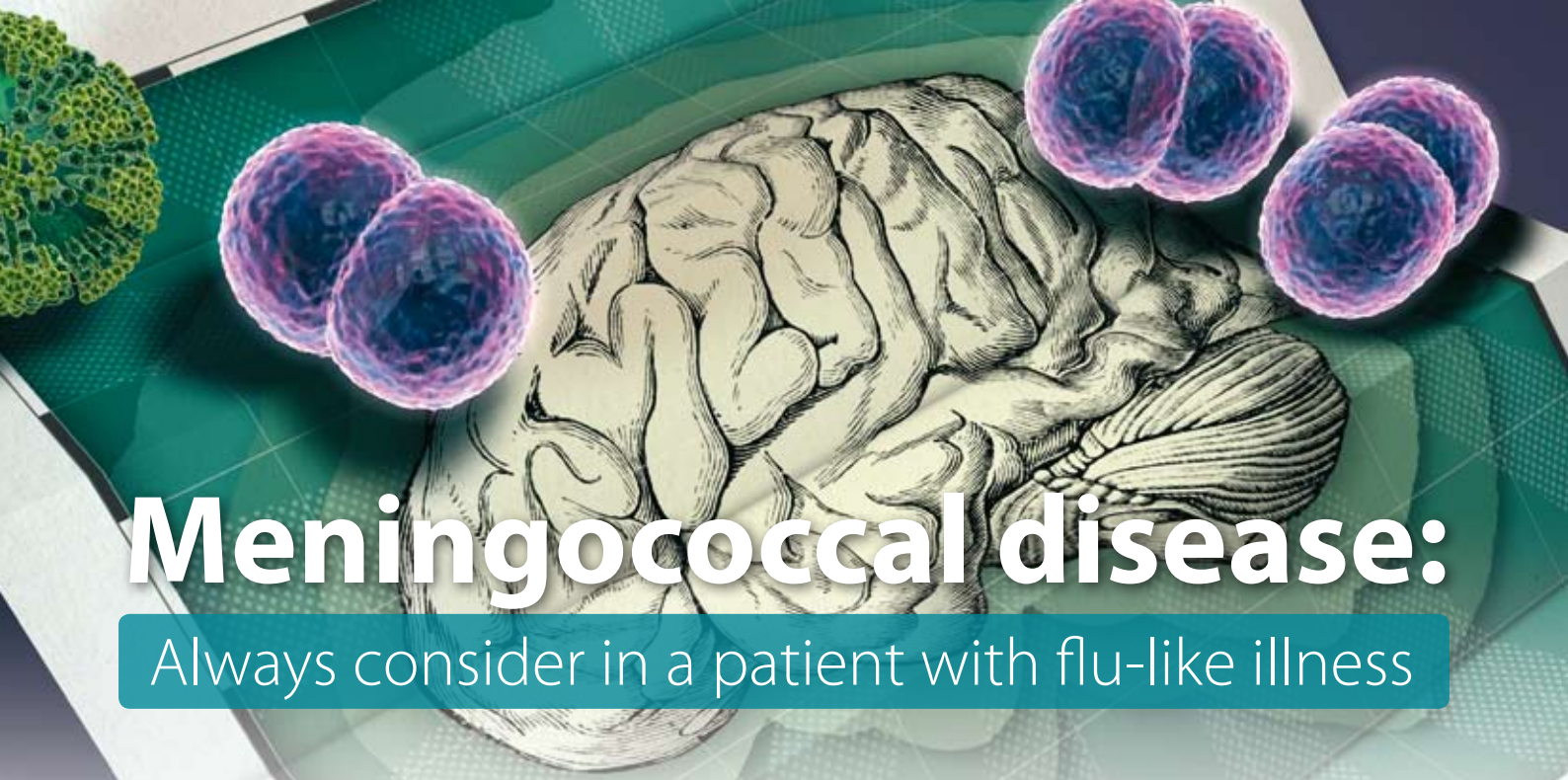

Meningococcal disease:

Always consider in a patient with flu-like illness

Patients with meningococcal disease can initially present with non-specific influenza-like symptoms. More specific signs and symptoms may develop as the illness progresses. Symptoms can rapidly progress from mild to life-threatening, therefore suspected meningococcal disease is a medical emergency.

Meningococcal disease is the term used to describe the two different types of illness caused by the bacterium *Neisseria meningitidis*: meningococcal meningitis and meningococcal septicaemia.[1] Meningococcal meningitis occurs when *N. meningitidis* multiplies on the meninges and in the cerebro-spinal fluid. Meningococcal septicaemia occurs when *N. meningitidis* multiplies to pathogenic levels in the bloodstream.[2] Septicaemia can occur in conjunction with meningitis, and is more likely to be fatal than meningitis without septicaemia.[3]

There are at least 13 serotypes of *N. meningitidis* in New Zealand;[1] most infections are caused by the group B or C strains.[4] Meningitis may also be caused by *Streptococcus pneumoniae* (pneumococcal meningitis) and *Haemophilus influenzae* (haemophilus meningitis), although vaccinations against *Haemophilus influenzae* have significantly reduced the incidence of this form of meningitis. Infants may develop meningitis due to a wider range of pathogens than adults, including Group B streptococcus, *Listeria* and *E. coli*, although these are rare.

In New Zealand in 2012 (latest available statistics), the highest rate of meningococcal disease was in infants aged under one year (19.8 per 100 000 population), followed by children aged between one and four years (5.6 per 100 000 population).[4] There was a secondary peak in notification rate in young adults aged 15–19 years (4.8 per 100 000 population).[4] Among ethnic groups, the highest rate of meningococcal disease in 2012 was in Māori (4.5 per 100 000 population), followed by Pacific peoples (3.7 per 100 000 population).[4] This compares to a rate of 1.5 per 100 000 population in people of European or other ethnicity.[4]

Identifying meningococcal disease in a patient with a "flu-like" illness

The first stage of meningococcal disease (prodromal stage) is associated with non-specific symptoms, which may persist throughout the illness. These symptoms include acute fever, vomiting, nausea, lethargy, irritability, refusing food or drink, headache, muscle and joint pain and respiratory symptoms.[5] Cough, particularly dry cough, is more indicative of influenza than meningococcal disease.[6]

Classical signs of meningococcal disease may be absent. Most patients will not display specific signs within with first four to six hours of illness (up to eight hours for adolescents), and infants may not display typical signs at all.[2, 5]

Specific signs and symptoms of bacterial meningitis include: [3, 7]

- Photophobia
- Severe headache
- Neck stiffness
- Focal neural deficit

- Drowsiness, confusion
- Seizures
- Kernig's sign – positive if a patient in a supine position with their leg raised at the hip and bent 90° at the knee experiences pain or resistance/restriction with further extension (low sensitivity, but high specificity)[8]
- Brudzinski's sign – positive if involuntary bending/flexion of the knees occurs when the patient in a supine position has their head passively raised or lifted (low sensitivity, but high specificity)[8]

Meningococcal septicaemia should be suspected if the patient has signs and symptoms including:[3, 7]

- Rash anywhere on the body, particularly if it is a non-blanching rash
- Rapidly deteriorating condition
- Limb and joint pain
- Cold hands or feet
- Capillary refill time greater than two seconds
- Unusual skin colour, e.g. pale, mottled, blue
- Tachycardia
- Rigors

Other factors that should be considered when assessing whether meningococcal disease is present, include:[5]

- How quickly the illness is progressing – people with meningitis can progress from asymptomatic to unwell enough to require hospitalisation within 24 hours[3]
- Clinical judgement, i.e. does this illness seem more severe than you would expect?
- The level of parental/caregiver concern

What to do if you suspect meningococcal disease

Immediately refer all patients with suspected meningococcal disease to hospital. The management of the patient prior to transfer can be discussed with the relevant specialist if required.

Give the patient benzylpenicillin while awaiting transport to hospital, as long as this does not unduly delay the transfer.[7] General Practitioners should not be concerned that the use of antibiotics will obscure the diagnosis, laboratory testing or retrospective review of the case.[1]

Benzypenicillin should be given in the following doses:

- Child aged under one year – 300 mg IV or IM
- Child aged between one and nine years – 600 mg IV or IM
- Child aged over ten years or an adult – 1.2 g IV or IM

Ceftriaxone 50 – 100 mg/kg, IV or IM, up to 2 g, is an alternative. However, almost any parenterally administered antibiotic in an appropriate dosage will inhibit the growth of meningococci, so if benzylpenicillin or ceftriaxone are not available, any other penicillin or cephalosporin antibiotic would be suitable.

If time permits while awaiting hospital transfer, record baseline physiological observations of:[2]

- Heart rate
- Respiratory rate
- Oxygen saturations
- Blood pressure
- Temperature
- Capillary refill time
- Neurological assessment – e.g. initially use the Alert, Voice, Pain and Unresponsive (AVPU) scale, i.e. is the patient awake, do they respond to verbal stimulus, do they respond to painful stimulus, is the patient completely unresponsive?

If there is any wait or delay in transfer, repeat observations at a frequency dependent on the clinical situation. A general recommendation is that observations are recorded up to every 15 minutes for the first two hours in infants and children and at least hourly for adults.[5, 9] Early-warning assessment tools are available in some DHBs, however, their clinical utility is still being developed and optimised. These tools use a points-based system to quantify severity and risk of meningitis using the above recorded physiological observations.

What to do if meningococcal disease cannot be ruled out

If it is unclear whether the patient has meningitis but their present clinical condition does not support immediate referral, "safety netting" is recommended, which involves:[7]

- Plan a review of the patient in four to six hours – if there is any deterioration, refer to hospital
- Advise the patient to return to the practice (or to an emergency clinic) in twelve to 24 hours or at any time if there is concern
- Between reviews, advise parents or caregivers to check the patient every hour for the next six to 12 hours and then every two hours (the parents should be advised on the signs and symptoms of meningitis)
- Ensure the patient is not being sent home alone or without support, e.g. young adults

If it is not possible to guarantee that the patient will be reliably observed at home, consider referral to hospital.

Meningococcal vaccines

Vaccines are available to protect against group A, C, Y and W135 meningococci. A vaccine is available, fully subsidised, for people who have undergone splenectomy or are functionally asplenic. There are no vaccines currently available for group B meningococci.

From 1 July, 2014, a meningococcal C conjugate vaccine (Neisvac-C) and a quadrivalent conjugate meningococcal A, C, Y and W-135 vaccine (Menactra) are expected to be funded on the National Immunisation Schedule for patients:

- Who are close contacts of people with meningococcal disease
- Who are pre- or post-splenectomy or have functional asplenia
- Post solid-organ transplant
- With bone-marrow transplants
- Who are immunocompromised

N.B. The high-risk groups for funding categories may change in the future; check the latest Pharmaceutical Schedule for clarification.

Vaccination is also recommended by the Ministry of Health, but unfunded, for:

- Adolescents and young adults living in communal accommodation, e.g. in a hostel or at boarding school, in military accommodation, in correctional facilities or in other long-term institutions
- People who are travelling to countries with a high prevalence of meningococcal disease (e.g. sub-Saharan Africa, refer to the WHO website for full list) or participating in the Hajj pilgrimage, where the risk of meningitis is increased
- Microbiologists and laboratory workers regularly handling meningococcal cultures

The recommended vaccines are the conjugate meningococcal C (NeisVac-C or Meningitec) or quadrivalent conjugate A, C, Y and W135 (Menactra). The traditional polysaccharide vaccines (Mencevax or Menomune) are available and less expensive, but generally are also less effective, not as long-lasting and are not approved for use in children aged under two years.[10]

There is currently no vaccine available that protects against group B meningococci, the dominant serotype in New Zealand. Even if someone has received the MeNZB vaccine between 2004 and 2008, they are unlikely to have retained immunity against group B meningococcal disease and they are not protected from other strains of meningococcal disease.[10]

New vaccines against disease caused by group B meningococci may be available in the future.

For further information on meningococcal vaccines, see: **www.immune.org.nz/meningococcal-vaccines-detail-0**

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Changes to the pneumococcal vaccine for children

Pneumococcal infection by the bacterium *Streptococcus pneumoniae* is a frequent cause of respiratory illnesses in children, e.g. pneumonia, otitis media, bronchitis and sinusitis.

From 1 July, 2014, the 10-valent pneumococcal vaccine, Synflorix, will be replaced on the Immunisation Schedule by the 13-valent vaccine, Prevenar13.[1]

From 1 October, 2014, the 13-valent vaccine will be the only pneumococcal conjugate vaccine available on the Immunisation Schedule. This vaccine is intended to provide broader protection with the additional three serotypes present in the 13-valent vaccine.

The 10-valent conjugate vaccine has been available on the Immunisation Schedule for children at age six weeks, three months, five months and 15 months to prevent pneumococcal disease. The 13-valent conjugate vaccine was available, but has been reserved for high-risk groups.[2]

If a child has started their immunisation schedule using the 10-valent vaccine, from July, 2014, they should receive the 13-valent vaccine for their remaining doses.[1] The total number of pneumococcal vaccine doses should equal four (three doses in the infant primary course and one dose at age 15 months). For example, if the child received one dose of the 10-valent vaccine they require three doses of the 13-valent vaccine.[1]

A 23-valent polysaccharide vaccine is also available, but is only indicated for adults and children aged over two years, who are at increased risk of invasive pneumococcal disease due to co-morbidity or immunodeficiency.[2]

ACKNOWLEDGEMENT Thank you to **Associate Professor Nikki Turner**, Department of General Practice and Primary Health Care, Director CONECTUS and the Immunisation Advisory Centre, University of Auckland for expert review of this article.

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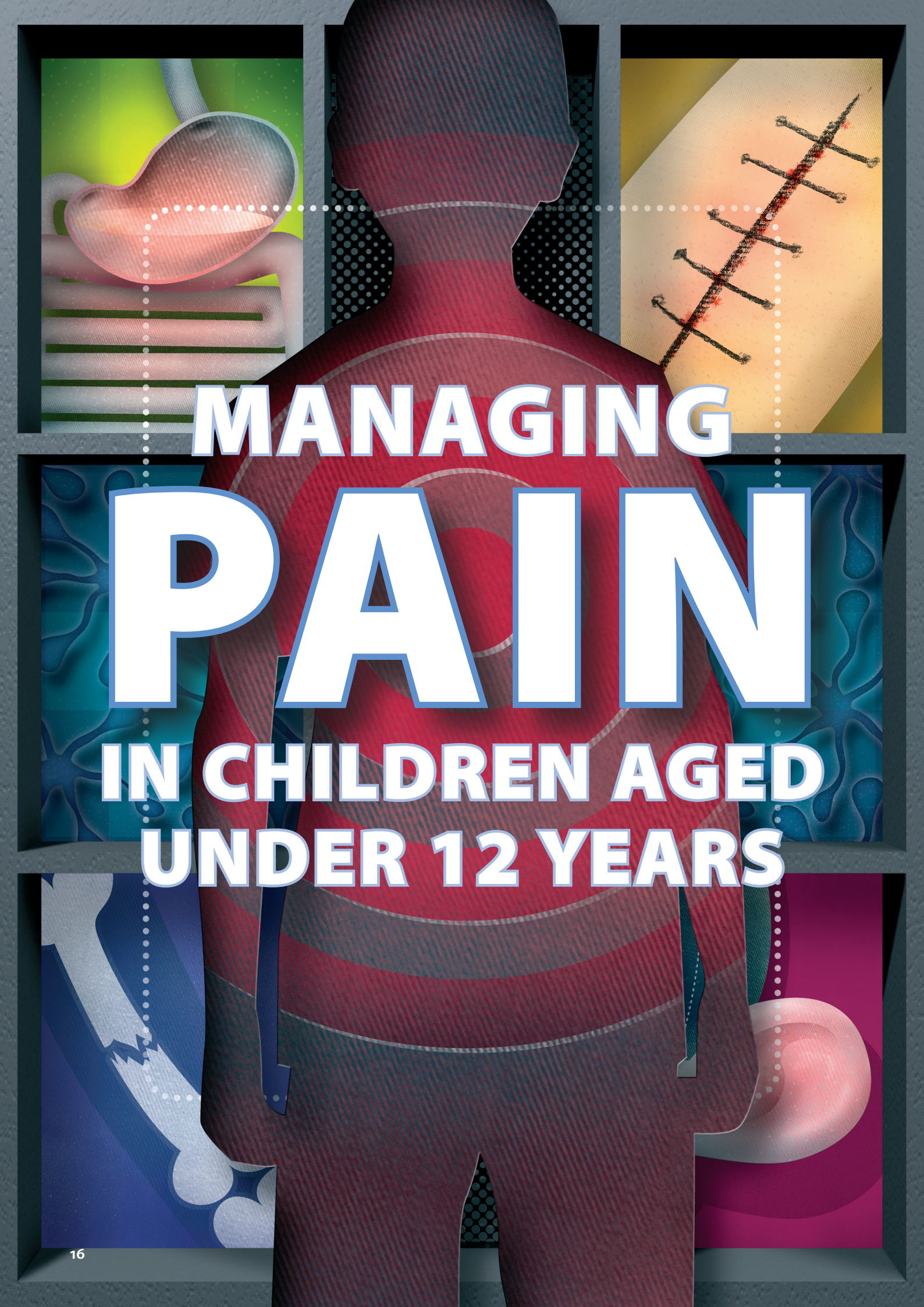


MANAGING PAIN IN CHILDREN AGED UNDER 12 YEARS

"Pain is what the patient says it is". This definition of pain can be applied to any patient, regardless of their age. Good pain management in children involves identifying and assessing the pain, followed by prompt control of the pain through pharmacological management and resolution of the underlying cause. If unmanaged, pain can lead to anxiety and stress, and in the long-term this can impact on the psychosocial health and development of a child. Presentations of pain in children in primary care will generally fall into three broad categories: mild pain associated with childhood conditions commonly treated in general practice, acute trauma and medical situations where referral and stronger analgesia may be required, and management of pain associated with long-term conditions.

