



The Management of Middle Ear Infection in Aboriginal and Torres Strait Islander Populations

Plain Language Summary
of the Systematic Review
on the Management of

Otitis Media
(Middle Ear Infection)

in Aboriginal and
Torres Strait Islander
Populations

March 2001

For the Office for Aboriginal and Torres Strait Islander Health
Commonwealth Department of Health and Aged Care

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By the National Aboriginal Community
Controlled Health Organisation
(NACCHO).



March 2001

For the Office for Aboriginal and Torres Strait Islander Health,
Commonwealth Department of Health and Aged Care, Canberra, ACT.

This document is part of a package of information to assist primary health care providers in the delivery of comprehensive, effective and appropriate care for Aboriginal people with otitis media (ear infections).

The package includes:

- The Systematic Review of Existing Evidence and Primary Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations, prepared by the National Aboriginal Community Controlled Health Organisation;
- **A Plain Language summary of the Systematic Review;**
- Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations, including seven treatment algorithms, a summary of practical treatment plans and key messages for primary health care providers;
- A Middle Ear Infection checklist poster highlighting key messages for primary health care providers.

Additional copies of the components, can be obtained by contacting the Health Strategies Section of the Office for Aboriginal and Torres Strait Islander Health, Commonwealth Department of Health and Aged Care by

- *phone: (02) 6289 5280;*
- *facsimile: (02) 6289 1408; or*
- *email: oatsih.enquiries@health.gov.au*

The publications are also available on-line at www.health.gov.au/oatsih/pubs/index.htm

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Introduction

In wealthy countries fluid in the middle ear (otitis media with effusion) is thought to be the most common cause of conductive deafness in children. Conductive deafness means there is a problem with how sound passes through the eardrum and little bones in the middle ear. In poor countries, acute and chronic ear infections are the most common cause of deafness. Children can die as a result of these infections. The World Health Organisation has said the most important cause of deafness to be controlled and prevented in the world is middle ear infection.

Like people in poor countries, Aboriginal people have a lot of ear infections.

Although Aboriginal people do not die from these infections, they can suffer ongoing chronic ear infection and deafness from a young age. This can leave them badly educated, socially disadvantaged and poor. Overcrowding, big families and ear infection in other family members are common to many Aboriginal families. Poverty is a major cause of these problems. Middle ear infections early in life often lead to long-lasting and repeated ear infections that can cause chronic eardrum holes (perforation). Deafness caused by these problems enables the cycle of poverty that helped the disease begin in the first place to continue.

Middle ear infections early in life often lead to long-lasting and repeated ear infections that can cause chronic eardrum holes (perforation).

Many surveys have shown that there is a lot of ear disease among Aboriginal people, but how this affects Aboriginal education and employment has not been studied. The best way to treat ear disease in Aboriginal and non-Aboriginal people has also not been clear, and different health care groups have used different ways of treating ear disease.

Ear disease and its complications are important Aboriginal health issues which can be prevented. It is essential that health staff are given information which helps them to provide appropriate and acceptable care which is proven to work.

Best practice guidelines are needed to help health staff manage ear disease in the best way.

There is a lack of studies in Australia indicating the best way to manage ear disease in Aboriginal people, the compilers of this report have turned to studies and guidelines from overseas. Their task has been to seek evidence on what has been proven to help people with middle ear disease and how middle ear disease can be prevented. Some things have been proven very convincingly, while others have not. Consequently, a system of marking how strong the proof is has been used in the main report. The aim of this report is to help health services provide consistent, high quality and up to date health care for patients with middle ear disease.

This plain language summary of the main report has been written for Aboriginal Health Workers and other staff working with Aboriginal people who have middle ear disease. To help readers locate more specific information in the main report, the headings from the main report have been placed in brackets after the plain language headings.

How bad is ear disease in Aboriginal people?

(Burden of suffering)

Middle ear infections (otitis media) are very common in Aboriginal children. More Aboriginal people have ear disease than non-Aboriginal people. Even though ear infections can be treated and prevented, they are the main cause of deafness in Aboriginal people.

In 1993, 51,000 children under the age of five years in poor countries died as a result of ear disease. This makes ear disease in these countries as important as brain infections, syphilis, trachoma and polio.

Many surveys have measured ear infections in Aboriginal people. The National Trachoma and Eye Health Program surveyed 60,273 Aboriginal people between 1976 and 1979. The survey found 11% of people had middle ear disease. Other surveys have found between 10-54% with chronic middle ear disease, 9-36% with perforated eardrums, and deafness in 10-41%.

Experts have estimated that Aboriginal people spend nearly 32 months with middle ear infections between the ages of two and 20 years. But non-Aboriginal people have only about three months of middle ear infection during these years.

How many Aboriginal people are deaf or have some hearing loss is not clear. The long-term effect on hearing loss during childhood in Aboriginal people, and how this affects language development and employment, is not known. Experts believe chronic ear infections and hearing loss impact significantly on Aboriginal children.

Hearing loss

There have been lots of surveys to test how well Aboriginal people hear, but these studies have measured deafness in different ways. This makes it hard to compare the results of these studies. Even so, most surveys have shown that there is much more hearing loss in Aboriginal people, than in non-Aboriginal people. Experts have found that between 6% and 80% of Aboriginal children (the range is wide because this varies from community to community) can have significant hearing loss. Significant hearing loss is more than 25 decibels (dB).

By adulthood, some form of hearing loss can affect up to 70% of Aboriginal people. A survey of Aboriginal university students found that 15% had hearing loss in one or both ears.

Aboriginal people living in remote areas often have the worst hearing loss.

In Central Australia, 53% of Aboriginal school children could not pass the hearing test in their first school year. In the Kimberley and Desert regions, 25-35% of children had slight hearing loss, two to three percent had moderate hearing loss and less than one percent had very bad hearing loss. In the Eastern Goldfields region of WA, 41% of

school aged children had more than 25 (dB) hearing loss in at least one ear. In the United States hearing loss is reported only in five to seven percent of children aged five to eight years. In Australia, only about four to five percent of children in the general population are reported to have some hearing loss.

Some experts believe that hearing loss may vary in Aboriginal children depending on the season, with better hearing levels occurring in spring in children without perforated eardrums.

Fluid in the middle ear (Otitis media with effusion)

Fluid in the middle ear (otitis media with effusion) is a big problem in the general Australian population and other wealthy countries. One to two thirds of preschool children in these countries are thought to have fluid in the middle ear at least once during their childhood. In the United Kingdom, fluid in the middle ear is reported as the most common cause of hearing loss in children under 12 years. In poorer countries, other ear infections are thought to be more common. These are sudden painful infection in the middle ear (acute otitis media) and chronic runny ears (chronic suppurative otitis media).

Because many Aboriginal children have runny ears with hearing loss, fluid in the middle ear may not be reported properly. Fluid in the middle ear was found in 95% of Aboriginal babies aged six to eight weeks. The same study found only 30% of non-Aboriginal babies of the same age had this problem. Another study showed that fluid in the middle ear can cause hearing loss in the first week of life.

One way of checking for fluid in the middle ear is with a tympanogram. Such tests on Aboriginal children aged four years or younger have found middle ear fluid in 40 - 52% of children. Studies of children aged two to five years in the United States show that only 15-20% of children had fluid in the middle ear. By the time American children are seven years old, only five percent have fluid in the middle ear.

Perforated eardrums and chronic runny ears (Tympanic membrane perforations and chronic suppurative otitis media [CSOM])

Surveys have shown that many Aboriginal children have perforated eardrums, scarred eardrums from old perforations, ear infections or signs of old ear infections. Some of the results showed:

- 19% of Aboriginal children in the north-west Kimberley region had chronic runny ears;
- 20% of people at Bidyadanga had perforated eardrums;
- 12% of an Aboriginal community in Queensland had perforated eardrums;
- 37% of inland Aboriginal school-aged children had perforated eardrums.

Aboriginal children can have perforated eardrums from a very early age. One study found perforated eardrums in 11% of babies under six months, 43% of babies aged 7-12 months and 30% of children aged one to two years.

Eardrum perforation, although caused by infection in childhood, can go on into adulthood.

In one community survey in the Northern Territory, up to 22% of males and 31% of females still had runny ears at 20 years of age. In the same survey only 17% of people had no eardrum perforations.

The percentage of Aboriginal people with perforated eardrums is similar to the percentage of people with this problem in poor countries.

Aboriginal people have put up with chronic ear disease for a long time and often there is no ear pain with these infections. This means that patients often delay going to the doctor or clinic with this problem.

Some experts say that Aboriginal people have found ways of communicating within their community which makes up for the hearing loss caused by ear disease. But outside the community, deafness can make education and employment difficult. Unemployment is more common in those with poor hearing, both in Australia and in other countries. The Royal Commission into Aboriginal Deaths in Custody found that poor education and unemployment were important issues which brought people into contact with the justice system. These two issues were present in all 99 deaths the commission investigated.

Deafness can make education and employment difficult. Unemployment is more common in those with poor hearing.

Link between chronic runny ears and hearing loss (Otitis media and hearing loss)

Some people with perforated eardrums can have normal hearing. But most people with chronic runny ears will have some level of deafness because of the perforated eardrum, pus, scarring, swelling of the ear canal or stiffness (fixation) of middle ear bones.

Studies in other countries have found hearing loss was worse in children with perforated eardrums, but hearing improved when eardrums healed.

Perforated eardrums seem to cause more hearing loss in Aboriginal children than fluid in the middle ear (otitis media with effusion).

Many studies have proved that hearing loss caused by chronic runny ears in the first two years of life can seriously affect language development. This can in turn slow or prevent the child from learning in school. Experts disagree on whether chronic fluid in the middle ear can cause the same problems.

No studies have investigated how well children hear or speak when they have fluid in the middle ear. Neither is it known how long fluid needs to be in the middle ear, before a child's development is affected. However, experts say that if children suffer repeated middle ear infections, or chronic fluid in the middle ear, then this will probably affect the child's education.

Some experts say that three or more episodes of middle ear infection before a child is two years will affect how well a child hears and speaks.

What factors encourage chronic middle ear disease? (Risk factors for chronic otitis media)

Studies have proven that getting middle ear infections early in life increases the chance that the infection will become chronic.

Bacteria in the nose and throat has been linked to early middle ear infection. Environmental conditions such as overcrowding, help to spread bacteria which encourage middle ear infection.

Early bacteria infection of the nose and throat (Early nasopharyngeal bacterial colonisation)

Bacteria can be grown from the middle ear in two-thirds of children with acute middle ear infections. Viruses which normally cause upper or lower respiratory infections have been found in 20% of middle ear infections.

