

Guidelines for the control of measles outbreaks in Australia

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Australia New Zealand**

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Preface

Since the re-introduction of notification of measles in 1986, over 15,000 cases of measles have been reported in Australia. In response to the high incidence of measles, the National Health and Medical Research Council developed the report *Measles: Guidelines for the Control of Outbreaks in Australia* in 1996.

Australia has now moved from the 'outbreak prevention' to the 'elimination' phase to arrest the indigenous transmission of measles. To facilitate the move to the 'elimination' phase, it has been necessary to revise the existing guidelines taking into account the need for:

- long-term, high vaccination coverage, with a two-dose strategy;
- an effective vaccination coverage monitoring system;
- enhanced measles case-based surveillance including urgent notification and confirmation of disease; and
- a comprehensive rapid response strategy to every measles case.

The Measles Elimination Advisory Committee (MEAC) was established in July 1997 to advise on strategies for eliminating measles in Australia. The *Measles: Guidelines for the Control of Outbreaks in Australia* was revised by the Measles Outbreak Guidelines Working Party to reflect the move to the 'elimination' phase. The revision was overseen by MEAC with Dr Mahomed Patel and Dr Stephen Lambert as principal technical advisers. The Communicable Diseases Network Australia New Zealand (CDNANZ) endorsed the revised Guidelines in July 2000.

These guidelines are intended for use primarily by public health officers in State and Territory health departments. Selected aspects of the guidelines are also recommended for use by institutions, health-care facilities and professionals that may be affected by measles. These include child-care facilities, schools, technical colleges, universities, prisons, diagnostic and public health laboratories, general practitioners, paediatricians, physicians and pathologists.

In developing these guidelines, the MEAC and the CDNANZ utilised *Measles: Guidelines for the Control of Outbreaks in Australia 1996* and *The National Measles Elimination Surveillance Strategy* developed by the National Centre for Immunisation Research and the Surveillance of Vaccine Preventable Disease (NCIRS) (Heath et al 1999) as the major reference sources.

Summary of changes to the 1996 NHMRC *Measles: Guidelines for the Control of Outbreaks in Australia*

For those familiar with the previous edition of the 1996 National Health and Medical Research Council *Measles: Guidelines for the Control of Outbreaks in Australia*, it should be noted that the second edition of these guidelines has introduced some important changes. These changes are significant steps in the process to eliminate measles in Australia.

Measles Mumps Rubella vaccination schedule.

In July 1998 the National Health and Medical Research Council recommended that the second dose of Measles Mumps Rubella (MMR) be brought forward on the childhood vaccination schedule from 10 to 16 years to four to five years of age. The seventh edition of the Australian Immunisation Handbook (NHMRC 2000) has further refined the timing of the second dose and it is now scheduled at four years of age. The recommended timing of the first MMR dose at 12 months of age was not changed.

Lowering the age of the first dose of MMR vaccine during an outbreak.

Infants aged between nine and twelve months can be offered MMR vaccine within 72 hours of coming in contact with an infectious case of measles. However, before this decision is made consideration should be given to the risk factors involved. For example, if an outbreak occurred in a intensive care unit the paediatrician may determine that it is appropriate for infants between nine and twelve months to receive immunoglobulin.

All infants between the ages of nine and twelve months who are at risk of coming in contact with the measles virus during an outbreak should also be offered a dose of MMR.

It should be noted that any dose of MMR given before 12 months does not alter the standard MMR vaccination schedule — infants who receive a dose early are still recommended to receive a dose at 12 months (or four weeks after the first dose, whichever is later) and another dose at four years of age.

Lowering the age of the second dose of MMR vaccine during an outbreak.

Children aged between 12 months and 4 years who have received one dose of MMR can be offered their second dose of MMR early if they are considered at risk of coming in contact with measles. This may apply during an outbreak or if a child is going to travel to a country that has a high incidence of measles. If a child receives the second dose early they are considered to have completed their MMR vaccination schedule and therefore they do not require another dose at four years of age. It is important to note a minimum of four weeks is required between the first and second dose.

Protecting young adults — an at-risk cohort in Australia.

A new chapter has been added to these guidelines that discusses the recommendations for young adults, persons born between January 1970 and December 1983, who are an at-risk cohort within Australia. Included in this chapter is the recommendation that all susceptibles, regardless of age, should be encouraged to receive the recommended two doses of MMR vaccine.

Communication and collaboration, and structured reviews of the response to an outbreak.

A new chapter has been added to these guidelines that outlines a public communication strategy, providing a plan that will assist the implementation of these guidelines during an outbreak. It also discusses the importance of reviewing the public health response following each measles outbreak, aiming to enhance the efficiency and effectiveness of future responses.

Executive summary

Measles is a highly infectious illness that primarily affects the respiratory tract. It may manifest as a severe disease complicated by bronchopneumonia (4 per cent of cases) and otitis media (2.5 per cent). Acute encephalitis occurs in 1 in 2,000 people and for every 10 children who develop measles encephalitis one will die and up to four will develop permanent brain damage.

As measles can pose a significant threat to a person's health, every effort must be made to arrest the indigenous transmission of measles in Australia.

A measles-containing vaccine was first introduced in Australia in 1968. Although the uptake of the vaccine was initially poor, it nevertheless had a dramatic impact on the number of measles cases by the early 1970s. Levels of immunisation coverage were not sufficient to prevent outbreaks in Australia, and a large nationwide epidemic of measles occurred in 1993–94. In 1994 a two-dose vaccination schedule was introduced, and in 1996 the National Health and Medical Research Council (NHMRC) developed national guidelines for the prevention and control of measles outbreaks in Australia.

Australia has now moved from an 'outbreak control' phase to an 'elimination' phase. This shift in strategy involves altering the vaccination schedule, improving surveillance systems and response to outbreaks, and reducing the susceptibility of at-risk age groups.

Vaccination

Strategies include:

- implementing changes to the vaccination schedule to improve coverage rates and reduce the risk of an epidemic outbreak occurring;
- lowering the ages of the first and second dose of Measles Mumps Rubella (MMR) vaccine during an outbreak; and
- encouraging susceptible young adults to bring their vaccination status up to date, particularly during outbreaks.

To facilitate a rapid introduction of the new two dose strategy (ie moving the second dose of the MMR vaccine from 10 to 16 years to four years), it was decided to offer all primary school children a second dose of the MMR vaccine, and a one-off, school-based Measles Control Campaign (MCC) was conducted in 1998. Evaluation of the Campaign showed that 96 per cent of the 1.78 million school children aged five to twelve years in Australia were vaccinated during the MCC, and following the Campaign 94 per cent of children aged six to twelve years were immune to measles. Among children aged 12 to 18 years (who were not targeted by the Campaign) 91 per cent were protected. Only 66 per cent of children aged 12 to 24 months were protected, suggesting that many children do not receive their first dose of MMR vaccine on time at the age of 12 months.

Following the excellent results of the 1998 MCC, Australia is on target to fulfil the national measles vaccination coverage targets set for the year 2000.

Surveillance

In addition to improving levels of vaccination, successful measles elimination will require a sensitive surveillance system to detect every case of measles. Surveillance should be based on clear case definitions, with standard methods for serological diagnosis and laboratory testing. A specific strategy for surveillance has been published elsewhere (Heath et al 1999).

Standardised data collection is also important. Despite the success of the vaccination program, a generally low incidence of disease with periodic outbreaks should be expected among high school students and young adults who were not targeted for vaccination in the 1998 MCC.

Response to measles in the community

A rapid response capability is necessary to prevent further transmission of the virus once measles is detected in the community. An effective surveillance and response strategy should be implemented to arrest indigenous transmission in Australia, with every effort made to reduce delays from onset of illness to notification and confirmation of measles.

There should be immediate investigation of and response to every case of confirmed or suspected measles. The key components of a rapid response are:

- isolate the case while infectious;
- confirm the diagnosis;
- identify other cases in the community; and
- identify and protect all susceptible people in the community.

In specialised settings such as schools and health-care facilities, additional measures are required. In child-care facilities and schools the identification of susceptible contacts is greatly assisted when facilities record vaccination status and regularly update records.

In the event of an outbreak, the local public health authority may recommend that children and siblings aged between 12 months and 4 years who have received one dose of MMR be offered their second dose of MMR early, and that susceptible facility personnel (eg employees, service providers) should also be offered the MMR vaccine.

Once a case is detected at a facility, a control plan including a timeframe for action should be implemented by the State/Territory health department or the local public health unit. This should give staff and parents written information, provide a plan for a vaccination program, and outline rules for exclusion of measles cases and susceptible contacts and non-contacts.

Nosocomial transmission of measles is well documented. However, there is at present no standard approach to measles control in medical settings. An outbreak of measles affecting health-care providers has serious medical and economic implications. A

number of strategies help minimise nosocomial spread, including maintaining a high level of awareness among staff, offering opportunistic vaccinations, isolating individuals with fever and rash and encouraging vaccination of health facility staff.

In the event of an outbreak, the four key components of rapid response described above should be implemented. Health-care providers should consider the wider public health ramifications when diagnosing a case of suspected measles, and collaborate closely with the State/Territory health department or local public health unit.

Protecting at risk groups

Young Australian adults (born between January 1970 and December 1983) appear to be at higher risk of measles infection as they would not have routinely received two doses of a measles-containing vaccine, and some will not have received a single dose.

During an outbreak, all susceptible young adults should be advised to consult their immunisation provider and have their measles vaccination status checked. If there is no documented evidence of the person having received two doses of measles vaccine they should be encouraged to receive the scheduled two doses of MMR vaccine. It is particularly important for susceptible young adults who have come into contact with an infectious case of measles to have their vaccination status checked.

Young adults who travel to measles endemic countries should be advised to check their measles vaccination status and if they have not received two doses of a measles-containing vaccine they should be encouraged to update their vaccination status.

In the event of contact with a measles case, infants aged between six and nine months should be offered immunoglobulin within seven days of contact. Infants between nine and twelve months should be offered MMR vaccination within 72 hours of contact, or if contact was between three and seven days previously, they should be offered immunoglobulin. Infants who receive a dose of MMR vaccine before the age of 12 months should receive a further dose at 12 months of age or four weeks after the first dose, whichever is later. This second dose does not replace the routine dose of MMR at four years.

In outbreaks where infants are assessed to be at risk, consideration should be given to lowering the age of vaccination from twelve months to nine months of age, with widespread publicity about this change until the routine vaccination schedule is re-introduced.

If a case of measles occurs in a child-care setting, attending infants aged between 6 months and 12 months should be excluded from attendance in order to interrupt local transmission of infection. Children over nine months can return to child care if they receive an MMR vaccination within 72 hours of their first contact or if they receive immunoglobulin within seven days of contact. Children over six months can return to child care if they receive immunoglobulin within seven days of contact. It is not necessary for infants under six months of age to be excluded except if the infected contact is the infant's mother.

During an outbreak, children aged between twelve months and four years who have received one dose of MMR can be offered their second dose of MMR early. If a child receives the second dose early they are considered to have completed their MMR vaccination schedule and do not require another dose at four years of age. A minimum of four weeks is required between the first and second dose.

Communication and collaboration

An important part of the implementation of these guidelines is effective communication to health professionals, schools, child-care facilities and community organisations, as well as to the wider community, about public health control measures for measles. This should further support efforts to identify and report all incident cases, and to maximise vaccine uptake among people who are susceptible to measles.

The way in which information is imparted to the public during an outbreak can have a significant impact on the success of implementing control guidelines. A communications strategy has been designed to support and complement the action of State and Territory public health units. This involves a comprehensive range of strategies to inform the health system and both affected and 'at-risk' groups.

It is recommended that a structured review of the response to each outbreak be undertaken. This provides an important opportunity to enhance the efficiency and effectiveness of future responses.

Introduction

Measles is a highly infectious illness that primarily affects the respiratory tract, the causative virus being spread readily by aerosols. It has an incubation period of 7 to 18 days (mean of 10 days) to onset of symptoms, and a mean of 14 days to the appearance of the rash. The infectious period begins five days before the appearance of the rash and continues until four days after the appearance of the rash. Measles may manifest as a severe disease complicated by bronchopneumonia (4 per cent of cases) and otitis media (2.5 per cent). Acute encephalitis occurs in 1 in 2,000 people who develop measles; and for every 10 children who develop measles encephalitis, one will die and up to four will have permanent brain damage (NHMRC 2000). Sub-acute sclerosing panencephalitis (SSPE) is a late complication of measles in about 1 of 25,000 cases. SSPE causes progressive brain degeneration and is always fatal.

As measles can pose a significant threat to a person's health, every effort should be made to arrest the indigenous transmission of measles in Australia.

Vaccination: towards eradication

Measles remains a leading cause of vaccine preventable deaths (NHMRC 2000; Expanded Programme on Immunization 1996; Murray & Lopez 1996). Even with near universal coverage with the single-dose childhood vaccination program, measles outbreaks can still occur (Canadian National Advisory Committee on Vaccination 1996).

In the 1990s, major advances have been made in measles control, particularly in the Americas. Indigenous measles transmission has been interrupted in several Latin American countries, the English-speaking Caribbean, and the United States (WHO et al 1997; CDC 1997a). In Latin America and the United Kingdom, measles control has been achieved through mass vaccination programs, administered regardless of vaccination history, to preschool and school-age children. In Finland and the United States, similar achievements have been attained by maintaining high coverage for a prolonged period with a two-dose measles vaccination schedule (WHO et al 1997). Substantial progress has also been achieved in the Western Pacific Region other than Australia (CDC 1996). Mass campaigns are able to interrupt indigenous transmission quite quickly. However, to prevent the reappearance or re-introduction of measles, very high routine vaccination coverage or smaller follow-up campaigns are needed.

In July 1996, a joint meeting of the World Health Organization, the United States Centers for Disease Control and Prevention (CDC), and the Pan American Health Organization (PAHO) was convened to consider the feasibility of global measles eradication (WHO et al 1997). This group recommended the goal of global measles eradication, with a target date between 2005 and 2010.

Measles elimination objectives

The principal objectives of the Australian measles elimination initiative are (Heath et al 1999):

- to cease measles-related morbidity and mortality, by interrupting indigenous transmission of measles; and
- to prevent re-introduction of measles until global eradication is achieved, by maintaining uniformly low levels of population susceptibility.

To facilitate progression from the ‘outbreak prevention’ phase to the ‘elimination’ phase, on 9 July 1998, the National Health and Medical Research Council (NHMRC) endorsed a change in the timing of the second dose of Measles Mumps Rubella (MMR) vaccination. This was previously recommended to be given between ages 10 and 16 years. It is now recommended before school entry at four years of age. The first dose should continue to be given at 12 months (NHMRC 1998). By bringing the second dose forward, the gap between the first dose of MMR and the second dose is three years — this reduces the likelihood of measles outbreaks (Forrest et al 1998).

To ensure a rapid introduction of the new two dose strategy, it was decided to offer all primary school children aged five to twelve years a second dose of the MMR vaccine. Therefore, a one-off, school-based Measles Control Campaign (MCC) was conducted in Australia between 3 August and 6 November 1998.

Results of the MCC show significant increases in the level of protection against measles among preschool and primary school age children (detailed results are given in Chapter 1).

Measles vaccination coverage targets

In order to achieve elimination objectives, very high vaccination coverage levels are needed, especially in closed settings such as schools where contact rates are high. Uniformity of coverage is also important, because pockets of susceptible persons are capable of perpetuating endemic transmission. The following vaccination coverage targets were set by the Communicable Diseases Network Australia New Zealand (CDNANZ) (Heath et al 1999).

By the year 2000:

- 90 per cent coverage of children with two doses of measles-containing vaccine by school entry; and
- 95 per cent coverage of primary school children with one dose of measles-containing vaccine in a school-based campaign.

By the year 2001:

- 95 per cent coverage of children with one dose of measles-containing vaccine by their second birthday (ie 10 per cent susceptible due to vaccine effectiveness of 95 per cent);¹ and

1 If there is 95 per cent coverage with one dose and 95 per cent vaccine effectiveness, 90.25 per cent (ie 95 per cent of 95 per cent) of children are immune. Therefore approximately 10 per cent are susceptible.

- 95 per cent coverage of children with at least one dose, and 90 per cent with two doses of measles-containing vaccine by school entry (5 per cent susceptibility).²

Following the excellent results of the 1998 MCC, Australia is on target to fulfil the national measles vaccination coverage targets set for the year 2000.

Measles surveillance tasks

For successful measles elimination, laboratory diagnostic methods and case investigation protocols must be standardised, and an agreement reached with all States and Territories to collect the same minimum dataset. Measles elimination requires coordinated efforts, perhaps more than any previous health initiative in Australia, and comprehensive surveillance is a critical element for success.

Development and scope of the guidelines

The Measles Elimination Advisory Committee (MEAC) was established in July 1997 to advise on strategies for eliminating measles in Australia. MEAC has updated *Measles: Guidelines for the Control of Outbreaks in Australia* to reflect the move to the 'elimination' phase.

These guidelines outline the components required to achieve the elimination of measles. They include sections on:

- the epidemiology of measles and data on vaccination coverage (Chapter 1);
- clinical diagnosis and surveillance (Chapter 2);
- outbreak control measures (Chapters 3 and 4);
- protecting at-risk populations (Chapters 5 and 6);
- a communication strategy for implementing the guidelines during an outbreak and a structure for conducting a review of the response to each outbreak (Chapter 7); and
- a series of appendices including implementation and evaluation of the guidelines, information on the administration of immunoglobulin; sample documentation including parent information sheets and consent forms; flow charts relating to measles diagnosis and outbreak control measures; and information sheets for child-care facilities, schools and general practitioners.

The guidelines do not preclude the need for careful clinical judgement when managing a person who may have measles. Nor do they preclude the need for public health practitioners to carefully consider the implications of implementing or ignoring the recommendations in a particular situation.

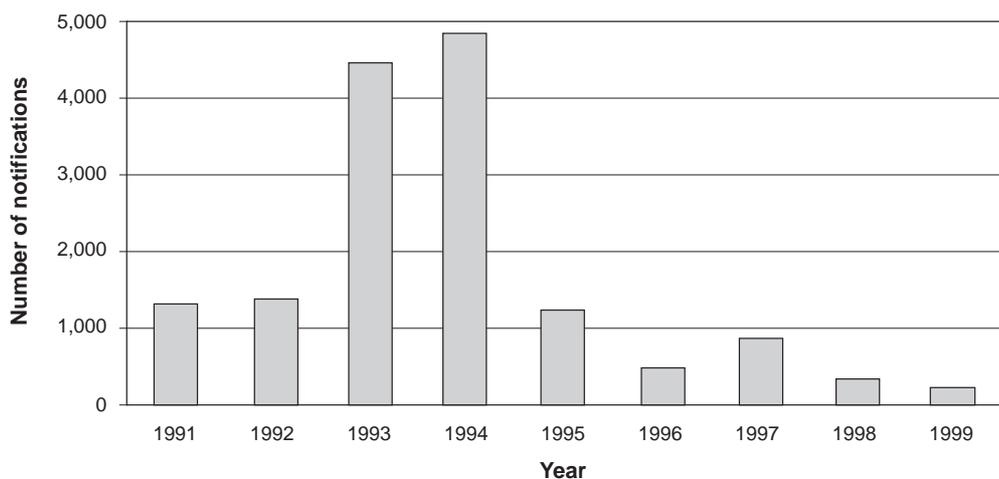
2 If there is 90 per cent coverage with two doses and 100 per cent vaccine effectiveness, then all of these 90 per cent are immune. Another 5 per cent have had one dose. With 95 per cent vaccine effectiveness, 4.75 per cent of the children are immune (95 per cent of 5 per cent) and 5 per cent are not immune because they have had no dose. The total proportion who are immune is therefore 94.75 per cent (90+4.75+0), leaving approximately 5 per cent susceptible.