Children experience pain in much the same way as adults do, but may manifest or display that pain in a different way. Pain for children is often emotionally complex, and the involvement of parents and caregivers can add to the difficulty of management. These factors, along with a cautious approach to giving analgesia to children, can lead to pain being under-treated in some situations.

Identifying pain involves observing the child's verbal and non-verbal cues and listening to the parent's judgement of the child's pain. The signs and symptoms that indicate pain in children may be different from those seen in adults, and can be counterintuitive, e.g. quietness and withdrawal.

Children presenting with pain in general practice fall into three broad categories:

- Mild, acute presentations of conditions that are associated with pain and can be managed in the community, e.g. otitis media, sore throat and minor trauma
- Acute presentations that require assessment or management in secondary care, e.g. burns, fractures, severe abdominal pain
- Ongoing management of pain associated with long-term conditions, e.g. rheumatological disorders, cancer pain and pain without an identifiable cause, e.g. recurrent abdominal pain

For General Practitioners, the key decision point in an acute setting is: "is this child's pain severe enough to warrant referral"? Depending on the cause, mild pain can usually be managed in the community, whereas moderate to severe pain is best managed in secondary care. If the source of the child's pain cannot be identified, consider referral. In most situations, infants aged under six weeks should be discussed with or referred to a Paediatrician if pain relief is required and there is not an identifiable cause.

Assessing and managing mild pain associated with general illness and injury in childhood

Assess the cause and severity of the child's pain

The aim of assessment of children with mild pain is to identify the location, quality, duration and intensity of their pain.[1] Consider aggravating and relieving factors, and if the child has already taken analgesia, consider the medicine, preparation, dose and effect in relation to current pain intensity.[1]

Self-reporting of pain by the child is the preferred method of assessing the level of pain.[2] From approximately age 18 months, children will have acquired words to express pain, and from age three to four years, children may be able to provide information on the location of pain and describe the characteristics of their pain.[1] However, consider whether the child is competent to provide such information.[2]

If pain has been present for some time, usual behavioural indicators of pain, such as grimacing and crying, may be replaced with abnormal posturing or movement, lack of facial expression or interest in surroundings, quietness, low mood and changes in sleep patterns, appetite or sociability.[1]

The signs and symptoms present will also depend on the physical and emotional state of the child, their coping style and their familial and cultural expectations of pain and illness, e.g. stoicism, hiding pain to avoid parental distress, expressing pain to receive attention.[2]

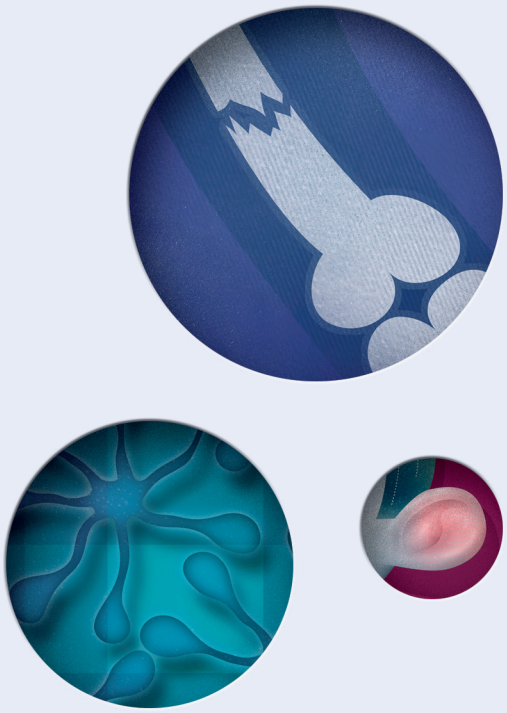
Pain assessment tools can be considered, but these tools are subjective and may under or over estimate pain. Examples include the Faces scales where the child is shown a series of faces in increasing distress and asked to identify the one they most relate to and the Poker chip tool where the child is given

Non-pharmacological management of pain

Non-pharmacological techniques should be included in the management of children with pain, when appropriate. These techniques are particularly helpful for children undergoing frequent procedures, e.g. IV insertion, burn dressing changes, but they can also be useful in more general situations such as administering immunisations.

Distraction and comfort can be provided by parents with physical touch (e.g. cradling, cuddling), books, toys, singing, storytelling or engaging in conversation. The child should be encouraged to choose the distraction, as this gives them a sense of control and will usually provide better engagement. Education about their illness or injury, such as why it hurts and when it will resolve, is useful in helping both the child and their parents feel more in control. Cognitive behavioural strategies that involve the use of breathing techniques, education and self-regulation have been shown to be effective in providing pain relief on their own or in conjunction with pharmacological pain management.[2]

Rest, ice, compression and elevation ("RICE") and techniques to stabilise an injury, e.g. splinting a fractured limb, will also reduce pain.



a set of chips that represent "hurt" and asked how many pieces their pain equals. Many of these tools are available online, e.g. **www.wongbakerfaces.org**

Managing mild pain: Paracetamol and ibuprofen

In most acute childhood presentations associated with pain, analgesia should be used to provide short-term symptomatic relief while the cause of the pain is being investigated and managed, e.g. in a child with stomach pain due to constipation analgesia may be used until laxatives and dietary changes have had time to be effective.

Paracetamol (usually first-line) or ibuprofen are the most appropriate medicines for children with mild pain. These medicines are also commonly used for their antipyretic effect (see opposite). Aspirin is contraindicated in children aged under 16 years.[3]

When prescribing analgesia to a child:

- Calculate dose based on an up-to-date measurement of weight and then double-check the calculation
- Check that the prescribed strength of liquid is as intended
- Check that the total volume of medicine does not exceed what is required
- Ensure the child is not being given any over-the-counter medicines that also contain the prescribed medicine

If pain is constantly present, analgesics should be administered on a regular schedule, i.e. "by the clock".[1] This results in more predictable and consistent levels of analgesia. The exception to this is children with intermittent or unpredictable pain, e.g. due to otitis media, where analgesia given on an as required basis is more appropriate.[1] Estimating the peak effect time of analgesics in children is difficult due to the variability in absorption rate. For example, paracetamol absorption rate following oral administration depends on gastric emptying time, which is variable in infants and children, ranging from five minutes to several hours (average approximately one hour).[4]

Paracetamol

Weight-based dosing is the preferred method of prescribing paracetamol in children, although there has been some debate as to whether weight-based or aged-based dosing is most appropriate.[1] The recommended doses of paracetamol are outlined in Table 1.

Weight-based dosing can present a problem in a very overweight or underweight child. There is disagreement as

to whether actual body weight or lean-mass weight should be used, and at present, there is limited evidence to indicate which is superior. In practice, clinical judgement should be applied when a calculated dose for a child falls outside of the usual dose range.

Age-based dosing of paracetamol does not account for the variations in body weight of children within each age category. Using this method of dosing leads to a potential risk of over-dosing in underweight children, and under-dosing in overweight children.

Paracetamol should be used with caution in children who are dehydrated, e.g. following diarrhoea or insufficient fluid intake in an infant refusing to feed. Hepatic impairment and chronic malnutrition also increase the risk of toxicity. In a child with any of these risk-factors, consultation with a Paediatrician or referral to secondary care should be considered.

Ibuprofen

Ibuprofen is the preferred non-steroidal anti-inflammatory drug (NSAID) in children. The recommended doses of ibuprofen are outlined in Table 1.

Diclofenac sodium 12.5 mg and 25 mg preparations are approved for use in children aged over one year,[3] however, it is rarely used for analgesia or inflammation in children treated in primary care.

Due to insufficient evidence and experience with use, no other NSAID should be routinely used in children or infants for the management of pain or fever.[1]

Antipyretic effects of paracetamol and ibuprofen

Many parents administer paracetamol and/or ibuprofen as antipyretics to a child with fever. Fever, however, is not an illness but a beneficial physiologic mechanism that aids in controlling infection. There is no evidence that fever itself worsens the course of an illness or that it causes long-term neurologic complications, unless particularly severe.[7] In general, the use of antipyretics will not prevent febrile convulsions. Therefore, the primary goal of treating febrile children should be to improve the child's overall comfort rather than the normalisation of body temperature.[7]

The practice of giving paracetamol before or after an immunisation to reduce the likelihood of fever is not recommended, as there is some evidence that this may reduce the antibody response to vaccinations.[9] Giving paracetamol after vaccinations, if fever does develop, is not associated with this effect.[9]

Table 1: Non-opioid pharmacological management of pain in young children[3]

Medicine	Age one month to 12 years	Maximum daily dose
Paracetamol	15 mg/kg, every 4 hours	Do not exceed 1 g per dose, four doses per day or 4 g per day
Ibuprofen	5 – 10 mg/kg, every 6 – 8 hours (5 mg/kg in children aged one to three months)	Do not exceed 30 mg/kg per day

There is evidence that NSAIDs are associated with an increased risk of acute kidney injury in children, even when given at recommended doses.[5] Therefore, NSAIDs should be second-line to paracetamol in most cases and should be prescribed with caution in children who are dehydrated.

Combining or alternating paracetamol and ibuprofen is not routinely recommended

The practice of combining paracetamol and ibuprofen or alternating doses has gained popularity. Although acceptable, this is not routinely recommended in children as there is currently a lack of evidence to support the safety or efficacy of this practice.[6] If pain persists despite treatment with paracetamol or ibuprofen, first confirm that the child is receiving an adequate dose at the correct dosing interval. Short-term use of alternating doses of paracetamol and ibuprofen may be considered if the child still has unmanaged pain despite optimal monotherapy,[6] although consideration should also be given to the original diagnosis of the underlying cause of the pain and the assessment of the severity of the condition.

Due to their mechanisms of action, using paracetamol and ibuprofen together theoretically increases the risk of renal and hepatic toxicity. While this has not been demonstrated in large clinical trials, there are individual case reports of reversible renal damage occurring in children being given the two medicines together.[6] Most studies on alternating doses of paracetamol and ibuprofen have been short-term and have focused on the medicines' use as antipyretic agents rather than analgesics. There is some evidence that combining paracetamol and ibuprofen is more effective at lowering body temperature,[7] but

Codeine and tramadol are best avoided in children

Codeine and tramadol are not recommended in a general practice setting for use in children, as other analgesic options with better safety data are available.

Codeine was previously recommended as an intermediate step on the pain ladder for managing pain in children. However, it is associated with safety and efficacy problems due to genetic variability in metabolism of codeine.

Codeine is a pro-drug that relies on conversion by the enzyme CYP2D6 to morphine, the active metabolite, to provide analgesic relief. The analgesic effect of this medicine relies on the amount and speed at which this conversion occurs, which is individually variable.[1] It is estimated that up to 10% of adults under-metabolise codeine and up to 29% are ultra-rapid metabolisers, resulting in either insufficient analgesic effect or increased adverse effects and overdose.[10] There is also significant ethnic variation, e.g. approximately 16 – 28% of people in North African, Ethiopian and Arab populations are ultra-rapid metabolisers of codeine.[10]

Codeine metabolism is even less predictable in children. It has been demonstrated that CYP2D6 activity in foetuses is approximately 1% of the adult rate.[1] From birth this slowly increases; by age five years, enzyme activity is approximately 25% of the adult rate. Because of this, codeine will generally be under-converted in children, resulting in insufficient analgesic effect,[1] however, this also depends on the ethnicity of the child. Many paediatric hospitals around the world have now removed codeine from their formularies, although codeine is still sometimes used in a secondary care setting in New Zealand, e.g. following surgical procedures such as tonsillectomy, where appropriate monitoring can be carried out.

Tramadol metabolism is also individually variable, resulting in different levels of the active component and uncertainty in dosage. As such, there is currently insufficient evidence of its effectiveness or safety in children.[1] Some developed countries limit the use of tramadol to children aged over 12 years. In New Zealand, immediate release preparations are approved for use in children aged over two years, but modified release and IV preparations are restricted to children aged over 12 years.[3]

evidence is still conflicting on whether combination treatment improves analgesic effect. One systematic review found that paracetamol and ibuprofen combined provided superior analgesia for post-operative pain in adults and children, than either medicine alone.[8] However, data on the safety of short-term use of paracetamol and ibuprofen is lacking or conflicting and long-term safety has not been established.[6]

Have a plan for ongoing pain management

Discuss the child's ongoing pain management with the child and their parents. The plan should include instruction on ongoing assessment of the child's pain by the parents, including advice on when to stop the pain relief, and when to return to a health professional, e.g. if their condition worsens.

Refer if further pain relief is required

If paracetamol or ibuprofen are insufficient to control the child's pain, strong opioids, e.g. morphine, may be required. However, the need for strong opioids indicates that referral to secondary care is appropriate.

Weak opioids, e.g. codeine and tramadol, are no longer routinely recommended in children (see opposite).[1] The well understood risks of using morphine is acceptable compared to the uncertainty associated with a child's response to codeine or tramadol.[1]

Assessment and management of children requiring referral for moderate to severe pain

A child aged under 12 years presenting in general practice with moderate to severe pain, generally requires referral to secondary care.

If urgent referral is required, and ambulance transport is most appropriate, pain relief should be started while waiting. This allows the child to be moved more easily and can reduce the total amount of analgesic administered overall.[2]

Pharmacological management in children who will be referred

Morphine is the first-line choice stronger analgesic for children with moderate to severe pain.[1] Fentanyl can be considered if morphine is contraindicated, if use of an IV injection will be problematic (see: "Intranasal fentanyl", over page) or if the child has previously had intolerable adverse effects with morphine.

Pethidine should not be used in children, as it is considered inferior to morphine due to central nervous system toxicity.[1]

Dosing strong opioids

The goal in any acute situation is to control the child's pain as rapidly as possible. Table 2 outlines the initial doses; further doses should be titrated depending on patient response.

Table 2: The starting dose for morphine in opioid-naive children aged one month to 12 years[3]

Route of administration	Starting dose, adjusted according to response
IV injection (over at least 5 minutes)	Age 1 – 6 months: 100 micrograms/kg, every 6 hours Age 6 months – 12 years: 100 micrograms/kg (max 2.5 mg), every 4 hours
Oral (immediate release)	Age 1 – 3 months: 50 – 100 micrograms/kg every 4 hours Age 3 – 6 months: 100 - 150 micrograms/kg, every 4 hours Age 6 – 12 months: 200 micrograms/kg, every 4 hours Age 1 – 2 years: 200 – 300 micrograms/kg, every 4 hours Age 2 – 12 years: 200 – 300 micrograms/kg (max 10 mg), every 4 hours

For further information see the NZFC: **www.nzfchildren.org.nz**

Technically, there is no "upper-limit" for opioid analgesics as, unlike paracetamol and NSAIDs, there is no ceiling to their effectiveness.[1] The appropriate dose is the lowest dose which provides effective analgesia, with manageable adverse effects.[1]

The main adverse effect associated with opioids is respiratory depression. Appropriate monitoring is necessary, e.g. respiratory rate and pulse oximetry.

Choice of opioid formulation

Opioids are most commonly given intravenously for managing acute, severe pain. If available, immediate-release oral morphine tablets may be given to children who are reliably able to swallow them, [1] but oral morphine is more likely to be used for continuing or persistent pain (if required) rather than in an acute, emergency situation.

Intranasal administration of fentanyl is increasingly being used in hospital and ambulance settings (see: "Intranasal fentanyl"). This is an unfunded, off-label use of fentanyl, however, St John and Starship Hospital have both developed protocols for its use.

Analgesia should not be given intramuscularly in children, because absorption can be unpredictable.[1, 2]

Intranasal fentanyl: a potential option for emergency pain relief

Fentanyl is a strong opioid that has traditionally been used for chronic pain as a transdermal patch or via IV injection. Intranasal administration is becoming more widespread in emergency situations for both adults and children. Fentanyl provides approximately equal analgesic effect to morphine.[11] Intranasal administration has the advantages of very rapid onset of analgesia, with significant reductions in pain scores within five minutes, and is less invasive than IV administration.[11] The duration of action is at least 30 minutes, which in most situations will be long enough for transport to hospital or for a topical anaesthetic to take effect, meaning that an IV cannula can then be sited more easily.[11]

In a hospital setting, intranasal fentanyl is used for children aged over two years with moderate to severe pain, e.g. due to burns or suspected fractures.[11] It is often used if the child has an injury or requires a procedure where IV access may not be required. Intranasal fentanyl is contraindicated in children with head trauma, chest trauma, abdominal trauma, epistaxis or hypovolaemia.[11] Dosing may be unreliable if used in a child with a "blocked nose", i.e. upper respiratory tract infection.