Many experts agree that the most important bacteria which cause acute middle ear disease are: *Streptococcus pneumoniae* (25-50%), *Haemophilus influenzae* (15-30%) and *Moraxella catarrhalis* (3-20%). Some experts have studied whether *Chlamydia* causes middle ear disease in Aboriginal children. But they have proven that *Chlamydia* does not cause ear infections, even in areas where trachoma is common in Aboriginal children.

Bacteria found in middle ear fluid are often also found in the nose or throat. If children have these bacteria in the nose or throat, they are more likely to have middle ear disease. These children are sometimes called 'otitis prone'.

The earlier children get these bacteria in their throat or nose, the more chance they have of developing middle ear disease. These children also have more chance of getting repeated middle ear infections. A study of babies in the Northern Territory found that bacteria could be found in the nose or throat of most Aboriginal babies within 28 days of life, compared to 200 days in non-Aboriginal babies.

Experts have found that 84% of children with bacteria in the nose and throat will have middle ear fluid and 30% will have hearing loss greater than 25 (dB).

It is thought that early bacterial infection of the nose and throat, before the baby's immune system is working properly, leads to long term middle ear infection in Aboriginal children.

Early bacterial infection in the nose and throat is often seen in people from poor countries and is thought to be associated with poverty, overcrowding and big families.

It is suggested that ways to prevent early bacterial infection in the nose and throat may also prevent middle ear disease. Vaccines and long-term low dose antibiotics may help to prevent this, but decreasing the number of people living in poverty and poor housing will have the best long-term effect.

Conclusion:

- ***Early nose and throat infection with certain bacteria increases the risk of developing early and repeated middle ear infections. Aboriginal children in remote***

Australia have been shown to have these bacteria in their nose and throat from a very early age.

- *Children from poor countries get bacteria in their nose and throat early as well. Environmental factors such as overcrowding, helps to spread bacteria amongst family members and cause middle ear disease.*

Early middle ear infection

Many studies have reported that middle ear infections early in life increase the risk that the child will have frequent and repeated middle ear infections. This 'early and frequent' infection pattern has also been seen in indigenous children in other countries.

Experts have found that issues such as early ear infection, poverty or a history of ear infections may be more important than what sort of treatment is given. Some experts believe this explains why Aboriginal children have high rates of chronic middle ear infection, even though most get some sort of treatment.

Once middle ear infection occurs in Aboriginal children, repeat infections and fluid in the middle ear are common.

When Aboriginal children have perforated eardrums, the perforation lasts a long time.

One study compared ear disease in Aboriginal and non-Aboriginal newborn babies. Although all the Aboriginal babies had normal eardrums at birth, 95% had fluid in the middle ear or acute middle ear infection by the age of eight weeks. Only 30% of the non-Aboriginal babies had fluid in the middle ear at eight weeks and none had acute ear infection.

Studies have shown that Aboriginal children are more likely to have middle ear infections and are less able to recover from them. Aboriginal babies with acute middle ear infection will go on to have perforated eardrums and chronic runny ears if no treatment is given. This means that treatment must be started early before chronic disease can develop.

Conclusion:

- ***Middle ear infection early in life increases the chance that ear infections will be repeated or recurrent. Once the eardrum is perforated it is often persistent and recurrent.***
- ***Studies prove that acute middle ear infection occurs before eardrum perforation. The prevention of these acute ear infections in Aboriginal people should prevent the development of chronic infection and eardrum perforation.***
- ***Aboriginal babies who develop early ear infections have little chance of having normal ear health. This means that these children will most likely have a hearing loss that starts at an early age and continues during the important years of development - infancy and young childhood.***

Acute middle ear infection with no symptoms and progress to chronic runny ears (Asymptomatic acute otitis media and progression to CSOM)

Acute middle ear infections do not always show clear symptoms.

Earache, a high temperature or excessive crying is often present in children with acute middle ear infection. However, these symptoms can also be present in children who do not have this infection.

You need a good light source to look in the ear to pick up acute middle ear infection. A bulging, red or cloudy eardrum that does not move are signs of an acute middle ear infection. A red eardrum alone does not mean there is a middle ear infection, as this can be caused by a virus infection, the child crying or attempting to remove wax. Experts recommend that children at risk of acute middle ear infections should have their ears examined when they have a cold, even if they have no ear symptoms.

Children with fluid in the middle ear may not have the symptoms of an acute infection, and this is why screening for this problem has been suggested.

Many believe that acute middle ear infection in Aboriginal children often has no symptoms, or the symptoms are so brief they are not noticed.

Many Aboriginal mothers of children with middle ear infections say that their children do not show signs of ear infections until the infection is chronic and pus starts to drain from the ear.

Some experts suggest that antibodies in the mother's breast milk stop signs and symptoms of ear disease, but do not stop the development of the ear infection. Others suggest that health staff may not have the skills needed to identify ear infection symptoms, or may confuse the infection with other health problems. There is also the problem of health staff lacking confidence to examine a small baby's ear. These issues can delay diagnosis until the eardrum is perforated.

Delayed diagnosis means that the ear infection can become chronic before any treatment is started. This also increases the chance of repeated ear infections.

Studies have shown that middle ear infections in Aboriginal babies can be diagnosed within the first eight weeks of life if health staff are adequately trained and have the proper tools.

Experts have proved that Aboriginal populations can develop fluid in the middle ear at a very young age, and this will go on to develop into acute middle ear infection and eardrum perforation. Signs of acute middle ear infection or fluid in the middle ear are present in all Aboriginal children who go on to have a perforated eardrum.

Conclusion:

- *Many children with acute middle ear infection do not show symptoms of earache or fever. Although earache and fever are often present with ear infection, they can also occur in other respiratory infections. Therefore, all children who are at risk of having ear infections who have a cold (an upper respiratory tract infection) should have their ears examined.*

- **Aboriginal children may have no signs or symptoms. This may explain why ear infection is only noticed once the eardrum is perforated.**
- **Finding ear infections at an early stage in Aboriginal babies can be difficult because symptoms may not always be present. But health staff can be trained to look for signs and to examine ears with tools to help with diagnosis (otoscopy and tympanometry). This means that screening to help find ear infection early, as well as appropriate treatment, may help reduce ear disease in Aboriginal children.**

Are allergies important in Aboriginal children with ear infections? (Allergic rhinitis - risk factor in Aboriginal populations?)

Some experts believe that because the nose, throat, eustachian tube and ear are so close together, allergies in the nose may help children develop ear infections. However, no studies have been able to show that allergies in the nose in very young children cause ear infections.

In fact, experts have found that Aboriginal people have very few allergies in the nose. It is not recommended that drugs to treat nasal allergies (anti-histamines and decongestants) are administered to children with ear infections.

Role of virus infections in the upper respiratory tract (Role of viral upper respiratory tract infections)

Experts have found that virus infections in the upper respiratory tract such as a cold, often occur before a middle ear infection.

The most common viruses are usually respiratory syncytial virus, rhinovirus, adenovirus and influenza virus.

Antibiotics normally treat the bacteria that cause middle ear infections quite well. But if a virus is present with the bacteria in the middle ear fluid, antibiotics do not seem to work as effective as usual. What seems important is if the child's nose or throat is already infected with bacteria before becoming infected with a virus.

Some experts believe that viral vaccines may be important in preventing middle ear infections. However, it is not clear if virus vaccines will help prevent ear infections in Aboriginal people. Experts say that until further studies are done, treating bacterial infections of the middle ear in Aboriginal people is more important than vaccination.

Many children who do not have bacteria colonised in their nose or throat seem to get over a middle ear infection even without antibiotics. But children who have bacteria and catch a virus, and who live in poor conditions, will need antibiotic treatment for middle ear infections.

Conclusion:

- **There is little proof that allergies of the nose are important in middle ear infections in Aboriginal people. Infection with bacteria appears to be a much more important cause of middle ear infections.**

- ***Viral infections increase the risk that the child will develop a middle ear infection, especially if they have bacteria in the nose and throat.***
- ***When a virus is present in the middle ear, it may affect how well an antibiotic can work.***
- ***It is unclear if viral infections encourage middle ear infections in Aboriginal children. Infections by bacteria are believed to be the most important.***

Overcrowding and infection in family members

The risk of ear infection is three times greater in children if another member of the family has an acute middle ear infection. There is also more chance of ear infection if a child goes to a daycare centre. The more children there are at the centre, the greater the chance of ear infection. This increased risk of getting ear infections is also seen in children from large families. The more children there are in the family, the more chance there is that ear infection will occur.

A study of Aboriginal babies found that they were nine times more likely to have a middle ear infection and eardrum perforation if they had young brothers and sisters.

All this relates to the effects of overcrowding. It is unclear if taking a child away from day-care stops the development of middle ear infection. Overcrowding and poor housing are known to encourage skin infections, rheumatic fever and trachoma. Many Aboriginal families still need better housing to deal with overcrowding. Water supply and water quality also need to be improved for some Aboriginal groups. It is thought that one-third of Aboriginal people in Australia are either homeless or living in poor conditions.

A national survey of Aboriginal people found that only 57% of those living in country areas, and 74% of those living in cities, said their housing was adequate. Housing problems included a shortage of bedrooms, living areas were too small, and the need for repairs.

A national survey showed that, on average, 4.9 people live in Aboriginal households in country areas and 4.0 in city housing. Non-Aboriginal Australians on average have 2.6 persons per household. Some Aboriginal households had many more people living at the house. In the ATSIC region of Nhulunbuy in the Northern Territory an average of 8.5 people lived in each Aboriginal household.

Guidelines have been developed to help work out how much housing people need to live a healthy and happy life. These guidelines are:

Parents need to have a separate bedroom which can be shared with a partner. Older children who are not dependent on their parents and other adults living at the house, need to have a separate bedroom. (If they are married they should share with their partner).

Younger children who are still dependent on their parents can share a bedroom, with no more than two children to the same bedroom.

Adapted from: Jones R. The housing need of indigenous Australian 1991. Centre for Aboriginal economic research policy. Australian National University. 1994; Research Monograph No.8.

Based on these guidelines a lot more housing is needed for Aboriginal and Torres Strait Islander people. One area with the greatest need is the Warburton ATSIC region in Western Australia, where approximately 400 more bedrooms for every 1000 people are needed.