1 Profile of measles and vaccination coverage in Australia

1.1 Changing epidemiology of measles

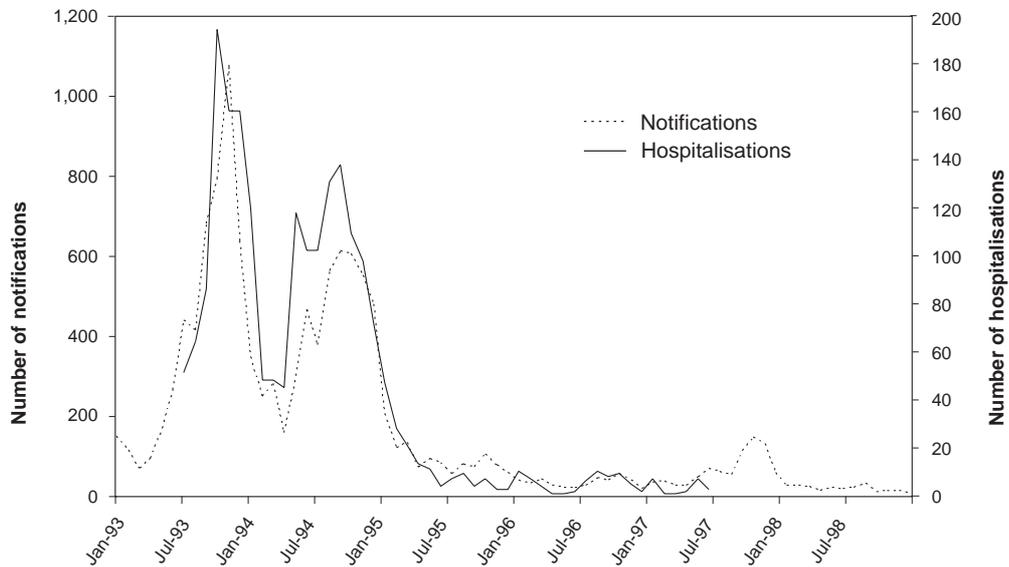
Between 1993 and 1994, a large epidemic of measles affected Australia with over 9,000 notified cases (Figure 1.1). A marked decrease in measles notifications has occurred since the 1994 epidemic (Figure 1.1). Figures from the Australian Bureau of Statistics show that measles was responsible for 98 deaths in Australia between 1976 and 1995. Over this 19-year period, measles caused more deaths in Australia than diphtheria (4 deaths), pertussis (21 deaths), and tetanus (52 deaths) combined (NHMRC 2000). Figure 1.2 shows the correlation between the number of measles cases admitted to hospital and the number of measles notifications.

Figure 1.1 Measles notifications in Australia for the period 1991 to 1999



Source: National Notifiable Diseases Surveillance System.

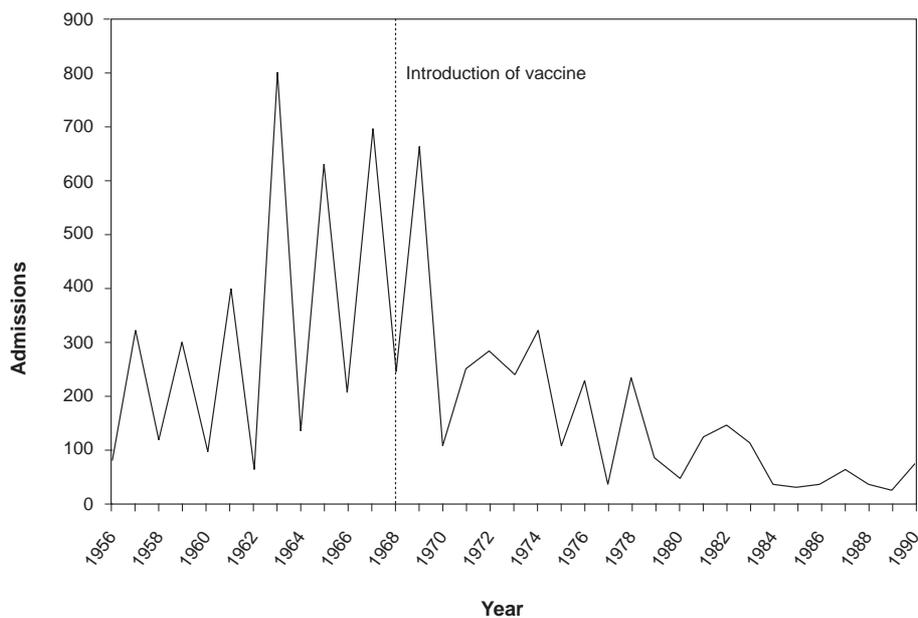
Figure 1.2 Measles hospitalisations by month of admission and notifications by month of onset, Australia, 1993 to 1998



Source: NCIRS. Notification data were provided by the National Notifiable Disease Surveillance System and data about numbers of hospitalised cases were provided by the Australian Institute of Health and Welfare.

The introduction of a measles-containing vaccine to Australia had a dramatic impact on the number of measles cases in Australia. Figure 1.3 shows the decrease in measles cases admitted to Fairfield Hospital, Victoria, following the introduction of the vaccine into Australia in 1968 despite the low level of uptake of the vaccine.

Figure 1.3 Measles admissions to Fairfield Hospital, 1956 to 1990



Source: Reproduced from Tobin & Kelly (1999).

1.2 Evaluation of the National Measles Control Campaign

Due to the change in the timing of the second dose of the Measles Mumps Rubella (MMR) vaccine, it was necessary to offer all primary school children aged five to twelve years a second dose of the MMR vaccine. Therefore, a one-off, school-based Measles Control Campaign (MCC) was conducted in Australia between 3 August and 6 November 1998.

The *Australian Measles Control Campaign 1998 Evaluation Report* (NCIRS 1999), assessed vaccination coverage and immunity achieved by the Campaign, and evaluated the outcome of the Campaign. The results of the evaluation report are as follows.

- It was estimated that 96 per cent of the 1.78 million school children aged five to twelve years were vaccinated during the MCC. More than 1.33 million of these children were vaccinated in the school program that reached 8,783 schools throughout Australia.
- After the Campaign, a serosurvey showed that 94 per cent of children aged six to twelve years were immune to measles, a rise from 84 per cent before the Campaign (more detailed results are given below).
- In the pre-school group it was estimated that 98 per cent of those aged 12 months to 42 months had received the first dose of MMR vaccine, and serology showed that 89 per cent of children aged two to five years were protected, a rise from 82 per cent before the Campaign.
- As expected, a deficiency remained in the levels of immunity to measles in the group of young people aged 12 to 18 years who were not targeted in the Campaign. The post-Campaign serosurvey showed that 91 per cent of this age group were protected.
- According to the combined pre and post-Campaign serosurvey, 66 per cent of children aged 12 to 24 months were protected, suggesting that many children were not receiving their first dose of MMR vaccine on time at the age of 12 months.
- By far the majority of parents (89 per cent) said they were satisfied with the school Campaign.

Results from the pre and post-Campaign serosurveys are shown in Table 1.1.

Table 1.1: Results of pre and post-Campaign surveys in different age groups showing evidence of past infection or immunisation and evidence of susceptibility before and after the Campaign

Age group		Infant (1 year)	Preschool (2–5 years)	Primary (6–11 years)	High school (12–18 years)	Total
'Pre'1	No. tested	169	751	960	1,061	2,941
	Positive	118 (70%)	617 (82%)	809 (84%)	942 (89%)	2,486 (85%)
	Equivocal	4 (2%)	13 (2%)	27 (3%)	52 (5%)	96 (3%)
	Negative	47 (28%)	121 (16%)	124 (13%)	67 (6%)	359 (12%)
	IgG detected ²	122 (72%)	630 (84%)	836 (87%)	994 (94%)	2,582 (88%)
	95% CI	65.4%, 78.9%	81.3%, 86.5%	85.0%, 89.2%	92.2%, 95.1%	86.8%, 89.1%
	Susceptible ³	51 (30%)	134 (18%)	151 (16%)	119 (11%)	455 (15%)
	95% CI	23.3%, 37.1%	15.1%, 20.6%	13.4%, 18.0%	9.3%, 13.1%	14.2%, 16.8%
'Post'1	No. tested	182	714	956	1054	2906
	Positive	114 (63%)	635 (89%)	903 (94%)	958 (91%)	2,610 (90%)
	Equivocal	3 (2%)	21 (3%)	17 (2%)	40 (4%)	81 (3%)
	Negative	65 (36%)	58 (8%)	36 (4%)	56 (5%)	215 (7%)
	IgG detected ²	117 (65%)	656 (92%)	920 (96%)	998 (95%)	2691 (93%)
	95% CI	57.3%, 71.2%	89.9%, 93.9%	95.0%, 97.4%	93.3%, 96.0%	91.6%, 93.6%
	Susceptible ³	68 (37%)	79 (11%)	52 (6%)	96 (9%)	295 (10%)
	95% CI	30.3%, 44.4%	8.8%, 13.4%	4.1%, 7.0%	7.4%, 10.8%	8.8%, 11.0%
P values	IgG detected ⁴	0.14 (NS)	<0.001	<0.001	0.35 (NS)	–
	Susceptible ⁴	0.18 (NS)	<0.001	<0.001	0.11 (NS)	–
	Positive	0.18 (NS)	<0.001	<0.001	0.11 (NS)	–

1 'Pre' and 'Post' refer to results of serological surveys before and after the Campaign.

2 Includes all sera in which measles IgG was detected (positive and equivocal enzyme immunoassay [EIA] results, see text). CI=confidence interval.

3 Includes all sera in which IgG antibody was not detected (EIA negative) or PRN titres were below protective level (EIA equivocal).

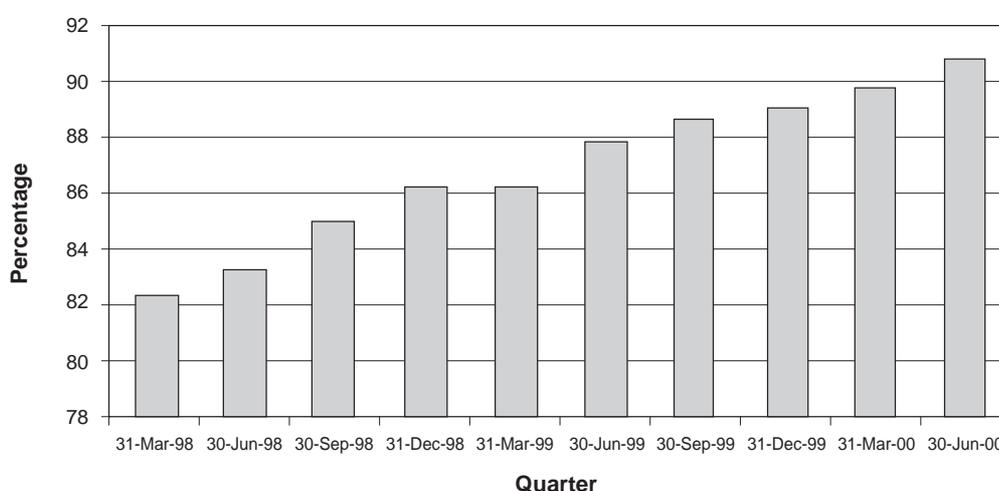
4 Chi-square test, two-sided p value, to compare 'Pre' and 'Post' survey results for each age group.

1.3 Data collection on vaccination coverage — the Australian Childhood Immunisation Register

The Australian Childhood Immunisation Register (ACIR), administered by the Health Insurance Commission (HIC), was established on 1 January 1996 as one element of the national strategy to improve childhood vaccination rates. The ACIR is a national database containing information on the vaccination status of all children under the age of seven years who live in Australia. Vaccination information may be sent to the ACIR by vaccination providers, including general practitioners, public vaccination clinics and others.

On 31 March 1998, the ACIR began providing quarterly data on the vaccination coverage rates of children at two years of age for MMR. By two years of age, a child should have received the first dose of MMR (due at 12 months). Figure 1.4 indicates that the vaccination coverage for MMR has gradually increased since the first data report on 31 March 1998. The latest coverage figures reported by the ACIR (Figure 1.4) indicate that 91 per cent of children are vaccinated with MMR by two years of age. (There has been an increase in reporting since the introduction of the ACIR, which may account for some of the rise.)

Figure 1.4 Quarterly vaccination coverage rates reported by the ACIR for the first dose of MMR by two years of age, March 1998 to June 2000



Source: Communicable Diseases Intelligence.

One part of the 1998 MCC aimed to encourage parents to have their preschool children who were due or overdue for their first dose of MMR vaccine vaccinated as soon as possible. In addition to the media and educational component of the MCC, the then Department of Health and Family Services asked the HIC to search the ACIR for children aged 12 to 42 months who were due or overdue for MMR and send their parents a letter reminding them to have their children vaccinated.

A study was conducted to compare measles vaccination coverage in the preschool aged cohort before and after the Campaign. The most important finding from this evaluation was the estimation that coverage of one dose of MMR in children aged 12 to 42 months rose from approximately 95 per cent before the MCC to 98 per cent after the Campaign.

Summary — Profile of measles and vaccination coverage in Australia

- The introduction of a measles-containing vaccine to Australia in 1968 had a dramatic impact on the number of measles cases. However, immunisation levels were not sufficient to prevent episodic outbreaks across Australia, and there was a large epidemic of measles in 1993–94. Measles notifications have decreased significantly since then.
- In the 19 years from 1976 to 1995, measles caused more deaths in Australia than diphtheria, tetanus and pertussis combined.
- Evaluation of the Measles Control Campaign shows significant increases in the level of protection against measles among preschool and primary school age children to 89 per cent and 94 per cent respectively. Among older children, 91 per cent were protected. Low levels of protection (66 per cent) in children aged 12 to 24 months suggest that young children were not being vaccinated at the recommended age of 12 months.
- Data collected by the Australian Childhood Immunisation Register indicate that vaccination coverage among children at their second birthday is increasing.

2 Case definitions, diagnosis and investigation³

To achieve measles elimination, disease surveillance must fulfil several functions. In addition to measuring case rates and characterising populations at high risk of infection, it is also necessary to:

- detect cases and the source of infection rapidly so that timely control measures can be implemented;
- detect resurgence of indigenous measles transmission;
- detect importations of measles; and
- monitor serious complications of measles infection (death, encephalitis, seizures, and pneumonia).

A detailed strategy for surveillance has been published elsewhere (Heath et al 1999).

2.1 Measles case definitions

Confirmed infection

A confirmed case of measles is defined as:

- a laboratory-confirmed case (Serologically diagnosed cases who received a measles-containing vaccine eight days to eight weeks (Helfand et al 1999) before testing should be classified as confirmed measles cases only if they are also linked epidemiologically to another laboratory-confirmed case (CDC 1996)); or
- a case in a person with signs and symptoms consistent with measles who has been in contact with a laboratory-confirmed case.

Suspected infection

A sensitive clinical definition is needed for the early detection of outbreaks and imported infection, and for timely interventions.

A suspected case is an illness with all of the following features:

- morbilliform rash;
- cough; and
- fever present at the time of rash onset (Ferson et al 1995).

The decision tree in Appendix 6 (see page 80) can be used to classify a person with suspected measles.

³ This section is based on the National Measles Surveillance Strategy 1999, developed by the National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases and the Victorian Infectious Diseases Reference Laboratory (Heath et al 1999).

Differential diagnoses

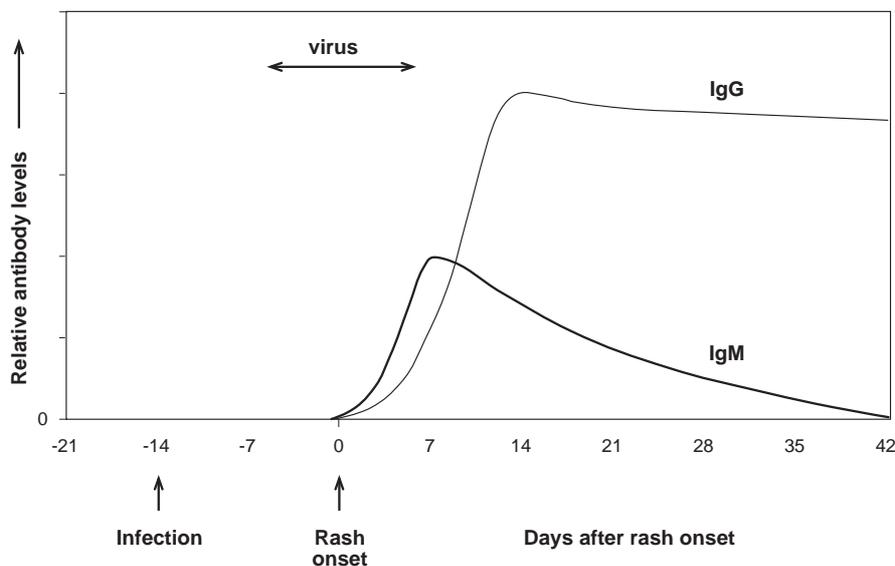
Several other infectious diseases can mimic measles and, when measles is well controlled, the majority of suspected cases have alternative aetiologies. The most common of these are: human herpes virus 6 (exanthem subitum), rubella, enterovirus, dengue and human parvovirus B19 (Gay et al 1997). Figure 2.1 shows the clinical features of measles and figure 2.2 shows the antibody responses to acute measles infection. In cases of suspected measles which are rejected on the basis of serological testing, it is recommended to test for rubella, and for other diseases as clinically indicated.

Figure 2.1 Clinical features of measles



Source: Krugman et al (1992).

Figure 2.2 Antibody responses to acute measles infection



Source: PAHO (1999).

Measles reference laboratories will intermittently measure prevalent causes of rash illness by cross-sectionally testing negative sera for a variety of pathogens. This will provide supportive evidence for measles elimination in later stages of the campaign.

Epidemiological linkage

Epidemiological linkage can provide additional evidence for measles infection in instances where laboratory confirmation is unavailable, or is equivocal (eg serodiagnosis following vaccination).

A measles case is epidemiologically linked if:

- there was exposure to a laboratory-confirmed case during their infectious period (five days before to four days after rash onset); and
- this exposure occurred within the expected incubation period of the case under investigation — 7 to 18 days (mean 14 days) before rash onset (Chin 2000).

Exposure must be face to face or in a confined setting such as a classroom.

Imported measles

Importation of measles poses an ongoing risk during the elimination phase of measles control. An increasingly large proportion of measles notifications in the United Kingdom and in the United States are attributable to imported infection (Gay et al 1997; Chin 2000; Vitek et al 1997). The 1999 Victorian outbreak was initiated by a case imported from Bali; the case was obviously infectious after arrival in Australia (Lambert 1999).

A person who has confirmed measles and whose rash onset was within 18 days of arrival in Australia or another State/Territory is classified as an international or interstate importation respectively. The last country or State/Territory visited before arrival should be recorded on the measles report form (see page 78).

These definitions are intended to maximise detection of importation, and therefore will incorrectly label some locally acquired infections as imported.

Indigenous infection

Measles cases are classified as indigenous if the person becomes infected in Australia.

Indigenous cases are further categorised as either:

- epidemiologically linked to an internationally imported case; or
- not linked epidemiologically to an internationally imported case (CDC 1998a).

Preventable cases of measles

All confirmed cases of measles should be classified as preventable or non-preventable cases.