Adverse effects of intranasal fentanyl can include nausea, vomiting and sedation.[11] Respiratory depression and muscle rigidity are theoretically possible, but have not been described with the use of intranasal fentanyl.[11]

Intranasal fentanyl uses an IV preparation (e.g. a 100 microgram/2 mL ampoule), with a 1 mL syringe and a Mucosal Atomiser Device (MAD) head attached to the syringe.[11]

A dose of 1.5 micrograms/kg is used initially. A second dose of 0.5 micrograms/kg can be given ten minutes after the first dose if significant pain persists.[11] Doses of greater than 1 mL in volume should be divided between the nostrils.[11]

To administer the dose, sit the child at approximately a 45° angle, or with their head to one side. Insert the device loosely into the nostril and depress the plunger rapidly to atomise the medicine. The child should be observed for 20 minutes for adverse effects.[12]

At present, intranasal administration is an off-label use of fentanyl. Fentanyl is not available subsidised on Practitioner's Supply Order, and practices will need to purchase both the medicine and the atomiser device required for intranasal application. The medicine is relatively inexpensive to purchase.

For further information on intranasal fentanyl, see: **www.adhb.govt.nz/starshipclinicalguidelines/Intranasal%20Fentanyl.htm**

OR

www.rch.org.au/clinicalguide/guideline_index/Intranasal_fentanyl

Managing persistent pain in a child

The most common causes of persistent or recurrent pain in children include migraine, complicated recurrent abdominal pain and general musculoskeletal pain.[12] Pain should be regularly assessed and the analgesic regimen altered as necessary. The use of a pain assessment tool can allow change to be measured against baseline.

Assessing the psychosocial aspect of pain

Long-term or recurrent pain in children can affect physical and social development.[1] Psychosocial issues are more likely to occur if the child's pain leads them to feel out of control, the pain is overwhelming, the source of the pain is unknown or the cause of the pain is serious.[2]

Common psychosocial issues in children with persisting pain include:[1]

- Distress due to restriction of physical and social activities
- Emotional disturbances, e.g. fear, anxiety and emotional stress, usually seen as irritability, tantrums and failing school performance
- Sleeping difficulties
- Poor or inappropriate coping skills, usually worse in younger children, e.g. withdrawal, anger

Pain itself may also have a psychosocial cause. Recurrent abdominal pain is the classic example of a challenging diagnosis in children. One United Kingdom study showed that presentations of idiopathic abdominal pain in children increase during the school term and decrease during school holidays, a trend not seen in presentations for appendicitis and other forms of identifiable abdominal pain.[13] Another study found that approximately 75% of children presenting with recurrent abdominal pain had no identifiable organic cause, but that presentations were closely tied to stressful life events such as economic hardship, moving house and parental divorce.[14]

Violence and abuse (physical, emotional and sexual), bullying, anxiety and mental health issues can all be underlying factors in children presenting with recurrent pain. Assessment should include evaluation of the child's mental health and social factors; in older children (generally not before age ten years), consider using a HEADSSS assessment (Home, Education/employment, peer group Activities, Drugs, Sexuality, Suicide/depression and Safety).[15]

If a child's pain is thought to be psychosocial in origin or if significant psychosocial morbidity is present, consultation with or referral to a Paediatrician or other relevant specialist is recommended.

Pain management in children with chronic pain

Management of children with chronic conditions will usually be under the guidance of a relevant specialist. In these situations chronic, moderate to severe pain may be managed with strong opioid analgesics, such as morphine (Table 2). Other medicines may be initiated depending on the source or type of pain, e.g. neuropathic pain.

The role that general practice plays in the management of chronic conditions in children will vary with the child's condition and the availability of secondary services. This may involve observing for adverse effects and complications of treatment, being aware of potential medicine interactions and monitoring and adjusting the dose of analgesic medicines over time with assessment of pain levels and tolerance.[1]

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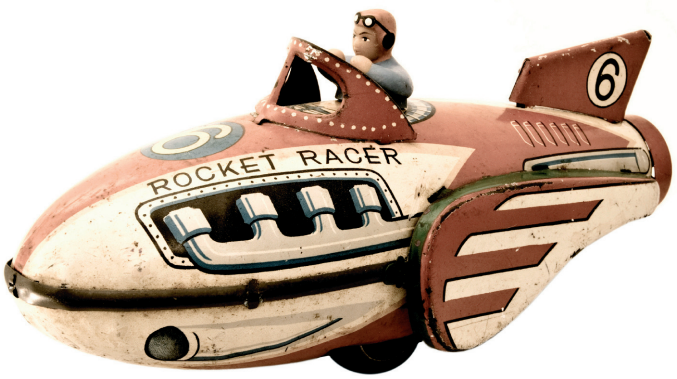

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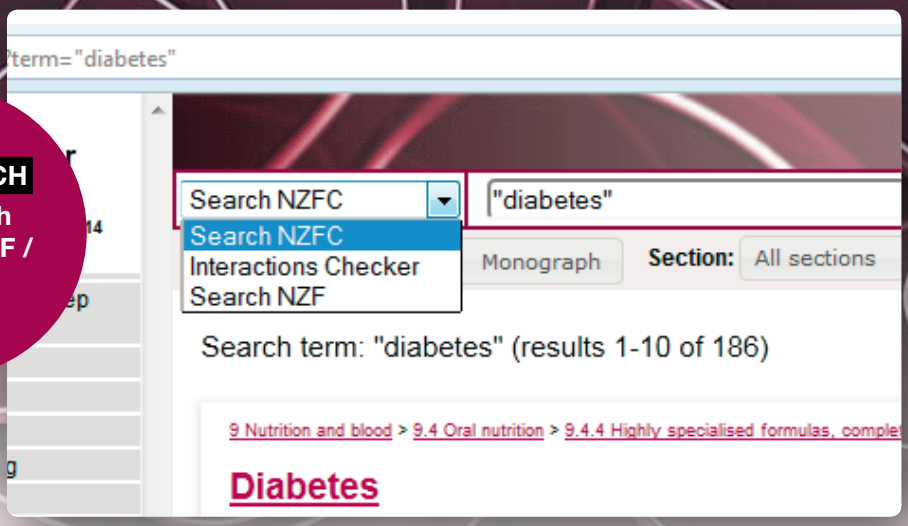

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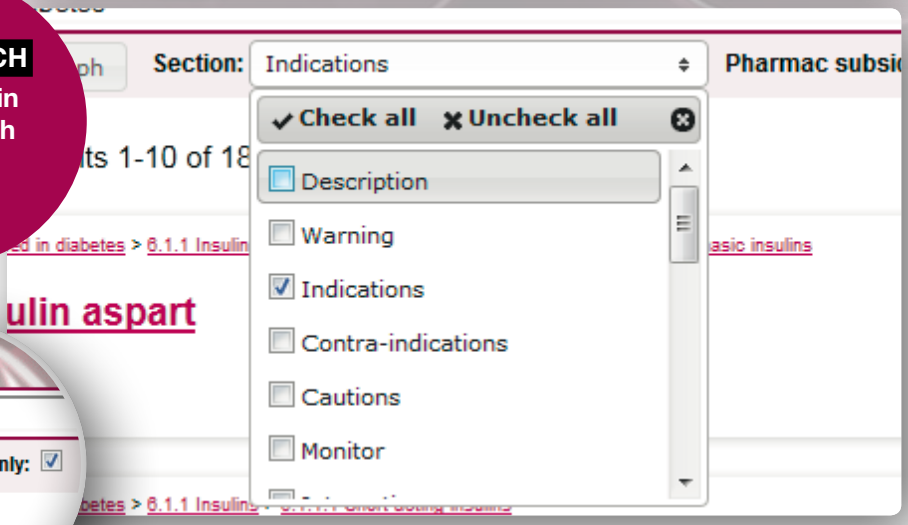

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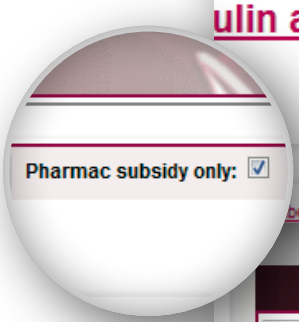

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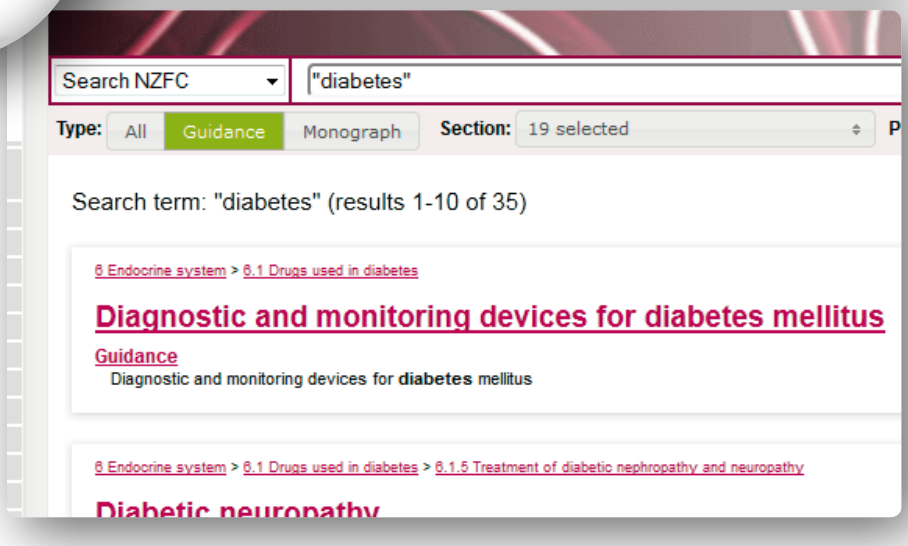

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GLAUCOMA

who to refer for testing and how to manage their treatment

Glaucoma is the leading cause of preventable blindness in New Zealand and it is estimated that half of the people affected by it are undetected.[1] To improve detection rates every person should ideally have an assessment of their optic nerve before age 45 years, and people with risk factors, e.g. a family history of glaucoma, examined earlier. Topically administered intraocular pressure-lowering medicines are the mainstay of glaucoma prevention and treatment. However, systemic absorption of these medicines does occur, which can result in adverse interactions with other treatments, e.g. antihypertensive medicines, or exacerbations of underlying conditions. Adherence to glaucoma treatment is a problem for many patients as the condition is often asymptomatic until it is relatively advanced.

Glaucoma: the sneak-thief of sight

The term glaucoma describes a group of progressive conditions characterised by damage to the optic nerve and a reduction in the visual field. The neural damage that occurs is currently irreparable and all forms of glaucoma can lead to an irreversible loss of vision.[2] Chronic glaucoma is usually asymptomatic until it is advanced, therefore detection largely relies on Optometrists testing people who are at increased risk, e.g. people aged over 45 years or who have a family history of glaucoma, and then referring those with signs of glaucoma to an Ophthalmologist for treatment initiation. Glaucoma treatment is not curative; however, it does slow the progressive visual loss. On average, patients receiving treatment for the most common type of glaucoma (primary open-angle glaucoma – Page 28) will increase the amount of time until they lose their vision by more than 50%.[3]

Raised intraocular pressure is not a defining feature of glaucoma

Ocular hypertension (intraocular pressure [IOP] > 21 mmHg) is no longer considered a defining characteristic of glaucoma.[2] A large study found that over one-third of patients aged over 55 years who were diagnosed with glaucoma had an IOP < 21 mmHg.[4] Therefore glaucoma is best thought of as an optic neuropathy for which ocular hypertension is the most important risk factor.

Reducing IOP is the only pharmacological strategy for slowing glaucoma progression; IOP-lowering treatment has been shown to be effective in multiple trials, including in patients with IOP levels within the "normal" range.[5]

Patients who are diagnosed with ocular hypertension and have major risk factors (Page 29) for developing glaucoma are also generally treated with IOP-lowering medicines to reduce their risk of developing glaucoma.

The pathophysiology of glaucoma

In a glaucomatous eye ganglion cell axons are damaged at the optic nerve head, which is the most anterior section of the optic nerve, visible on ophthalmoscopy. This damage results in a characteristic "cupped" appearance of the optic nerve head and a typical pattern of visual field loss, usually an arcuate scotoma (Figure 1). Often chronic glaucoma will affect eyes asymmetrically.[1] Genetic mutations in multiple genes appear to increase the risk of people developing the most common

Figure 1: Normal vision (left) and an arcuate scotoma (right) in a patient in the advanced stages of primary open-angle glaucoma

form of glaucoma. More than 30 mutations of the myocilin gene have so far been linked to glaucoma in different ethnic groups.[6]

The optic nerve itself is made up of 1.2 million ganglion cell axons, whose cell bodies lie in the retina and transmit axon potentials from the retina to the lateral geniculate nucleus, where the visual pathway continues to the visual cortex. When a person has elevated intraocular pressure, damage to the ganglion cell axons is thought to occur due to mechanical stress and/or impaired vascular perfusion from increased pressure. In people with glaucoma without ocular hypertension, other factors are also likely to be involved, such as microvascular insufficiency and neurodegenerative processes.

The classification of glaucoma

Glaucoma is classified according to the morphology of the angle of the anterior chamber, between the iris and the cornea, where the aqueous humour drains through the trabecular meshwork (Figure 2). In patients with open-angle glaucoma the iris does not block the flow of fluid. In patients with angle-closure glaucoma there is contact between the iris and the trabecular meshwork which causes the two structures to adhere to each other (synechia), obstructing the drainage of aqueous humour and causing IOP to rise.[3]

The same medicines (mostly topical) are used to treat patients with open-angle or angle-closure glaucoma, however, patients with angle-closure glaucoma also generally benefit from laser iridotomy. Both open-angle and angle-closure glaucoma can be further classified as primary or secondary.

Open-angle glaucoma

Open-angle glaucoma occurs when the trabecular meshwork becomes blocked over time or the tissues around it harden preventing the drainage of aqueous humour from the anterior chamber of the eye.[8]

Primary open-angle glaucoma is the most common form of glaucoma and accounts for 90% of cases in developed countries.[1] If open-angle glaucoma occurs in a patient with an IOP within the normal range this is termed "normal tension glaucoma". Many glaucoma experts now regard normal tension glaucoma and primary open-angle glaucoma to be at opposite ends of the same disease spectrum.

The physiology of intraocular pressure

Aqueous humour supplies nutrients to structures in the eye and removes waste products. It is produced by the ciliary body in the posterior chamber of the eye (Figure 2). Aqueous humour circulates from the posterior chamber, through the pupil and into the anterior chamber where it exits, mainly through the trabecular meshwork and into venous circulation. A smaller quantity also leaves the eye through the secondary uveoscleral drainage pathway. The balance between the production and drainage of aqueous humour in the eye determines IOP. The average IOP in "normal" eyes is 15 – 16 mmHg, with a range of 10 to 21 mmHg, skewed to the high end.[1] Diurnal variations in IOP can occur, typically of 3 – 6 mmHg, with a peak in the morning and a trough in the evening.[3]

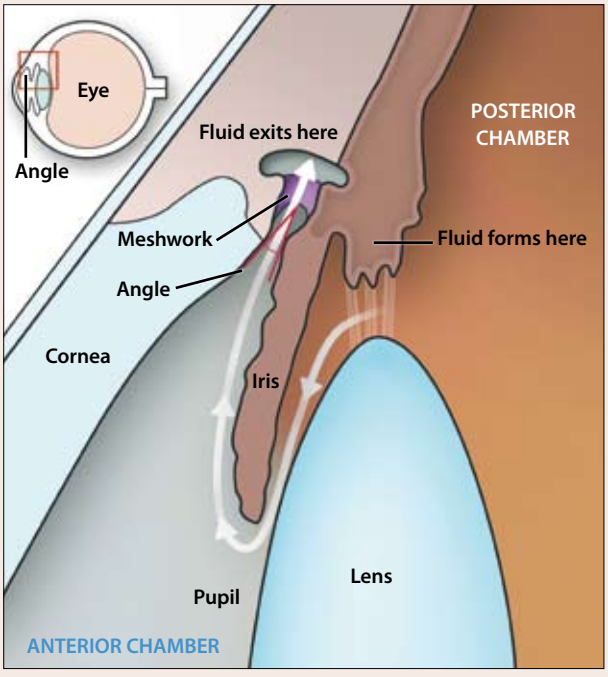

Figure 2: The production and drainage of aqueous humour. Adapted from Yumori and Cadogan, 2011[7]

Secondary open-angle glaucoma is most often caused by pseudoexfoliation (PFX) syndrome, although not everyone with PFX syndrome will develop glaucoma.[9] PFX syndrome is a systemic condition which mainly affects the eyes and is characterised by the deposition of flaky, white protein fibres within the anterior segment of the eye resulting in the trabecular meshwork becoming blocked. There is likely to be a genetic component to the development of PFX syndrome, although ultraviolet light, oxidative stress, infection and inflammation have also been linked to the condition.[10] PFX syndrome is more common with increasing age and is estimated to affect approximately 25% of people aged over 60 years.[10]

Patients with glaucoma due to PFX syndrome are generally managed in the same way as those with primary open-angle glaucoma, although the topical treatments used to lower IOP are often less effective.[11] Some patients require laser trabeculoplasty to alter the drainage tissue of the eye or surgical interventions.