Conclusion:

- ***There is proof that children have more chance of getting middle ear infections if someone else in the household has an ear infection. More perforated ear drums occur in Aboriginal families as the number of young children increases.***
- ***Children attending child care centres are likely to have middle ear infections. This risk increases as the number of children at the centre increases. All this relates to the effects of overcrowding.***
- ***Poverty, poor housing and overcrowding are important factors which increase other infections. Improvement of the environment in which people live is the most important issue to prevent ear infections. Other strategies such as antibiotics or surgery will be less effective if the environment is not changed.***

Nutritional status of children

Studies have shown that Aboriginal children with low weight (below the third percentile) have much more chance of having runny ears.

Infections are closely related to poor environmental conditions and poor nutrition.

Growth and nutritional status of Aboriginal and Torres Strait Islander children varies widely around Australia. Many areas report that between 3 - 17% of children younger than age three years have very poor nutrition and can be called 'failure to thrive' children.

Some studies have found that hearing loss is more common in children with low weight, while others have shown there is no relationship.

Eating healthy food depends on personal choice, availability and cost. Factors such as, areas, storage, preparation, clean water availability, refrigeration and working stoves are important. Availability of healthy food and high costs are very real problems for many Aboriginal people. Surveys have found that 29% of Aboriginal people lack food security - they are worried about going without food.

Many Aboriginal people cannot always make healthy food choices because they are poor.

In 1994, 59% of Aboriginal people over age 15 reported an annual income of \$12,000 or less. Only 11% reported an annual income of over \$25,000.

Does swimming make ear infections worse? (Role of swimming)

Some experts believe that swimming in dirty water when the eardrum is perforated makes the perforation stay longer and grow larger. Others say swimming in any water causes reinfection in ears with perforations. However, there is no good proof one way or the other on this point.

There is some proof that swimming actually improves personal hygiene and helps keep ears clean.

One national survey found that Aboriginal communities which had a permanent swimming hole, pool or access to the ocean, had 40% less middle ear infections than communities with no areas for swimming.

Since swimming is an important part of life for many Aboriginal children, more proof is needed before people with perforated eardrums should be told not to swim.

Conclusion:

- ***There is no proof one way or the other that people with eardrum perforations should not swim in treated pools, running waterholes or the ocean. Therefore, until there is more information that clearly shows swimming is harmful, swimming should not be stopped.***

Does bottle feeding encourage ear disease? (Bottle feeding as a risk factor in infancy)

Middle ear infections are more common in babies who are bottle-fed, rather than breast-fed. Bottle-fed babies had two to three times the risk of developing acute middle ear infection in the first year of life. It is not known if bottle-feeding increases the risk of developing fluid in the middle ear as well.

Breast-feeding provides good nutrition and has psychological benefits for both mother and baby. Human milk also contains antibodies which help protect the baby from infection. Some experts believe this explains why fewer breast fed babies have ear infections. These antibodies in breast milk have been found to be very low in Aboriginal women who are ten percent or more underweight.

Some experts believe antibodies in the breast milk may stop acute middle ear infection in young babies, but not a low-grade ear infection.

Does passive smoking encourage ear disease? (Passive smoking as a risk factor)

Passive smoking has been shown to increase illness and death in all children who have people smoking tobacco around them. There is some proof that passive smoking increases the risk of developing fluid in the middle ear. Studies have found that children are nearly two times more likely to develop an acute middle ear infection if their parents smoke. Babies who use a dummy are a little bit more likely to develop acute middle ear infection than those who do not.

How much passive smoking is needed to cause ear infections is not clear. But it is reasonable to assume that in groups where there are lots of smokers there will be lots of

ear infections. Smoking is very common amongst Aboriginal and Torres Strait Islander people. One national survey reported that 50% of Aboriginal people smoke. Another found 71% of Aboriginal people attending a city clinic smoked. Other studies have reported that smoking in Aboriginal people is two to three times more than non-Aboriginal people.

It is possible that high numbers of smokers in the Aboriginal population may be helping to cause more ear disease in Aboriginal children.

As an example of how costly passive smoking can be, experts in America have estimated that each year smoking causes an extra 3.4 million outpatient visits for acute ear infections and an extra 110,000 ear operations to treat fluid in the middle ear. Other studies have found that fluid in the middle ear takes longer to get better after surgery in children of parents who smoke.

Conclusion:

- ***There is proof that bottle-fed babies have a small increased risk of developing ear infections.***
- ***Passive smoking also provides an increased risk for developing middle ear infections. High rates of smoking in Aboriginal adults may make ear infections in Aboriginal children more common.***
- ***Since there are so many Aboriginal children affected by middle ear disease, increasing breastfeeding and reducing passive smoking in the Aboriginal population may help reduce the number of children who suffer from ear infections.***

How middle ear infection is described (Case definition)

Acute middle ear infection (Acute otitis media)

This is an acute infection of the middle ear and eardrum. It starts suddenly and may be caused by bacteria, viruses or a combination of these. Children may have ear pain, fever, may rub or pull their ears and may be grizzly and irritable. The eardrum can be bulging and may or may not be red. Later in the infection the eardrum can perforate and drain pus. The eardrum may not move as it should when tested for this. Hearing loss can occur in the infected ear. Acute middle ear infection is most common in young children and often occurs after a cold (upper respiratory tract infection). Some children may not show signs of this infection. Some children may present with crying, lack of appetite, nausea, vomiting or diarrhoea.

Repeated acute middle ear infection (Recurrent otitis media)

Repeated middle ear infections are acute middle ear infections which occur frequently.

Experts disagree how often ear infections need to occur to be called recurrent middle ear infections. Here are some examples of how experts describe repeated middle ear infections:

- Three acute middle ear infections in three months, or four infections in six months, or more than six infections in 12 months;

- More than three acute middle ear infections in six months or more than four infections in 12 months;
- Acute ear infection which happens more often than every second month or more than three times in six months.

Fluid in the middle ear (Otitis media with effusion)

Fluid in the middle ear (otitis media with effusion) is sometimes called serous otitis media, secretory otitis media or ‘glue ear’.

Normally air fills the middle ear, but when there is an effusion fluid with the consistency of raw egg white replaces the air. The eardrum is not perforated, but may look sucked in (retracted). Sometimes a fluid level or bubbles can be seen through the eardrum. Some children may complain of ear pain, but children with this effusion do not have the signs and symptoms of an acute ear infection.

Fluid in the middle ear usually follows an acute middle ear infection.

Chronic runny ear (Chronic suppurative otitis media)

This infection is described as chronic because it lasts a long time. The eardrum has a hole in it and pus flows from the middle ear into the ear canal. When the ears are runny with pus for six weeks or longer it is called chronic suppurative otitis media. The World Health Organisation has recently said that runny ears for even two weeks may be called chronic.

If the time the discharge has been present is shorter than this, the infection could be an acute otitis media that has perforated. This is different to a chronic otitis media that will need different treatment.

A chronic runny ear usually follows an untreated or poorly treated acute middle ear infection. Chronic runny ears often occur in the first five years of life, in children who live in poverty and poor environmental conditions. Ear pain is not common, though discharge in the ear canal may be uncomfortable. Often the child has a history of frequent colds or repeated acute middle ear infections. Without treatment ear discharge will continue for months or even years, causing damage to the bones in the middle ear and increasing hearing loss. It may also cause serious infections in the mastoid area behind the ear and infection (meningitis) or abscess in the brain.

If chronic runny ears occurs in the first two years of life, the associated hearing loss can damage the child’s ability to learn and speak.

Hearing loss (Hearing impairment)

There are two main types of hearing loss. They are:

Sensori-neural hearing loss

This is permanent hearing loss caused by damage to the cochlear or auditory nerve and its central connections. This can be caused by damage to the ear during pregnancy such as rubella infection.

Conductive hearing loss

In conductive deafness there is a problem with how sound passes through the eardrum and little bones in the middle ear. This sort of deafness can come and go or be persistent due to middle ear infections or fluid in the middle ear.

Both sorts of hearing loss can occur together.

The point between when patients can hear sound all the time, and when they can't hear a sound at all is known as the Auditory Threshold. This threshold can be affected by background noise, the age of the patient and what sort of testing equipment is used. From the age of three years, thresholds in children tend to improve.

Children who are most at risk of poor speech development are those who have had fluid in the middle ear three or more times in the first 18 months of life. What seems to be important, even if hearing loss is low, is if it persists for a long time.

Some experts have recommended a lower threshold when screening Aboriginal groups. A threshold of 15dB instead of 15-20 dB may reveal children who are at risk of hearing problems in school and later social problems.

There is no agreement on how hearing assessments should be grouped. This makes comparing different surveys difficult. The World Health Organisation has suggested a threshold of over 25 dB as a sign of hearing loss. This is shown in Table 1. A hearing threshold of 25 dB means that normal speech is heard as a whisper.

Table 1. Grades of hearing impairment as recommended by the World Health Organisation (WHO).

Grade of Impairment	Corresponding Average Threshold Level (of 500, 1000 and 2000 Hz) in the better ear.	Performance	Recommendations
0 No Impairment	25dB or better	No or very slight hearing problems. Able to hear whispers	

1 Slight Impairment	26 - 40dB	Able to hear and repeat words spoken in normal voice at one metre	Counselling and hearing aids may be needed.
2 Moderate Impairment	41 - 60dB	Able to hear and repeat words using raised voice at one metre	Hearing aids usually recommended.
3 Severe Impairment	61 - 80dB	Able to hear some words when shouted into better ear	Hearing aids needed. If no hearing aids available, lip reading and signing should be taught.
4 Profound Impairment including deafness	81dB or greater	Unable to hear and understand even a shouted voice	Hearing aids may help understanding words. Additional rehabilitation needed. Lip-reading and sometimes signing essential.

From: Report of the Informal Working Group on Prevention of Deafness and hearing Impairment Programme Planning WHO, Geneva, 1991. Provided by Smith A. Prevention of Deafness and Hearing Impairment, WHO, Geneva, Switzerland. URL: http://www.who/programmes/pbd/pdh_home.htm

Conclusion:

- ***There are four main categories of otitis media that health staff should be aware of. Experts will vary in their definition of each one. This can make it difficult to group many studies together and compare results.***
- ***Acute middle ear infection is an infection of the middle ear which usually has symptoms, but these may not be present. However, the middle ear is always filled with fluid and this may reduce or stop movement of the eardrum.***
- ***Repeated middle ear infection is present when a child has more than three infections in six months, or four infections in 12 months. In families with a history of ear infections, where children are prone to ear infections, one infection in the first six months of life or two infections in the first 12 months can be called repeated middle ear infection.***
- ***Fluid in the middle ear can affect hearing but does not cause the acute symptoms.***
- ***Chronic runny ear is a chronic infection of the middle ear when the eardrum has***

a hole in it for the pus to drain. This is called 'chronic' when a runny ear has been present for at least two weeks (some say six weeks).