A preventable case of measles is when a person is diagnosed with measles who:

- was born during or after 1970; and
- lacks documented evidence of age-appropriate vaccination against measles; and
- had no medical contraindication to receiving the vaccine; and
- had no documented episodes of confirmed measles previously.

A case is classified non-preventable if the person does not meet these criteria.

Susceptible persons

A person considered susceptible to measles is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

- infants under six months of age unless the infected contact is the infant's mother; or
- children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
- persons over four years of age and born during or after 1970 (unless serosurveillance data show otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
- persons born before 1970 (unless serosurveillance data show otherwise); or
- persons with documented evidence of immunity; or
- persons with documented evidence of laboratory confirmation of measles.

Rejected measles infection

A rejected case is an illness that is:

- initially categorised as suspected measles and subsequently found to have negative measles serology, and/or diagnosed as having an alternative cause based on laboratory evidence; or
- the person experienced onset of rash within six to ten days of receiving a MMR vaccination (this applies with or without positive measles IgM antibody), unless epidemiologically linked to a laboratory-confirmed case.

2.2 Laboratory-confirmed infection

As measles becomes well controlled, the positive predictive value of clinical diagnosis becomes poor, especially for young children, and sporadic disease and laboratory-based surveillance becomes increasingly important (Gay et al 1997).

Laboratory confirmation should be sought on:

- all sporadic clinical notifications; and
- at least two cases during a cluster of cases.

However, case investigation should not be delayed pending laboratory results (see Chapter 3).

Criteria for laboratory confirmation are:

- a positive test for measles-specific IgM; or
- isolation of wild measles virus from a clinical specimen; or
- a diagnostic rise in measles antibody titres in paired sera; or
- a clinical specimen that is positive using a measles-specific polymerase chain reaction (PCR) test.

A laboratory-confirmed case does not need to meet any clinical criteria (except for serologically diagnosed cases who received a measles-containing vaccine eight days to eight weeks before testing) (Helfand et al 1999).

Serological diagnosis

Serum anti-measles IgM antibody testing is recommended for diagnosis of acute measles infection. The indirect EIA is recommended for routine laboratory diagnosis, because it is relatively quick and convenient to perform. The test characteristics of commercially available indirect IgM EIAs are variable. The sensitivity and specificity of various EIAs have been evaluated using the plaque reduction neutralisation (PRN) test as the gold standard. Sensitivity estimates ranged between 85.7 per cent and 100 per cent while specificity ranged between 58.8 per cent and 96.4 per cent (Mayo et al 1991; Ratnam et al 1995). Until further data are available, any of the commercially available kits for measles IgM are considered satisfactory for routine diagnosis.

Blood collection requirements

Laboratories generally require a minimum of 1 mL clotted blood for serology. Some laboratories offer testing of a finger-prick or heel-prick blood specimen, but venipuncture is less traumatic in the hands of an experienced collector. The testing laboratory should be consulted if there are doubts about the minimum volume of blood required. It is also possible to test blood that has been collected onto filter paper and air dried. This method is not routinely available in Australia, but is being investigated at the Victorian Infectious Diseases Reference Laboratory. Special arrangements with the laboratory should be made to ensure that results are available within 24 hours of being submitted.

Timing of specimen collection

Detailed data on the optimum timing of specimens for IgM serology have been obtained using a measles capture IgM assay developed by the CDC.

This assay was:

- frequently positive at the onset of rash illness;
- approximately 80 per cent sensitive within 72 hours of onset;
- 100 per cent sensitive between 4 and 14 days;
- 94 per cent sensitive at four weeks; and
- 64 per cent sensitive at six weeks (Helfand et al 1997).

Therefore, a negative EIA test for IgM on serum sampled more than 72 hours after rash onset is reliable. However, when initial anti-measles IgM antibody is negative, but serum is sampled within the first 72 hours of rash onset, repeat serum sampling for IgM and IgG estimation is recommended after 14 days (range 10 to 30 days).

Confirmatory testing and quality assurance

As the incidence of true measles declines, the positive predictive value of diagnosis falls and the reliability of a negative test improves. Confirmatory testing of IgM positive cases is needed to achieve acceptable diagnostic accuracy. In Australia, during inter-epidemic periods, all sera that are measles IgM positive or equivocal should be forwarded to a reference laboratory for confirmatory testing. During measles outbreaks, when positive tests are more likely to be reliable, a random sample of IgM positive sera should be forwarded. A reference laboratory network is currently being established in Australia to provide confirmatory measles testing and serological quality assurance.

Alternative methods of diagnosis

Serodiagnosis may also be made by demonstrating IgG seroconversion (change from negative to positive) or rise in measles-specific IgG antibodies. Measles-specific IgG generally peaks approximately two weeks after onset of rash (Griffin & Bellini 1996). Paired sera are collected 10 to 30 days apart, the first of which should be sampled in the week following rash onset, and the sera are tested simultaneously. For reasons of

Viral culture and molecular epidemiology

Viral culture is not currently recommended for routine diagnosis of acute measles. However, characterisation of measles isolates will become important in discerning whether future measles outbreaks are caused by strains of domestic origin (which implies failure to interrupt local transmission) or by imported strains of measles.

In the United States, molecular epidemiological analysis based on nucleotide sequencing of either haemagglutinin or nucleoprotein genes has been used together with standard epidemiological techniques to provide this capability. It appears that a single indigenous measles genotype was once prevalent in the United States. Now the situation is more heterogeneous, and an increasing proportion of cases are caused by measles strains previously seen largely in Japan, Europe, and Africa (Rota et al 1996). Currently, eight genotypic groups of measles are known to be circulating worldwide (CDC 1997b). A global network and a standard system of genotype nomenclature has been developed to help track measles transmission worldwide (CDC 1997b; Expanded Programme on Immunization 1998).

Characterisation of measles strains circulating in Victoria after the introduction of measles vaccine in 1968 has demonstrated that a number of different genotypes have been present in the population in an apparently sequential manner (Chibo et al 1998).

When to collect specimens for culture or PCR

Specimens for culture should be collected from:

- at least one case in every two or more epidemiologically linked cases; and
- from at least two cases during a cluster of cases.

The yield from sporadic cases is likely to be low, because clinical diagnosis is unreliable in this setting.

A nasopharyngeal aspirate is the specimen of choice for measles culture. Urine, heparinised blood and throat swabs are also suitable specimens. Culture should be performed simultaneously with initial blood collection, rather than waiting for serological confirmation. The virus may be present in respiratory secretions for up to one to two days after onset of rash (Ruckle & Rogers 1957), and in the urine for up to 10 days (Gresser & Katz 1960). Viral ribonucleic acid (RNA) can be detected in the urine, peripheral blood leucocytes and nose/throat swabs by RT-PCR up to three weeks after the rash onset (unpublished data, Victorian Infectious Diseases Reference Laboratory). A reference laboratory should be contacted regarding the best method of specimen collection and transportation before sending specimens for culture. All positive measles cultures must be referred for molecular typing.

Salivary antibody testing

For diagnosis

It can be difficult to obtain serological confirmation for a large number of suspected measles cases, and considerable interest has focused on the possibility of convenient, non-invasive diagnosis of measles using salivary specimens. Saliva has been shown to contain measles-specific IgM antibodies in more than 90 per cent of cases where measles IgM is present in serum (Helfand et al 1997; Brown et al 1994). Salivary measles IgM testing is now in routine use in measles surveillance in the United Kingdom, but not as yet in the United States (Gay et al 1997). There are technical difficulties with serological tests of saliva, and currently these tests are not available for routine diagnosis of measles in Australia.

For serological surveys

Salivary antibody tests have also been used for seroprevalence studies in paediatric populations. Unfortunately, salivary detection of measles IgG antibodies is very insensitive compared with their detection in serum, and it is unlikely that this method will be useful for population surveys of susceptibility.

Summary — Definitions, diagnosis and investigation

- To achieve measles elimination, disease surveillance is critical. To be effective, this surveillance should be based on clear case definitions, with standard methods for serological diagnosis and laboratory testing.
- As measles becomes well controlled, the positive predictive value of clinical diagnosis becomes poor, and laboratory-based surveillance becomes increasingly important. Laboratory confirmation should be sought on all sporadic cases of measles and on at least two cases during a cluster of cases. Serum anti-measles IgM antibody testing is recommended for diagnosis of acute measles infection, using the indirect enzyme immunoassay for routine laboratory diagnosis.
- Confirmatory testing of IgM positive cases in a reference laboratory is needed to achieve acceptable diagnostic accuracy.
- New and alternative diagnostic techniques are being used to measure population susceptibility, distinguish between vaccine virus and wild strains, and characterise measles isolates to determine whether outbreaks are caused by domestic or imported strains.

3 Response to measles in the community

As stated earlier, the principal objectives of the measles elimination strategy in Australia are to interrupt indigenous transmission of measles and maintain uniformly low levels of population susceptibility.

To prevent indigenous transmission of measles, the following are required:

- a high uptake of the two-dose MMR vaccine schedule;
- a sensitive surveillance system to detect every case of measles; and
- a rapid response capability to prevent further transmission of the virus once measles is detected in the community.

This chapter addresses the rapid response component for the control of measles, modelled on the strategy for implementing the 'elimination' phase, and is therefore a sequel to the MCC.

Because young adults (born between January 1970 and December 1983) were not targeted for vaccination in the 1998 MCC, a generally low incidence of disease with periodic outbreaks among them should be expected. This pattern of disease may continue until this cohort is replaced by the primary school children who were covered by the 1998 Campaign. If comprehensive serosurveillance data on the former cohort were available, it may be possible to identify high-risk subpopulations for a targeted vaccination campaign, and to predict outbreaks. Currently, such data are not available.

It should be feasible to implement an effective surveillance and response strategy to arrest indigenous transmission in Australia. Victoria has developed and implemented a structured response to each person notified with suspected measles since 1997 (Enhanced Measles Surveillance Working Party 1999). For this, blood specimens were collected from 89 per cent of notified cases, and vaccination status assessed in 99 per cent of cases. The median delay from onset of illness to notification was six days, and from notification to specimen collection, one day. Victoria has since developed plans to improve on these responses.

3.1 Controlling an outbreak

A measles outbreak is defined as the occurrence of any number of measles cases including one or more locally acquired cases. Control and evaluation measures may vary according to the number of cases, the number of susceptible contacts and the period of time over which the cases are diagnosed. It is up to the judgement of the State/Territory health department or public health unit as to the level of action required.

Once a case of suspected or confirmed measles comes to the attention of a public health authority, a delegated staff member should acquire all the relevant clinical and demographic information on the case and any other related cases within one working

day (see the measles report form on page 78), discuss this information with the person responsible for communicable diseases control in the locality, and resolve what control measures should be instituted.⁴

Key people should be identified for an urgent meeting to discuss priorities for control. In addition to the unit's staff, this planning team may include a representative of the community health services, a medical/nursing administrator from the local hospital, a Divisions of General Practice representative and a medical microbiologist.

The team should:

- nominate a member to direct and coordinate investigations;
- assign specific tasks to each member of the team; and
- establish effective lines of communication between the team and the community-based health-care workers, the media and the general public.

Objectives for investigating measles in the community

There are immediate and longer-term objectives for investigating every case of measles.

The immediate objectives are to:

- confirm the diagnosis of measles;
- identify the possible source of infection;
- determine whether the case may be related to other cases in the community; and
- institute immediate control activities for arresting ongoing transmission of the virus.

Additional objectives for detecting clusters of measles are to:

- identify the origins, geographic and temporal spread of the virus;
- explore, understand, and address reasons why the cluster occurred; and
- define high-risk populations deserving special attention for preventing measles.

The intermediate to longer-term objectives of case investigations are:

- to evaluate the effectiveness of the routine vaccination program;
- to characterise how the epidemiology of measles changes with the implementation of the 'elimination' phase in Australia;
- to monitor progress towards achieving Australia's goal of elimination; and
- ultimately, to determine when indigenous transmission of the virus has been arrested.

4 These guidelines aim to provide a clear statement of the evidence while allowing for flexibility and adaptability in implementation. Discretion can be used by public health authorities when following these guidelines, based on the number of doses of MMR received by those with measles and the incidence of measles in the community.

Rapid response to a case of measles

The four key components of a rapid response to a case(s) identified with measles are to:

1. isolate the case while infectious;
2. confirm the diagnosis;
3. identify other cases in the community; and
4. identify and protect all susceptible individuals in the community.

Isolate the case — this should occur immediately to minimise any possible ongoing transmission of the virus. Isolation is advisable whether the person has measles that is either suspected clinically or laboratory confirmed. The diagnosis, isolation requirements, and the need to institute wider public health measures should be discussed with the patient/parents/guardian and notifier. This should help prevent parental and notifier antagonism to any perceived breach of confidentiality.

Confirm the diagnosis — as described in Section 2.1 (see page 7).

Identify other cases — to determine a possible source of infection, and also the extent of spread that has already occurred in the community, it is necessary to:

- trace all contacts of the case (A contact is a person who has been exposed to a person with measles from 5 days before the onset to 4 days after the onset of the rash);
- institute active surveillance in the community where the person with measles lives or may have visited during the preceding 14 days. Sources of information should include general practitioners, hospitals, community health centres, local councils, schools, kindergartens, child-care centres and pharmacists;
- ensure that locality-specific control guidelines are provided to, and are being implemented by health facilities, schools and child-care centres;
- inform neighbouring health regions of the case(s), and of the status of the outbreak at regular intervals, so that they too can assess the need for vaccination and other control programs; and
- track all suspected cases until the diagnosis of measles has been confirmed or excluded confidently. This should ensure that the control measures have effectively arrested transmission of the virus.

Identify and protect susceptible individuals in the community —

- determine whether contacts of the case and other community members may be susceptible (as defined on page 10) to measles;
- offer MMR vaccine as soon as possible to eligible, susceptible contacts, preferably within 72 hours of contact with the case, including susceptible siblings of the contacts. Indications for using immunoglobulin are described in Appendix 4. The rationale for administering the MMR vaccine within 72 hours is that in the vaccine strain of measles protective antibodies develop in about six days. By contrast, in the wild strain of measles, protective antibodies develop in 10 to 14 days;

- encourage persons who receive their first dose of MMR vaccine during an outbreak to return in four weeks to receive a second dose;
- inform the public through the media and by other means, of likely reasons for the outbreak, the potential seriousness of measles, and the importance of vaccinating susceptible persons (discussed further in Chapter 7). An outbreak provides an opportunity to promote the efficacy and safety of vaccines to the general community and to health-care workers. There is little point in promoting measles as the 'killer disease' as the community perception of this message may vary;
- advise susceptible persons refusing vaccination to keep away from facilities where they may encounter infectious persons. If they have been in contact with a person with measles, they may also need to be monitored for early symptoms and signs of measles;
- assess vaccine uptake in the community to decide whether an emergency catch-up vaccination program should be targeted for susceptible persons in the community, and encourage all health service providers to enhance opportunistic vaccinations in the community;
- advise all young adults in the community to have their measles immune status checked by their immunisation provider (if the young adult population is considered by the State/Territory health department or the local public health unit to be at risk during a measles outbreak). If they are assessed to be susceptible to the measles virus they should be encouraged to receive the scheduled two doses of MMR vaccine (see Chapter 5);
- consider reducing the age of vaccination to nine months of age, where the attack rate is high in infants under twelve months of age (see Chapter 6); and
- be sensitive and responsive to the culturally specific needs of affected or at-risk communities when discussing their participation in control activities.

Control measures should be relaxed about three weeks after the onset of rash in the last known case, and health-care providers and the community should be informed accordingly.

Summary — Response to measles in the community

- Preventing indigenous transmission of measles requires, as well as a two-dose MMR vaccine strategy, a sensitive surveillance system to detect every case of measles and a rapid response capability to prevent further transmission of the virus once measles is detected in the community.
- Ideally, an effective surveillance and response strategy should be implemented to arrest indigenous transmission in Australia, with every effort made to reduce delays from onset of illness to notification and confirmation of measles.
- There should be immediate investigation of every case of confirmed or suspected measles. The key components of a rapid response are to: isolate the case while infectious; confirm the diagnosis; identify other cases in the community; and identify and protect all susceptible individuals in the community.

4 Response to measles in special settings

Appropriate response to measles differs in settings such as child-care centres, schools, health-care facilities and prisons.

4.1 Child-care and educational facilities

Measles outbreaks often occur among preschool-aged children, and in child-care facilities, and schools (Hanna 1992; Cheah et al 1992; Merianos et al 1993; McDonnell et al 1995; Markowitz et al 1989). Although outbreaks mainly affect unvaccinated children, highly vaccinated school populations have also been affected (Markowitz et al 1989). The identification of susceptible contacts is greatly assisted when facilities record vaccination status with individual enrolment records that are updated on a regular (eg six monthly) basis by staff. All facilities should maintain such data. Staff of these facilities are encouraged to access information on measles and its control (and other aspects of communicable disease control) through continuing contact with their State/Territory health department or local public health unit.

Flow charts C and D in Appendix 6 illustrate measles control in child-care facilities and in schools. Information sheets for use by child-care centres and schools are given at Appendix 7.

Control measures

During an outbreak, children and their siblings who are aged between one and four years should receive their second dose of MMR early. If a child receives the second dose early they are considered to have completed their MMR vaccination schedule and do not require another dose at four years of age. It is important to note that there should be a minimum of four weeks between the first and second dose. Special consideration needs to be given to infants under 12 months of age, as discussed in Chapter 6.

Facility personnel (eg employees, service providers) who are susceptible should be offered the MMR vaccine. Consideration should also be given to other facilities in the area that may be at risk of exposure to the case. It may also be appropriate for these facilities to implement a vaccination strategy.

Once a case is detected at a facility, it is suggested that a control plan including a timeframe for action be submitted by the State/Territory health department or local public health unit to the supervisor/principal at the facility, local health services and general practitioners in the area. The control plan should provide staff and parents with written information (see pages 63 to 70) about:

- the symptoms, signs and potential complications of measles;
- the need to alert a doctor's surgery or the Emergency Department of the hospital before taking a child with suspected measles for assessment;

- plans, if any, for holding a catch-up vaccination clinic at the facility or local health service;
- the need to keep a child with suspected measles at home, isolated, until assessed by a medical practitioner and/or for at least four days after the appearance of the rash;
- the need for appropriate personnel to quickly notify any new cases to the facility or State/Territory health department or local public health unit by telephone (include relevant names and contact telephone numbers); and
- the reasons why parents/guardians of immunocompromised contacts should be notified of a measles outbreak as a matter of urgency.

The practice of ‘willing contacts’ or measles parties, where deliberate attempts to become infected are made, should be actively discouraged.

Some activities will need to be negotiated with the facility, however, if activities are planned they should also be included in the control plan. The State/Territory health department or local public health unit should consider/discuss the following with the facility:

- the need for convening a meeting with parents at the facility;
- if any children were absent from the facility during the two weeks before the illness in the index case, the need to assess if they have had an illness consistent with measles (it is often the second generation of cases that first come to the attention of the State/Territory health department or local public health unit); and
- a plan for implementing a vaccination program at the facility, including:
 - distributing consent forms (see page 71); and
 - ensure infection control guidelines are followed, including the provision of adequate hand washing and waste disposal facilities and enough room for vaccination procedures to be implemented safely.

In addition:

- updates should be provided regularly to the supervisor/principal and parents about the outbreak and the impact of control measures; and
- child-care and educational facilities in the locality should be informed of the need for enhanced surveillance and ensuring that all children are fully vaccinated.