Eye trauma can cause neovascular open-angle glaucoma which may develop immediately after blunt or penetrating eye trauma, or years later.[6] Corticosteroids raise IOP when administered by oral, nasal or ocular routes and this is the most common cause of medicine-induced glaucoma.[6]

Angle-closure glaucoma

There are several different angle-closure conditions. Unlike open-angle forms of glaucoma they are all generally treated by laser iridotomy once IOP and any inflammation have been stabilised.[3]

Acute angle-closure crisis is a medical emergency and the patient should be discussed with an Ophthalmologist immediately. This condition is rare and occurs in people who have a narrow ocular drainage angle, a thicker lens or a thinner iris, which are factors that increase the likelihood of blockage. IOP can be elevated to approximately 70 mmHg during acute angle-closure crisis which may cause permanent damage to ganglion cells in days to weeks, rather than the much slower progression of typical glaucoma.[12] Often acute angle-closure crisis will occur when the pupil is dilated, e.g. watching TV or in dim lighting, during periods of acute stress or excitement or as an adverse effect of atropine following surgery.[12] The most common symptoms of acute angle-closure glaucoma include intense deep eye pain, blurred vision, headache, nausea and vomiting. Ciliary injection, a fixed mid-dilated pupil, a hazy cornea and decreased visual acuity are all features suggestive of acute-angle closure glaucoma. Acute angle-closure crisis usually occurs only in one eye, but in a small number of cases, it will occur in both eyes simultaneously.[12] People who have had acute angle-closure crisis in one eye have an increased risk of developing the same condition in the other eye in the future.[12]

For further information see: "Causes, complications and treatment of a red eye", BPJ 54 (Aug, 2013).

Intermittent angle-closure glaucoma occurs in patients who have a series of minor acute angle-closure episodes due to the angle of drainage becoming partially or intermittently blocked.[3]

Chronic angle-closure glaucoma occurs when the drainage meshwork is occluded by iris synechiae gradually without the acute symptoms of angle-closure crisis. This condition mimics primary open-angle glaucoma and is diagnosed by an Ophthalmologist or Optometrist.[3]

Increased ocular pressure is the most important risk factor

An increase in IOP is the most significant risk factor for open-angle glaucoma. Ten percent of people with ocular hypertension develop open-angle glaucoma within five years.[6] This risk can be reduced by intervention with the same IOP-lowering medicines used for the treatment of glaucoma. There is strong evidence supporting the treatment of people with ocular hypertension and major risk factors for glaucoma.[6] Several trials have demonstrated that for every 1 mmHg increase in mean IOP there is an associated 10% increased risk of progression to glaucoma.[13] Other major risk factors for open-angle glaucoma include:[1, 3, 14]

- Advanced age – The prevalence of open-angle glaucoma is estimated to be 1% in people of European descent aged under 40 years and as high as 5% in European people aged over 75 years
- A family history of glaucoma – The incidence of glaucoma in first-degree relatives is three to five times higher than in the general population
- Myopia requiring optical correction – It is thought that the stronger the myopia, the higher likelihood that the patient will develop glaucoma. There may be genetic linkage between glaucoma and myopia
- Diabetes – People with diabetes have almost twice the risk of developing open-angle glaucoma than people without diabetes
- African descent – People of African descent are reported to have a greater than four-fold increased risk of developing open-angle glaucoma compared with people of European descent

The use of corticosteroids can result in substantially increased expression of the myocilin gene and the long-term use of corticosteroids by any route of administration increases the risk of glaucoma.[3, 15] In general, patients taking long-term, high-dose corticosteroids (> 10 mg prednisone equivalent) for periods of greater than two months should be considered for referral to an Optometrist or Ophthalmologist for an eye assessment. Patients who are taking high-dose prednisone for longer periods are likely to require regular follow-up examinations.

Other risk factors for open-angle glaucoma include: hypertension, smoking, hypothyroidism, peripheral vasospasm, migraine and sleep apnoea, although these associations are thought to be less strong.[1, 6] Low systemic blood pressure may be a risk factor for normal tension glaucoma.[6] A low incidence of glaucoma in Māori has been noted in the literature but there is currently no explanation for this.[16]

The principal risk factors for angle-closure glaucoma are having an eye that is anatomically predisposed to aqueous humour blockage or being of Asian descent.[3, 8]

Glaucoma is usually diagnosed by an Ophthalmologist or Optometrist

Optic nerve head pathology is reported to be over 90% sensitive and specific for glaucoma.[1] This generally involves an Ophthalmologist or Optometrist using a slitlamp and other specialised equipment to perform IOP measurements and automated field testing, as well as objective measurements of the volume of ganglion cell axons. Confrontational visual field testing in primary care is not sensitive or specific enough to be used for the diagnosis of glaucoma. New technologies are now available that allow IOP measurement using simple hand-held devices, some of which do not require topical anaesthesia, and these may become more prevalent in general practices over time.

Ophthalmoscopy has a limited role in diagnosing glaucoma as it only allows viewing of structures of the eye in two dimensions and is limited to single optic nerve assessment, one eye at a time. However, direct visualisation of the optic nerve head by ophthalmoscope can detect some features which should increase the suspicion of glaucoma:

- An increased cup-to-disk ratio (vertical ratio 0.6 or more)
- Thinning and/or notching of the neuroretinal rim
- Flame-shaped disk haemorrhage

An example of optic cupping viewed by ophthalmoscope, and the resulting increased cup-to-disk ratio, can be seen here (Figure 2 "Glaucomatous excavation of the optic nerve"): **www.ncbi.nlm.nih.gov/pmc/articles/PMC1479464/**

Ideally by age 45 years every person should have an eye examination, repeated five-yearly from age 45 years and then three-yearly from age 60 years.[8] First-degree relatives, e.g. siblings or children, of people with glaucoma are recommended to have their first eye examination five to ten years earlier than when their relative developed the condition.[6] For patients with multiple risk factors the monitoring frequency is increased. Early eye examinations can also help identify people who are susceptible to angle-closure glaucoma.

Referral of patients at risk of glaucoma

In most situations patients at risk, or suspected of having glaucoma, should be referred to an Optometrist. This is because it is difficult to gather sufficient clinical detail in primary care to allow triage into a public eye clinic. However, General Practitioners are able to refer patients to an Ophthalmologist for a publicly funded eye examination, e.g. if the patient has suspected cupping of the optic disc on ophthalmoscopy or visual field loss, if cost is a barrier.

Managing ocular hypertension and glaucoma

Reducing IOP is the focus of glaucoma treatment and prevention. IOP-lowering topical medicines are generally effective at slowing the progression of glaucoma and should be started before there are clear signs of the condition. However, there is a substantial variability in individual response.[6] In general, patients who are diagnosed with glaucoma late in its course are more likely to lose their vision, and a larger reduction in IOP will be required to reduce the likelihood of this occurring.[6] Treatment can still provide benefit to patients with advanced glaucoma.

IOP-lowering treatment is most often initiated by an Ophthalmologist, however, from July, 2014, it is expected that Optometrists will be able to prescribe topical medicines for glaucoma. Rarely, in a crisis situation, e.g. the patient has IOP > 30 mmHg, where there is an immediate risk of nerve damage and venous or arterial occlusion and access to an Ophthalmologist is problematic, then initiation of treatment in primary care may be appropriate.

Treatment targets

When glaucoma treatment is initiated, an Ophthalmologist will set an IOP target that is predicted to halt nerve damage and vision loss. This target will take into account the extent of damage to the optic nerve, baseline IOP, the speed of disease progression and other risk factors. An initial drop in IOP may occur within minutes to hours of medicine administration.[3] The patient's response is assessed by an Ophthalmologist after two to six weeks.[6]

Topical intraocular pressure-lowering medicines

Topical medicines for glaucoma are introduced in a step-wise method; a single medicine is given before another is added.[1] Patients who are on maximum treatment will therefore be using multiple medicines. Treatment of slowly-progressive glaucoma is sometimes trialled in one eye first to determine if the patient is responding, with the other eye acting as a control.[6] Alternative medicines will be introduced if there is not a clinically significant reduction in IOP or the patient is experiencing adverse effects.

There are five classes of medicines used to reduce IOP and their efficacy for achieving IOP targets may vary from up to 30% for prostaglandin analogues to 15% for carbonic anhydrase inhibitors.[3] Almost exclusively these are available as topical medicines which act by one or a combination of mechanisms, including decreasing production of aqueous humour in the ciliary body, increasing outflow through the trabecular meshwork, or increasing uveoscleral outflow:[1, 6]

- Prostaglandin analogues increase uveoscleral outflow
- Beta-blockers decrease production of aqueous humour
- Sympathomimetics (alpha2-adrenoceptor agonists) decrease aqueous humour production and increase uveoscleral outflow
- Carbonic anhydrase inhibitors decrease production of aqueous humour – an oral form of this medicine is available for the treatment of glaucoma in patients unable to tolerate topical IOP-lowering medicines
- Miotics (cholinergics) increase trabecular outflow through papillary constriction – this class of medicine is now restricted to the management of acute angle-closure crisis due to its significant adverse effects, e.g. headache and iris cysts, and the availability of more effective medicines

A topical prostaglandin analogue is usually the first choice for the treatment of glaucoma due to a higher treatment efficacy and the once daily dosing of this class of medicine.[3] Evening dosing is generally recommended for topical prostaglandins as the first studies conducted on latanoprost (Table 1) reportedly showed a beneficial effect when the medicine was administered in the evening compared with the morning.[17] This may be due to diurnal variations in IOP.[17]

Topical beta-blockers are recommended as an alternative treatment in the initial management of glaucoma, unless they are contraindicated.[3] When patients cannot tolerate topical prostaglandin analogues or beta-blockers, or they are ineffective at reaching the target IOP, other topical medicines will be considered before systemic administration is considered.[3]

Confirm that the patient's administration technique is optimal

The Double DOT (Digital Occlusion of Tear duct and Don't Open Technique) is the preferred method for eye drop administration because it maximises the efficacy of topical medicines and reportedly reduces systemic absorption by up to 70%.[6] The drop should be placed in the eye with the head horizontal. Immediately after it is placed the eye should be closed and forefinger placed in the corner of the eye, gently against the nose (punctual occlusion) for at least two minutes. Older patients should be advised to sit or lie in the supine position as this may make administration easier. If two or more drops are being administered to the same eye leave an interval of five minutes between applications.[6]

Soft contact lenses should be removed before administering topical treatments as they can absorb components of the solution resulting in prolonged ocular exposure. Contact lenses can be replaced 15 minutes after the eye drops have been administered. Gel-forming solutions and combination eye drop formulations reduce the need for patients to administer multiple medicines or multiple doses (Table 1).

The adverse effects and interactions of glaucoma medicines

Medicines that are administered topically to the eye move quickly through the nasolacrimal duct and into the nose. The nasal mucosa is highly vascular and rapid absorption into systemic circulation occurs without first-pass metabolism. Therefore medicines that are delivered via this route circulate directly to the heart and then to the lungs. IOP-lowering medicines may have clinically significant systemic effects for some patients. In particular, it is widely accepted that topical beta-blockers will produce some degree of systemic blockade and can also cause significant central nervous system adverse effects (Table 1).[3]

Table 1: Intraocular pressure-lowering medicines available in New Zealand for the treatment of intraocular hypertension and glaucoma[6, 18]

Medicine class	Indication	Dosage	Topical adverse effects	Systemic adverse effects
First-line treatments				
Prostaglandin analogues, i.e. bimatoprost (Lumigan 0.03%), latanoprost (Hysite 0.005%) and travoprost (Travatan 0.004%)	Ocular hypertension and open-angle glaucoma	One drop in the eye(s), daily, preferably in the evening	Blurred vision, stinging, conjunctival hyperaemia, foreign-body sensation, itching, reversible macular oedema, increased iris or skin pigmentation, longer, darker and thicker lashes, reactivation of herpetic infection, iritis/uveitis	Rare
Beta-blockers, i.e. betaxolol (Betoptic 0.25%, 0.5%), levobunolol (Betagan 0.25%, 0.5%) and timolol (Arrow-Timolol and Timoptol XE gel forming solution 0.25%, 0.5%)	Primary open-angle glaucoma	One drop in the eye(s), twice daily or once daily for gel-forming solution	Burning, stinging, photophobia, itching, tearing, decreased corneal sensitivity, hyperaemia, punctuate keratitis, diplopia	Bronchospasm, hypotension, bradycardia, heart block, can mask hypoglycaemia, adverse lipid effects, impotence, fatigue, depression, syncope, confusion and alopeica
Second-line treatments				
Sympathomimetic (alpha2-adrenoceptor agonists), i.e. brimonidine (Alphagan, Arrow-Brimonidine, Brimonidine 0.15%, 0.2%)	Ocular hypertension and open-angle glaucoma, or as an adjuvant treatment for inadequately controlled IOP	One drop in the eye(s), twice daily	Allergic reaction, burning, stinging, blurring, foreign-body sensation, itching, hyperaremia (increased blood flow), lid retraction, conjunctival blanching, photophobia, mydriasis (pupil dilation)	Central nervous system depression, oral dryness, headache, fatigue, drowsiness
Combination medicines, i.e. brimonidine+ timolol (Combigan 0.2% + 0.5%), dorzolamide + timolol (Cosopt or Dorzolatim 2% + 0.5%), timolol + travoprost (Duotrav 0.004% + 0.5% not subsidised)	Ocular hypertension and open-angle glaucoma not responding to monotherapy	Brimonidine+ timolol, Dorzolamide + timolol: one drop in the eye(s), twice daily. Timolol + travoprost, Latanoprost + timolol: one drop in the affected eye, once daily.	Similar to individual components	Similar to individual components
Topical carbonic anhydrase inhibitors, i.e. brinzolamide (Azopt 1%) and dorzolamide (Trusopt 2% – partly subsidised)	Brinzolamide and dorzolamide drops to reduce IOP, treat ocular hypertension and open-angle glaucoma. Dorzolamide can be used as adjunctive treatment with a ophthalmic beta-blocker.	Brinzolamide, one drop in the eye(s), twice daily. Dorzolamide, 1 drop in the eye(s), three times daily.	Drops may cause: burning, stinging, itching, keratopathy	Drops may cause: bitter taste, headache, nausea, fatigue

Third-line treatments				
Oral carbonic anhydrase inhibitor, i.e.acetazolamide (Diamox 250 mg tablet)	Oral acetazolame to reduce IOP in open-angle and secondary glaucoma, also peri-operatively following angle-closure glaucoma	Acetazolamide tablets for open-angle glaucoma, 250 mg – 1 g, daily, in divided doses	Acetazolamide tablets can cause transient myopia	Up to 50% of patients do not tolerate oral acetazolamide. Treatment may cause: fatigue, anorexia/weight loss, gastrointestinal symptoms, paraesthesia, depression, loss of libido.
Miotics (cholinergics), i.e. pilocarpine (Pilopt and Isopto Carbine 0.5%, 1%, 2%, 3%, 4%, 6%) and pilocarpine nitrate. N.B. 0.5% and 3% solutions are not subsidised. (Minims Pilocarpine Nitrate 2%, preservative free, subsidised under Special Authority)	Pilocarpine hydrochloride for open-angle glaucoma. Pilocarpine nitrate for emergency treatment of glaucoma.	One to two drops in the eye(s), up to four times, daily	Eye pain, decrease in night vision, blurred vision, miosis	Headache, salivation, urinary frequency, diarrhoea, abdominal cramps

Periocular allergic dermatitis can be caused by brimonidine drops or by preservatives in multi-use eye drop solutions. The erythema, oedema and excoriation will often form a distinctive pattern from the conjunctival sac to the lower nasal punctum and extend towards the cheek.[6] If allergic dermatitis is suspected then refer the patient to an Ophthalmologist for consideration of another medicine.[6]

The cardiovascular effects of IOP-lowering medicines

Topical beta-blockers can cause systemic effects and may exacerbate underlying cardiovascular conditions or combine with oral cardiovascular medicines causing an additive effect. Topical beta-blockers are contraindicated in patients with bradycardia, sick sinus syndrome, second or third degree atrioventricular block, severe hypotension or uncontrolled heart failure.[3] Topical beta-blockers should not be used with verapamil, diltiazem or digoxin unless under the supervision of a Cardiologist.[3] Topical beta-blockers and oral beta-blockers should not be prescribed concurrently.[3]