- *The World Health Organisation describes a slight hearing loss as present when the hearing threshold is 26 dB or more in the better ear. It describes disabling hearing loss as a threshold of 31 dB in the better ear. During important periods of speech development in children, a small loss can cause important language and social problems.*

Diagnosis of middle ear disease (Diagnostic procedures)

In diagnosing middle ear disease, this history should include signs and symptoms of middle ear disease and when they began. Previous treatments and how the patient has responded should also be noted. Environmental risk factors should be checked and a general physical examination of the child should also be done. This includes checking the child's growth and development, looking for any infectious diseases and examining the head and neck for nasal obstruction or deformities of the face or head.

Acute middle ear infection (Acute otitis media)

The best way to diagnose acute middle ear infection is by looking at the eardrum through an otoscope (sometimes called an auroscope). If infected, an unperforated red and bulging eardrum will usually be seen. Some experts suggest that testing the ear with a tympanometer will prove that fluid is present in the middle ear. In everyday practice this test is not usually done to diagnose this infection.

If the child presents later in the infection, the eardrum may already be perforated and draining fluid or pus. When this happens, it is important to decide if this is an acute infection which has recently perforated the eardrum, or if it is a chronic runny ear which has been discharging for more than several weeks. Perforated eardrums in Aboriginal children can stay perforated for a long time and often progress to chronic runny ears. Viewing the eardrum of babies can be difficult. Often their ear canal is very narrow, or wax hides the eardrum, or they are crying. Experts suggest that if the baby has ear pain and a fever, this supports that an acute middle ear infection is present.

Fluid in the middle ear (Otitis media with effusion)

The best way to diagnose fluid in the middle ear is with the following tools:

- otoscopy (to examine the eardrum and look for fluid behind the eardrum)
- pneumatic otoscopy (to look for fluid behind the eardrum and see the movement in the eardrum)
- tympanometry (to measure how much movement there is in the eardrum).

During otoscopy the eardrum's colour, translucency (how see-through the eardrum is) and resting position (whether retracted or in the natural position) can be checked.

A normal eardrum is slightly see-through and usually a pearly-grey-colour, and turns red when the patient cries. Even though a fluid level can sometimes be seen behind the eardrum when there is fluid in the middle ear, otoscopy by itself is not an accurate tool to diagnose this problem.

Even if the examiner is experienced, experts suggest that otoscopy will only diagnose 50% of cases. Wax or other foreign bodies may have to be removed before the eardrum can be seen properly. Narrow or crooked ear canals and a child's fear or pain can make getting a good look at the eardrum difficult, especially with babies.

Pneumatic otoscopy is the screening test of choice for the diagnosis of fluid in the middle ear.

See Hearing Testing below for a description of this test.

Once health staff can use a normal otoscope, learning to use pneumatic otoscopy is simple.

However, studies show that these skills must be used regularly for health staff to maintain their expertise.

Tympanometry measures the obstruction or impedance of sound to the middle ear. A tympanogram is only accurate in diagnosing fluid in the middle ear 49-99% of the time. Therefore, it should not be used as the only test for fluid in the middle ear. See Hearing Testing below for description of this test.

Pneumatic otoscopy (sometimes called pneumatocopy) and tympanometry testing go well together. Experts recommend pneumatic otoscopy be used as the first test and tympanometry be used to confirm the result. Tympanometry can be used in children over the age of seven months.

Hearing testing (Hearing evaluation)

There are many different tests to assess children's hearing. Unfortunately none are very accurate, especially in children younger than three years.

1. Special testing for newborn babies and young children (ABR and other specialised testing for neonates and young children)

Testing babies between birth and six months aims to identify sensori-neural hearing loss caused by problems during birth and the development of the baby before birth. Babies who are at high risk of sensori-neural hearing loss include those who:

- have a family history of inherited sensori-neural hearing loss;
- experienced infections before or during birth eg syphilis, rubella;
- are thought to be abnormal;
- have a low birth weight;
- have bacterial meningitis;
- had severe lack of oxygen during birth;
- needed a blood exchange at birth
- have particular syndromes.

All high risk children should be checked again at age 12 months by an audiologist, even if no hearing loss was found earlier.

Tests used to identify babies with sensori-neural hearing loss include: auditory brain-stem evoked response (ABR); auditory response cradle (ARC); crib-o-gram (COG); steady state evoked potential (SSEP); and otoacoustic emission (OAE). These tests are usually given before the baby leaves hospital, or the baby may return for testing later.

Other hearing tests which Aboriginal Health Workers need to know about are behavioural testing, eardrum testing, pure tone audiometry and tuning fork tests. These are briefly described below.

2. Behavioural testing

Behavioural testing checks if a child can show a certain behaviour response when a sound is made. There are different sorts of behaviour tests, but which test is best for children under three years is not clear.

Behaviour testing is quite good for testing children aged six months to three years. The behaviour tests which are described here include the distraction test and the parental questionnaire.

a. Distraction test (seven to nine months)

The distraction test checks if a baby will turn its head when a sound is made to find where the sound comes from.

Two people test the baby. One makes the sound out of the child's sight and the other brings the baby's attention forwards between sounds. It is best if the baby is able to sit upright. Babies should be able to hear the sound in two out of three times the sound is given. The objective of the test is to find the quietest sound level that the baby will turn to.

No turn of the head may mean there is hearing loss. It can also mean the baby is developmentally delayed or is disabled.

Some experts say that 22-76% of babies aged 6-9 months with hearing loss will not be found by the distraction test. Others say, however, the test gives good information about hearing loss.

Australian experts do not recommend distraction testing to check for hearing loss, but recognise that it is still used in some areas.

b. Parental questionnaires (throughout childhood)

Questioning parents on whether a child shows signs of hearing loss has not been widely studied. So there is no direct proof that the method is useful. However many experts agree that if parents or care-givers are concerned about a child's hearing, this is very important and the child's hearing must be investigated.

Most experts suggest that parents should be asked about their child's hearing and other health problems periodically. Questionnaires for parents can help with this.

However, studies have shown that up to 50% of parents of children with hearing loss may not notice that the child has hearing loss and not show any concern. Also, hearing loss is often noticed later by parents than when screening tests can find it. Therefore, screening programs for hearing loss are essential.

The following box contains some of the questions for parents found in the Personal Health Record (child health record for parents). A full example of questions for parents is provided in Diagnostic Procedures in the main document.

Example of some questions for parents about their child's hearing.

- Before your child's 18 month health check - Hearing and language.
- Are you concerned about your child's hearing?
- Does your child have frequent ear infections?
- Is your child saying single words other than "mamma" or "dadda"?
- Can your child understand simple instructions, like "Put the ball on the table," "Give the ball to me"?
- Can your child point to one body part?
- Does your baby have a constant cold and/or green runny nose?
- Can your child tell where a sound comes from?

3. Eardrum testing (tympanometry and pneumatic otoscopy)

a. Tympanometry

Tympanometry measures the obstruction or impedance of sound to the middle ear. A probe from the tympanometer seals the ear canal and makes a sound. The sound either passes through the middle ear or is reflected. The tympanometer then prints a graph. A flat graph is called a type B tympanogram. This shows that the middle ear is filled with fluid. Ear wax, perforated eardrum, ear canal stenosis or bad placement of the probe can also give the wrong reading. A tympanogram is only accurate in diagnosing fluid in the middle ear 49-99% of the time.

Nevertheless, studies have shown that very few children with normal tympanograms have hearing loss.

However, some children with abnormal tympanometry may not have hearing loss (false positives). Consequently, some experts do not think this test should be used for general screening.

In Aboriginal children, where many children have hearing loss, tympanometry is an important test which can help identify children with normal hearing who do not need further hearing tests.

b. Pneumatic otoscopy

Pneumatic otoscopy is a two step test. The instrument is placed in the ear which seals the ear canal. This allows the eardrum to be viewed, while the examiner applies a very slight positive and negative pressure to the eardrum by puffing some air into the canal. While this is happening, the examiner watches the eardrum for movement. When there is no fluid behind the ear (as in a normal ear) the eardrum moves quickly with a slight amount of pressure. Experts describe this movement as 'crisp'. When there is no eardrum movement, there is probably fluid behind the eardrum. A thick eardrum - scarred from previous ear infections may move less than a normal ear.

Pneumatic otoscopy is a simple way of screening Aboriginal babies and children for hearing loss, even in remote areas where trained staff and equipment can be limited. Studies have shown that combining pneumatic otoscopy and tympanometry is the best way to test for hearing loss in Aboriginal children.

Experts recommend pneumatic otoscopy be used as the first test and tympanometry be used to confirm the result.

4. Pure tone audiometry

Pure tone audiometry is the best test for hearing loss in older children and adults. It can be used for children older than three years. Testing equipment and a soundproof room is needed for audiometry. Sounds are given through earphones to the child at different noise levels from quiet to loud. The need for a soundproof room limits the test usefulness as a screening test.

Play audiometry has been developed and this can be useful in children aged between two and three and half. However, it cannot detect thresholds below 20-25 dB and testing preschool age children needs trained testers.

Lack of sound-proof testing areas means background noise is often a problem with audiometry, especially in remote areas.

5. Tuning fork tests

Tuning fork tests compare how well the patient can hear sound through the air with sound through the bones behind their ear. This is done by placing the vibrating tuning fork near the outer ear and then placing it on the mastoid bone behind the ear. Many doctors use this test, but there is no proof that this test is a good screen for children with hearing loss from fluid in the middle ear.