The State/Territory health department or local public health unit should implement the following procedures if a vaccination program is to be run at the facility:

- recruit appropriate numbers of qualified immunisation staff and supporting clerical staff;
- ensure adequate supplies of vaccine, cold chain monitoring equipment, emergency equipment, syringes and swabs are available; and
- ensure that transport, administration and recording of the vaccines proceed according to the *Australian Immunisation Handbook* (NHMRC 2000).

Exclusion from child-care/school

Measles cases

People with measles should be excluded for at least four days after appearance of the rash (NHMRC 1992).

Susceptible contacts

A susceptible person is defined in Section 2.1 (see page 10). Where acceptable presumptive evidence of immunity to measles is not available, the attending practitioner will have to balance the risk of accepting a history that the person may be immune, against the risk of not offering vaccination. Special consideration should be given to infants under 12 months (see Chapter 6).

Susceptible contacts may return to school, preschool or child care if:

- they are vaccinated within 72 hours of their first contact with the case; or
- they receive immunoglobulin within seven days of the contact (see Appendix 4).

The State/Territory health department or local public health unit can instigate exclusion requirements under the public health act of their State or Territory.

Children of one to four years of age who have received one dose of MMR (ie are vaccinated up to date) are not to be considered susceptible. However, during an outbreak it should be strongly recommended that these children receive their second dose of MMR early. Hence, exclusion legislation would not/could not be applied to these children. Further, these children should not receive immunoglobulin.

Again, for infants under 12 months of age refer to Chapter 6.

Susceptible contacts who do not receive protection, should be excluded for 14 days after appearance of rash in the last case occurring at the facility (NHMRC 1992) and observed for signs and symptoms of measles. If the vaccine is given more than 72 hours after first contact, measles infection may not be prevented; this should be explained to the parents/guardians.

Other susceptible children (non-contacts)

Consideration should be given to excluding other susceptible children from a facility affected by an outbreak if they refuse MMR vaccine, until 14 days after appearance of the rash in the last case at the facility (NHMRC 1992). Again, the State/Territory health department or local public health unit can instigate exclusion requirements under the public health act of their State or Territory. This policy is effective in reducing transmission when other standards of optimal measles control have been achieved, ie where the initial cases are detected early, the vaccine uptake rate at the facility is high, and where vaccination status of all children can be determined readily. Where such standards have not been met, the exclusion policy will be less effective in reducing virus transmission.

A susceptible child who does not have a history of contact with a person with measles may return to the facility after receiving MMR vaccine.

Immunocompromised persons

In consultation with the patients' treating doctors, immunocompromised persons (eg children or staff with malignancies or HIV/AIDS, or those receiving immunosuppressive therapy), should be excluded regardless of their measles vaccination status. If they accept immunoglobulin, it is still advisable to exclude them for their own safety, until 14 days after appearance of the rash in the last case (NHMRC 1992).

Other restrictions

Other restrictions (eg cancellation of school events) are logistically difficult, disrupt school routines and have not been shown to be effective for controlling measles outbreaks. They are not recommended as a routine part of outbreak control (Osterman & Melnychuk 1992). However, any potential visitors to an event at an affected school (eg a sports carnival) should be informed of the risk that unvaccinated persons may acquire measles.

Outbreak report

In addition to a report on the outbreak (see Chapter 7), it may be agreed that the supervisor/principal and local health authority should prepare a joint report covering the following information:

- possible reasons for the outbreak at the school or child-care facility;
- the impact of the outbreak on routine activities and attendance;
- the impact on vaccine coverage rates at the facility (before and after the outbreak);
- the collaborative efforts of the school/child-care facility and public health unit;
and
- strategies to prevent and control future outbreaks.

Summary — Response to measles in child-care facilities and schools

- Measles outbreaks can occur among preschool-aged children, and in child-care facilities and schools. The identification of susceptible contacts is greatly assisted where facilities record and regularly update vaccination status.
- In the event of an outbreak, the State/Territory health department or local public health unit may recommend that children and siblings aged between 12 months and four years who have received one dose of MMR be offered their second dose of MMR early. If a child receives the second dose early, he/she is considered to have completed the MMR vaccination schedule, and does not require another dose at four years of age. A minimum of four weeks is required between the first and second doses. Special consideration needs to be given to infants under 12 months of age, as described in Chapter 6. Facility staff who are susceptible should also be offered the MMR vaccine.
- Once a case is detected at a facility, it is suggested that a control plan including a timeframe for action should be implemented. The control plan should provide staff and parents with written information, provide a plan for a vaccination program, and outline regulations for exclusion of measles cases and susceptible contacts and non-contacts.
- The practice of ‘willing contacts’ or ‘measles parties’, where deliberate attempts to become infected are made, should be actively discouraged.

4.2 Health-care facilities

The prime role of health-care providers in the control of measles is a preventive one, to encourage all patients to be fully vaccinated at all times. Health professionals who provide a vaccination service should check the vaccination status of all children attending their health facility for any reason. If a child is not fully vaccinated he/she should be offered the appropriate opportunistic vaccination if not contraindicated. This should be implemented at all vaccination clinics, doctors’ rooms, public and private clinics, and health centres. Hospital emergency and outpatient wards could also consider implementing an opportunistic immunisation policy.

Health-care providers should consider the wider public health ramifications when diagnosing a case of suspected measles, and collaborate closely with the State/Territory health department or local public health unit.

Hospital inpatients and health-care workers

Nosocomial transmission of measles is well documented. Approximately 3,000 (4 per cent) of reported measles cases in the United States between 1985 and 1991 were probably acquired in a medical facility and of these cases 700 (25 per cent) occurred in health-care personnel, many of whom were not vaccinated. Furthermore, of the 2,765 measles cases reported between 1992 and 1995, 385 (14 per cent) occurred in health-care settings (CDC 1998b).

There are no confirmatory data for nosocomial transmission of measles in Australia. As it is essential to understand how measles continues to be transmitted in the community, data on nosocomial transmission of measles should be specified on the measles data collection form (see the measles report form on page 78).

In Australia, there is no standard approach to measles control in medical settings. Similarly, there is an ad hoc approach to staff vaccination against vaccine preventable diseases. A limited number of vaccinations are provided on a voluntary basis, or staff are advised to update their vaccinations through general practitioners. An outbreak of measles affecting health-care providers has serious medical and economic implications. *Infection Control in the Health Care Setting* (NHMRC 1996) and *The Australian Immunisation Handbook* (NHMRC 2000) both make recommendations on the vaccination of health-care workers.

Measles transmission in medical settings continues to occur because:

- people are infectious before the diagnosis is made;
- people with measles attend health-care facilities;
- clinical misdiagnosis and reliance on serology delay implementation of control strategies; and
- guidelines for the vaccination of health-care workers have not been consistently implemented (Weber et al 1991; Enguidanos et al 1992).

The extent of an outbreak in a hospital and therefore the scope of control measures, will depend on:

- the lag time between presentation and diagnosis of a case(s) with measles;
- whether the patient was ambulant between wards before diagnosis;
- the number of susceptible staff, patients and visitors in the hospital;
- risk of transmission to immunocompromised patients; and
- vaccine coverage rates within the hospital and in the wider community.

Recommendations for prevention

Since measles is highly contagious 5 days before the onset of the rash, it is extremely difficult to eliminate its nosocomial transmission. However, a number of strategies help to minimise nosocomial spread (Biellik & Clements 1997).

Maintaining a high level of awareness among staff — It is vital to maximise awareness among health facility staff that an individual with measles can enter the facility at any time and that there is a continuous risk of the nosocomial spread of measles.

Offering opportunistic vaccinations — The measles vaccination status of all children and young adults attending any health facility for any reason should be checked and vaccination offered unless contraindicated. Children admitted to hospital should have their vaccination history checked on admission, and due or overdue vaccines given before discharge.

Isolating individuals with fever and rash — To reduce the chance of exposure to measles, individuals with fever and rash should preferably not enter the common waiting areas of a health facility. Wherever feasible, such patients should be fitted with a mask and taken directly to a room reserved for those with diseases subject to respiratory isolation. Moreover, if possible, waiting and treatment areas should be well ventilated. Wherever possible, care should be taken to ensure that patients with measles do not use the same room as other patients and are not dealt with by the same staff, as this could clearly provide a vehicle for measles transmission.

Ensuring vaccination of health facility staff — All staff members born since 1970 who have not received two doses of a measles-containing vaccine or who do not have adequate measles antibody titres at the time of employment should be offered MMR vaccination if there are no contraindications for receiving it. A second MMR vaccination should be offered four weeks after the first if the staff member had never previously received a measles-containing vaccine.

Control measures in hospitals

Flowchart E in Appendix 6 (see page 84) illustrates measles control in hospitals.

When a case of measles is diagnosed in a hospital, following the isolation of the patient, the responsible clinical team should inform the Infection Control Officer immediately and identify key people for an urgent meeting to discuss priorities for control. This planning team may include the infection control officer, a clinician, medical and nursing administrator, a medical officer from the Accident and Emergency Department, a medical microbiologist, pharmacist, media liaison adviser, and a public health physician.

The team should:

- nominate one member to direct and coordinate the investigations and control activities within the hospital;
- coordinate control measures with the public health unit in the community;
- assign specific tasks to each member of the team; and
- establish effective lines of communication between the Infection Control Unit, the affected ward and other hospital staff, patients, public health unit, community-based health-care workers, the media and the general public.

Once again, the four key components of rapid response should be implemented (see page 19).

Isolate patients with measles within a hospital

Strategies include the following.

- Discussing with patient/parents/guardians the isolation requirements, and the need to institute wider public health measures.
- Considering home-based hospital care for the patient with measles.
- Keeping the patient with measles in respiratory isolation (Chin 2000) for at least four days after appearance of the rash. Only staff who have documented evidence of having had measles or are vaccinated should provide direct care to the patient.
- If the patient is discharged during the infectious period, the room should not be used for at least two hours if possible. Susceptible persons entering the room within this time period are at risk of developing measles and should be managed as direct contacts of the case (page 19). The patient/parents/guardians should be advised of the need for the patient to stay at home for at least four days after the appearance of the rash.
- Staff presenting with measles symptoms should be given leave after appropriate tests are taken to confirm measles. They may return to work if they have serological evidence of immunity (ie are IgG sero-positive and IgM negative) or four days after appearance of the rash if they develop measles (Immunization Practices Advisory Committee 1989).

Confirm the diagnosis — see laboratory-confirmed infection, page 7.

Identify other cases, through:

- active surveillance for measles among all hospital patients, staff (including students and volunteers), visitors, and inpatients discharged before diagnosis of the first case; and
- provision of daily updates on the number of patients and staff with suspected measles by wards to the outbreak control team.

Identifying and protecting all susceptible persons in the hospital

Strategies include the following.

- Implementing a hospital outbreak vaccination strategy (see below).
- Offering MMR vaccine or immunoglobulin if appropriate (refer to Appendix 4) to susceptible household contacts.
- Offering susceptible health-care workers (refer to page 10) exposed to measles within the last 72 hours a dose of MMR vaccine or immunoglobulin if appropriate (refer to Appendix 4). Until the health care worker receives either the MMR vaccine or immunoglobulin or if they do not receive MMR vaccine or immunoglobulin within the specified timeframes they should be excluded from the facility until 14 days after their last exposure. Furthermore, if a susceptible health-care worker has not previously received any doses of a measles-containing vaccine they should be offered a second dose of MMR four weeks after the first dose. Susceptible health care workers may include medical, nursing, allied health or domestic staff, ward staff and nursing or medical students.

- Isolating susceptible patients who refuse vaccination, and discharging them as soon as possible.
- Redeploying susceptible staff who refuse vaccination to duties not requiring direct patient care.
- Possibly restricting visitors to specified wards, depending on the severity of the outbreak.
- Arranging in-services for all staff to answer concerns about the outbreak.

Following an outbreak

- Control measures can be relaxed about three weeks after the onset of rash in the last known case, with staff and patients being informed accordingly.
- A report on the outbreak should be prepared (see Chapter 7) which identifies the strengths and weaknesses of the collaborative control efforts. Infection control guidelines should be revised accordingly.

Hospital outbreak vaccination strategy

A strategy should be developed that includes the following.

- Redeploying adequately trained staff to assist in administering the vaccine.
- Ensuring adequate vaccine supplies are available.
- Determining the susceptible population by interviewing staff and patients. The target age group for vaccination will vary, depending on the knowledge of previous outbreaks of measles in the locality.
- Lowering the minimum age for vaccination to nine months if this younger group are considered at risk of being exposed. Infants who receive a dose of MMR vaccine before 12 months of age should be encouraged to receive a further dose of MMR at 12 months of age or four weeks after the first dose whichever is the later. This second dose does not replace the routine dose of MMR at four years. Children under 12 months who have direct contact with a person with measles should be managed as described in Chapter 6.
- Special consideration should be given to providing vaccine/immunoglobulin to non-immune patients in neonatal intensive care units. A significant proportion of infants under nine months, and those admitted to neonatal intensive care units since birth, may lack measurable measles antibody. Gestational age of less than 37 weeks has been identified as a risk factor for acquiring low levels of maternal antibody (Kamat et al 1994).
- Preparing and distributing appropriate information and consent forms (see page 71). Consent forms may be used to collect epidemiological data: name, date of birth, sex, occupation, department, date of current and past vaccinations, type of vaccine (monovalent, bivalent, trivalent), vaccine batch number and name of supervisor.

- Offering MMR vaccine as soon as possible to susceptible contacts (see page 81), within 72 hours of contact with the case, and offering immunoglobulin according to criteria outlined in Appendix 4.
- If serological testing can be done quickly and cheaply, it may be cost-effective to screen staff providing direct patient care (Schwarz et al 1992; Sellick et al 1992).
- Asymptomatic HIV positive patients/staff, or oncology patients in remission who have not received chemotherapy for at least six months, can be safely vaccinated with MMR.
- All age-eligible children attending the hospital for any reason should be offered vaccination.
- Preparing a schedule for a phased vaccination campaign for staff, including arrangements for night duty and casual staff and staff on leave.

Outpatients and other health facilities including general practice

This section applies to emergency and outpatient departments, and to community health centres and private consulting rooms. Flowchart F in Appendix 6 (see page 85) illustrates the general practitioner's response and an information sheet for use by general practitioners is given in Appendix 7.

The roles of health-care providers, including Divisions of General Practice and general practitioners in controlling the outbreak should be defined. Health-care providers should be informed of all outbreak-specific recommendations eg policy for vaccinating contacts, catch-up vaccination campaigns at schools or child-care facilities, lowering the vaccination age in the community, and the need to review vaccine storage requirements (the cold chain).

When a patient with measles attends a medical facility, contacts will be at risk of acquiring the infection. Nosocomial spread can be minimised through maintaining a high level of awareness among staff, offering opportunistic vaccinations, isolating individuals with fever and rash, and encouraging health facility staff to be fully vaccinated.

The four key components of a rapid response to a case of measles (see page 19) will minimise the risk of transmission of the virus.

Isolating the patient with measles

When there is an outbreak in the community:

- Triage patients with fever and rash so that they can be identified and assessed promptly.
- Where possible, examine patients with suspected measles at home.
- Advise the receptionist when booking appointments that the patients should be asked if they have a fever and rash. Furthermore, a sign could be placed outside health facilities instructing patients with fever and rash or parents/guardians accompanying a child with fever and rash to wait outside and to ask another attendee to inform the health-care staff that they have arrived.

If a patient with suspected measles attends a facility:

- If possible have the patient avoid the waiting room, by going directly to a room that can be left for at least two hours after the consultation. The consultation should take place in that room rather than the doctor's normal consulting room (Davis et al 1986; Bloch et al 1985; Remington et al 1985; Riley et al 1978), or examine the person as soon as possible. It is acknowledged that closing a consultation room following the examination of a patient with suspected measles is extremely difficult for general practitioners; however, this action is considered necessary to interrupt the transmission of measles.

Confirm the diagnosis

- Refer to laboratory-confirmed infection (page 7).

Identify other cases

- Notify the suspected case to the State/Territory health department or local public health unit immediately by telephone (ie before the laboratory results are available) so that further investigations and the need for control measures at the community level can be considered.
- Maintain surveillance for more cases, and ensure that patients with fever and rash attending the facility are identified and assessed promptly.

Identify and protect susceptible contacts

- Other people who attend the rooms at the same time, or for at least two hours after, are at risk of developing measles and should be treated as contacts. Their stay in the waiting room should be minimised, and any susceptible contacts identified and offered vaccine (Davis et al 1986; Bloch et al 1985; Remington et al 1985; Riley et al 1978).
- Contacts include other patients who were in the waiting room with the 'measles case' and who left the facility before the case was seen, those who accompanied patients and staff. In a hospital setting it includes all those who visited the department including allied health staff, ambulance officers, police officers.
- Provide opportunistic vaccinations for susceptible age-eligible children and adults attending the facility for any reason.
- Consider lowering the minimum age for vaccination to nine months, as described above.

Summary — Response to measles in health-care facilities

- Nosocomial transmission of measles is well documented. However, there is at present no standard approach to measles control in medical settings, and an ad hoc approach to staff vaccination against vaccine preventable diseases exists. An outbreak of measles affecting health-care providers has serious medical and economic implications.
- A number of strategies help minimise nosocomial spread, including: maintaining a high level of awareness among staff; offering opportunistic vaccinations; isolating individuals with fever and rash; and encouraging health facility staff to be fully vaccinated.
- In the event of an outbreak, the four key components of rapid response should be implemented: isolating patients with measles within a hospital, confirming the diagnosis, identifying other cases and identifying and protecting all susceptible persons in the hospital. A hospital outbreak vaccination strategy should also be in place.
- These rapid response measures should also occur in the event of a measles outbreak in outpatients facilities or in general practice. Health-care providers should consider the wider public health ramifications when diagnosing a case of suspected measles, and collaborate closely with the State/Territory health department or local public health unit.

4.3 Prisons

Prison populations include a high concentration of young adults born between 1970 and 1983 who are at greater risk of measles infection because they are too old to have been recipients of the two-dose MMR vaccination program (see Chapter 5). It is therefore important that prevention and control measures are implemented promptly. If a prisoner or a prison staff member is diagnosed with measles the State/Territory health department or local public health unit should be notified and control measures similar to those required in the hospital setting (see pages 28 to 32) should be implemented.

4.4 International events strategy

International events such as sporting, cultural, and arts festivals may increase the risk of measles transmission within Australia. Several factors increase the risk of measles transmission during international events including: people coming from parts of the world where measles circulates freely; large crowds of people who mingle in confined spaces; and the increased potential for higher proportions of people to be susceptible to the measles virus (ie people from countries where the level of immunity to measles is lower than in Australia, and who are therefore at greater risk of contracting and transmitting measles).

The following measures should be considered to minimise the risk of measles transmission at international events (CDC 1992).

- Participant governing bodies and local organising officials should encourage national and international participants, all delegation members, staff, volunteers and accompanying visitors to be appropriately vaccinated.
- Participants aged less than 18 years should have authority to designate an accompanying adult to authorise medical interventions.
- In the event of an outbreak, State/Territory health departments and local public health units should work quickly with organising committees and governing bodies to establish plans for evaluation, treatment, exclusion and to ensure vaccination clinics are held promptly and conveniently.

5 Protecting young adults: an at-risk cohort in Australia

5.1 Rationale for prophylaxis guidelines in this group

As discussed in Chapter 1, the epidemiology of measles in Australia has undergone an important change since the introduction of the two-dose measles vaccination policy. This has occurred in all parts of the world where this policy has been implemented, or where national measles vaccination days have been conducted. Being a highly contagious disease, measles has traditionally affected young children. When measles vaccine coverage reaches a level where circulation of the virus in younger age groups is markedly reduced, the age of those infected during outbreaks rises (Duclos et al 1999).