Topical beta-blockers can also interact with other medicines and result in an excessive drop in blood pressure.[3] This interaction can be significant for older patients who are at an increased risk of falls. If hypotension is not a concern topical beta-blockers can be safely used with dihydropyridine calcium channel blockers that have no effect on cardiac conduction, e.g. amlodipine.[3] Topical beta-blockers can impair peripheral circulation and worsen symptoms of peripheral vascular disease and Raynaud's syndrome.[3]

Sympathomimetics should be used with caution in patients with severe cardiovascular disease as these medicines can cause hypertension and may worsen the patient's symptoms.[3]

Other medicines used for the management of glaucoma can be taken safely by patients with cardiovascular disease.[3]

Topical beta-blockers can exacerbate asthma

Worsening of asthma following the use of beta-blockers is not uncommon.[3] Non-selective topical beta-blockers, e.g. timolol, are contraindicated in patients with asthma, although selective topical beta-blockers, e.g. betaxolol, may be used with caution.[3] Prostaglandin analogues and miotics rarely cause exacerbation of asthmatic conditions and are a safer treatment option for patients with asthma.[3]

Patients with COPD are less likely to experience adverse effects with the use of topical beta-blockers compared with patients with asthma.[3] However, there is a possibility that COPD may be exacerbated.[3]

Prescribe topical beta-blockers with caution to patients with diabetes

Topical beta-blockers can be safely prescribed to patients with diabetes, however, this should be done cautiously.[3] Patients with diabetes who are at risk of hypoglycaemia should be aware that topical beta-blockers may mask their symptoms of hypoglycaemia, e.g. increased heart rate and tremor.[3]

Topical beta-blockers may mask signs of hyperthyroidism
When considering prescribing topical beta-blockers for patients with a history of hyperthyroidism be aware that this treatment can mask the clinical signs of the condition, e.g. tachycardia.[3]

Medicines for depression and glaucoma may interact
Depression is a possible adverse effect of topical beta-blockers and sympathomimetics.[3] Tricyclic antidepressants (TCAs) and selective serotonin re-uptake inhibitors can cause acute angle-closure crisis in susceptible patients due to their anticholinergic effect which can cause pupil dilation.[3]

Carbonic anhydrase inhibitors and hepatic and renal impairment
Acetazolamide is contraindicated in patients with severe hepatic impairment due to an increased risk of hepatic encephalopathy.[3] The safety of topical carbonic anhydrase inhibitors, i.e. dorzolamide and brinzolamide, in patients with hepatic impairment is unknown.[3]

Acetazolamide given orally or intravenously is contraindicated in patients with severe renal impairment due to the risk of severe acidosis.[3] In patients with creatinine clearance 10 – 30 mL/min, the dose of acetazolamide should be reduced.[3] Acetazolamide also increases the risk of urolithiasis. There is a lack of information about the use of topical carbonic anhydrase inhibitors in patients with reduced renal function, therefore it is recommended that the same caution be applied as for oral acetazolamide.[3]

Monitoring long-term treatment

After glaucoma treatment has started patients are generally reassessed by an Ophthalmologist at three to 12 month intervals depending on the patient's risk profile, degree of glaucoma progression and ability to self-manage their treatment regimen.[3] Patients who are not achieving their IOP target will be seen more frequently.[3] Regular glaucoma medicine reviews in primary care are likely to assist with treatment adherence and emphasise the need for regular eye examination of other family members.

The glaucoma medicine review check-list:

1. Ensure the patient is persisting with treatment, has sufficient medicine until their next prescription renewal or repeat and that they understand the potential consequences if treatment is stopped
2. Confirm the patient is using the Double DOT method of medicine administration
3. Review any new diagnoses or treatments that may interact with glaucoma treatment
4. Confirm the patient is attending follow-up consultations with an Ophthalmologist
5. Ensure the patient has discussed the diagnosis of glaucoma with their family and that first-degree relatives understand the need to have their eyes examined at least five years earlier than the age when the patient developed the condition

Many patients do not persist with treatment

Because glaucoma is asymptomatic in its early stages some patients may not appreciate the importance of treatment. It has been estimated that after one year following treatment initiation only 10% of patients will be taking their medicines as prescribed and less than 50% of patients can be expected to be persisting with treatment at all.[7, 19] Patients who understand that glaucoma is progressive and if untreated will eventually lead to blindness are more likely to see the value of treatment.

Assessing treatment adherence in primary care
If a patient is not responding to IOP-lowering treatment it is important to confirm they are using the Double DOT technique for medicine administration. For patients who sometimes forget to administer eye drops, linking administration to daily routines, e.g. brushing of teeth, may improve adherence. A small study has suggested that patients may prefer morning administration of once daily eye drops.[17] This may be appropriate for patients taking travoprost as there is no strong evidence that evening dosing for this medicine is more effective compared to morning dosing.[17] Other prostaglandins analogues are recommended to be dosed in the evening, but if adherence issues mean that the medicine is not being taken at all, the possibility of morning dosing can be discussed with an Ophthalmologist.

Co-morbidities, e.g. arthritis, may be a barrier to self-administration of eye drops. Suggest to patients that administration may be easier while they are lying down in bed before sleeping, and/or before getting up.

Changes to the patient's management plan

If the visual field or optic nerve continues to deteriorate then an Ophthalmologist will recommend a change in the patient's medicine regimen. An eye examination will then be conducted two to eight weeks after making this change to assess the patient's response as well as to monitor for adverse

effects during the washout period of up to six weeks when the previous medicine will still have pharmacological effects.[3] Occasionally the patient's visual field loss or optic nerve deterioration will proceed atypically, raising the suspicion of other causes of nerve damage including: brain (especially pituitary) tumours, stroke and inflammation. Appropriate neuro-imaging is arranged for patients with atypical or suspicious features.

Additional treatment options

Laser techniques, incision or implant surgery are the only other routine treatment options currently available to reduce the risk of vision loss in patients with glaucoma who are unresponsive to topical medicines or unable to tolerate them. Topical medicine may still be required after surgery, but for patients prescribed multiple treatments the number of medicines may be able to be reduced.

Laser iridotomy involves creating a hole in the iris to disrupt the pupillary block which usually halts the progression of synechial closure and "opens up" the angle of the anterior chamber.[3] Prophylactic iridotomy of the unaffected eye is generally recommended.[3]

Laser trabeculoplasty is often used to treat open-angle glaucoma that cannot be controlled by medicines and tends to be more successful in patients with PFX syndrome.[3] This technique increases aqueous outflow through the trabecular meshwork and is reported to successfully control glaucoma in 80% of patients.[3]

Surgical techniques which lower IOP include trabeculectomy and glaucoma drainage device implantation, e.g. Molento Implant. These operations create a new pathway for aqueous drainage from the eye with reduced resistance to outflow. It is reported that there are no detectable differences between the change in visual field defects between patients with glaucoma who are treated by topical medicines or surgery.[7] However, surgery is associated with increased eye discomfort, increased cataract risk and a slight reduction in distance vision at five years.[7]

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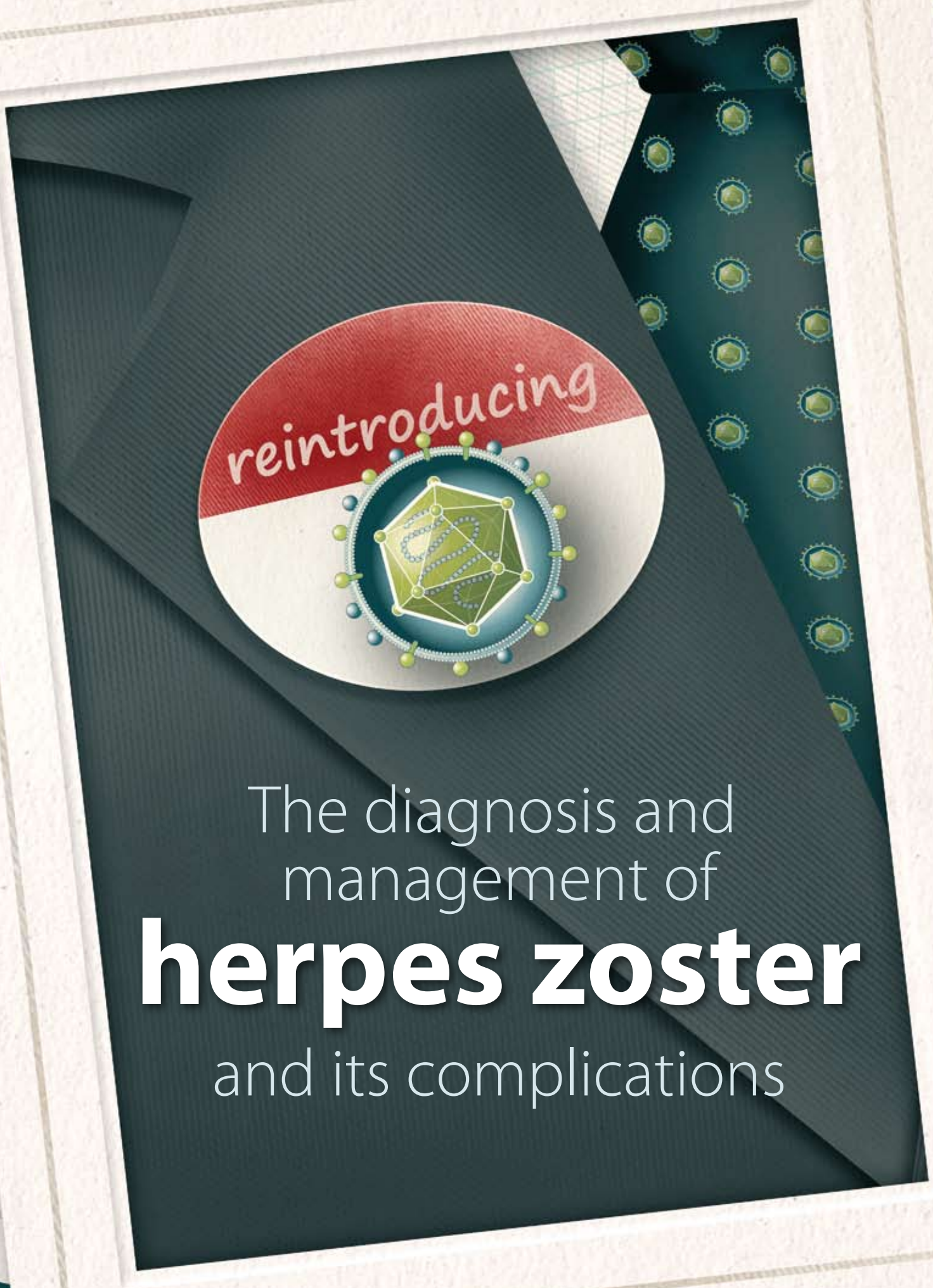

The diagnosis and management of **herpes zoster** and its complications

Herpes zoster (shingles) is a self-limiting condition caused by reactivation of the Varicella zoster *virus. Shingles most frequently develops in older people and people who are immunocompromised. Diagnosis is straightforward if the characteristic rash of shingles is present, however, patients can present with atypical features. Antiviral medicines may reduce the duration of the rash and associated pain, however, they do not reduce the risk of patients developing post-herpetic neuralgia, the most common long-term complication of shingles.*

What is herpes zoster?

Herpes zoster, also known as shingles, is a condition usually characterised by pain, followed by the development of a vesicular rash, which is unilateral and typically affects one dermatome. One-third of people are estimated to be affected by shingles during their lifetime, rising to one-half of those who live to age 80 years.[1]

Shingles is caused by reactivation of the *Varicella zoster* virus (VZV). Initial infection with VZV occurs as varicella (chicken pox); over 97% of people are infected with VZV by age 40 years.[1] The virus then resides in a dormant state in cranial nerve and dorsal-root ganglia.[2] If VZV is reactivated, it travels from the cell bodies of neurons to their nerve terminals in the skin. This causes local inflammation and pain, followed by the distinctive shingles rash.

Shingles itself is self-limiting, however, post-herpetic neuralgia is a frequent complication, where pain persists for months or years after the rash has resolved.

Who is at risk of shingles?

Only people who have previously had chicken pox are at risk of shingles. The risk of shingles and its complications increases with age, due to a decline in cell-mediated immunity to VZV.[3] Shingles most often affects people aged over 60 years, but infants who contract chicken pox in their first year have an increased risk of developing shingles before age 60 years.[2] Approximately 60% of people who develop shingles are female.[4] Compromised immunity is a significant risk factor for developing shingles, e.g. patients undergoing immunosuppressive treatment or people with HIV infection. There does not appear to be an increased prevalence of shingles in women who are pregnant, and shingles does not appear to pose the same risk to the foetus as chicken pox.[5]

Clinical features and diagnosis of shingles

Symptoms and signs

The course of shingles can be divided into three stages:[6]

1. Prodrome (early symptoms stage) – one to four days prior to rash appearing
2. Infectious rash (acute stage) – seven to ten days duration
3. Resolution (healing stage) – two to four weeks duration

Prodrome

Acute neuralgia is usually the first symptom of shingles and occurs in approximately 70 – 80% of patients.[7] It is experienced as a localised tingling, itching or burning sensation with intermittent stabbing pain. The type and intensity of pain can vary over time, but the pain usually persists through all three stages of shingles.

Systemic symptoms, including malaise, fever and headache, may also be present in some patients; reportedly in less than 20% of cases.[7] Lymph nodes in the affected area may also be enlarged.[8]

Infectious rash

The shingles rash usually affects a single dermatome in a unilateral band-like pattern and sometimes extends past the midline (Figure 1). More rarely the rash can occur in multiple adjacent dermatomes.[4] The rash most often appears on the trunk, but can also occur on other sites, such as the neck, forehead and genitals. Pain almost always accompanies the rash, but in rare cases the rash may be painless; this is more likely in children.[8] Immunocompromised people may have an atypical presentation of shingles, e.g. a widespread non-dermatomal rash.

The first stage of the shingles rash is a brief erythematous and macular phase, which is often missed. Papules appear over the

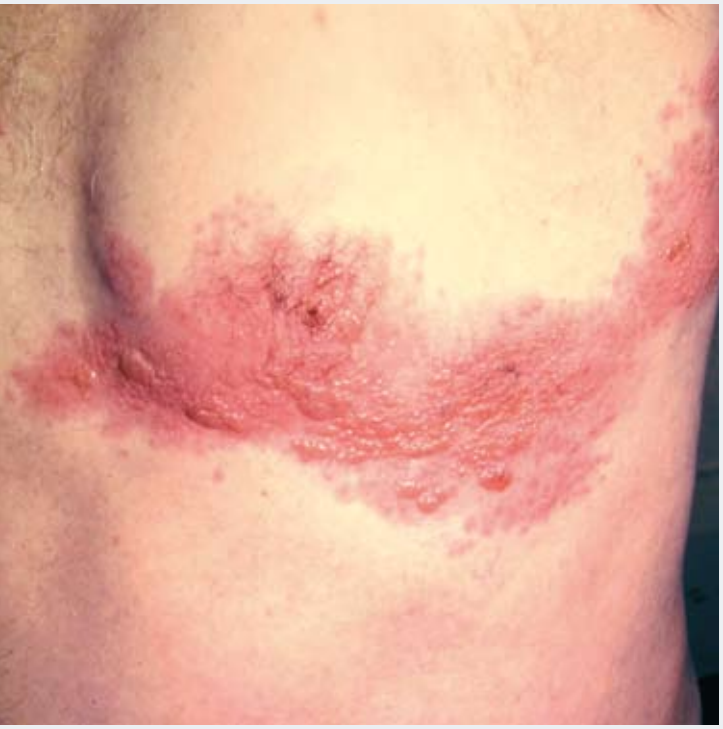

Figure 1: Unilateral shingles rash affecting a thoracic dermatome with slight extension past the midline (Supplied by Dermnet NZ)

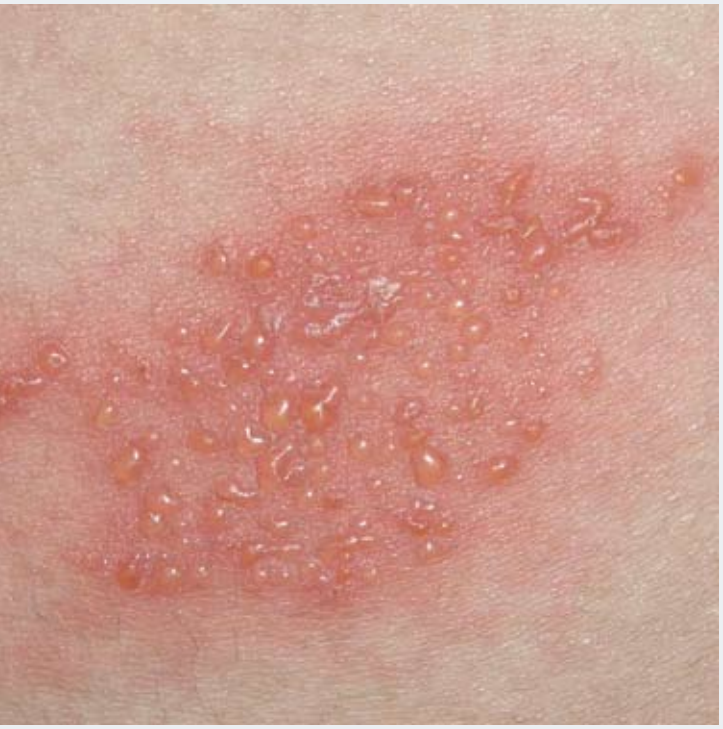

Figure 2: Characteristic vesicles due to shingles with background erythema (Supplied by Dermnet NZ)

next three to four days, and develop into vesicles within one to two days (Figure 2).[7] The vesicles then begin to pustulate within one week, followed by ulceration (which may appear black) and crusting three to five days later.[7]

Rubbing from clothing and scratching can irritate the rash, resulting in infectious lesions if vesicles burst. If this occurs, the virus can be transmitted via contact with fluid from the lesions to people who have not been previously exposed to VZV, resulting in chicken pox.[8] Transmission of VZV most often occurs to very young children and only occasionally to adults.[1]

Resolution

After the vesicles crust over, usually within ten days of onset of rash, the patient is no longer infectious. Crusted lesions may persist for a further two to four weeks.[4] Healing may take longer in older patients and patients who are immunocompromised. If the lesions have burst there may be scarring or changes in skin colour that can persist for some time after the rash has resolved.[7]

Diagnosing shingles

Dermatomal rash and pain? Shingles can be diagnosed based on the presence of the distinctive, painful dermatomal rash. Shingles is likely to be difficult to diagnose in the prodrome stage, prior to appearance of rash. The differential diagnosis at this stage will vary widely and depend on the site and nature of the pain. Severe thoracic pain, for example, can be mistaken for cardiac or pleuritic chest pain.