Conclusions:

- ***All children thought to have a middle ear infection should have a full examination and assessment of growth and development. A medical history which includes when signs and symptoms began, and what treatment was given, should be included.***
- ***The best way to diagnose acute middle ear infections is by looking at the eardrum through an otoscope. Usually the drum is not perforated, but it may be red and bulging. If the eardrum is already perforated, and the ear is discharging, a careful history must be taken to decide if this is an acute or chronic ear infection.***
- ***In a child that was difficult to examine, a fever and ear pain indicates that an acute middle ear infection is likely.***
- ***The best way to diagnose fluid in the middle ear is with pneumatic otoscopy. Lack of movement suggests that fluid in the middle ear is likely. This should be followed by tympanometry as a check of the first test. Just looking in the ear with an otoscope will miss diagnosing many children with fluid in the middle ear.***
- ***Pneumatic otoscopy skills are easily learnt once health staff can use a normal otoscope. New skills need to be practiced regularly for staff to stay skilled.***

- *Tympanometry measures the obstruction of sound through the middle ear. Fluid in the middle ear will produce a flat (type B) tympanogram. Ear wax, eardrum perforation, ear canal stenosis or wrong placement of the probe can give a false reading.*
- *However, few children with normal tympanograms have hearing loss and so tympanometry may help to identify Aboriginal children who do not have hearing loss. Tympanometry can be used in children over seven months of age.*
- *Several special tests are available for testing newborn babies for hearing loss. All high risk newborn babies should be checked soon after birth. They should be rechecked again at 12 months of age, even if the newborn test was normal. Some experts have called for testing of all newborn babies, not just those classified as high risk.*
- *Which behavioural screening test is the best for young children is uncertain. Although the distraction test is still used in some areas of Australia, not all experts recommend it as a good screening test.*
- *Questioning parents about their child's hearing and other health problems, is recommended as part of the periodic health check. Children whose parents are concerned that hearing loss may be present should have prompt hearing testing. However, many parents may not notice their child has hearing problems and so good screening programs are still needed.*
- *Pure tone audiometry is the best test for finding hearing loss in children aged three years or older. Lack of suitable testing areas to stop background noise continues to be a problem for audiometry testing, especially in remote areas.*
- *Tuning fork tests to diagnose fluid in the middle ear, or to screen children for hearing loss, is not recommended.*

Is prevention effective? (Effectiveness of prevention)

The most important way to control middle ear infections in Aboriginal children is to improve the environment in which they live. This includes reducing overcrowding and improving nutrition. It is also essential that ear health care be provided as part of primary health care.

How effective prevention strategies are depends on how well:

- strategies stop the early development of middle ear infections and repeated infections (primary prevention);
- strategies can control chronic runny ears and prevent hearing loss (secondary prevention);
- hearing loss can be treated to reduce disability (tertiary prevention).

A summary of prevention strategies for ear infections and hearing loss in Aboriginal populations is shown in the following box.

Primary prevention strategies

Change Risk Factors

- Environmental and nutritional improvements
- Breastfeeding
- Passive smoking
- Swimming
- Nose blowing (BBC), chewing and other strategies

Early Antibiotic Therapy
Vaccination

Secondary prevention strategies

Medical Interventions

- Ability to take medicine (Adherence issues)
- Antibiotic treatment of acute middle ear infection, repeated middle ear infections, fluid in the middle ear, chronic runny ears.

Surgical Interventions

- Surgical treatment of repeated middle ear infections, fluid in the middle ear and chronic runny ears.

Screening

Screening for infection
Screening for hearing loss

Primary prevention

Primary prevention involves improving the child's environment and changing behaviour to reduce the risk of infection. Primary prevention also involves the proper use of antibiotics and vaccines.

1. Changing risk factors (Modify risk factors)

Improvement of the environment and nutrition (Environmental and nutritional improvements)

Poor standards of living will lead to more childhood ear infections. This is a consequence of overcrowding because children in close contact can spread the bacteria that cause infections. A low expectation of health and lack of available swimming areas also increase the risk of chronic middle ear infections.

Improvement of these risk factors would therefore reduce middle ear infections in Aboriginal populations. These factors are the responsibility of local, state and national governments. Strategies to screen and treat ear infections without improving these problems will only have limited success.

Breastfeeding

Some studies have found that breastfeeding protects babies from ear infections. A study across six different countries proved that feeding for at least three months helped to reduce acute middle ear infections.

Passive smoking

There is no proof that stopping passive smoking helps to prevent the development of fluid in the middle ear. However, passive smoking has been linked with the development of fluid in the middle ear in many studies. Children of parents who smoke take longer to clear fluid from their middle ear after grommets have been inserted.

Parents should be encouraged not to smoke in the house or near their children.

Swimming

Many doctors in the north of Australia believe swimming reduces the amount of pus produced by children with discharging perforated ears.

There is no proof that swimming worsens the discharge of chronic runny ears.

A few studies of children who had discharging ears after grommet surgery showed that ear discharge was worse in children who were not allowed to swim.

Other experts agree that children with grommets in their eardrums can swim without the need for earplugs. Some experts suggest, however, that bath water should be kept out of ears. This is because it is thought that water with soap or shampoo in it may be more able to pass into the middle ear.

The lack of proof that swimming increases ear infection in children with perforated eardrums or who have grommets, means that these children should be allowed to swim. It may even be possible that swimming in treated water (eg a swimming pool) helps to clear pus from the ear. However, there have been no studies which prove this.

Nose blowing (BBC), chewing and other strategies

In the Northern Territory, the breathing, blowing, coughing (BBC), strategies have been used in school-aged children to clear runny noses and help reduce ear infections and improve hearing in the belief that it was effective.

Although there is no proof that BBC is useful in preventing ear infections and in making hearing better, there is support from parents, community members and teachers for this activity.

One study has shown that using tissues to cough and clear the face will make faces cleaner. The BBC program made no difference to the hearing of children who participated in the program for five months. Other nose-blowing studies also failed to show a benefit in hearing.

Other studies have shown that a balloon blown up by the nose (called an otovent device) may improve tympanometry results if it is used three times a day for 1-3 months. Those studies that showed a benefit also showed that hearing improvement was very small. Children do not like doing this for a long time and give up after a while.

It is possible that nose blowing and the valsalva manoeuvre may help clear fluid from the middle ear. But few studies have looked at this in children who have fluid in their middle ear. No studies have looked at whether these activities prevent this problem.

Children with runny noses need to keep their faces clean. African studies have shown that children with unclean faces have 70% more chance of trachoma because dirty faces attract flies which help spread trachoma. Keeping faces clean and using antibiotics has been shown to reduce trachoma.

In Aboriginal communities where trachoma is common nose blowing, coughing and personal hygiene (especially washing of faces and hands) should continue, even though there is no proof that this helps stop ear infections.

Chewing xylitol gum has also been shown to prevent middle ear infections in children in Finland. This gum contains a substitute for sugar and so does not cause tooth decay. Chewing it has also been found to reduce tooth decay. Maybe studies in Australia should look at this for school-aged children.

Conclusions:

- ***Poor housing and overcrowding in Aboriginal populations encourages middle ear infections in Aboriginal children. The need to improve the living standards of Aboriginal people needs urgent attention.***
- ***It has been proved that breastfeeding helps to prevent acute middle ear infections and therefore should be encouraged.***
- ***There is proof that passive smoking increases the risk that children will develop fluid in the middle ear and suffer poor hearing as a result. Passive smoking is completely avoidable and parents should be advised not to smoke in the home or near children.***
- ***No quality studies have looked at the effect of swimming on children with chronic runny ears. There is also little proof that swimming harms children who have grommets in their ears, although experts consider this a controversial issue. Without proof of harm, children with chronic runny ears should be permitted to swim in clean water, especially if they swim in a treated pool.***
- ***There is no proof that nose blowing activities improve the hearing of children. Since there is no clear proof, these activities cannot be recommended for the control of middle ear disease. However, they are important in the control of trachoma.***
- ***There is good proof that special xylitol chewing gum helps prevent acute middle ear infections in young school-aged children. However most of the middle ear infections in Aboriginal children occur in children too young to chew gum.***

2. Early treatment with antibiotics (Antibiotic therapy)

Parents often want the doctor to give antibiotic medicine to their children when they have a cold or upper respiratory tract infection. But colds are caused by viruses, which antibiotics cannot treat.

There is little proof that giving antibiotics stops middle ear infection developing after a child has a cold.

In Aboriginal children, if throat and nose infections could be prevented it may stop the development of ear infections and prevent hearing loss. It could also help prevent eardrum perforation and chronic runny ears developing.

However, it is still not clear whether low dose treatment with antibiotics for Aboriginal children who are at high risk of getting ear infections is useful. One study has shown that giving antibiotics like this to Aboriginal children causes resistance of germs to the antibiotic and did not reduce the number of children who developed chronic runny ears.

More research on this is needed.

Conclusions:

- ***There is little proof that acute middle ear infections can be prevented if children are given antibiotics when they first get a cold or upper respiratory infection. Low dose antibiotic treatment for this cannot be recommended.***
- ***More studies are needed to find out if early ear infections can be prevented in Aboriginal children by giving low dose antibiotic treatment. What effect this sort of treatment may have on children is also unclear. Bacterial infections in the nose and throat do not seem to be affected by low dose antibiotic treatment. Using a treatment like this may help bacteria to become resistant to the antibiotic.***

3. Immunisation (Vaccination)

A lot of research has looked at whether vaccines could be used to prevent ear infections in children.

Pneumococcal vaccination

It is recommended that Aboriginal and Torres Strait Islander people over the age of 50 years, or those who have chronic diseases like heart disease, kidney disease, chest infections, diabetes and people who abuse alcohol, should have a pneumococcal vaccine with Pneumovax23[®] every five years.

More than 50% of middle ear infections are caused by *Streptococcus pneumoniae* (pneumococcus). Therefore experts believe that a vaccine would help to reduce ear infections, especially in children with repeated ear infections. But no Australian guidelines say Pneumovax23[®] should be used to help prevent middle ear infections.

Can Pneumovax23® prevent middle ear infections? (Pneumococcal vaccine prevention of otitis media - evidence of effectiveness)

Studies have shown that children under two years of age are unable to use Pneumovax23® properly because their immune systems are not mature enough. Therefore, this vaccine is unable to prevent acute middle ear infections in young children.

But some studies have shown that Pneumovax23® helps to prevent ear infections in children older than two years.

Most middle ear infections start in children younger than two years, but Aboriginal children often continue to have ear infections after that age. This suggests that Pneumovax23® may be an important vaccine for Aboriginal children.

Several experts recommend this vaccine be used to help prevent ear infections in children who have repeated ear infections over the age of two years.

Studies have shown that the Pneumovax23® vaccine does not stop bacteria living in the nose or throat of children.

There are now studies that show that another sort of pneumococcal vaccine (glycoprotein conjugate pneumococcal vaccine) may help prevent middle ear infections. This is a new vaccine and now available in Australia. It is proven to be a much better vaccine than Pneumovax23® for children under two years of age and can stop bacteria living in the nose. This will be helpful in preventing the spread of these germs in communities. More work needs to be done to see how much effect it will have in preventing ear infections in Aboriginal children.

Other ways to look at vaccine protection is to give Pneumovax23® to mothers. In this way, the mother's protection can pass to the baby so that they are protected against the ear germs from the time of birth. Further work is also needed to examine the value of this.

Research for vaccines to help control middle ear infections is important because experts are worried that overuse of antibiotics will help more germs to become resistant to the antibiotics.