The MCC conducted in 1998, and the two-dose MMR policy in place since 1994, appear to have raised levels of immunity in younger age groups to a point where sustained transmission of measles is unlikely to occur.

Of the 75 people notified as part of the measles outbreak in Victoria at the beginning of 1999 (Lambert 1999), 63 (84 per cent) were in the 1968–1981 birth cohort. There are few published reports about the susceptibility of this cohort in Australia. A serostatus study at a Melbourne Juvenile Justice Centre (birth cohorts 1978 to 1981) showed that 12 per cent of entrants did not have protective levels of measles antibody, a level insufficient to prevent outbreaks of disease (Thompson et al 1998).

Young Australian adults are at greater risk of measles infection because they are too old to have been recipients of the two-dose MMR vaccination program. The two-dose policy was introduced in 1994 for children aged between 10 and 16 years (birth cohorts 1978 to 1984). In most States/Territories the second dose was provided to students through a school-based program (an extension of the previous schoolgirl rubella vaccination program) for Year 6 or Year 7 students. The members of the first cohort to receive MMR in 1994 (birth cohorts 1983/1984) will be turning 16 or 17 years of age in 2000.

There are few published reports of early measles vaccine coverage, but a New South Wales paper published in 1972 (Christopher 1972) suggested early uptake may have been low. Though low, coverage may have been sufficient to reduce the circulation of measles virus. Even though individuals from these birth cohorts may not have been vaccinated themselves, the reduction in circulating virus brought about by community vaccination may have meant they are less likely to be immune due to exposure to wild virus infection. The birth cohort from the year measles vaccine was introduced to the schedule will be turning 29 years of age in 2000.

Not only are individuals from these birth cohorts more at risk of acquiring infection, they also appear to be at higher risk of complications when they do get infected.

A report of an outbreak in Western Australia in 1994 reported a high morbidity in young adults (Jeremijenko et al 1996) and the 1999 Victorian outbreak had a high rate of hospitalisation (Lambert et al 1999).

Anecdotal evidence from the 1999 Victorian measles outbreak suggests individuals from the cohort born between 1969 and 1981 may incorrectly believe they have immunity to measles infection (Lambert et al 1999). This may be due to either a mistaken belief they have received vaccination against measles or that they had wild measles infection as a child. Investigation into an outbreak in Los Angeles involving young adults demonstrated poor correlation between reported measles vaccination or measles infection history, and antibody prevalence (Krause et al 1979). A study of health-care workers (all born before 1972) in New South Wales showed 100 per cent of those with a hearsay history of measles infection were immune, compared to 96 per cent of study subjects without a hearsay history of measles (Ferson et al 1994). The very high level of immunity in both groups would suggest the year of birth, and therefore likelihood of exposure to wild measles virus, as opposed to hearsay history of previous infection, is the more important marker of measles immunity. A report of vaccination or wild virus infection from young adults in Australia should be viewed with caution. Verbal reports of vaccination or infection in this birth cohort should not form part of the decision-making process when recommending MMR or immunoglobulin prophylaxis.

5.2 Protecting young adults

If a young adult population is considered by a State/Territory health department or local public health unit to be at risk during a measles outbreak, the public health unit should consider advising all young adults (born between January 1970 and December 1983) to have their measles vaccination status checked by their immunisation provider.

If original contact with an infectious case was 72 hours earlier or less, susceptible young adults should be advised to receive the scheduled two doses of MMR vaccine. If a person receives their first dose during an outbreak they should be encouraged to return in four weeks to receive their second dose. Individuals who have received one dose of measles-containing vaccine should be advised to receive their second dose. If original contact with the infectious case was between three and seven days before, young adult contacts who have not received any measles-containing vaccine should be offered immunoglobulin.

If a susceptible young adult refuses or is unable to receive the MMR vaccine or immunoglobulin they should be informed of the possibility of contracting measles. Furthermore, they should be advised if they develop symptoms consistent with prodromal measles in the incubation period, they should isolate themselves and seek medical advice. The advice regarding MMR use in this birth cohort should be made regardless of verbal history of vaccination or previous measles infection.

5.3 Consideration of other issues

Delivering vaccinations to individuals in the at-risk birth cohorts

Providing preventive medical services to individuals from these birth cohorts is difficult. During outbreaks that involve these birth cohorts, free vaccine should be made available through all medical services likely to be used by this age group. Such services could include general practices, medical centres, hospital emergency departments, university health services, and sexual health clinics (Staat et al 1998). At all times, but particularly during a measles outbreak, these centres should be encouraged to identify individuals who may be susceptible to the measles virus from this at-risk group, and offer opportunistic MMR vaccination if not contraindicated.

MMR vaccination as part of travel health consultations

High rates of travel to measles endemic countries by young adults has been identified as a possible factor contributing to higher rates of measles infection in this age group (Duclos et al 1999). General practitioners and specialist travel health clinics who provide travel advice to young adults should always include questions about the likelihood of measles immunity in consultations. Once again, verbal reports of previous measles vaccination or infection from this group should be viewed with caution. To maximise the likelihood of protection, young adults who travel to measles endemic countries should be advised to check their measles vaccination status and if they have not received two doses of a measles-containing vaccine they should be encouraged to update their vaccination status.

Summary — Protecting young adults

- Several factors may have resulted in young Australian adults (those born between January 1970 and December 1983) being currently at risk of measles infection. These include the poor uptake of the measles vaccine in the early 1970s, that this cohort is too old to have been recipients of the two-dose MMR vaccination program or the MCC, and the decline in the circulation of the virus in the community.
- If original contact with an infectious case of measles was under 72 hours earlier, susceptible young adults should be advised to be vaccinated with MMR vaccine as soon as possible. If original contact with the infectious case was between three and seven days before, young adults who have never received a measles-containing vaccine should be offered immunoglobulin.
- If a susceptible young adult refuses or is unable to receive the MMR vaccine or immunoglobulin they should be informed of the possibility of contracting measles. Furthermore, they should be advised that if they develop symptoms consistent with measles in the incubation period, they should isolate themselves and seek medical advice.
- If a young adult population is considered by a State/Territory health department or local public health unit to be at risk during a measles outbreak, the unit/department should consider advising all young adults in the community to have their measles immune status checked by their immunisation provider. If they are assessed to be susceptible to the measles virus they should be encouraged to receive the scheduled two doses of MMR vaccine. If a person receives their first dose during an outbreak they should be encouraged to return in four weeks to receive their second dose.
- At all times, but particularly during a measles outbreak, all medical services likely to be used by this age group should identify individuals who may be susceptible to the measles virus, and offer opportunistic MMR vaccination if not contraindicated. Such services include general practices, medical centres, hospital emergency departments, university health services, and sexual health clinics.
- Young adults who travel to measles endemic countries should be advised to check their measles vaccination status and if they have not received two doses of a measles-containing vaccine they should be encouraged to update their vaccination status.

6 Protecting infants under 12 months of age

Although most infants under 12 months of age are thought to be protected due to maternal antibodies, some children in this age group may be susceptible. This group therefore requires special consideration and protection, particularly in the event of an outbreak.

It is difficult to anticipate every possible scenario that may influence the decision to offer an infant immunoglobulin or MMR vaccination when exposed to a case with measles. It is therefore advisable to consult a paediatrician or a public health physician for recommending prophylaxis to a particular infant contact.

The recommendations in this chapter should be viewed as guidelines to assist decisions about prophylaxis. These recommendations should not be followed dogmatically in situations where common sense or clinical experience suggests that immunoglobulin may provide more certain protection against measles infection than MMR vaccination.

6.1 Prophylaxis for contacts under 12 months of age

Infants under nine months of age

There is no clear evidence that measles vaccination of infants under the age of nine months will induce an effective immune response. Furthermore, very young infants with measles may be prone to severe complications. Therefore, infants aged between six and nine months exposed to a case of measles within the last seven days, should be offered immunoglobulin at a dose of 0.2 mL/kg body weight by deep intramuscular injection. Infants under six months of age should not be given immunoglobulin unless the infected contact is the infant's mother.

Infants between nine and twelve months of age

If the first contact with the infectious case was within 72 hours, infants in this age group should be offered MMR vaccine as soon as possible, and receive a further dose of MMR at 12 months of age or four weeks after the first dose, whichever is later. This second dose does not replace the routine dose of MMR at four years as infants who are less than 12 months of age may have a decreased response to one or more components of the vaccine due to the presence in the circulation of residual antibodies of maternal origin. The younger the infant, the lower the likelihood of seroconversion.

If contact with the infectious case occurred more than 72 hours earlier, but within seven days, immunoglobulin should be offered at a dose of 0.2 mL/kg body weight by deep intramuscular injection.

6.2 Vaccinating infants under 12 months during outbreaks

Evidence from the Victorian measles outbreak in 1999 suggests children under the age of 12 months were not at high risk of acquiring measles, as only 2 of the 75 notified cases were in this age group (Lambert 1999).

In outbreaks where infants are assessed to be at risk, consideration should be given to lowering the age of vaccination from twelve months to nine months of age. Such outbreaks include those that affect the entire community where it is reasonable to expect infants will be exposed (such as a school-based outbreak where older siblings may expose infants to infection), and those where confirmed cases of measles have already occurred in infants.

This change to the vaccination schedule may extend to involve all infants aged between nine and twelve months of age in the community, or may be targeted to those thought to be at highest risk, such as sibling infants of all children who attend a school where an outbreak has occurred. This change to the schedule should be announced by the relevant public health authorities, and where possible, all relevant vaccination providers should be directly informed by way of a letter. A public announcement should again be made when the outbreak has concluded, and the routine vaccination schedule is re-introduced. Parents and vaccination providers should be made aware that this alteration to the routine vaccination schedule is only in force during the outbreak, and infants vaccinated early should still receive the routine two doses of MMR vaccine; the next dose should be given at age 12 months or four weeks after the first dose, whichever is later. This second dose does not replace the routine dose at four years of age.

6.3 Exclusion of cases and contacts from a child-care setting

There is an increasing use of child-care facilities for infants under 12 months of age. The rationale for excluding contacts of a case with measles from child-care and educational facilities is to interrupt the local chain of transmission. If there is a case of measles in a child-care setting where infants between six months and 12 months of age are present, they should be excluded from attendance to interrupt local transmission of infection. Infants can return to child care if they receive an MMR vaccination within 72 hours of their first contact or if they receive immunoglobulin within seven days of contact. It is not necessary for infants under six months of age to be excluded except if the infected contact is the infant's mother. If the infant's mother is the infected contact the infant can return to child care if they receive immunoglobulin within seven days of contact.

Parents of contacts should be advised about MMR or immunoglobulin prophylaxis depending on when they had first contact with the infectious case. The contact should be excluded from attendance for 14 days after onset of the rash in the last case at the facility if:

- it is too late to offer either MMR or immunoglobulin; or
- prophylaxis is refused.

As discussed in Section 6.2, when there is a confirmed case of measles in a child-care facility, consideration should be given to lowering the age of vaccination from twelve to nine months of age.

Summary — Infants under 12 months of age

- In the event of contact with a measles case, infants aged between six and nine months should be offered immunoglobulin. Infants aged between nine and twelve months should be offered MMR vaccination if contact occurred within 72 hours, or immunoglobulin if contact was within three to seven days. A further dose of MMR should be given at twelve months of age or four weeks after the first dose, whichever is later. This second dose does not replace the routine dose of MMR at four years.
- In instances where infants are at risk during an outbreak, consideration should be given to lowering the age of vaccination from twelve months to nine months of age, with widespread dissemination of this fact until the routine vaccination schedule is re-introduced.
- If there is a case of measles in a child-care setting where infants between six and twelve months of age are present, they should be excluded from attendance to interrupt local transmission of infection. Infants can return to child care if they receive an MMR vaccination within 72 hours of their first contact or if they receive immunoglobulin within seven days of contact. It is not necessary for infants' under six months of age to be excluded, except if the infected contact is the infant's mother.

7 Communication and collaboration in the event of an outbreak

An important part of the implementation of these guidelines will be effective communication to health professionals, schools, child-care facilities and community organisations, as well as to the wider community. This will raise general awareness of the importance of vaccination and notification of infection. Effective communication is particularly important during an outbreak of measles, to ensure widespread understanding of the public health control measures being adopted.

The size of an outbreak will depend on the proportion and number of susceptible persons in the population. Any number of measles cases constitutes an outbreak, but the suggested control and evaluation measures refer to outbreaks that are generating large numbers of cases over a short time frame. Slow, small outbreaks will not require the full range of responses outlined here. It will be up to the judgement of the local State/Territory health department as to the level of action taken.

7.1 The outbreak report

Details of outbreak and control measures should be regularly provided via mail/email/facsimile to general practitioners, schools, child-care centres, Divisions of General Practice, local councils and neighbouring local councils. The community should be kept informed through media releases, which aim to inform about public health control measures, to further encourage efforts to identify and report all incident cases, and to maximise vaccine uptake among people who are susceptible to measles.

After any outbreak, a final report should be prepared. Such a report could include details on:

- the evolution of the outbreak;
- the associated morbidity, particularly admissions to hospital;
- the nature and impact of the control measures;
- the sensitivity of routine surveillance for measles;
- the efficiency of the response to notified cases;
- the level of vaccine uptake in the community and/or institutions before the outbreak;
- deficiencies, if any, in the routine vaccine delivery system and how these will be improved;
- reasons for the outbreak, including an estimate of vaccine effectiveness (if relevant);
- the proportion of preventable and non-preventable cases (defined on page 10);

- a reminder to enable recall of children for the second dose of MMR if vaccinated under 12 months of age; and
- gaps in these Outbreak Control Guidelines.

The final report should be published as soon as possible in the State or Territory bulletin and/or *Communicable Diseases Intelligence*.

7.2 Communication and collaboration⁵

A measles outbreak has the potential to affect many people in the community. In particular, parents of children who cannot attend child care or school may need to stay home from work to care for their children. Therefore, the general public may be concerned, confused or angry at public health measures taken during an outbreak.

The way in which information is imparted to the public during an outbreak can have significant impact on the success of implementing the control guidelines. A workable communication plan will assist the implementation of the measles guidelines for the control of outbreaks. This communication strategy is designed to support and complement the action of the State and Territory public health units.

Informing the health system

This should involve:

- advising clinicians in hospitals and the private sector to increase awareness of the disease and to encourage case finding and opportunistic vaccination;
- advising local and regional public health networks of the outbreak, and of the plans for investigation and control; and
- notifying the CDNANZ either at the routinely scheduled fortnightly teleconference, or at an extraordinary meeting. Details should be provided on:
 - the local contact person coordinating the investigation;
 - what is known of the outbreak;
 - the extent of investigations already completed and planned;
 - priorities for investigation and control;
 - the level of interest and concern in the local community, the media and among politicians; and
 - the likely need for additional resources such as expertise, staff and funding, to control the outbreak.

⁵ This section has been adapted from the communications chapter in the CDNANZ document titled *A Framework for an Australian Influenza Pandemic Plan* (CDNANZ 1999).

Informing the affected and the at-risk community

A risk communication strategy should be developed, with consideration of the need for a telephone hotline to provide information to the public. The information should be presented in a format that is sensitive to the needs of the relevant social, cultural and language groups. In addition:

- an experienced person should be appointed to be responsible for media liaison;
- existing educational resources eg pamphlets, videos, web sites should be identified and distributed;
- there should be collaboration with relevant institutions and community agencies that could assist investigations and help disseminate preventive messages eg schools, child-care facilities, playgroups and sporting groups; and
- a media management strategy should be considered for all measles outbreaks.

Below is a suggested media management strategy.

- 1 Involve the media adviser, appoint official spokespersons** — The State/Territory Public health media adviser should coordinate a State/Territory response to an outbreak of measles. A spokesperson to the media and hence the public should be designated.
- 2 Develop a State/Territory media strategy** — State/Territory health media relations staff should discuss tactics, and then invoke its information strategy. They will also be responsible for keeping public relations officers at hospitals, medical health facilities and the Divisions of General Practice informed of the latest developments.
- 3 Prepare and disseminate fact sheets** — State/Territory health media relations staff, should immediately prepare fact sheets (refer to Appendix 5) for dissemination to the public, other government departments and to local media. The fact sheets should include:
 - information about measles, symptoms, complications, and what to do if symptoms are discovered, including contact numbers for State/Territory health departments; and
 - any unusual measures to be implemented, including emergency powers under the law, and the rationale for such measures.
- 4 The hot line: keeping the public informed** — The State/Territory health media relations staff should consider setting up a telephone hotline for individuals wanting information. Telephone staff should be given a set of questions and answers, and a doctor/public health officer should be called in to answer other queries.
- 5 Recorded messages: update regularly** — A separate 1800 phone line should be considered, to provide the public with a recorded message. This message should be updated daily or as necessary, and outline appropriate public action.

- 6 **Print advertising: getting the facts** — A half-page or full-page print advertisement should be prepared, setting out the measures being taken to respond to the measles outbreak, and including hotline telephone numbers. The advertisements should be placed in daily metropolitan newspapers within the State/Territory if required.
- 7 **Indigenous and ethnic media: spreading the word** — Indigenous media and ethnic media, both print and electronic, should be targeted with publicity and advertisements (translated), to ensure that the messages reach the whole community.
- 8 **The Internet** — Information on the Internet should include fact sheets, phone-in numbers, media releases and updates. The website of the Population Health Division, Commonwealth Department of Health and Aged Care could be used, or a separate dedicated State/Territory site established.
- 9 **Daily news conferences** — The media should have daily access to an authoritative spokesperson. To avoid continual interruption of key workers, a media conference should be called each day at a convenient time for media if required. Spokespersons should be available at other times as much as possible for current affairs television and talkback radio.
- 10 **Politicians: keeping the press secretaries informed** — In general, it is best if Ministers do not comment publicly on the outbreaks to ensure a coordinated, apolitical response. At times, it may be appropriate or expedient for politicians to take the lead eg to announce the invoking of emergency powers. It is necessary, therefore, to include Ministerial press secretaries in the dissemination of media information.

7.3 Structured reviews of the response to an outbreak of measles⁶

Structured reviews of significant events are often undertaken in clinical medicine. They are sometimes referred to as clinical audits, significant event auditing, critical event auditing or facilitated case discussions. Such reviews are undertaken to identify ways of improving practice by identifying barriers to best practice, highlighting exemplary practice, and for debriefing staff after stressful incidents.

Structured reviews are not often undertaken in public health practice. However, an organised review of the response to an outbreak allows evaluation of the responses, and is also a unique opportunity to enhance the efficiency and effectiveness of future responses.

The expectations of the review must be well defined at the outset. It may be appropriate to define the terms of reference and the expected product well in advance so that participants can bring appropriate data to the review.

The approach to the review is modelled from emergency management theory, and is directed at four phases: prevention, preparedness, response and recovery.

⁶ This section is reproduced from the then Department of Health and Family Services *Guidelines for the Control of Communicable Disease Outbreaks in Australia* (Dalton et al 1997).

Prevention

- 1 How does the public health agency monitor vaccine coverage in the region:
 - Does the agency evaluate, and address deficiencies in vaccine coverage in the region regularly?
 - Can the agency access vaccination records of children in the region?
 - Does the agency have an efficient call back system for children who have missed vaccinations?
 - What is the extent of opportunistic vaccinations in the region when there is no outbreak?
- 2 Does the level of vaccine uptake in the region meet national goals for achieving high uptake?
- 3 Do vaccine providers in the region comply with the standards for childhood vaccination recommended by the National Immunisation Committee?