Dermatomal pain, but no rash? Zoster sine herpete is a rare form of shingles that occurs without the rash; diagnosis is more challenging and is based on the presence of dermatomal pain and often laboratory investigation (see below).[4] Once diagnosed, zoster sine herpete is managed in the same way as shingles.

Dermatomal rash, but no pain? A patient with a rash but no pain is less likely to have shingles, although this can occur rarely, most often in young children.[8] Other dermatological conditions that may be considered include: herpes simplex, impetigo, atopic eczema or contact dermatitis.

Laboratory testing is rarely indicated

Laboratory testing to investigate suspected shingles is not routinely required. However, there are three tests for shingles available, which may be requested if there is diagnostic uncertainty, e.g. to differentiate between herpes simplex and

herpes zoster or if shingles without a rash is suspected:

- Testing of cells from the base of a vesicle for the presence of VZV by immunofluorescent microscopy
- Real-time polymerase chain reaction (PCR), which can rapidly detect VZV DNA in skin lesion samples
- Serological testing, which can assess immunity to VZV

Both immunofluorescent staining and real-time PCR testing are useful for distinguishing *Herpes simplex* virus (HSV) from VZV.[9] Antibody testing can be used to confirm zoster sine herpete in patients without a rash but pain that is dermatomally distributed. The presence of VZV specific IgM antibodies in blood serum or cerebrospinal fluid indicates an acute infection.[10]

HIV testing may be considered in patients aged under 40 years with shingles, if there are other risk factors for HIV present.

If investigation of shingles is required talk to your local laboratory about which test is most appropriate to request.

Treatment and management of shingles

The goals of treatment for patients with shingles are to:

- Minimise the duration and severity of the rash
- Manage the associated pain

Patients should be advised not to scratch lesions to reduce the risk of transmission and avoid scarring, and to keep the lesions clean and dry. Patients should also be encouraged to avoid physical contact with other people, particularly immunocompromised people and infants aged under one year. Simple absorbent dressings can be used to cover the rash; adhesive dressings should not be used as they can delay healing and cause irritation.[6]

When vesicles pustulate, patients are at risk of secondary bacterial infection, usually with *Staphylococcus aureus* or *Streptococcus pyogenes*.[4] Topical antibiotics should not be used on the rash.[7] An oral antibiotic, e.g. flucloxacillin or cephalexin, is appropriate if secondary infection occurs.

Calamine lotion is sometimes used for symptomatic relief to reduce itch and dry lesions, although the overall usefulness of calamine lotion for shingles is limited. Antiseptics should not generally be used for the prevention of infection due to a lack of evidence that they are effective and uncertainly as to whether use of antiseptics promotes resistant strains of bacteria.

The role of antiviral medicines

There is much debate as to whether antiviral medicines are useful in the management of patients with shingles. They may have a modest effect on reducing the severity of shingles in the acute stage, but there is conflicting evidence as to whether they reduce the incidence of post-herpetic neuralgia. A recent review concluded that they were ineffective for this indication.[11]

Antiviral medicines are reported to reduce the duration of viral shedding and new lesion formation and accelerate rash healing time when given to patients in the early stages of shingles.[7] In a systematic review of evidence of antiviral treatment for post-herpetic neuralgia, four trials showed some evidence that patients with shingles treated with aciclovir within 72 hours of rash onset had a reduction in the incidence of acute pain (i.e. herpetic neuralgia) four weeks after the rash.[11]

Antiviral medicines have not, however, been conclusively shown to reduce the likelihood of patients with shingles developing post-herpetic neuralgia. A systematic review of evidence found that there was no significant difference in the incidence of post-herpetic neuralgia (pain persisting for at least 120 days after onset of rash) after four or six months in patients initially treated with either oral aciclovir or famciclovir compared to placebo.[11] The authors concluded that taking antiviral medicines within 72 hours of onset of rash, does not significantly reduce the subsequent incidence of post-herpetic neuralgia.[11]

Keeping in mind the limitations of treatment effectiveness, antiviral medicines may be considered for patients with:[6]

- Age > 50 years
- Ophthalmic involvement
- Immunocompromised status
- Atypical presentation of rash, e.g. shingles affecting the neck, limbs or perineum
- Moderate or severe pain
- Moderate or severe rash

Although likely to be most effective if given within 72 hours of rash onset, antiviral medicines may still be considered up to seven days after rash onset if the patient has an increased risk of severe shingles or complications, e.g. severe rash, severe pain, older age or immunocompromised.[6]

Oral aciclovir is first-line if antiviral treatment is given

Aciclovir 800 mg, five times daily, for seven days is the recommended first-line antiviral treatment for a patient with

shingles.[12] For patients with an estimated glomerular filtration rate (eGFR) of 10 – 25 mL/min/1.73m^2, the dose should be reduced to 800 mg, three times daily; 800 mg, twice daily, is appropriate for patients with eGFR < 10 mL/min/1.73m^2.[6]

Valaciclovir is an alternative antiviral

Valaciclovir is reported to have greater overall effectiveness than aciclovir as it produces higher levels of antiviral activity in blood.[7] Therefore, it may be a better alternative to aciclovir in patients at increased risk of complications, however, it is only subsidised for specific patients. The Special Authority criteria for valaciclovir in patients with shingles are:[12]

- Patients with a previous history of ophthalmic zoster and who are at risk of vision impairment **OR**
- Patients who are immunocompromised and valaciclovir treatment is to be no longer than seven days

The recommended dose for shingles is valaciclovir 1000 mg, three times daily, for seven days.[12] For patients with an eGFR between 30 – 50 mL/minute/1.73m^2, the dose should be reduced to 1000 mg, twice daily.[6]

N.B. Famciclovir is used in other countries as an antiviral treatment for shingles. This medicine is available in New Zealand, but is not subsidised and herpes zoster is not an approved indication.[12]

Treatment for patients who are immunocompromised

It is appropriate for patients with shingles who are immunocompromised to be managed in primary care if the rash is localised and they do not have systemic symptoms. VZV pneumonia, encephalitis and hepatitis are complications of shingles that are frequently reported in immunocompromised patients.[10] Specialist advice or referral should be sought immediately if:[6]

- The rash is severe, widespread or affecting multiple dermatomes
- Systemic symptoms are present
- The patient is severely immunocompromised, e.g. haematological malignancy, organ transplant recipient

Aciclovir is the recommended first-line antiviral treatment for shingles in patients who are immunocompromised, however, treatment should be given for ten days instead of seven.[6] Valaciclovir is an alternative.[6]

The role of corticosteroids

The role of corticosteroids in the treatment of shingles is even less clear than antiviral treatment. Oral corticosteroids are unlikely to significantly benefit the majority of patients with shingles and do not reduce the incidence of post-herpetic neuralgia. The decision on whether or not to prescribe must take into account the patient's individual risk of corticosteroid treatment.[6]

Although subject to much debate, some reviews recommend that corticosteroids may be considered alongside antiviral treatment, to treat acute neuralgia associated with shingles.[3, 7] The United Kingdom's NICE guidance recommends that oral corticosteroids may be considered in the first two weeks following onset of rash, but only in patients with severe pain who are immunocompromised.[6]

A meta-analysis of aciclovir alone compared to aciclovir with corticosteroids failed to show a benefit of corticosteroids in improving quality of life or reducing post-herpetic neuralgia.[13]

Managing associated pain

A step-wise approach can be taken to treating both acute neuralgia and post-herpetic neuralgia, adjusted according to the severity of the patient's symptoms.

Almost all people with shingles will experience acute neuralgia. Paracetamol or a non-steroidal anti-inflammatory drug (NSAID) (unless contraindicated) is recommended first-line.[6] Treatment can then be stepped up as required, depending on the severity of symptoms (Table 1). Options for moderate to severe pain include codeine, tramadol, morphine, tricyclic antidepressants and gabapentin.[3]

Post-herpetic neuralgia occurs in up to one-third of patients with shingles.[3] It is treated the same as for other types of neuropathic pain (Table 1). In general, topical treatment such as capsaicin can be trialled in patients with mild pain or with contraindications to systemic treatment. If pain is moderate to severe, traditional treatments for neuropathic pain, including tricyclic antidepressants and gabapentin, can be trialled. If pain is still unmanaged, opioid analgesics may be considered, but referral to a pain management specialist may also be considered.[3]

Table 1: Medicines for treatment of acute and post-herpetic neuralgia[6, 12]

Medicine	Typical dose	Notes
Paracetamol	0.5 – 1 g, every 4 – 6 hours; maximum 4 g daily	Paracetamol can be combined with other medicines if required, e.g. codeine, tramadol
NSAIDs	Ibuprofen: 200 – 400 mg, three to four times daily; maximum 1200 mg daily Naproxen: 250 – 500 mg, twice daily; maximum 1000 mg daily	Be aware of contraindications and cautions for NSAID use, e.g. people with renal impairment, gastrointestinal ulcer
Codeine	15 – 60 mg, every 4 hours, as necessary; maximum 240 mg daily	If a patient requires a high dose of codeine or tramadol, pain relief may be better achieved with the equivalent dose of morphine
Tramadol	50 – 100 mg, up to every 4 hours; maximum 400 mg (300 mg for elderly) daily	
Topical capsaicin	0.075% cream (Zostrix HP): pea-sized amount rubbed in to affected area, 3 – 4 times daily	Topical capsaicin is indicated for use on healed lesions in patients with post-herpetic neuralgia, and is available fully subsidised (with endorsement for post-herpetic neuralgia). Topical capsaicin is not generally used for acute shingles rash as application to broken skin (i.e. burst vesicles) causes a painful burning sensation.
Tricyclic antidepressants	Nortriptyline: initially 10 mg, once daily at night, gradually increased if necessary N.B. Dose for patients with shingles should generally not exceed 75 mg daily Amitriptyline is an alternative	There is little difference in analgesic efficacy between TCAs, however, nortriptyline is usually better tolerated and less associated with sedation than amitriptyline,[6] therefore it is the preferred choice. TCAs are associated with anticholinergic adverse effects, e.g. dry mouth and blurred vision. TCAs should be used with caution in people with cardiovascular disease, and are contraindicated in people with arrhythmias. For further cautions see NZF.[12]
Gabapentin	300 mg, once daily on day 1, then 300 mg, twice daily on day 2, increasing to 1.8 g daily in 2 or 3 divided doses	Gabapentin is a second-line option for neuropathic pain. It is available fully subsidised under Special Authority, which requires that treatment with TCAs has been tried without success/tolerance. Doses need to be adjusted in patients with renal impairment (see NZF)[12] Pregabalin is an alternative to gabapentin for neuropathic pain in patients with shingles,[6] but is not subsidised (see NZF for further details).[12]

For further information on treatment of neuropathic pain, see "Pharmacological management of neuropathic pain", BPJ 16 (Sept, 2008).

Vaccination for prevention of shingles

Zostavax vaccination is available (unsubsidised) for protection against shingles. A 2012 meta-analysis showed that older adults who had received the zoster vaccine had a 50% reduced incidence of shingles compared with those who had a placebo vaccination.[16] The vaccine was most effective in people aged 60 – 69 years (64% reduced incidence of shingles).[16] A related meta-analysis was inconclusive as to whether zoster vaccination prevents post-herpetic neuralgia in patients who get shingles despite vaccination.[17]

A single dose of Zostavax may be considered for people aged over 50 years, irrespective of exposure to chicken pox or previous occurrence of shingles.[18] It is contraindicated for immunocompromised people, women who are pregnant, people with active untreated tuberculosis, and people with known anaphylactic reactions to any component of the vaccine.[12,18]

Zostavax contains the same live attenuated Oka strain as the varicella (chickenpox) vaccine, Varilrix,[12] however, vaccination with the varicella vaccine will not protect against reactivation of VZV. This is because the two vaccines are of different strengths – the shingles vaccine is up to 14 times more potent than the varicella vaccine.[8]

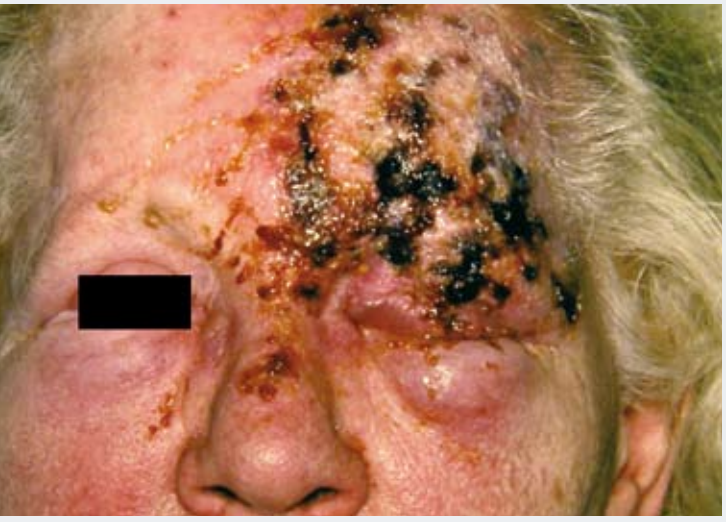

Figure 3: Herpes zoster ophthalmicus

(Supplied by Dermnet NZ)

Detecting and managing complications of shingles

Post-herpetic neuralgia is the most frequent complication

Post-herpetic neuralgia is defined as pain lasting for more than 120 days after onset of the shingles rash.[7, 11] Most cases resolve spontaneously, but pain can persist for several months or even years.[4, 11] In rare cases, post-herpetic neuralgia may first appear months to years after resolution of the acute shingles episode.[3] Often this is precipitated by a painful event, e.g. surgical procedure or tooth abscess,[3] and the patient may not connect the pain with their past shingles episode.

Post-herpetic neuralgia usually occurs in the same dermatome as the rash, and is felt as a burning or shooting pain, itch, numbness or increased sensitivity to pain or touch.[3, 8] Patients often experience abnormal sensations in the affected dermatome (and sometimes extended beyond the margins), e.g. areas of anaesthesia, or lack of response to thermal, tactile, pinprick or vibration sensation.[3]

Post-herpetic neuralgia is the most frequent complication of shingles; estimates of prevalence range from 9 – 34% of patients with shingles.[3] However, age is the most important risk factor; it is estimated that 30% of patients aged over 80 years and 20% of patients aged 60 – 65 years experience post-herpetic neuralgia.[4] It is rare in patients aged under 50 years.[4] Increasing age is also associated with increasing severity of the post-herpetic pain.[3] Other risk factors for post-herpetic neuralgia include: severe pain when the shingles rash is present, greater severity of the rash and ophthalmic location of the rash.[3, 4]

Herpes zoster ophthalmicus

Herpes zoster ophthalmicus occurs when shingles affects the ophthalmic branch of the trigeminal nerve (the 5th cranial nerve). It is estimated to represent 5 – 25% of all cases of herpes zoster.[4, 14, 15] Patients with herpes zoster ophthalmicus should be urgently referred to a Ophthalmologist, particularly if they have visual symptoms, corneal epithelial defect on fluorescein examination or Hutchinson's sign (see: Best Practice Tip),[6] as it can lead to permanent vision loss and cranial nerve palsies.[4]

The symptoms and signs of herpes zoster ophthalmicus are the same as for shingles affecting other areas, but patients present with a periorbital distribution of the rash, and all parts of the eye innervated by the ophthalmic branch of the trigeminal nerve can be affected (Figure 3). A small number of patients may develop conjunctivitis, keratitis or uveitis.[14, 15]

For further information on investigating a patient with "red eye" see: "Causes, complications and treatment of a red eye", BPJ 54 (Aug, 2013).