Conclusion:

- **Several experts recommend that children who have repeated middle ear infections and who are over two years old, should have the Pneumovax23® vaccine. However, the National Health and Medical Research Council has not yet recommended this.**
- **Pneumovax23® is not recommended for children under the age of 2 years. However, there is good proof that it can prevent acute middle ear infections in children over that age.**
- **A new pneumococcal vaccine has been developed and may help prevent ear infection. It is now available in Australia for the prevention of meningitis, blood infections and pneumonia.**
- **There is some proof that low dose antibiotics and vaccination together may be better at preventing middle ear infections.**

- **Research into vaccines for ear infections is important because of the risk of germs becoming resistant to antibiotics. Other research is looking at whether immunity in children can be improved by immunising their mothers.**

Does Haemophilus influenzae type b (Hib) vaccine help prevent middle ear infections? (Haemophilus influenzae type b (Hib) vaccination)

The Haemophilus germ is also known as Hib. But Hib is only one type of Haemophilus germ. Almost all ear infections that are caused by the Haemophilus germ are caused by types different to Hib. This means that the Hib vaccine is not really effective in preventing middle ear infections. This explains why ear infections still occur even though the Hib vaccine has been used a lot.

Further research is being done on finding a Haemophilus vaccine to prevent ear infections.

Does the flu needle prevent ear infections?

Studies in Finland and the US have shown that the flu needle given to children less than three years of age prevents middle ear infections during the flu season.

Because of this, some experts feel that children who get a lot of ear infections should get the flu needle each year. Australian experts have not recommended this action because more studies are needed.

Secondary prevention - medical treatments (Medical interventions)

Once middle ear infections have developed, medical treatment includes sensible use of antibiotics. Drugs like decongestants and antihistamines are not recommended for the treatment of middle ear infections.

Lack of refrigerators for storage of antibiotics can be a problem for some families living in poverty.

Using antibiotics from sachets has not helped because of the need for repeated preparation of the medicine. This may mean that these families need more follow up and support from Aboriginal Health Worker staff to complete treatments.

Some studies have shown that providing a lot of support to take medicine such as reminders, special pill containers, support groups and care for people at their work, helps people to keep taking their medicine properly. However, some experts question whether many clinics have the resources to provide this level of care. Counselling patients on the importance of taking medicine properly has been shown to help patients when they are on short-term medication.

Providing a lot of support to take medicine such as reminders, special pill containers, support groups and care for people at their work, helps people to keep taking their medicine properly.

1. Antibiotic treatment of acute middle ear infection (Antibiotic treatment of acute otitis media)

Complications of acute middle ear infection (Suppurative complications of otitis media)

Few studies have looked at how well antibiotics work in children who are at high risk of acute and chronic middle ear infections.

Mastoiditis (infection of the mastoid bone area behind the ear) is more likely to occur if antibiotics are not used to treat middle ear infections.

In children who are at high risk of middle ear infections, runny complications are more common than in the general population. High risk children are more likely to have poor nutrition, a high risk for other infections, bacteria in their nose and throat from an early age, poor living conditions, a large family, poor hygiene and have poor access to early primary health care.

Mastoiditis symptoms are very similar to acute middle ear infection symptoms, but will have been present for longer. Ear discharge and earache are important signs. If an abscess is present, the mastoid area behind the ear will be swollen, red and will cause the ear to stick out more than the other (usually downward, outward and forward). If the eardrum perforates early in the infection, this can help prevent mastoiditis. Antibiotics can be used to treat mastoiditis, however, most doctors like to insert grommets (tympanostomy tubes) into the eardrum to help drainage as well. If this treatment fails surgery on the mastoid is needed to clear out the infection and dead tissue (mastoidectomy).

Improvement without treatment (Spontaneous resolution of symptoms)

Some experts have found that some children will get over their middle ear infections without any treatment. However, it is impossible to tell which child will do this. Most experts believe that antibiotics should be used to treat every acute middle ear infection. Studies have shown that antibiotics help to reduce pain and other symptoms in children with middle ear infections.

Does antibiotic treatment clear fluid from the middle ear? (Effect on middle ear effusion upon review after 30 days)

Studies have shown that a normal course of antibiotics does not reduce deafness in children with fluid in their middle ear.

How effective is penicillin in treating acute middle ear infections? (How effective is penicillin in acute otitis media?)

Penicillin is given as the first line of treatment for these infections in some countries, but few studies have looked at how effective it is in curing ear infections. Penicillin is not effective in treating middle ear infections of children who have *Haemophilus influenzae* in their nose or throat.

New oral antibiotics for middle ear infections. (New oral antibiotics for otitis media)

One dose of azithromycin a day for three to four days has been shown to be just as effective as some other drugs which need to be given for 7-10 days. But any of these newer types of medications are no more effective than the older ones, such as amoxicillin or co-trimoxazole.

Antibiotic treatment by injection (Parenteral antibiotics)

Acute middle ear infection can be treated with a single injection of ceftriaxone. Studies have shown that many parents prefer a single-dose treatment for their children. However, this drug is very expensive and very important for other life-threatening infections, and should be kept for this special use.

Careful use of antibiotics in the treatment of middle ear infections (Judicious use of antibiotics in the treatment of otitis media)

In Aboriginal people, there is already an increasing number of germs which are becoming resistant to antibiotics. Most experts believe it is important to reduce the amount of antibiotics used in order to slow down this development of resistance amongst germs. This means using antibiotics only when they are really needed.

Azithromycin and ceftriaxone are used to treat other very important infections in Aboriginal people and experts are concerned that some germs may become resistant to these drugs.

How often should children with acute middle ear infections be followed up? (Optimal follow up of acute otitis media)

No research has described the best follow-up of children with acute middle ear infections. However, many guidelines suggest that the child should be reviewed in the first two days if symptoms have not improved. Generally, follow-up after one month is suggested.

Children at high risk, however, should be followed up more regularly.

Children at high risk of treatment failure include children under the age of 15 months, children who have repeated middle ear infections, children who have a brother or sister with ear infections, or children who have already been treated with antibiotics for an ear infection in the last month. In this instance, follow up should be at two to three weeks.

Frequent follow up is advised for Aboriginal children.

Guideline recommendations

As it is not possible to pick which children have middle ear infections caused by a virus or which children will get over their ear infection without antibiotic treatment, it is recommended that all Aboriginal children with middle ear infections should be treated with antibiotics.

Most experts advise that amoxicillin should be the first drug used to treat a middle ear infection.

If the germ causing the middle ear infection is resistant to penicillin, experts suggest that

the amoxicillin dose should be increased or treatment changed to a combination of amoxicillin and amoxicillin-clavulanate. It is not clear how long amoxicillin should be taken. Experts suggest treating from 3-20 days, however, most believe ear infections should be treated for at least seven days.

See *Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations* for summary of guidelines and expert recommendations for treatment of acute middle ear infections.

Conclusions:

- ***In the general population, most children with acute middle ear infections will get better without antibiotic treatment. This is not the case for Aboriginal children. Middle ear infections in Aboriginal children occur early in infancy and will often persist for many years. Early antibiotic treatment at the beginning of the ear infection is recommended.***
- ***Antibiotics reduce the pain of ear infections, but do not seem to be able to prevent the development of fluid in the middle ear following an acute ear infection.***
- ***Newer single daily dose antibiotics (eg azithromycin) have been shown to be effective in treating middle ear infections. However, these drugs are not recommended as the first choice of treatment for middle ear infections. This is because they are no more effective than amoxicillin or co-trimoxazole. They should only be used for cases in which the usual treatment has not worked or when there are complications.***
- ***Antibiotic treatment for middle ear infections should in general, be given for seven to ten days.***

2. Antibiotic treatment of repeated middle ear infections (Antibiotic treatment of recurrent otitis media)

Low-dose antibiotics given for a longer period is currently the only treatment for repeated middle ear infections that do not improve with insertion of grommets.

Low-doses of amoxicillin and co-trimoxazole, or once weekly doses of azithromycin, have been shown to be effective in these children.

There is some proof that giving low-dose antibiotics at the start of a cold or upper respiratory tract infection can help prevent repeated middle ear infection in those children who have already had repeated infections. But, parents have found that it can be a problem to get antibiotics every time the child gets a cold. For these parents it may be better to suggest low-dose antibiotics for a long period.

How long should low-dose antibiotics be given for repeated middle ear infection? (Optimal duration of antibiotics for prophylaxis against recurrent otitis media)

It is unclear how long low dose antibiotics should be given. Most experts recommend amoxicillin at half the normal dose for between one and six months.

Guideline recommendations

See *Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations* for a summary of guidelines and expert recommendations on the treatment of repeated middle ear infections.

Conclusions:

- *There is proof that low-dose antibiotics are effective in preventing middle ear infections, especially if the child has already had repeated ear infections.*
- *This supports the use of low-dose antibiotics in Aboriginal children who are otitis-prone.*
- *Children who have the most ear infections will receive the most benefit from low-dose antibiotic treatment, but not all repeat ear infections will be prevented. Parents need to understand this.*
- *Most experts recommend amoxicillin for low dose treatment, although phenoxymethyl penicillin or co-trimoxazole have been shown to be effective too.*
- *There is some proof that low-dose antibiotic treatment at the beginning of a cold can help prevent an ear infection in children with repeated middle ear infections. It is not clear if this sort of treatment would be acceptable to Aboriginal parents.*
- *How long low dose treatment should last is also not clear. Most experts prefer to treat for three to six months with amoxicillin at half the normal dose, given once a day.*
- *Although careful use of antibiotics is important, long courses of low dose antibiotics could be useful in some children. Children with repeated middle ear infections who have hearing loss, children who have their first ear infection before age six months or children with a family history of ear infections should be considered.*

3. Antibiotic treatment of fluid in the middle ear (Antibiotic treatment of otitis media with effusion)

The main reason for treating fluid in the middle ear is that long periods of poor hearing during the time when the child is learning to speak, can result in poor language development and learning problems at school.

Antibiotics are considered as treatment for fluid in the middle ear because nearly 50% of these children have bacteria in the middle ear fluid. However, it is unclear how effective antibiotic treatment is.

It is important to remember that most cases of fluid in the middle ear clear without treatment within three months unless another acute middle ear infection occurs.

Effect of antibiotics

Studies have shown that antibiotic treatment should be tried before surgery for fluid in the middle ear. Use of antibiotics may help to avoid or at least delay surgery for this problem. It is not clear if antibiotics actually help to improve the child's hearing, or if repeated courses of antibiotics are more effective than just one course.

Antibiotics treatment should be tried before surgery for fluid in the middle ear.

Watching for three months (Observation for three months)

Experts believed that 80-90% of fluid in the middle ear clears without treatment within 12 weeks. Therefore, treatment before this is generally not recommended.