Preparedness

- 1 What is the sensitivity of the surveillance system for identifying sporadic cases of measles and/or clusters?
- 2 Does the public health agency have trained staff to respond to sporadic cases and clusters of measles cases? If not, does the agency have access to additional trained personnel in an outbreak?
- 3 Can the agency establish and staff an information hotline within 24 hours of identification of an outbreak?
- 4 Does the agency have sources of public information brochures for distribution in the event of an outbreak?
- 5 Does the agency have predefined financial resources to allocate to outbreak investigation and control?
- 6 Does the agency conduct structured reviews of response to outbreaks?

Response

A. Public health action

- 1 Was the case or cluster of cases recognised quickly enough to permit early intervention?
- 2 Was the public health response to sporadic cases or a cluster of cases timely and efficient?
- 3 Was ongoing counselling provided to cases, contacts and their families?
- 4 Were opportunistic, selective and/or mass vaccination programs indicated and conducted in a timely manner?

B. Epidemiological investigation

- 1 If the outbreak involved a number of health jurisdictions, was the response well coordinated?
- 2 Was the standard data collection form used in the investigation?
- 3 Was the form of contacting potentially exposed people appropriate? Were general practitioners offered the opportunity to contact their patients?
- 4 If the investigating team was responsible, what was the training of its members?
- 5 How were people contacted eg by phone, letter or other (specify)?
- 6 At what point in the investigation were people contacted?
- 7 Could this have happened more quickly and if so, what were the impediments?
- 8 Was simple, clearly written information made available at the time of first contact?
- 9 Were arrangements made for laboratory testing at the time of initial contact?
- 10 Was frequent contact maintained with infected people to ensure that they received appropriate support?

C. Laboratory investigation

- 1 How quickly was a laboratory identified that could do all appropriate testing?
- 2 Were adequate specimens collected and tested promptly?
- 3 Were appropriate laboratory tests available for rapid diagnosis? Did all laboratories use standard procedures?
- 4 How long did it take for all testing to be completed? Could this have happened more quickly and if so, what were the impediments?

D. Communication

- 1 Was a risk communication strategy developed?
- 2 Were hospitals, laboratories and medical practitioners provided with appropriate and timely information?
- 3 Were other relevant agencies contacted and if so, when?
- 4 Were epidemiological, and laboratory findings obtained in different jurisdictions shared with other relevant health-related agencies?
- 5 Was someone appointed to deal with political processes (eg local, State/Territory and/or Commonwealth governments)?
- 6 Were public health preventive messages clearly defined?
- 7 How long after recognition of the outbreak were educational materials identified or developed? Could this have happened more quickly and if so, what were the impediments?

- 8 Were the materials suitable (simple, accurate and clearly written) and in adequate supply?
- 9 Was there a coordinated response to the media - one person identified to coordinate response, regularly scheduled press conferences? Was this person outside the investigation team?
- 10 Was a hotline set up to provide information to the community?
- 11 Was success of public relations activities evaluated?
- 12 Were members of the CDNANZ notified of an outbreak in a timely manner?

Recovery

- 1 Was there a structured debriefing at the agency or agencies involved?
- 2 Was counselling for staff members provided, if necessary?
- 3 Were reasons for the outbreak established?
- 4 Was a report on the outbreak provided to the community (usually via media), data providers, colleagues and the wider public health community? How and when was the information communicated?
- 5 Were needs for further studies identified eg epidemiological or laboratory studies, economic impact studies?
- 6 Was adequacy of the surveillance system reviewed? Were weaknesses identified and rectified?
- 7 Is there a plan in place to address the deficiency that allowed the indigenous transmission of measles?
- 8 Was the utility of the measles outbreak control guidelines reviewed?

Summary — Communication and collaboration

- An important part of the implementation of these guidelines will be effective communication about public health control measures for measles to health professionals, schools, child-care facilities and community organisations, as well as to the wider community. This should further encourage efforts to identify and report all incident cases, and to maximise vaccine uptake among people who are susceptible to measles.
- The way in which information is imparted to the public during an outbreak can have a significant impact on the success of implementing control guidelines, and a communications strategy has been designed to support and complement the action of the State and Territory public health units. This involves a comprehensive range of strategies to inform the health system and both affected and at-risk groups.
- It is recommended that structured reviews of each response to an outbreak be performed, to evaluate the responses. These provide a unique opportunity to enhance the efficiency and effectiveness of future responses.

Appendix 1 Membership of MEAC and the Measles Outbreak Guidelines Working Party

Membership of the Measles Elimination Advisory Committee

Dr Cathy Mead (Chair)	Assistant Secretary Communicable Diseases and Environmental Health Branch Commonwealth Department of Health and Aged Care
Professor Margaret Burgess	Director National Centre for Immunisation Research and Surveillance of Vaccine Preventable Disease
Dr Mike Catton	Medical Director Victorian Infectious Diseases Reference Laboratory (from 17 March 2000)
Ms Sue Campbell-Lloyd	AIDS/Infectious Diseases Branch Department of Health, New South Wales National Measles Control Campaign Manager
Dr Robert Hall	Director Communicable Disease Control Branch South Australian Health Commission
Dr Jeffrey Hanna	Medical Director Communicable Disease Control Tropical Public Health Unit, Queensland Health
Dr Brian Kable	Chair, National Preventive and Community Medicine Committee Royal Australian College of General Practitioners
Dr Rosemary Lester	Manager, Prevention and National Health Priorities Section Department of Human Services, Victoria
Dr Osman Mansoor	Public Health Physician New Zealand Ministry of Health
Dr Eddie O'Brien	National Centre for Disease Control Commonwealth Department of Health and Aged Care (until 7 October 1999)
Dr Mahomed Patel	Fellow, National Centre for Epidemiology and Population Health Australian National University, Canberra.

Membership of the Measles Outbreak Guidelines Working Party

Dr Stephen Lambert
Technical Adviser

Disease Control Section
Department of Human Services, Victoria

Dr Mahomed Patel
Technical Adviser

National Centre for Epidemiology
and Population Health
Australian National University, Canberra.

Ms Anita Soar

National Centre for Disease Control
Commonwealth Department of Health and Aged Care

Appendix 2 List of submissions

Submissions received from Stage 1 consultation

Adelaide Central and Eastern Division of General Practice
Director and Chair, Vaccination Committee, Dr VE Tsakalos

Australian Institute of Environmental Health
Lecturer in Environmental Health, Ms M Stoneham

Barossa Division of General Practice
Medical Director, Dr S Urlwin

Brisbane North Public Health Unit
Public Health Physician, Dr R Davison

Child and Youth Health (South Australia)
Vaccination Nurse Consultant, Ms D Petrys

Department of Human Services, Victoria
Enhanced Measles Surveillance Working Party

Health Department of Western Australia
Director, Communicable Disease Control Branch, Dr JS Gill

Osborne Division of General Practice
Representative, Health Promotion Sub-Committee, Dr H Donnelly

Royal College of Nursing Australia
Executive Director, Ms E Percival

Queensland Health Pathology Service
Director of Microbiology, Dr J Faoagali

South Eastern Sydney Public Health Unit
Director, A/Professor M Ferson

Territory Health Services (Northern Territory)
Director of Pathology and Director of Microbiology, Dr G Lum

The University of New South Wales
Lecturer, School of Community Medicine, Dr J Frith

Westgate Division of Family Medicine
Program Manager, Vaccination, Dr S Leslie

Submissions received from Stage 2 consultation

The New Children's Hospital
Department of Immunology and Infectious Diseases, Clinical Professor David Isaacs

Health Department of Western Australia
Regional Immunisation Coordinator, Mr David Richardson

Centre for Disease Control
Brisbane Northside Public Health Unit, Dr R Davison

University of New South Wales
School of Community Medicine, Professor Mark Harris

Deafness Foundation (Victoria)
Rubella Education Officer, Ms Eleanor F McLean

Osborne Division of General Practice
Health Promotion Subcommittee, Dr Helena Donnelly

NSW Department of Education and Training
Student Services and Equity Program, Mr George Green

Consumers' Health Council
Executive Director, Ms Michele Kosky

South Eastern Sydney Public Health Unit
Director, A/Professor Mark Ferson

NAPCAN
Chairman, Dr Bronwyn Gould

Great Southern Division of General Practice
Public Health Medical Officer, Dr Jim Leighton

Australian Medical Association
Director Health Services, Dr Carmel Martin

Australian Institute of Environmental Health
AIEH Communicable Diseases and Immunisation Convenor, Dr Andrew Mackintosh

Great Southern Public Health Unit
Disease Control Coordinator, Ms Trish Sullivan

CNC Lismore Base Hospital
Ms Sue Devlin

Northern Rivers Public Health Unit
Public Health Officer, Ms Janet Terry

Corrections Health Service NSW
Director Population Health, Mr Michael Levy

Queensland Catholic Education Commission
Executive Director, Mr Alan Druery

Pharmacy Guild of Australia
Executive Director, Mr Stephen Greenwood

ACT Immunisation Coordinator
Ms Louise Remington

Illawarra Public Health Unit
Public Health Nurse, Fran Horne

Tropical Public Health Unit
Medical Director, Communicable Disease Control, Dr Jeffrey Hanna

Westgate Division of Family Medicine
Dr Simon Leslie

Association of Independent Schools of Queensland Inc
Executive Director, Dr John Roulston

Child and Youth Health South Australia
Immunisation Nurse Consultant, Debra Petrys

Catholic Education Commission NSW
Director, Education Policy and Programs, Ian Baker

NSW Family Day Care Association
Convenor, Health and Safety Subcommittee, Wendy Lawson

NSW Health Department
Chief Health Officer, Dr Andrew Wilson

Association of Independent Schools of Western Australia
Mrs Audrey Jackson

National Association of Community Based Children's Services, Victoria
Celia Haddock

Queensland Health
Public Health Registrar, Dr Justine Ward

Commissioner of Health, Western Australia
Alan Bansemer

ACT Department of Health
Chief Health Officer and Executive Director, Dr Shirley Bowen

ACT Division of General Practice
Project Officer, Veronica Frewin

SA Independent Schools Board
Executive Director, Gary Le Duff

Catholic Education Office of WA
Therese Temby

Education Department of WA
A/Director, Peter Browne

Appendix 3 Implementation and evaluation

Target audience for the guidelines

These guidelines are intended for use primarily by public health officers in State and Territory health departments. Selected aspects of the guidelines are also recommended for use by institutions, health-care facilities and professionals that may be affected by measles. These include child-care facilities, schools, technical colleges, universities, prisons, diagnostic and public health laboratories, general practitioners, paediatricians, physicians and pathologists.

The new *Guidelines for the Control of Measles Outbreaks in Australia* have been endorsed by CDNANZ and published as best-practice guidelines.

Selected aspects of the Guidelines should be made available to all professionals working with children, including the Education Department and schools, child-care services and child-care centres, hospital staff, general practitioners, laboratory staff, and environmental health officers.

Dissemination

The Commonwealth will be responsible for ensuring that the document is distributed to general practitioners via the Divisions of General Practice. Furthermore, the Commonwealth will provide access to the document via the Commonwealth Department of Health and Aged Care's web site.

The Communicable Diseases Unit in each State/Territory should take the responsibility of distributing the guidelines to other key stakeholders, and ensure that a supportive education program is provided to health-care workers at all levels.

The guidelines should be promoted by the CDNANZ through relevant print media including:

- *Communicable Diseases Intelligence*;
- State/Territory health bulletins;
- Australian medical journals including *Medical Journal of Australia*, *Journal of Paediatrics and Child Health*, *Australian and New Zealand Journal of Public Health* and *Australian Family Physician*;
- medical newsletters eg *Australian Doctor*, *Medical Observer*;
- newsletters of colleges and other relevant health professional groups, eg. Public Health Association, Divisions of General Practice, Australian Nurses Federation, Infection Control Association, Hospital Association, Aboriginal Health Worker Training Centres, Nursing Education Centres, Australian Institute of Environmental Health;

- publications of the education department, child-care services; and
- the usual channels for promoting CDNANZ publications.

These institutions/colleges/professionals should be encouraged to promote the guidelines through scientific meetings, infection control meetings, health departments, seminars.

The knowledge and application of the guidelines could be incorporated into existing accreditation mechanisms eg for hospitals, training programs for nurses, infection control staff, general practitioners and public health professionals.

Barriers for the implementation of these guidelines

Lack of availability or understanding of the guidelines among health professionals should be addressed by State/Territory communicable disease units through their regional public health units.

Evaluation

The most critical components of the measles elimination strategy is measuring and maintaining a high level of uptake of the vaccine combined with an enhanced case based surveillance strategy. Regular evaluation of vaccine coverage rates should continue to be undertaken by the ACIR and reported regularly in *Communicable Diseases Intelligence*.

Process evaluation should include an assessment of:

- the extent of distribution and availability of the guidelines;
- the comprehensibility and acceptability of the guidelines; and
- training programs that are implemented by local public health units.

The effectiveness of the guidelines in reducing the incidence of, and morbidity from measles can be assessed only by scrutiny and analysis of the documentation described in Section 7.1. This should include identification of any deficiencies in the guidelines.

Revision of the guidelines

The recommendations made by these Guidelines should be reviewed annually by the CDNANZ. Furthermore, the complete document should be revised within five years to reflect an even tighter surveillance strategy to ensure the elimination of measles from Australia.

Appendix 4 Immunoglobulin prophylaxis

Immunoglobulin is a human blood-product. However, it is prepared (in Australia) by processes that inactivate (ie destroy) all known viruses including HIV. Immunoglobulin is considered to be safe — there have not been any reports of the spread of viruses such as hepatitis C and HIV through the usage of (Australian) immunoglobulin.

Normal immunoglobulin (human) should be considered for contacts of patients with confirmed or suspected measles. If immunoglobulin is administered within seven days of exposure, it can prevent or modify measles in non-immune persons. It should be given to:

- infants between six and nine months of age if contact was within the last seven days;
- all persons aged nine months and over who have never received MMR vaccination if contact was within three to seven days previously;
- persons aged nine months and over where administration of MMR vaccine would be contraindicated or where the person is assessed to be at risk;
- persons exposed to measles who are immunocompromised, regardless of their previous measles vaccination status; and
- infants under six months of age where the infant's mother is the person infected.

Any person receiving immunoglobulin should subsequently be offered an MMR vaccination if this is not contraindicated. This should be administered no earlier than three months after the immunoglobulin was administered, provided that the person is older than 12 months (Varicella vaccine should not be administered until five months after the administration of immunoglobulin.)

Immunoglobulin should not be used with the primary purpose of controlling a measles outbreak.

Dose

The recommended dose of immunoglobulin is 0.2 mL/kg body weight (maximum dose = 15 mL) given by deep intramuscular injection. Children who have immunodeficiency diseases including leukaemia, lymphoma, Hodgkin's disease, symptomatic HIV infection or other malignancies require a higher dose (0.5 mL/kg body weight, maximum dose = 15 mL). Management of such persons should be discussed with their paediatrician (CDC 1998c).

Contraindications to normal immunoglobulin

- Persons with coagulation disorders are contraindicated.
- Immunoglobulin should not be given to infants under six months of age, unless the infant's mother is the infected contact.

Refusal of immunoglobulin

The contact or his/her parents may refuse immunoglobulin. In this situation, MMR should be offered if the contact is nine months of age or more, even though it is more than three days after the possible exposure. The contact or his/her parents should be informed that the MMR may not prevent measles.

Appendix 5 Sample documentation

A Measles: a guide for parents⁷

Measles sounds innocent enough, but it is actually a serious viral illness. It is highly contagious and causes fever, rash, runny nose, cough and conjunctivitis.

These symptoms usually worsen over three days. The cough tends to be worse at night. The person may wish to avoid light because the eyes are inflamed. At this stage, there may be small white spots on a red base present on the inside of the cheek. These are called Koplik's spots.

Between the third and seventh day of the illness, a rash starts at the hairline and takes one or two days to spread over the body. Once the rash reaches the legs, the rash on the head and face begins to fade. The rash usually disappears after six days. The infection lasts about 10 days, and the cough is usually the last symptom to disappear.

Complications following measles can be very dangerous, and pneumonia occurs in one in 25 cases. Approximately one child in every 2,000 who contracts measles will develop inflammation of the brain (encephalitis). Of every ten children who contract measles encephalitis, one will die and up to four will have permanent brain damage. More deaths have been caused in Australia by measles in the past 15 years than by diphtheria, pertussis and tetanus combined.

When does the person become ill?

The person begins to show symptoms between 8 and 14 days after contact with another person with measles.

How long does the person remain infectious?

The person can spread measles to other people for about five days before the rash appears, and for four days after the rash appears.

What are the responsibilities of parents?

If you think your child has measles keep your child home for at least four days after the rash appears. Make sure all the children at home are vaccinated. If they have not been vaccinated, contact your doctor or on telephone at the <LOCAL> Public Health Unit.

Take your child to see a doctor if you are concerned, but make sure you have an appointment and the receptionist knows that your child may have measles. This is to make sure your doctor is prepared and can take precautions so that your child does not pass the infection on to others at the doctor's rooms, or in hospital. Inform the State/Territory health department or local public health unit that the child may have measles so that appropriate action can be taken to protect other people in the community from catching measles.

⁷ This guide for parents is based on the Measles Information Booklet used during the 1998 MCC.

How can you avoid measles?

The best way to avoid measles infection and its side effects is to have your child vaccinated. The more children who are vaccinated, the less chance there is for an outbreak of measles in the community.

What is the vaccine?

The vaccine used in Australia is called the MMR vaccine and protects your child against measles, mumps and rubella. The MMR vaccine is given by injection in the upper arm. Children do not usually suffer any immediate side effects.

If you have any questions regarding the MMR vaccine, please discuss them with your doctor or health-care provider. Alternatively you can contact your State or Territory Health Department. (Phone numbers are provided on page XXX.) Or, if you are on the Internet, you can visit the Commonwealth Department of Health and Aged Care's web site at <http://immunise.health.gov.au>.

When should your child be vaccinated?

The routine childhood vaccination schedule recommends that the MMR vaccine is given at 12 months and 4 years of age.

Common reactions to the MMR vaccine and what you can do about them.

Many children experience some symptoms following vaccination. Most of these last a short time and the child recovers without any problems.

Common reactions	What to do
<ul style="list-style-type: none"> • Discomfort in the area where injection is given. • The following may occur 5–12 days after vaccination and last less than 48 hours: <ul style="list-style-type: none"> — low grade fever — faint rash (not infectious) — head cold and/or runny nose — cough and/or puffy eyes — swelling of the facial glands may occur about three weeks after vaccination. 	<ul style="list-style-type: none"> • A cold wet cloth on the sore spot where the injection was given will help relieve any discomfort • Give extra fluids to drink • Do not overdress the child if hot • Give paracetamol (dose for weight) to lower temperature every 3–4 hours if needed — up to a maximum of six doses in 24 hours. If fever persists consult your doctor or health-care provider.

What if an outbreak occurs in a school and my child is not vaccinated?

You will be advised of the correct course of action by the school and the local health authorities. If your child remains unvaccinated, he/she may have to be excluded from school until the outbreak is over.

Questions and answers

Q What if my child has had measles, mumps or rubella?

A It is safe to vaccinate a child against the disease even if there is a history of prior infection. Vaccination of someone who is already immune boosts immunity and carries no risk.

Q What if my child has not received a dose of measles vaccine?

A Your child has no protection against measles. You should arrange for your child to receive the MMR vaccine within 72 hours of coming in contact with the person who has measles.