Best Practice Tip: Hutchinson's sign refers to the presence of vesicular lesions on the nose due to involvement of the nasociliary branch of the trigeminal nerve.[14] Although uncommon, this sign gives a reliable prediction of ophthalmic complications in a patient with herpes zoster ophthalmicus.

Ramsay Hunt syndrome type II

Ramsay Hunt syndrome type II, also known as herpes zoster oticus, is a rare complication of shingles involving the geniculate ganglion of the facial nerve. A patient with Ramsay Hunt syndrome generally presents with lesions in the ear and side of the tongue and facial paralysis.[7] Other symptoms may include loss of taste and, if the vestibulocochlear nerve is affected, vertigo and tinnitus. Ramsey Hunt syndrome may initially be difficult to differentiate from Bell's palsy,[2] however, Bell's palsy is usually painless and does not affect the ear or tongue.

Other rare complications of shingles include encephalitis, myelitis, hemiparesis, pneumonia and meningitis.[4, 6]

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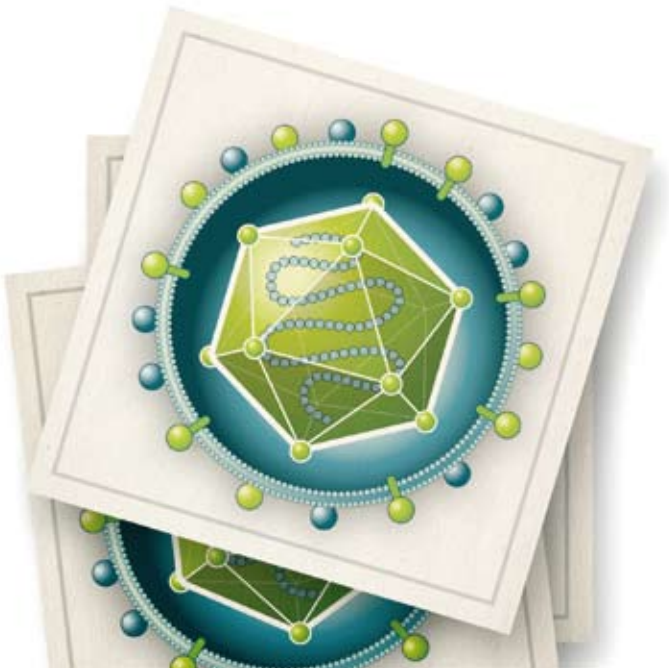

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Annual update of the New Zealand Health Survey reveals declining smoking rates but increasing rates of obesity

Statistics New Zealand carries out the New Zealand Health Survey as part of a programme to develop and coordinate official social statistics. These statistics provide relevant health information to help formulate and evaluate policy. In the most recent update of the New Zealand Health Survey covering 2012/13, 13 009 adults and 4485 children were surveyed.[1]

In the latest update released in December 2013, it was reported that daily smoking rates in adults are continuing their downward trend dropping from 16.4% in 2011/12 to 15.5% in 2012/13. Smoking rates in young people have also declined from 24% of people aged 18-24 years smoking daily in 2011/12 to 20% in 2012/13. However, smoking rates among Māori and those living in the most deprived areas are still high; 36% of Māori adults and 28% of adults living in the most deprived areas smoke daily.

Current survey results show an increase in the incidence of obesity in adults. In New Zealand, 31% of the adult population are now obese. This is an increase from 29% in 2011/12 and 26.5% in 2006/7. Rates of obesity are significantly higher among those living in socioeconomically deprived areas.

Prescription prices increased from $3 to $5 on 1 January 2013 and it was anticipated that more people would be unable to collect their prescriptions due to the increased cost. However, in the 2012/13 survey, fewer adults (6%) reported that they were unable to collect a prescription due to cost in the last 12 months, compared to the previous year (7.4%). However, the authors stated that more data is required to confirm this finding as the 2012/13 survey included responses from interviews conducted both before and after the price change. Results from the 2013/14 survey will enable better comparison of rates of unfilled prescriptions before and after the policy change.

Of concern, people living in more deprived areas have poorer health and report greater unmet need for health care. Significantly higher levels of all health risks, including smoking, hazardous drinking, inadequate fruit and vegetable intake, low physical activity and obesity are reported by those living in the most socioeconomically deprived areas. This group have a higher incidence of most health conditions, with rates of diabetes and psychological distress being particularly high in comparison to rates in people living in the least deprived areas. Cost was a major barrier to seeking health care for adults and children living in the most deprived areas. In particular, children living in the most deprived areas were seven times more likely than children in the least deprived areas to have unfilled prescriptions due to cost in the past year.

For more findings from the 2012/13 New Zealand Health Survey update see: **www.health.govt.nz/publication/new-zealand-health-survey-annual-update-key-findings-2012-13**

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Further roll-out of the Community Pharmacy Anticoagulation Management Service

Following a successful pilot in 2010, the Community Pharmacy Anticoagulant Management (CPAM) Service was rolled out to a further 50 pharmacies in 2013. Currently, 125 pharmacies throughout New Zealand are offering this service to over 2000 patients.

The CPAM Service is a new model of care which involves accredited community pharmacies providing point-of-care INR testing (by finger prick sample) and adjusting warfarin doses "on the spot" with the aid of a decision support system (INR Online). The General Practitioner retains overall responsibility for the patient's management and is automatically informed of each test and the recommended dose, is consulted on tests that fall out of range, and can intervene at any time.

So far the service has been well received and has had some positive outcomes. In the latest evaluation (1 September, 2012 to 31 May, 2013) it was reported that INR test results for patients enrolled in the CPAM service were in the Therapeutic Treatment Range (TTR) 74 – 78% of the time.[1] TTR is a widely used measure of the quality of anticoagulant control. International guidelines recommend maintaining the results in the TTR 60% of the time or more in order to maximise the benefits of warfarin and to limit adverse effects. Studies of the usual model of care in New Zealand, where general practices arrange venous blood sampling, testing is carried out by a community laboratory, and results are received and communicated back to the patient, have reported TTRs less than 60%.[2]

Patients using the CPAM service were compliant with INR testing, with over 80% of patients getting their tests on or before the due date.[2]

Patients, Pharmacists, General Practitioners and Practice Nurses were surveyed on their opinions of the CPAM service during the pilot study and following the initial roll out. Pharmacists were overwhelmingly positive about the service and supported its continuation. Most patients found the CPAM service convenient and accessible, and had confidence in the pharmacist's ability to perform the service. A small proportion of patients expressed a preference for receiving care from their General Practitioner. Overall General Practitioners and Practice Nurses trusted the Pharmacists to provide this service, and felt that it freed up time for them and was more convenient for their patients. Some were concerned about communication of results and possible fragmentation of services. However, most believed the service should continue and be more widely available.[2]

Pharmacies are funded through DHBs to provide this service and it is provided free of charge to the patient. General Practitioners can work with pharmacies to identify patients suitable for the service. Some patients will still require management by the practice and others may be referred back. Patients can opt-out of CPAM at any time.

For further information, contact a local pharmacy or general practice involved in the Community Pharmacy Warfarin Service. A list of some pharmacies offering the CPAM service is available from: **http://beehive.govt.nz/sites/all/files/Community_Pharmacy_List.pdf**

For background information on CPAM, see: "INR point of care testing in community pharmacies – is this the future?", BPJ 31 (Oct, 2010).

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Sodium valproate in pregnancy – potential for long-term neurodevelopmental effects in children

Infants born to mothers who have taken antiepileptic medicines during pregnancy have a two- to three-fold increased risk of major congenital malformations compared to the general population.[1] This risk is further increased when mothers have taken more than one antiepileptic medicine during pregnancy. Despite this risk, in most cases the benefit of treating epilepsy outweighs the risks of having a child with abnormalities because uncontrolled epilepsy is dangerous for both the mother and foetus.[2]

While the link between antiepileptic medicines and congenital malformations is well established, more evidence is accumulating to suggest that there is also a risk of long-term neurodevelopmental effects in children following maternal use of sodium valproate during pregnancy. These effects include developmental delay, particularly of verbal IQ and of autism spectrum disorders.[3, 4, 5, 6] These risks are independent of maternal confounding factors. The risk appears to be higher with sodium valproate than with other antiepileptic drugs and also appears to be dose related. In some studies the outcomes for children exposed to lower doses of sodium valproate (<1000 mg/day) did not differ from children exposed to other antiepileptic medicines, however, higher doses of sodium valproate resulted in neurodevelopmental delays.[6]

A large European review is underway to re-evaluate the balance of benefits and risks of sodium valproate in pregnancy. In New Zealand sodium valproate is contraindicated in pregnancy (TGA pregnancy category D),[2] however, there may be a few women whose epilepsy can only be controlled by sodium valproate, who are therefore using this medicine throughout pregnancy.[6] In 2009 bpac^{nz} advised that lamotrigine or carbamazepine are the preferred initial treatment choices for women of child bearing potential with epilepsy.

The UK Medicines and Healthcare Products Regulatory Agency (MHRA) are advising Health Professionals that:

- Sodium valproate should not be used in pregnancy or in women of child-bearing potential unless clearly necessary
- Sodium valproate is a poor first choice for women of child-bearing potential and treatment with it should only be initiated in these women following specialist neurological or psychiatric advice as appropriate
- If sodium valproate is used in women of child-bearing potential explain the risks adequately and provide and/or counsel about effective contraception
- If sodium valproate is being used for bipolar disorder, it may be appropriate to cease treatment if there is an effective alternative
- If sodium valproate is to be used during pregnancy, it should be at the lowest effective dose, and doses should be divided throughout the day to avoid rapid peaks in plasma valproate levels
- High-dose folic acid supplementation (5 mg, once daily) is recommended, ideally for one month pre-conception and 12 weeks post-conception if sodium valproate is to be used during pregnancy

For further information, see: BPJ 24 "Prescribing issues associated with anticonvulsant medications for epilepsy", BPJ 24 (Nov, 2009).

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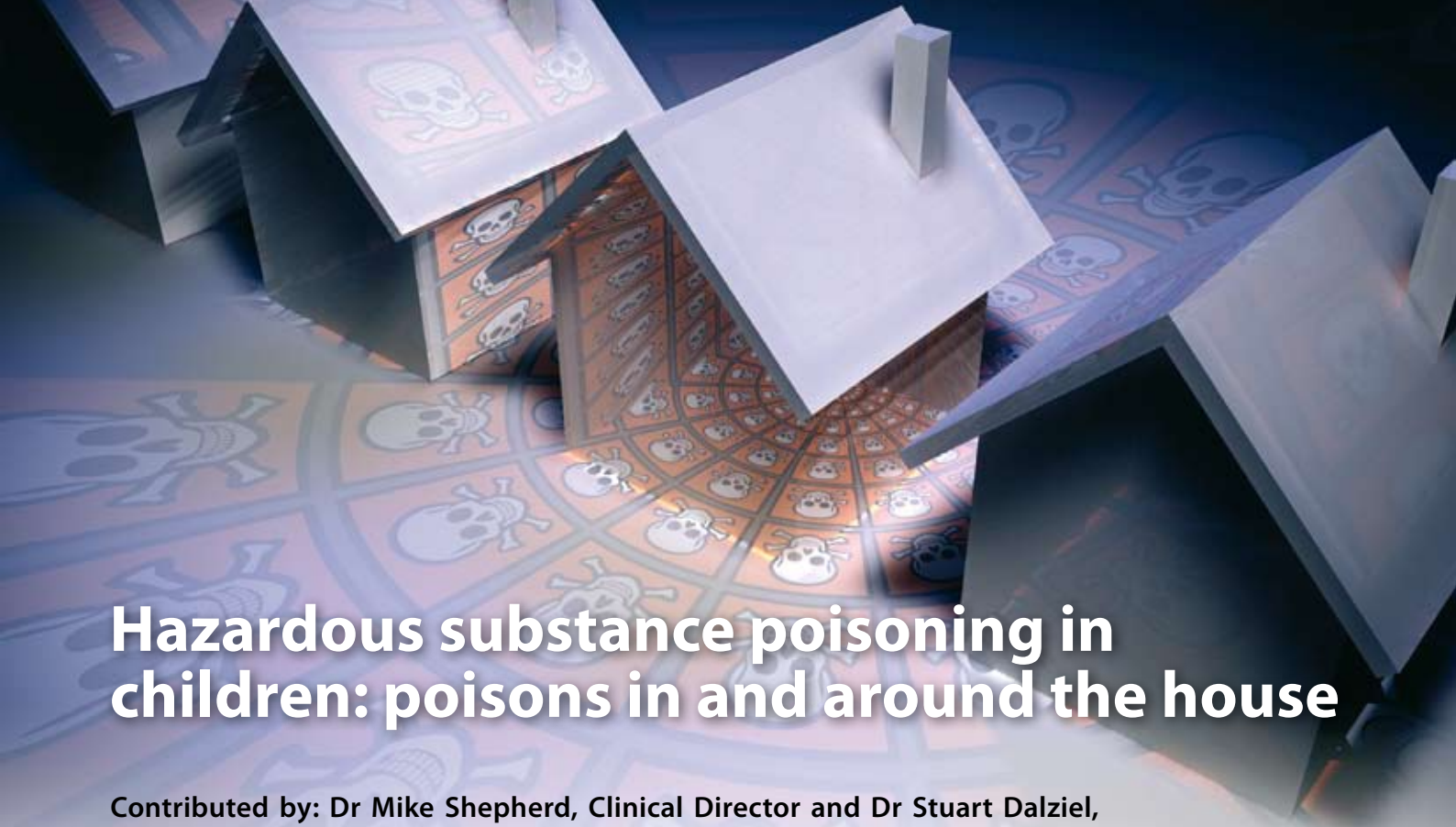


Hazardous substance poisoning in children: poisons in and around the house

Contributed by: Dr Mike Shepherd, Clinical Director and Dr Stuart Dalziel, Paediatric Emergency Specialist, Starship Children's Health, Auckland

Children are great explorers, and preschool children spend much of their time exploring at home. This can lead to children unintentionally being exposed to a number of hazardous substances. This article describes some of the common household poisonings, outlines their management and discusses their prevention.

The family home: welcome to the danger zone

Cleaning products

Exposure to cleaning products in the home is the cause of many unintentional poisonings in children. The most frequently involved toxins are bleach, low-molecular weight hydrocarbons (e.g. some house-hold solvents), acids/alkalis, detergents and ammonia products. These products have highly variable toxicity and highly variable packaging in terms of safety. There is an emerging issue with pre-packaged cleaning products, laundry detergents and particularly dishwasher tablets, as these appear attractive to small children.

Bleach is generally of low toxicity, with household solutions commonly containing less than 10% sodium hypochlorite (the active component of bleach). Children rarely ingest significant quantities as bleach is extremely unpalatable. Less than 100 mL of household bleach is unlikely to cause serious adverse effects. However, if children develop symptoms, they should be referred to hospital. Common effects include nausea, vomiting, and diarrhoea. Occasionally exposure to more concentrated bleach solutions may occur (industrial bleach may contain up to 50% sodium hypochlorite), presenting a risk of oesophageal injury (see below).

Acid/alkali ingestion such as dishwasher powder, drain cleaner and oven cleaner can cause severe corrosive injury. Oesophageal injury can occur without obvious lip or oral burns. Any stridor, dyspnoea, dysphonia, drooling or vomiting suggests serious injury to the airway or gastro-oesophageal tract and the child should be urgently referred to hospital. The child should be kept nil by mouth.

Ammonia solutions in household cleaners are at a concentration that does not cause corrosive injury, however occasionally exposure to more concentrated ammonia solutions occurs. These should be managed as for acid/alkali exposure.

Ammonia gas is highly irritant to mucosal surfaces and may be released when an ammonia-containing cleaning solution is mixed with a strong alkali, such as sodium hydroxide in drain cleaner. The child's eyes should be irrigated and they should be urgently referred to hospital if they have signs of respiratory irritation (cough, wheeze, stridor or respiratory distress).

Superglue (cyanoacrylate)

Cyanoacrylate adhesives have become a common household product. While exposure will not be lethal it can be both painful and distressing. Exposure may occur during exploration by child or if the glue is mistaken for an ear or eye drop due to similar packaging.

The general principles of managing superglue related injury are to:

- Immerse the bonded surfaces in warm soapy water
- Attempt to peel or roll the surfaces apart with the aid of a blunt edge, e.g. a teaspoon handle. Do not try and pull surfaces apart with a direct opposing action.
- Attempt to remove the glue with acetone, however, acetone should not be used in the mouth or on the eye

If lips are accidentally stuck together, irrigate with warm water and encourage maximum wetting from saliva and pressure from the tongue inside the mouth. Peel or roll lips apart.