Most guidelines recommend follow-up to identify children with persistent fluid in the middle ear after this three month period. A monthly ear check with inspection of the eardrum and assessment of its mobility and a hearing test is recommended.

Effect of antihistamines and decongestants

Antihistamines or decongestants do not help clear fluid from the middle ear. However, they may help patients feel more comfortable if they have a blocked up nose.

Effect of systemic steroids

Experts disagree whether steroids are useful in treating children with fluid in the middle ear. Most agree that it may be used as a last resort before surgery in children who are older than three years.

Guideline recommendations

A hearing assessment should be performed if fluid in the middle ear lasts longer than three months.

Experts evaluated several studies that looked at the best way to treat fluid in the middle ear. The United States Agency for Health Care Policy and Research recommend the following management of children with fluid in the middle ear:

without hearing loss: observe child without treatment or treat with an antibiotic;

with hearing loss: after at least three months of this, antibiotics or surgery with insertion of grommets. Grommets should be inserted after four months or more of hearing loss.

See *Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations* for other guidelines and expert recommendations.

Conclusion:

- *It is important to review the child with fluid in the middle ear regularly.*
- *Some children respond well to two weeks of antibiotic treatment for fluid in the middle ear. But improvement is usually short.*
- *The child can be started on antibiotics at diagnosis or they can be watched without treatment. Fluid in the middle ear should be checked monthly, and if it is still present after three months a hearing test should be performed. If there is no hearing loss the child can be observed or treated with antibiotics. If there is hearing loss the child should be treated with antibiotics or referred for surgery.*
- *There is little proof that long courses of antibiotics help children with fluid in the middle ear. It is also unclear if antibiotic treatment helps children to hear and learn to speak better.*
- *Antihistamines and decongestants do not help treat fluid in the middle ear. Experts disagree if steroids help with this problem. If used, they should only be used in children older than three years.*

4. Non surgical management of chronic runny ears (Non-surgical management of chronic suppurative otitis media.)

The aim in treating chronic runny ears is to heal the eardrum perforation, keep the eardrum healed and reduce hearing loss.

Bacteria which cause chronic runny ears (Bacterial pathogens in CSOM)

By the time a child has developed chronic runny ears after an acute ear infection, the bacteria causing the discharge are different to the bacteria that caused the acute infection. This means that different antibiotics are needed to treat the infection.

Pseudomonas is the most common bacteria which causes chronic runny ears. It can also be caused by Staphylococcus aureus and Proteus species.

Mastoid x-rays in children with chronic runny ears (Mastoid x-rays in children with CSOM)

Some experts perform x-rays of the mastoid area behind the ear in children with chronic runny ears, but they are generally not very helpful. However, the more powerful computed tomography (CT scan) is better. It helps to decide if patients are likely to have further complications, and also helps the surgeon to decide the best way to operate on the ear.

Ear swabs with chronic runny ears (Ear swabs in those with CSOM)

Some experts swab the middle ear to see what bacteria are causing the infection. Swabs from the middle ear are difficult and should be done by experts. This is not usually possible in a busy primary health clinic. An overview of studies showed that, in most cases, swabs from the ear canal will grow the same bacteria as swabs from the middle ear in patients with chronic runny ears. Therefore, it is appropriate to swab the discharge from the ear canal.

Initial hearing assessment in children with chronic runny ears (Initial hearing assessment in CSOM)

Most children with runny ears will have poor hearing.

Given this, it is unclear when children should have a hearing test done. In children less than three years of age, there is no hearing test that most services can use.

The important issue is that runny ears over a long period will affect hearing, and these children should be seen by a specialist if their ears cannot dry up. If these children have a hole in their drum for a long time, they should also be seen by a specialist.

If children are older than three years, they should have their hearing tested with audiometry. Waiting for the discharge to clear before testing can cause an unnecessary delay in checking hearing.

Some experts recommend hearing testing before and after treatment is started, especially if any ear drops which could be toxic to the ear are to be used.

Ear toilets

The purpose of ear toilets is to remove pus and allow air to get to the middle ear. In the Kimberley, diluted Betadine (povidine-iodine) solution 1:20 is used to syringe the ears with regular dry mopping with tissue paper spears.

Some experts recommend ear washes with 2% acetic acid (vinegar) for chronic runny ears.

The purpose of ear toilets is to remove pus and to allow air to get to the middle ear.

a. Simple disinfectants

All experts agree that ear toilets are essential in the management of chronic runny ears. But few studies have looked at how effective they are.

One important study found that ear toilets are more effective if they are combined with antibiotic treatment, especially antibiotic ear drops.

No good studies have looked at the effectiveness or safety of dilute Betadine ear washes.

b. Plain dry mopping

There is proof that plain dry mopping of the ear with tissue spears by itself does not help to reduce discharge or heal the eardrum perforation. Experts have reported that dry mopping is no better than doing nothing at all.

Antibiotic ear drops and medicine taken by mouth have been shown to help clear runny ear discharge. But antibiotics or dry mopping of the ear did not help eardrum perforations to heal faster.

Antibiotic ear drops (Topical antibiotics)

Examples of commonly used antibiotic ear drops are Sofradex or Otodex, Kenacomb Otic or Otocomb Otic, Chloramphenicol Otic, Locacorten-vioform, Soframycin. Some experts also use antibiotic eye drops to treat ear infections. These are the newer drops called Ocuflax or Ciloxan. They are also known as the fluoroquinolones.

Antibiotic ear drops (topical antibiotics) seem to be more effective than antibiotics taken by mouth in treating chronic runny ears. Ear toilets and treatment with antibiotic ear drops has been shown to be the most effective treatment to clear ear discharge.

But no studies measured whether this combined treatment helped children to hear better.

It is safe to say that if the discharge dries up then hearing will be better.

Antibiotic ear drops which also contain a steroid have been found to be more effective than antibiotics taken by mouth.

The newer fluoroquinolone drops are more effective in treating runny ears than the other drops.

Toxic effects of ear drops (Ototoxicity of topical antibiotics)

Many experts advise care in the use of antibiotic ear drops when the eardrum is perforated, because of concern that the ear drops may be toxic to structures and the nerves of the ear. Studies on animals have shown that some drops can damage the ear, but this has not been studied carefully in humans. Many human studies have shown ear drops are safe, but this may not be the case if they are used for very long periods such as years.

Although there is some risk of toxic effects, ear drops are used by many doctors to treat chronic runny ears.

Up to 94% of ear specialists use ear drops for the treatment of this problem.

Antibiotics taken by mouth (Oral antibiotics)

Few studies have looked at how well antibiotics which are taken by mouth (oral), treat chronic runny ears. This is because few oral antibiotics can treat *Pseudomonas* infections which cause most infections of chronic runny ears. Even so, some experts recommend treatment with oral antibiotics that cover a range of bacteria as well as ear toilets, to treat runny ears.

However studies have shown that antibiotic ear drops are more effective in drying up ear discharge than oral antibiotics.

Combining oral and topical antibiotics does not increase effectiveness.

Intravenous antibiotics (Parenteral antibiotics)

Intravenous antibiotic treatment has been shown to be effective in treating chronic runny ears but there are no clear guidelines on this.

Guideline recommendations

Even though many children suffer from chronic runny ear infections and have hearing loss as a result, there are few studies which have looked at which is the best way to manage these infections. This means that guideline recommendations vary, and which treatment is best is uncertain.

If treatment of acute middle ear infection can prevent chronic runny ears, then early treatment of the acute infection which caused the eardrum to perforate in the first place is important. Early treatment of acute middle ear infections with ear discharge is recommended.

See *Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations* for a summary of recommendations on the medical management of chronic runny ears.

Conclusions:

- **Hearing loss from a perforated eardrum improves once the eardrum heals. Treatment of chronic runny ears is necessary to stop discharge and allow the eardrum to heal.**
- **When ear discharge first starts, this is caused by perforation of the eardrum during an acute middle ear infection. This should be treated as an acute middle ear infection. When discharge has been present for six weeks or more, bacteria causing the pus more than likely have changed and oral antibiotics are not likely to be effective.**
- **Antibiotic ear drops are better than oral antibiotics, at drying up ear discharge and getting rid of bacteria in the middle ear. Combining oral antibiotics and ear drops does not clear infection better. Treatment with antibiotic ear drops and regular ear toilets is recommended to treat chronic runny ears.**
- **All children who have chronic runny ears should be considered to have their hearing affected. In those children older than three years, an audiogram hearing test should be done. Do not delay the hearing test until discharge stops, as the child may be lost to follow-up. Advise parents if their child has hearing loss.**
- **An ear swab should also be taken from the canal when the child is first seen with chronic runny ears to find out what bacteria need to be treated.**
- **Children with chronic runny ears for a long time, and who do not respond to treatment, should be seen by a specialist to look for infection of the mastoid and other complications of chronic runny ears. It is not certain how long the discharge should have been present before referral. This will differ in individual cases. If both ears are affected, then hearing loss will impact on development. If all treatments have been tried and failed, the child should then be referred.**
- **Regular ear washes in children with chronic runny ears use a great deal of Aboriginal Health Workers; time. However, discharge must be removed for healing to occur.**
- **There is no proof that ear toilets (either dry mopping or ear syringing) should be performed for several months before antibiotic treatment is started. Antibiotic ear drops should be started at the same time as the ear toilets.**

- *There is good proof that dry mopping is no better than giving no treatment for chronic ear infections.*
- *Fluoroquinolone eye drops are better than other drops in clearing up discharging ears.*
- *There is little proof that antibiotic ear drops cause hearing loss, but using them for a very long time should be avoided.*

Secondary prevention - surgical interventions

1. Surgical treatment of repeated middle ear infections (Surgical treatment of recurrent otitis media)

Experts disagree whether repeated middle ear infections should be treated with insertion of grommets.

Insertion of grommets allows air to enter the middle ear. This helps fluid to drain through the eustachian tube and reduces ear pain. Experts believe it is almost as effective as low-dose antibiotic treatment in treating repeated middle ear infections. However, insertion of grommets does not completely prevent further middle ear infections.

Generally grommets are recommended if antibiotic treatment fails to prevent repeat ear infections.

Few studies have looked at the effectiveness of grommets in children with repeated middle ear infections. Some studies have found that children with grommets have fewer ear infections, while others have found that grommets have made no difference.

If children have *Haemophilus influenzae* in their nose or throat, grommets do not help to stop ear infections. This may be important when deciding how to treat Aboriginal children who are at risk of repeated middle ear infections.

Removal of the adenoids has been recommended for children with repeated middle ear infections who have not been helped with antibiotics or grommets.