You should then discuss the timing of the second dose with your doctor or health-care provider.

Q What if I'm unsure whether my child has had two doses of the measles vaccine?

A It is safe for your child to have another dose of the measles vaccine as long as there has been a four week interval between the doses.

Q Why are two doses of MMR recommended?

A It is important that all children receive two doses of measles-containing vaccine because the second dose increases the probability of a child being protected against measles. Therefore, the second dose ensures that children receive the best possible protection against the three diseases.

Q Is vaccination compulsory?

A No. Parents can choose whether or not to have their child vaccinated. However, during an outbreak you may be asked to keep your child home from school if they are at risk of contracting measles.

Q What if my child is allergic to eggs?

A Children who are allergic to eggs can be given MMR vaccine. However, children who have an extremely severe reaction to eggs should be vaccinated under close supervision.

Q Should I give my child a dose of paracetamol on the day of the injection?

A No. This is not necessary because if your child gets a fever at all it will occur 5–12 days after the injection. Please refer to 'common reactions to the MMR vaccine'.

Q What if my child has asthma and takes cortisone or prednisone by a ‘puffer’?

A It is safe to vaccinate children with MMR vaccine if they use a ‘puffer’ for asthma. However, children who are taking oral prednisone or cortisone should seek advice from their doctor or health-care provider prior to vaccination.

Q Should the vaccine be given to a women who is or thinks she may be pregnant?

A No. Any woman who is or thinks she may be pregnant should not be vaccinated. Women should also ensure that they do not become pregnant for two months after the vaccination.

Any woman who becomes pregnant within two months after the vaccination should contact her doctor or health-care provider.

Q Is a pregnant woman at risk if she comes into contact with a child who has recently been vaccinated with MMR?

A No. Children who have recently been vaccinated with MMR are not infectious and so do not pose a risk to pregnant women or other persons.

Q Is it true that vaccinated children may still contract one of the diseases ?

A Yes. Vaccination is not 100% effective, but two doses of MMR will protect virtually all children against measles, mumps or rubella. If children do catch the illness they have been vaccinated against, the illness is milder than if they had not received the vaccine.

If enough of the population is vaccinated, those who respond poorly to the vaccine will be much less likely to come in contact with the disease.

NB: A small percentage of vaccinated children will not be fully protected against rubella. Therefore, all women are advised to have their immunity checked before every pregnancy.

Q Can vaccinations overload the immune system?

A No. All children and adults come into contact with many viruses, bacteria and other agents (such as the common cold viruses), that stimulate the immune system each day.

The body is always preparing an immune response against some agent. Vaccination adds only a tiny amount to this normal activity.

Vaccinations have an advantage over their corresponding natural diseases because they provide protection without causing the disease.

Q Is natural immunity better than vaccine-induced immunity?

A Natural immunity and vaccine-induced immunity are both natural responses of the body's immune system and response in both circumstances is the same.

The problem is that with 'natural' disease, the risks of serious illness, disability, and death are high. Vaccinations are very much safer than catching the 'natural' disease.

A healthy lifestyle, including good nutrition and hygiene and clean water supplies, does not produce the necessary immune response to protect a child from serious infection.

Q Is homoeopathic 'vaccination' of any value?

A No. Homoeopathic 'vaccination' offers no protection against infectious diseases. Only conventional vaccination produces a measurable immune response and protection against disease.

Q Are any animal products used in the vaccine that may not be acceptable to certain religions?

A MMRII, one of the measles vaccines, contains a small amount of porcine (pork) gelatin which acts as a stabiliser. Priorix, the other brand of MMR vaccine, does not contain porcine gelatin. Components of porcine gelatin are used in the early stages of the manufacture of this product but are removed in subsequent stages. Those with religious objections to pork products may request the Priorix vaccine.

Comparison of some effects of diseases and vaccines

Disease	Effects of disease	Side effects of vaccine
<p><i>Measles</i></p> <p>Highly contagious virus spread by coughing and nasal droplets. After incubation for 1–2 weeks, the infection causes fever, sore throat, cough, runny nose, itchy eyes, and a red rash that starts on the face and spreads to the rest of the body.</p>	<p>1 in 25 children with measles develops pneumonia and 1 in 2,000 develops encephalitis (inflammation of the brain). For every 10 children who develop measles encephalitis, 1 will die, and up to 4 will have permanent brain damage. About 1 in 25,000 will develop SSPE (brain degeneration) which is always fatal.</p>	<p>About 10% have discomfort, local inflammation or fever, About 1% develop a rash, which is non-infectious. 1 in 1 million recipients may develop mild encephalitis (inflammation of the brain).</p>
<p><i>Mumps</i></p> <p>Contagious virus spreads by saliva. After incubating for 2–3 weeks, the infection causes fever and painful swollen salivary glands.</p>	<p>1 in 200 children develops encephalitis (brain inflammation). 1 in 5 males past puberty develops inflammation of the testicles. Occasionally, mumps causes infertility or deafness.</p>	<p>1 in 100 recipients may develop swelling of the salivary glands. 1 in 3 million recipients will develop a mild encephalitis (brain inflammation).</p>
<p><i>Rubella</i></p> <p>Contagious virus spread by nasal droplets. After incubating for 2–3 weeks, the infection causes fever, headache, itchy eyes, swollen glands behind the ears and neck and a rash.</p>	<p>50% develop rash and painful swollen glands. 50% of adolescents and adults have painful joints. 1 in 3,000 develop thrombocytopenia (bruising or bleeding); 1 in 6,000 develops inflammation of the brain. 90% of babies infected during the first 10 weeks after conception will have a major congenital abnormality (such as deafness, blindness, brain damage or heart defects).</p>	<p>About 10% have discomfort, local inflammation or fever. About 5% have swollen glands, stiff neck or joint pains. About 1% have a rash, which is non-infectious. Thrombocytopenia (bruising or bleeding) occurs after the first dose of MMR at a rate of 1 in 30,500.</p>

B Sample letter from child-care supervisor or school principal to parents/guardians

Dear Parent/Guardian,

I am writing to inform you thatchild/ren at the (facility) have developed measles since .././....

We are working with the (Public Health Unit) to prevent more cases of measles at the(facility).

Please read the information in the measles pamphlet attached to this letter.

If your child has a skin rash, fever, cough, a runny nose or red or watery eyes, please do not send them to child care/school. Keep your child at home, and inform:

.....at the child-care centre/school, on telephone number.....;

Contact your family doctor if you need any advice on treatment.

Take your child to see a doctor if you are concerned, but make sure that you have an appointment and that the receptionist knows that the child may have measles. This is to ensure that your doctor is prepared and can take precautions so that the infection is not passed on to others at the doctor's rooms, or in hospital. Please take this letter with you.

Please check that all your children have received the vaccine against measles. If you are unsure, contact your family doctor or at the Public Health Unit.

1. Vaccination against measles is available from your doctor, or from the.....(health centre), on Mondays to Fridays betweenam andpm.

OR

2. The.....Public Health Unit will provide vaccinations to children at the (facility) on .././.... Please read and sign the attached letter if you would like to have your child vaccinated against measles. Children without a completed and signed consent form will not be vaccinated on the day.

Principal/Supervisor

To apply the exclusion policy, use this section

Dear Parent/Guardian,

I am writing to inform you thatchild/ren at the (facility) have developed measles since .././....

We are working with the (Public Health Unit) to prevent more cases of measles at the(facility).

Our vaccination certificate records show that <CHILD'S NAME> has either not had the measles vaccine, or does not have a vaccination certificate. <CHILD'S NAME> may be at risk of catching measles.

Please read the information in the measles pamphlet attached to this letter.

I have been advised by the local medical officer of health under theAct of (year) to notify you that your child should not attend child care/school until <DATE>. This measure is necessary to protect both your child and other children from measles.

(Insert this paragraph if the child can return after vaccination)

However, if you take your child to your local doctor or health centre for the vaccination before <DATE>, your child can return to child care/school immediately after the vaccine is given. If you do this you must also provide the school with a vaccination certificate showing that it was given. This will ensure your child is not excluded in future outbreaks of measles.

1. Vaccination against measles is available from your doctor, or from the.....(health centre), on Mondays to Fridays betweenam andpm.

OR

2. The.....Public Health Unit will provide vaccinations to children at the (facility) on .././.... Please read and sign the attached Consent if you would like to have your child vaccinated against measles. Children without a completed and signed consent form will not be vaccinated on the day.

If this outbreak of measles continues and you have not taken up the offer to vaccinate, your child may need to be excluded from school for a longer period. If this happens I will send you another letter.

Thank you for your cooperation in this important matter. Should you require further information, the medical officer of health <NAME> can assist on telephone number.....

Principal/Supervisor

C Consent forms

School-based sample consent form for vaccination⁸ against Measles Mumps Rubella (German Measles)

Dear Parent/Guardian,

Measles has been reported this week in children attending the (facility). ThePublic Health Unit will run a measles vaccination campaign at(facility) on/..

Enclosed is a leaflet providing information about the disease and vaccination.

This is an opportunity to update your children's vaccinations. A combined measles-mumps-rubella (MMR) vaccine is used in Australia which protects against all three diseases.

It is important to check for a written record of previous measles vaccination. If you are in any doubt, it is safer to vaccinate your child now, as more than two doses is not harmful.

We need your consent before we can vaccinate your child. Please indicate whether or not you wish your child to be vaccinated by completing the attached form.

Please return this form by/..Children without a signed consent form will not be vaccinated.

Parents/guardians who wish to discuss any aspect of the disease and possible adverse effects of vaccination are encouraged to phone the Public Health Unit on

Record of vaccination

(Do not fill in — for Department of Health use only.)

VACCINE ADMINISTERED: _____

DATE VACCINE GIVEN: _____

VACCINE BATCH NUMBER: _____

PROVIDER SIGNATURE: _____

⁸ This consent form is based on the primary school consent form used during the 1998 MCC.

Measles Mumps Rubella (German Measles) Vaccination Consent Form

Parent/Guardian to complete and sign if consenting to vaccination

School/preschool/child-care centre: _____

Class: _____

Child's Details

I hereby give consent for my son/daughter/ward:

Child's Family Name: _____

Child's Given Name: _____

To receive the three-in-one injection (MMR) against measles, mumps and rubella.

My son/daughter/ward is NOT:

- (a) suffering from an acute fever, with a temperature over 38.5°C;
- (b) suffering from a malignant condition (eg cancer) or tuberculosis;
- (c) suffering from a disease which lowers immunity (eg leukaemia or HIV/AIDS);
- (d) receiving treatment with cortisone/prednisone like drug or immunosuppressive therapy including radiation;
- (e) allergic to the antibiotic neomycin;
- (f) pregnant, or likely to become pregnant within two months of vaccination;

and has NOT HAD:

- (g) an immunoglobulin injection or blood transfusion within the past three months;
- (h) a live vaccine within the past four weeks (eg BCG (tuberculosis), varicella (chicken pox).

If you are unsure about items (a) to (h) above, please discuss with your doctor or health-care provider.

I have also read and understand *Measles: A Guide for Parents*.

Signed: _____ **Date:** _____

(parent/guardian)

Home Address: _____

Postcode: _____ **Tel: (H)** _____ **(W)** _____

NB: All children will be checked by the health-care provider on the day of the clinic and will not be vaccinated if they are suffering an acute illness, with a fever. If any circumstances change after you have signed the Consent Form (eg medical history has changed, new medication or fever on the day of the clinic) please notify the school/preschool/child-care centre.

PLEASE RETURN THIS FORM INTACT TO THE SCHOOL BY/..../....

Adult Consent Form

Measles Mumps Rubella (German Measles) Vaccination Consent Form.

Personal Details

Family Name: _____

Given Name: _____

Home Address: _____

Postcode: _____ Tel: (H) _____ (W) _____

I hereby give consent to receive the three-in-one injection (MMR) against measles, mumps and rubella.

I am NOT:

- (a) suffering from an acute fever, with a temperature over 38.5°C;
- (b) suffering from a malignant condition (eg cancer) or tuberculosis;
- (c) suffering from a disease which lowers immunity (eg leukaemia or HIV/AIDS);
- (d) receiving treatment with cortisone/prednisone like drug or immunosuppressive therapy including radiation;
- (e) allergic to the antibiotic neomycin;
- (f) pregnant, or likely to become pregnant within two months of vaccination;

and have NOT HAD:

- (g) an immunoglobulin injection or blood transfusion within the past three months;
- (h) a live vaccine within the past four weeks (eg BCG (tuberculosis), varicella (chicken pox)).

If you are unsure about items (a) to (h) above, please discuss with your doctor or health-care provider.

I have read the common reactions and comparison of effects of diseases and vaccines on the back of this consent form.

Signed: _____ Date: _____

Record of vaccination

(Do not fill in — for Department of Health use only.)

VACCINE ADMINISTERED: _____

DATE VACCINE GIVEN: _____

VACCINE BATCH NUMBER: _____

PROVIDER SIGNATURE: _____

Common reactions to the MMR vaccine and what you can do about them.

Many people experience some symptoms following vaccination. Most of these last a short time and the person recovers without any problems.

Common reactions	What to do
<ul style="list-style-type: none"> • Discomfort in the area where injection is given. • The following may occur 5–12 days after vaccination and last less than 48 hours: <ul style="list-style-type: none"> — low grade fever — faint rash (not infectious) — head cold and/or runny nose — cough and/or puffy eyes — swelling of the facial glands may occur about three weeks after vaccination. 	<ul style="list-style-type: none"> • A cold wet cloth on the sore spot where the injection was given will help relieve any discomfort • Give extra fluids to drink • Do not overdress the person if hot • Give paracetamol (dose for weight) to lower temperature every 3–4 hours if needed — up to a maximum of six doses in 24 hours. If fever persists consult your doctor or health-care provider.

Comparison of some effects of diseases and vaccines.

Disease	Effects of disease	Side effects of vaccine
<p>Measles</p> <p>Highly contagious virus spread by coughing and nasal droplets. After incubation for 1–2 weeks, the infection causes fever, sore throat, cough, runny nose, itchy eyes, and a red rash that starts on the face and spreads to the rest of the body.</p>	<p>1 in 25 children with measles develops pneumonia and 1 in 2,000 develops encephalitis (inflammation of the brain). For every 10 children who develop measles encephalitis, 1 will die, and up to 4 will have permanent brain damage. About 1 in 25,000 will develop SSPE (brain degeneration) which is always fatal.</p>	<p>About 10% have discomfort, local inflammation or fever, About 1% develop a rash, which is non-infectious. 1 in 1 million recipients may develop mild encephalitis (inflammation of the brain).</p>
<p>Mumps</p> <p>Contagious virus spreads by saliva. After incubating for 2–3 weeks, the infection causes fever and painful swollen salivary glands.</p>	<p>1 in 200 children develops encephalitis (brain inflammation). 1 in 5 males past puberty develops inflammation of the testicles. Occasionally, mumps causes infertility or deafness.</p>	<p>1 in 100 recipients may develop swelling of the salivary glands. 1 in 3 million recipients will develop a mild encephalitis (brain inflammation).</p>
<p>Rubella</p> <p>Contagious virus spread by nasal droplets. After incubating for 2–3 weeks, the infection causes fever, headache, itchy eyes, swollen glands behind the ears and neck and a rash.</p>	<p>50% develop rash and painful swollen glands. 50% of adolescents and adults have painful joints. 1 in 3,000 develop thrombocytopenia (bruising or bleeding); 1 in 6,000 develops inflammation of the brain. 90% of babies infected during the first 10 weeks after conception will have a major congenital abnormality (such as deafness, blindness, brain damage or heart defects).</p>	<p>About 10% have discomfort, local inflammation or fever. About 5% have swollen glands, stiff neck or joint pains. About 1% have a rash, which is non-infectious. Thrombocytopenia (bruising or bleeding) occurs after a first dose of MMR at a rate of 1 in 30,500.</p>

Immunoglobulin consent form

Immunoglobulin is a human blood-product. However, it is prepared (in Australia) by processes that inactivate (ie destroy) all known viruses including HIV.

Immunoglobulin is considered to be safe — there have not been any reports of the spread of viruses such as hepatitis C and HIV through the usage of (Australian) immunoglobulin.

Normal immunoglobulin (human) should be considered for contacts of patients with confirmed or suspected measles. If immunoglobulin is administered within seven days of exposure, it can prevent or modify measles in non-immune persons. It should be given to:

- infants between six and nine months of age if contact was within the last seven days;
- all persons aged nine months and over who have never received MMR vaccination if contact was within three to seven days previously;
- persons aged nine months and over where administration of MMR vaccine would be contraindicated or where the person is assessed to be at risk;
- persons exposed to measles who are immunocompromised; and
- infants under six months of age where the infant's mother is the person infected.

Any person receiving immunoglobulin should subsequently be offered an MMR vaccination if this is not contraindicated. This should be administered no earlier than three months after the immunoglobulin was administered, provided that the person is older than 12 months. Varicella vaccine should not be administered until five months after the administration of immunoglobulin.

Personal Details

Family Name: _____

Given Name: _____

Home Address: _____

Postcode: _____ Tel: (H) _____ (W) _____

I hereby give consent to receive immunoglobulin**I do NOT** suffer from a coagulation disorder.**If you are unsure please discuss with your doctor or health-care provider.****I have read the information on immunoglobulin provided above.****Signed:** _____**Date:** _____**Record of vaccination****(Do not fill in — for Department of Health use only.)****ADMINISTERED:** _____**DATE GIVEN:** _____**BATCH NUMBER:** _____**PROVIDER SIGNATURE:** _____

D Sample letter to doctors

ALERT: Measles has just been reported in

On .../.../.... the <insert name of PHU> Public Health Unit was notified ofcases with measles in(area). It is likely that there are other cases in the community.

MEASLES — THE FACTS

Measles is an acute viral illness transmitted by aerosol spread. The incubation period is about ten days. It is highly infectious from the beginning of the prodromal (approximately five days before the appearance of the rash) period to four days after the appearance of the rash. Measles is often a severe disease, and can be complicated by otitis media (2.5%) or bronchopneumonia (4%). Encephalitis occurs in about one in every 2,000 reported cases, and survivors of this complication often have permanent brain damage. Deaths can occur especially among children with immunodeficiencies and in very young infants.

DIAGNOSIS OF MEASLES

Please apply the following definition to make an early diagnosis of measles, and to allow for control measures to be implemented promptly:

An illness characterised by:

1. morbilliform rash, and
2. cough; and
3. fever present at the time of rash onset.

Please refer to the attached information sheet that outlines the general practitioner's response to measles outbreaks.

You can obtain further information from your State/Territory health department or local public health unit on telephone.....or the Commonwealth Department of Health and Aged Care's web site on: <http://www.health.gov.au>

What you could do

- Notify any patient who you think could have measles to your Public Health Unit.
- Maintain surveillance for more cases in your practice.
- Review the vaccination status of all persons born after 1970 who attend your practice for any reason, and offer MMR vaccination to all susceptibles.