If the eyelids are glued together, irrigate with warm water. Eyelids may then be able to be separated by rolling the lids. Otherwise trimming the eyelashes may be effective. If the eyelids still cannot be separated the recommended approach is overnight application of a wet eye patch, followed by ophthalmology review. Once the eyelids are separated, the eye should be carefully examined to ensure any fragments of glue are removed and corneal abrasion is excluded. Treat any corneal abrasion with chloramphenicol 0.5% eye drops, one drop, four times daily, for seven days, to prevent secondary infection. Ideally, children with corneal abrasions should be reassessed in 24 – 48 hours, and referred for review if the abrasion is not healing.

Nail-polish remover

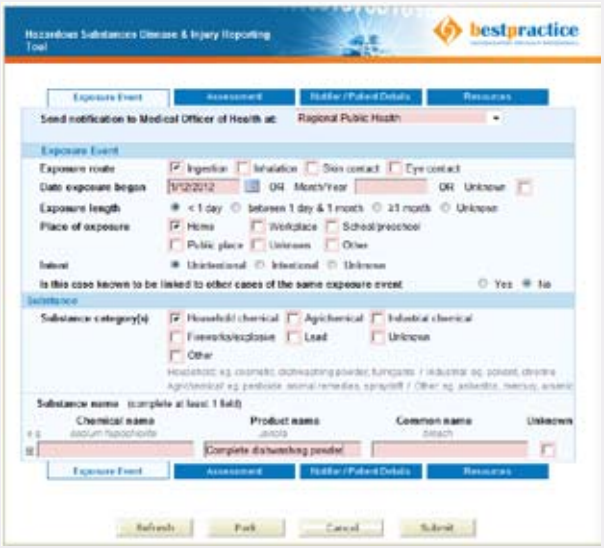
Nail-polish removers can be composed of a number of different products, including ethyl acetate, isopropanol and acetone (now less commonly used). The management of nail polish remover exposure is supportive. Charcoal is not recommended. If children are asymptomatic two hours after ingestion then no further treatment or follow up is required. Children with CNS symptoms should be referred to hospital.

Ethyl acetate has a local irritant effect to the skin, eyes, and mucous membranes that develops rapidly. If no symptoms occur over the first few minutes then exposure is likely to have been minimal. Only large ingestions result in systemic symptoms (gastrointestinal and CNS), and these symptoms are also likely to occur rapidly.

Isopropanol toxicity can cause CNS effects. Ingestion is best managed by observing the child for altered mental status. An

Notification of hazardous substances injuries

Any injury or disease caused by hazardous substances must be notified to the Medical Officer of Health, under the Hazardous Substances and New Organisms Act 1996. However, some medical practitioners may be unaware of this requirement. An electronic notification form is located on the bestpractice dashboard (log in at **www.bestpractice.org.nz** or go directly through MedTech) and look for "Hazardous Substances & Lead Notifications". Primary care practices that do not use bestpractice Decision Support software, should inform their Medical Officer of Health of any notifications manually.



observation period of two hours post-ingestion can be used to rule out clinical toxicity in paediatric patients.

Ingestion of small volumes of acetone can cause central nervous system (CNS) symptoms. The onset of symptoms is likely to occur rapidly but recovery may be slow. CNS symptoms may be followed by metabolic acidosis, cardiovascular compromise and coma.

Hazards outside the house

Although exposure to hazardous substances outside of the home is not as frequently implicated in unintentional child poisonings, a number of products used in the garage and garden present a risk.

Anti-freeze (ethylene glycol)

Ethylene glycol is rapidly absorbed and signs and symptoms similar to ethanol intoxication develop within four hours of ingestion (nystagmus, drowsiness, nausea and vomiting). Cardiorespiratory features may develop, leading to shock, seizures, coma and renal failure within several hours. All symptomatic patients, as well as those patients in whom exposure level is unknown, should be referred urgently to hospital. Patients with significant ingestion will develop metabolic acidosis. Patients presenting with unknown exposure level who have a normal bicarbonate level and a normal examination at four hours can be safely discharged.

Children with minor ingestions of ethylene glycol, e.g. a witnessed small taste, sip or a lick, do not require hospital evaluation and can be observed in the community unless symptoms develop.

Brief skin and inhalation exposure does not result in ethylene glycol intoxication. Skin exposure can be managed with soap and water. Ocular exposure should be managed with removal of contact lenses and irrigation with tap water at room temperature. This is usually sufficient; children with persistent ocular symptoms should have a formal ophthalmology examination.

Petrol

Ingestion of a small amount of petrol usually results in mild transient nausea and vomiting which can be managed in the community with observation. Administration of fluid "to dilute" or induce emesis, is not recommended due to the potential to further increase the risk of pneumonitis. Pneumonitis can be associated with ingestion and evolves over a few hours. Persistent coughing, gagging and respiratory signs may indicate aspiration and these patients should be observed in hospital.

Systemic CNS toxicity with onset of CNS depression, seizures and possible death within one to two hours can occur with larger ingestions/inhalations (usually >1-2 mL/kg). These patients require emergency transport to hospital. Fortunately such ingestions/inhalations are uncommon in unintentional poisonings in children. However, intentional "huffing" of petrol has resulted in deaths in New Zealand, and parents, caregivers and young people should be aware of the risks associated with this practice, and access appropriate support if needed, such as mental health or youth counselling services.

Dermal exposure to petrol should be decontaminated with soap and water. Ocular exposure should be managed with removal of contact lenses and irrigation with tap water at room temperature. This is usually sufficient; children with persistent ocular symptoms should have a formal ophthalmology examination.

Rodenticides (long-acting coumarin anticoagulants)

Common domestic rodenticides use long-acting anticoagulants or "superwarfarins" such as coumatetralyl, bromadiolone and brodifacoum. A child who has unintentionally ingested a single pellet does not require INR testing or medical review. Parents should be advised to seek medical attention if the child develops mucosal bleeding or bruising. Children who have ingested larger amounts of rodenticides should be evaluated for coagulopathy; it is estimated that a child needs to ingest > 30 g of a 0.005% (a standard concentration) preparation as a single dose to cause significant anticoagulation.

Cholecalciferol (vitamin D3) is also commonly used in domestic rodenticides and medical assessment is not required for single unintentional ingestions in children. Evaluation should occur if symptoms of hypercalcaemia occur.

Glyphosate

Glyphosate is present in common domestic herbicides, such as some Roundup, Zero Weedkiller and Weed Out products.

Ingestion of diluted preparations causes little concern other than mild gastrointestinal symptoms. Ingestion of concentrated preparations can lead to gastrointestinal symptoms (nausea, vomiting, diarrhoea and abdominal pain) as well as oropharyngeal/oesophageal erosions, aspiration pneumonia and hypotension.

Risk stratification in adults is based on volume of concentrate ingested:

- <50 mL – asymptomatic or minor gastrointestinal symptoms
- 50-120 mL – gastrointestinal symptoms
- 150-300 mL – severe gastrointestinal symptoms, risk of upper airways oedema and multi-organ failure
- >300 mL – potentially fatal.

In children risk stratification based on dose is less specific. However, children with minor ingestions do not require hospital assessment unless symptomatic.

Dermal exposure causes local irritation but not usually systemic toxicity. The skin should be decontaminated with soap and water; medical review is required only if the child is symptomatic. Ocular exposure should be managed with removal of contact lenses and irrigation with tap water at room temperature. This is usually sufficient; those with persistent ocular symptoms should have a formal ophthalmology examination.

Herbicides containing substances other than glyphosate are also available and care should be taken to read the label of the product ingested, and if necessary, information sought from sources such as the National Poisons Centre or the TOXINZ database (www.toxinz.com). Not all products from the same manufacture contain the same ingredients, further emphasising the need to read the label of the product ingested carefully and to confirm its exact name. N.B. glyphosate should not be confused with organophosphate poisoning, which is a separate toxidrome.

Prevention of unintentional exposure to potential toxins

Ideally the prevention of poisoning-related injury should form part of well child checks and primary care discussions. Specific recommendations include:

- All cleaning products and other potential poisons should be stored away from children; this includes using out of reach cupboards, locking cupboard doors and using child resistant catches on doors
- When getting products out to use, place immediately back into high storage, with closures correctly fastened
- Products should be supplied and purchased with child resistant packaging
- Products should always be stored in their original packaging and should be disposed of carefully
- Dishwasher detergent should be put into the machine last and the door closed immediately, children should be kept away when detergent is added
- When emptying dishwashers check for, and remove, leftover powder or liquid
- Choose a dishwasher with a child resistant lock or purchase an adhesive lock to prevent access to the dishwasher by toddlers
- Store petrol in a child resistant container
- If possible, purchase diluted herbicides

As new products are manufactured, packaged and purchased, further hazards in the home will emerge. Identification and prevention of injury to others requires notification of these events to the New Zealand National Poisons Centre and the Ministry of Consumer Affairs, as well as a Medical Officer of Health.

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Clinical indications on prescriptions

Dear Editor

I would like to share a letter I read in a recent BMJ (4.01.13) by a retired GP with an idea which is so simple it's genius:

"The reasons for prescribing a particular drug may be long forgotten by the patient and sometimes even by the original clinician. A simple solution to this problem is to add the clinical indication to the prescription instructions at the time of issue. This approach is already used by some GPs and is recommended in the General Medical Council's latest guidelines on prescribing." (Nigel J Masters)

Maybe other GPs are already doing this here, but embarrassingly it had never occurred to me, but I am going to implement this from now on.

Dr Joanna Joseph, General Practitioner
Wellington

We think this is a good idea too. More information, including advice about what to do if the patient is concerned about confidentiality, can be found here:
http://clinicalindications.com/index

The reference for the BMJ letter is: Masters NJ. Add clinical indications to prescription instructions to avoid problems of polypharmacy. BMJ. 2013;347:f7496. Available from:
www.bmj.com/content/347/bmj.f7496?tab=citation

As an additional point, some patient management systems have a field for inserting diagnostic indication for the prescription, however, this is not printed out with the prescribing instructions, but is stored within the PMS.

Iron infusions in general practice

Dear Editor

The article "Anaemia on full blood count: investigating beyond the pale" (Best Tests, Sep 2013) mentions iron infusion is appropriate when oral replacement is not tolerated, not effective or not appropriate and it is offered in some general practices. When is oral supplement "inappropriate"?

I wonder if BPAC can give some guidance on when a GP should initiate iron infusion given that it is still generally recommended by specialists in my experience.

Dr Angus Wong
(Online comment)

Iron infusion is usually carried out in secondary care, but increasingly, general practices who have the resources to carry this out (time, skills, resuscitation equipment and anaphylaxis kit), are offering this treatment. Iron infusion may be considered in adults with iron deficiency anaemia if oral treatment is not successful because the patient cannot tolerate the adverse effects (predominantly gastrointestinal) or if the patient is not adherent with treatment, i.e. they are not reliably taking oral medication. It may also be considered in patients where the use of oral iron may be inappropriate such as those with continuing blood loss or patients with gastrointestinal disorders which result in malabsoprtion, e.g. patients with inflammatory bowel disease. Patients with chronic renal failure who are receiving haemodialysis also require intravenous iron administration.

Link between irritable bowel syndrome and restless legs syndrome

Dear Editor

[BPJ 56, Nov, 2013] carries a letter which prompts me to draw attention to a recently noted association between Restless Legs Syndrome and Irritable Bowel Syndrome. About 25% of IBS patients complain of RLS.[1]

As IBS is a relatively common condition, and is now understood to be related to carbohydrate malabsorption and therefore amenable to treatment by dietary manipulation, I would recommend that it is worth asking all RLS patients about IBS

symptoms. They certainly will thank you if offered a chance to mitigate what can be a pair of deeply disturbing conditions.

I also wish to comment on the, I think, unnecessarily strict warning against magnesium supplements given in the accompanying editorial reply. Hypermagnesaemia is a rare condition and typically only seen in patients with more severe grades of chronic kidney disease. The normal adult kidneys are capable of excreting up to about 2000 mg of magnesium daily.[2] Furthermore, only about 40% of dietary magnesium is absorbed, and excess oral intake usually causes diarrhoea rather than systemic toxicity.

Dr Michael Becker, General Practitioner
Raglan

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In our recent article on IBS (BPJ 58, Feb, 2014) we mentioned that people with IBS may be more likely to have anxiety, depression, fibromyalgia or restless legs. It raises the question that if you improve the patient's IBS symptoms, will you also improve their RLS symptoms (or anxiety, depression, fibromyalgia...), or is this simply showing that the same characteristics that predispose a patient to IBS, predispose them to these conditions?

A question of authorship

Dear Editor
While I value the review articles disseminated via the Best Practice [Journal], and letters to the editor regarding topics discussed, it disturbs me that, almost without exception, there is no authorship ascribed to the published material. I note that relevant medical experts are named, and their contributions acknowledged, but the final document appears as anonymous, in an uncomfortably, almost "Big Brother, 1984" style. This does not encourage an honest and egalitarian discussion of topics covered.

Similarly, if a doctor writes in with a comment or question, his/her identity is always published, but the reply often remains covert (and in a few cases, has been frankly condescending). It is a brave GP that dares to question such a lofty authority!

Please explain why it is that for an article to be published in a peer-reviewed medical journal, the authors must be clearly identified, along with their qualifications, their possible conflicts of interest, and their contact details, yet BPAC does not hold to these internationally recognised and accepted standards. Am I missing something?

Dr Linda Witham, General Practitioner
Hawkes Bay

We do not assign individual authorship to our articles as by the time they are published they have been drafted, reviewed, corrected and edited by the entire publications team – the names of whom can be found on the inside cover of each edition of Best Practice Journal and Best Tests. If an article has been contributed by an external author, this is indicated at the start of the article. Almost all articles that appear in Best Practice Journal or Best Tests are written in-house by our publications team, which is made up of medical writers and clinicians. Our Editor (Rebecca) and medical writers (Mark, Gareth and Noni) have post-graduate health sciences-related qualifications and are members of the Australasian Medical Writers Association. Our clinical team is made up of three experienced General Practitioners (Sharyn, Nigel and Hywel) and Pharmacist (Kirsten). Our Editor-in-Chief (Murray) is also an experienced General Practitioner and CEO of bpac^{nz}. Staff bios for the entire team can be found on our website: **www.bpac.org.nz**

Our topics are decided on by our clinical advisory group which is made up of representatives from primary and secondary care, and healthcare management (the names of whom can also be found inside the front cover of our publications). The role of the group includes indicating key issues to cover within a topic, highlighting appropriate resources and suggesting expert input if required. The article is scoped and drafted by our publications team, then sent out to review with our clinical advisory group and a subject expert. Final revisions are then made by the clinical and editorial teams before articles are compiled into a publication. Final sign-off of each edition is the responsibility of the Editor-in-Chief.

We base our information on New Zealand guidelines, where available. We then look to guidelines from the United Kingdom's National Institute for Health and Care Excellence (NICE), Australian, United States and Canadian guidelines, Cochrane systematic reviews, meta-analyses, and where necessary, primary research. This information is then collated, revised and presented in the context of the New Zealand healthcare system, with guidance from selected experts, depending on the topic. The acknowledgements box at the end of an article lists the experts who have reviewed the article and provided written comment. These experts do not write the articles and are not responsible for the final content.

You correctly point out the requirements for submission to peer reviewed journals. However, Best Practice Journal is not, and does not wish to be, a peer reviewed journal – we aim to provide evidence-based, practical guidance for healthcare professionals working in New Zealand. In relation to any conflict of interest, we do declare our funding sources (PHARMAC and DHB Shared Services) and the names of our five shareholders are also inside the front cover of all publications. We also maintain an active conflict of interest register for all staff.

In regards to correspondence items – correspondents have the option to have their letter published anonymously, which some choose to do. If an expert is consulted for a response to a letter, this is acknowledged, otherwise the answers can be assumed to be from the bpac^{nz} publications team. The purpose of the correspondence section is to reflect on additional questions which have arisen from articles and to promote debate on topical issues; we also publish any feedback on articles or correspondence items online and many people comment directly there. It is certainly not our intention to convey a condescending tone in a response to a correspondence item; we value the wide variety of opinion among the general practice community in New Zealand and appreciate the time people take to write to us and engage with our articles.

The year in review

Dear Editor,
I want to commend BPAC on repeating the main messages from the BPJ editions of 2013. This has very good justification in educational theory. Retention of new information is poor if it is not used within a few days of reading it; repetition is essential, and preferably more than once.

I wonder about finding an appropriate way to repeat the main messages of the previous journal at the start of every BPJ, as well as a collation annually as you have done this time. This will enhance retention and application.

Dr Brett Mann
Medical educator
GP registrar education programme
Christchurch

We thought this was a good idea too, hence the new insert in this latest BPJ! We would love to hear from our readers as to whether this is a useful tool for personal and/or peer review.

We value your feedback. Write to us at: Correspondence, PO Box 6032, Dunedin or email: editor@bpac.org.nz

visit us at **www.bpac.org.nz**

Call us on **03 477 5418** Email us at **editor@bpac.org.nz** Freefax us on **0800 27 22 69**