However, one study has found that repeated ear infections occur more often in children who have had their adenoids and their tonsils removed. This may mean that the pattern of repeat infections is set well before the child is old enough for this type of surgery.

Insertion of grommets for repeated middle ear infections is more expensive than treating with antibiotics. Repeated insertion of grommets can also cause scarring of the eardrum which can cause hearing loss.

Guideline recommendations

The decision to use surgery to treat repeated infections of the middle ear will depend on how often and how severe the infections are.

Grommet insertion can be used in children who have failed to respond to low dose antibiotic treatment.

The removal of adenoids may be useful in a small number of children who do not respond to grommet insertion.

It is also important to consider that older children may benefit from pneumococcal and influenza vaccines.

See *Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations* for a summary of recommendations for surgery in children with repeated middle ear infections.

Conclusions:

- *Few studies have looked at whether insertion of grommets helps stop repeated middle ear infections. It is difficult to say if grommets are helpful in Aboriginal children with this problem.*
- *Experts recommend that the decision to have surgery needs to be made individually for each child, and should be based on failure of antibiotic treatment and personal and family issues.*
- *Surgery does not prevent all repeat ear infections, and many children may still get acute middle ear infections and runny ears.*
- *Although no studies have proven it, Aboriginal children who are otitis-prone and have bacteria in their nose or throat may not improve with surgery.*
- *Surgery is expensive and scarring can occur from repeated insertion of grommets.*
- *Experts recommend that removal of the adenoids may help if antibiotic treatment and grommets have failed to stop repeated middle ear infections. It is not known if removal of the adenoids helps Aboriginal children with this problem.*

2. Surgical treatment of fluid in the middle ear (Surgical treatment of otitis media with effusion)

Removal of fluid from the middle ear and insertion of grommets allows hearing to return to what it was before the fluid developed.

Removing the fluid allows the eardrum and the bones in the middle ear to vibrate normally. Grommets allow air to pass into the middle ear and stops fluid building up again.

Removal of middle ear fluid and insertion of grommets is needed in children who have not improved with antibiotic treatment, especially when hearing loss is causing learning or behaviour problems.

Surgery should only be used once antibiotic treatment has been tried.

Effect on hearing

Many parents say that children who have grommets inserted are less irritable and seem to hear better after surgery. Experts were unable to find that speech improved after insertion of grommets. Some studies have found that grommets improve hearing, but only for about 12 months.

Adenoidectomy

Studies could not show that removing the adenoids or combining grommet insertion with removing the adenoids improved hearing.

Adenoidectomy is not recommended for treatment of children aged 1-3 years with fluid in the middle ear, unless there is another adenoid problem. More research is needed to decide if removing the adenoids helps reduce fluid in the middle ear.

Access to specialist services

Almost all country and remote areas have no local ear nose and throat (ENT) specialist. These areas have to rely on visiting ENT services. The high levels of ear disease, and the fact that there is only a visiting ENT service, means that receiving specialist ear care is difficult and less likely to occur than in city areas.

The length of time that visiting ENT services are able to provide care in country areas is poor. In 1991 there were approximately 5200 children (approximately 50% Aboriginal) under the age of 14 years living in the Kimberley region of WA. But only 30 days of ENT specialist time was spent providing ENT services to this region.

Waiting times for surgery may be longer in remote areas as organisation of irregular visiting services can be difficult. Any cancellations also increase waiting times.

Medicare billing shows less ENT care is provided in country areas compared to city areas in every Australian State or territory except Victoria.

Guideline recommendations

Because most children will get better within three months of being found to have fluid in the middle ear, children with fluid in the middle ear should be watched and have their hearing retested just before surgery. This will check that the fluid in the ear has not gone away by itself. This period is called watchful waiting.

Sometimes watchful waiting may delay surgery, but it is important to prove that the fluid in the middle ear is persistent and that it is causing hearing loss.

Experts recommend that children with fluid in the middle ear should be placed on a temporary waiting list after their first hearing test shows the possible need for surgery. Children should remain on this list during the period of watchful waiting.

Grommet insertion is not needed when fluid in the middle ear does not cause hearing loss in both ears.

A summary of guideline and expert recommendations on the management of surgery in children with fluid in the middle ear is available in *Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations*.

Conclusions:

- **Grommets can improve hearing in children with fluid in the middle ear, but this benefit only lasts while the grommets are in place and able to allow air into the middle ear. Once the grommet falls out and fluid builds up again, hearing is reduced. There is little proof that improved hearing from grommet insertion improves speech development.**
- **Removal of the adenoids can improve hearing in children with fluid in the middle ear, but it is not clear if more improvement occurs when adenoidectomy is combined with grommet insertion.**
- **Experts recommend that surgery should only be considered after fluid has persisted in the middle ear for longer than three months and there is also a hearing loss threshold of more than 20dB.**
- **If there is no hearing loss, surgery for fluid in the middle ear should not be considered.**
- **Another hearing assessment should be done before surgery to make sure the fluid has not cleared by itself. This is important in remote and country areas where waiting lists for ENT care can be long.**
- **Systems of referral of children for specialist ENT care should be able to recognise the need for some children to attend specialist care more urgently than others. The need to increase the specialist services in country areas of Australia is urgent.**

3. Surgical treatment of chronic runny ears (Surgical treatment of chronic suppurative otitis media, CSOM)

Medical management of chronic runny ears has failed if there is no improvement, or if ear discharge gets worse, after two weeks with appropriate antibiotic treatment. If after repeat treatments, ear discharge is still present, children should be considered for referral to a specialist. Surgery is an option for these children when the eardrum doesn't heal.

Surgery to repair the eardrum is also needed when there is a persistent dry perforation.

Overseas studies show up to 20-30% of patients with chronic runny ears will eventually need surgery to clear infection from the bone around the ear (tympanomastoid surgery). The Australian figures are not known.

This surgery should be considered when the child repeatedly gets chronic runny ears.

Children with chronic runny ears should be managed by a specialist as permanent hearing loss or more serious complications such as a cholesteatoma (a type of cancer of the ear) can develop. Some children may need repeat surgery to clear infection.

Surgical repair of a perforated eardrum is called a myringoplasty or tympanoplasty. The patient must understand that the packing put in the ear during surgery must not be removed early.

What is the best age for eardrum repair? (Optimal age for surgery).

Experts disagree at what age the eardrums should be repaired.

Some experts say that young children's ears are more likely to perforate again if they are repaired too early. However, there is proof that eardrum repair has a good chance of success at almost any age. Studies have reported that hearing improvements in individual patients may vary after eardrum repair. Most patients will have improvement soon after surgery, but the best hearing level may take a few months to develop.

There is proof that the eardrum repair has a good chance of success at almost any age.

Guideline recommendations

Few guidelines give advice about when to refer for surgical management of chronic runny ears.

The NSW Working Party recommends that eardrum repair should be delayed until early adolescence because some eardrum perforations can heal by themselves.

In the Kimberley, eardrum repairs are recommended at a younger age (between five and ten years). Children with runny ears that do not dry up with persistent treatment should be referred for specialist advice as mastoidectomy may be needed.

See *Recommendations for Clinical Care Guidelines on the Management of Otitis Media in Aboriginal and Torres Strait Islander Populations* for summary of guideline and expert recommendations for the surgical management of chronic runny ears.

Conclusions:

- ***Specialist referral for surgical management should be considered in the child with persistent chronic runny ears despite correct medical treatment. Hearing loss should always be assessed before surgery.***
- ***Children with a perforated eardrum, which is dry but not healing, should be referred for surgical repair when there is hearing loss.***
- ***Experts have different opinions on what age eardrums can be repaired. There is some proof that repair in young children is effective. Each child needs to be assessed for repair individually.***
- ***Children should not have to wait for their ears to stop discharging before they can see a specialist.***
- ***The success of eardrum repair may depend on many factors. Patients should be advised of factors which can affect surgery success and should be supported by Aboriginal Health Worker and Aboriginal liaison staff after surgery.***
- ***There is reasonable proof that successful eardrum repair is not greatly affected by age. Referral for surgery should be considered in young children.***

Secondary prevention - screening

Early detection, appropriate treatment and follow-up, may prevent or reduce hearing loss from ear disease in Aboriginal people. For this reason, some form of screening for middle ear disease and early hearing loss should take place.

The World Health Organisation has recommended that screening and ear health care should be provided according to local primary health care priorities and circumstances.

Many guidelines and experts support screening for middle ear disease in Aboriginal people.

Before any screening program is started, important issues should be assessed. These are:

- the problem for screening should be an important social, psychological or health problem in the population to be screened;
- resources for assessment and diagnosis must be available;
- there should be an acceptable and affordable method of rehabilitation of those people found to have a problem;
- there must also be proof that finding the problem early helps to improve the outcome of the disease;
- screening must be able to identify the problem earlier than would occur through normal clinic care or observation;

Experts do not recommend screening non-Aboriginal children for fluid in the middle ear. Screening children for hearing loss within the periodic health checks is recommended. Screening at school entry is also recommended.

This is because this problem clears without treatment within three months in most children. Currently there is no way to tell which children may go on to have this problem for a long time.

Many Aboriginal children have frequent middle ear infections with long periods of hearing loss which may last into adulthood. Some Aboriginal people do not present with hearing problems or discharging ears because these problems are common. By putting screening programs in place more people will benefit. Screening should lead to referral and treatment which have been shown to improve ear health.

Referral of children with hearing loss (Referral of hearing impaired children)

Children who have persistent hearing loss, even with good medical or surgical care, should be referred for hearing, language and communication therapy.

The Commonwealth Hearing Services Program also provides free hearing assessment, rehabilitation, supply and fitting of hearing aids for eligible people aged 21 years or older. Pensioners and people receiving sickness benefits from the Department of Social Security, and dependants of these people, are eligible.

People under the care of the Commonwealth Rehabilitation Service are also eligible, but Health Care Card holders who do not receive a sickness allowance are not eligible. Applications are made to the Commonwealth Office of Hearing Services on the 'Application for Hearing Services' form.

Referral may require coordination between Australian Hearing Services (AHS); local audiologists; speech therapists; local schools and the Department of Education; teacher aides; and city based hearing rehabilitation services that specialise in other communication strategies.

The development of a register for hearing loss can significantly assist this referral and coordination process.

Access to, and use of, specialist services for hearing health is less in country and remote areas than in city areas. Since a great deal of the Aboriginal population lives in country and remote areas of Australia, these issues need to be improved when attempting to prevent and control complications of middle ear infections in Aboriginal people. The World Health Organisation recommends the identification of people with ear disease so that they can receive further investigation and appropriate treatment.