Public Health Unit

E Measles report form

State/Territory	Reporting GP/Clinic/Laboratory/Hospital _____		Address _____		Phone _____	
	Patient name _____		First name _____			
	Address (No. & Street) _____		Town/Suburb _____		Phone _____	
Patient details	Postcode	State/Territory	Notification date – State			State/Territory Identification No. _____
	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>		
	Date of birth		Date received – national			Sex <input type="checkbox"/> M = male, F = female, U = unknown
	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>		
	Age	Unit (if DOB if unknown)		ATSI origin <input type="checkbox"/>		
	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/>		A = Aboriginal or Torres Strait Islander, N = not Aboriginal or Torres Strait Islander, U = unknown		
	Unknown = 99	Y = years, M = months (if < 2 years)				
Clinical data	<input type="checkbox"/> Morbilliform rash?		Date of rash onset			
	<input type="checkbox"/> Cough? Y = yes, N = no, U = unknown		<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	
	<input type="checkbox"/> Fever at time of rash onset?		Day	Month	Year	
Complications	Hospitalised? <input type="checkbox"/> Y = yes, N = no, U = unknown		<input type="checkbox"/> Pneumonia?		Died? <input type="checkbox"/>	
	Date of hospitalisation? <input type="text"/> <input type="text"/> <input type="text"/>		<input type="checkbox"/> Encephalitis?		Date of death? <input type="text"/> <input type="text"/> <input type="text"/>	
	Days hospitalised? <input type="text"/> <input type="text"/> <input type="text"/> Unknown = 99		<input type="checkbox"/> Seizures?		Day Month Year	
			Y = yes, N = no, U = unknown		Cause of death _____	
Laboratory	Was laboratory testing for measles done? <input type="checkbox"/> Y = yes, N = no, U = unknown			If laboratory confirmed, date of first positive test		
	Date specimen taken			<input type="text"/> <input type="text"/> <input type="text"/>		
	Serum IgM	<input type="text"/> <input type="text"/> <input type="text"/>	Result	P = positive N = negative R = diagnostic rise/seroconversion I = intermediate E = pending X = not done U = unknown		
	Serum IgG*	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/>	Day Month Year		
Culture/antigen	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/>	Note: positive diagnosis by IgG requires seroconversion or diagnostic rise in paired sera. * For IgG specimen date, only provide the date the second serum was taken.			
	Day	Month	Year			
Epidemiological	Date investigation started		Where did this case most likely acquire measles? (1–9)			1 = home
	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/> Was there further documented spread from this case? Y = yes, N = no, U = unknown			2 = day care/preschool
	<input type="checkbox"/> Epi-linked?		<input type="checkbox"/> If yes, where did it spread to? (1–10)			3 = primary school
	<input type="checkbox"/> If epi-linked, was this case linked to an imported case?		<input type="checkbox"/> If case originated from No. 6–8, indicate patient's role (No. 12–15)			4 = secondary school
	<input type="checkbox"/> Outbreak related?		<input type="checkbox"/> Did this case arrive from overseas <18 days before rash onset? Y = yes, N = no, U = unknown			5 = university/college
	Outbreak name/number _____		<input type="checkbox"/> Did this case arrive from interstate <18 days before rash onset? Y = yes, N = no, U = unknown			6 = workplace
		If yes, country arriving from _____			7 = hospital	
		If yes, State/Territory arriving from _____			8 = other health-care facility	
					9 = remote community	
					10 = other	
					11 = spread to >1 setting	
					12 = health-care worker	
					13 = patient	
					14 = visitor to hospital or health facility	
					15 = other role	
					99 = unknown	
Vaccination	<input type="checkbox"/> Ever had measles-containing vaccine?		Date given		Information source	
	<input type="checkbox"/> Number of doses of measles-containing vaccines prior to illness onset?		1st <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/> 1 = Parental recall/self report	
			2nd <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/> 2 = Parent record	
			3rd <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/> 3 = Provider record	
		Day	Month	Year	<input type="checkbox"/> 4 = ACIR record	
					<input type="checkbox"/> 5 = State/local government register	
					<input type="checkbox"/> 6 = Other	
					<input type="checkbox"/> 9 = Unknown	
Final	Final case classification			Preventable?		
	<input type="checkbox"/> S = suspected, C = laboratory confirmed, R = rejected, X = lost to follow up			<input type="checkbox"/> Y = yes, N = no		

Contacts of a case

Name							
Age							
Sex							
Relationship							
Telephone							
Institution – child-care centre/ school							
Previous MMR/MM/M – First dose							
Previous MMR/MM/M – Second dose							
MMR given (DATE)							
Immunoglobulin given							
Rash illness							

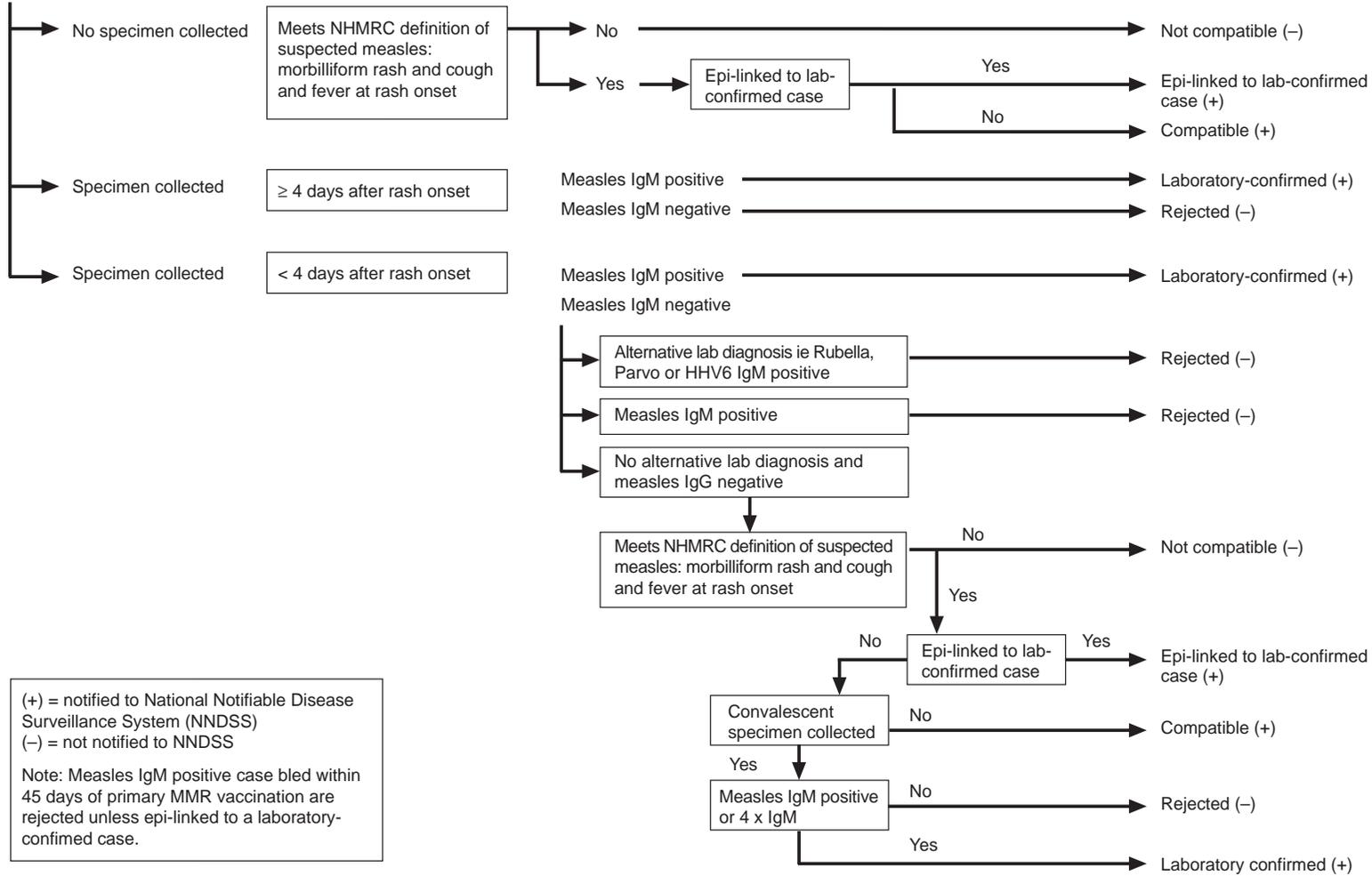
Comments

Final classifications:	Confirmed:	Laboratory Clinical	Discarded Final diagnosis _____
Possible source of infection: _____			

Appendix 6 Flow charts relating to measles diagnosis and outbreak control

A Decision tree for classifying a person with suspected measles

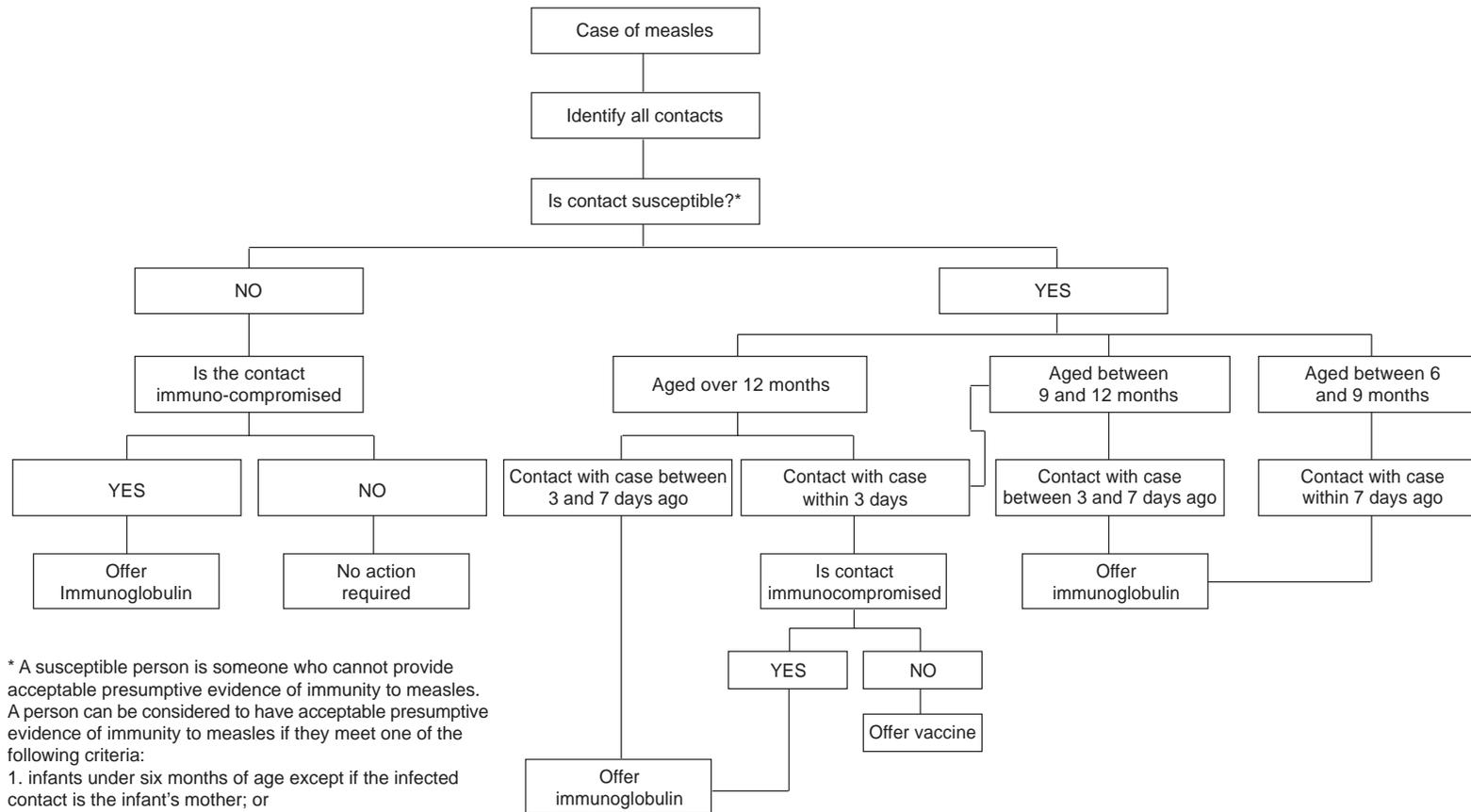
Suspected measles



(+) = notified to National Notifiable Disease Surveillance System (NNDSS)
 (-) = not notified to NNDSS

Note: Measles IgM positive case bled within 45 days of primary MMR vaccination are rejected unless epi-linked to a laboratory-confirmed case.

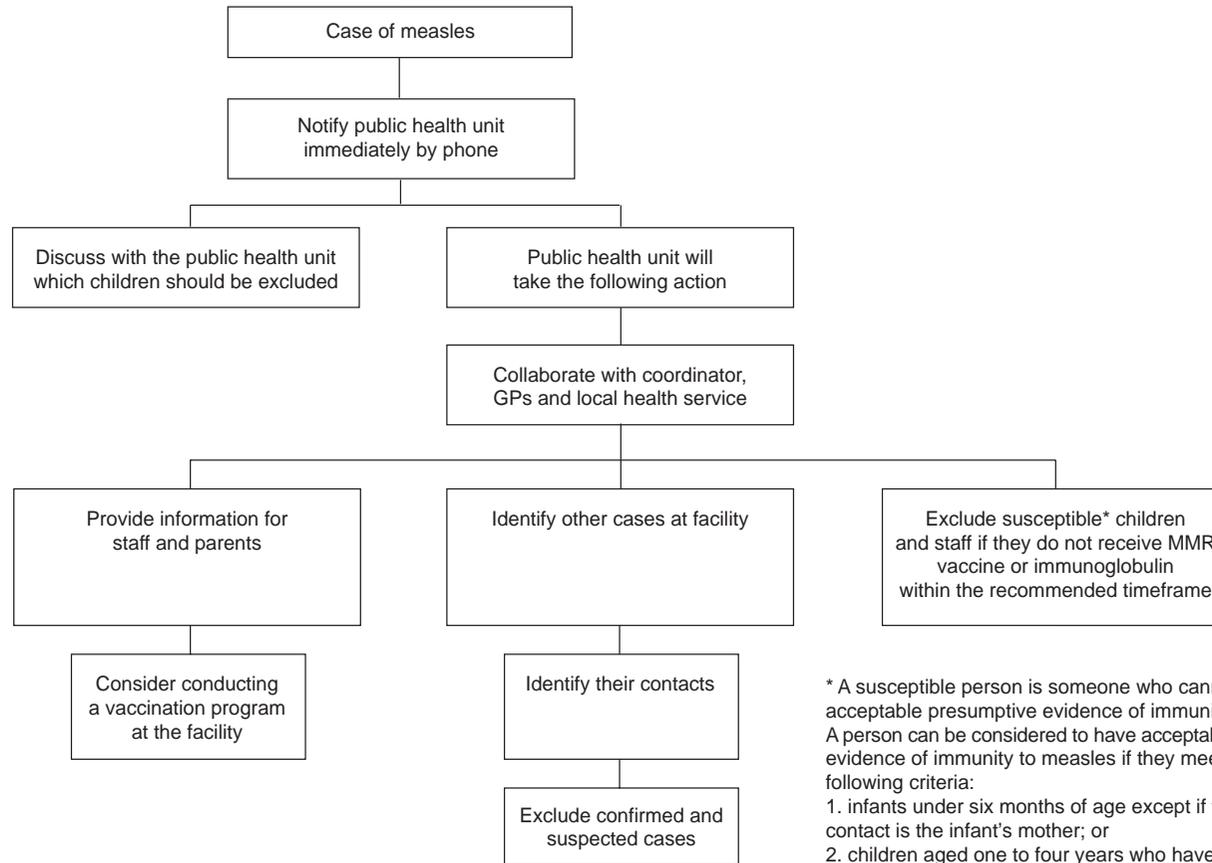
B Assessment and management of contacts of persons with measles



* A susceptible person is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

1. infants under six months of age except if the infected contact is the infant's mother; or
2. children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
3. persons over four years of age or born during or after 1970 (unless sero-surveillance data shows otherwise) who have documented evidence or receiving two doses of a measles-containing vaccine; or
4. persons born before 1970 (unless sero-surveillance data shows otherwise); or
5. persons with documented evidence of immunity; or
6. persons with documented evidence of confirmed measles.

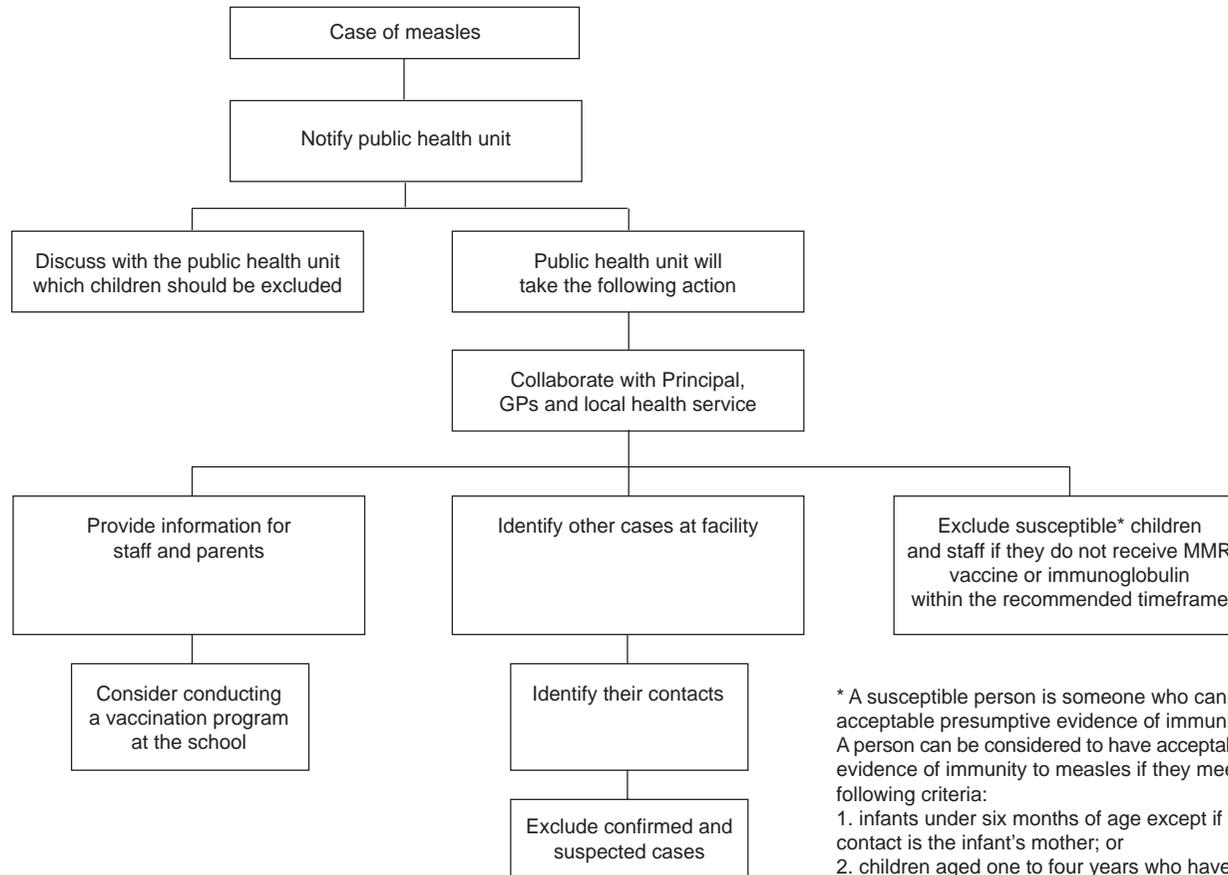
C Measles control in child-care facilities



* A susceptible person is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

1. infants under six months of age except if the infected contact is the infant's mother; or
2. children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
3. persons over four years of age or born during or after 1970 (unless sero-surveillance data shows otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
4. persons born before 1970 (unless sero-surveillance data shows otherwise); or
5. persons with documented evidence of immunity; or
6. persons with documented evidence of confirmed measles.

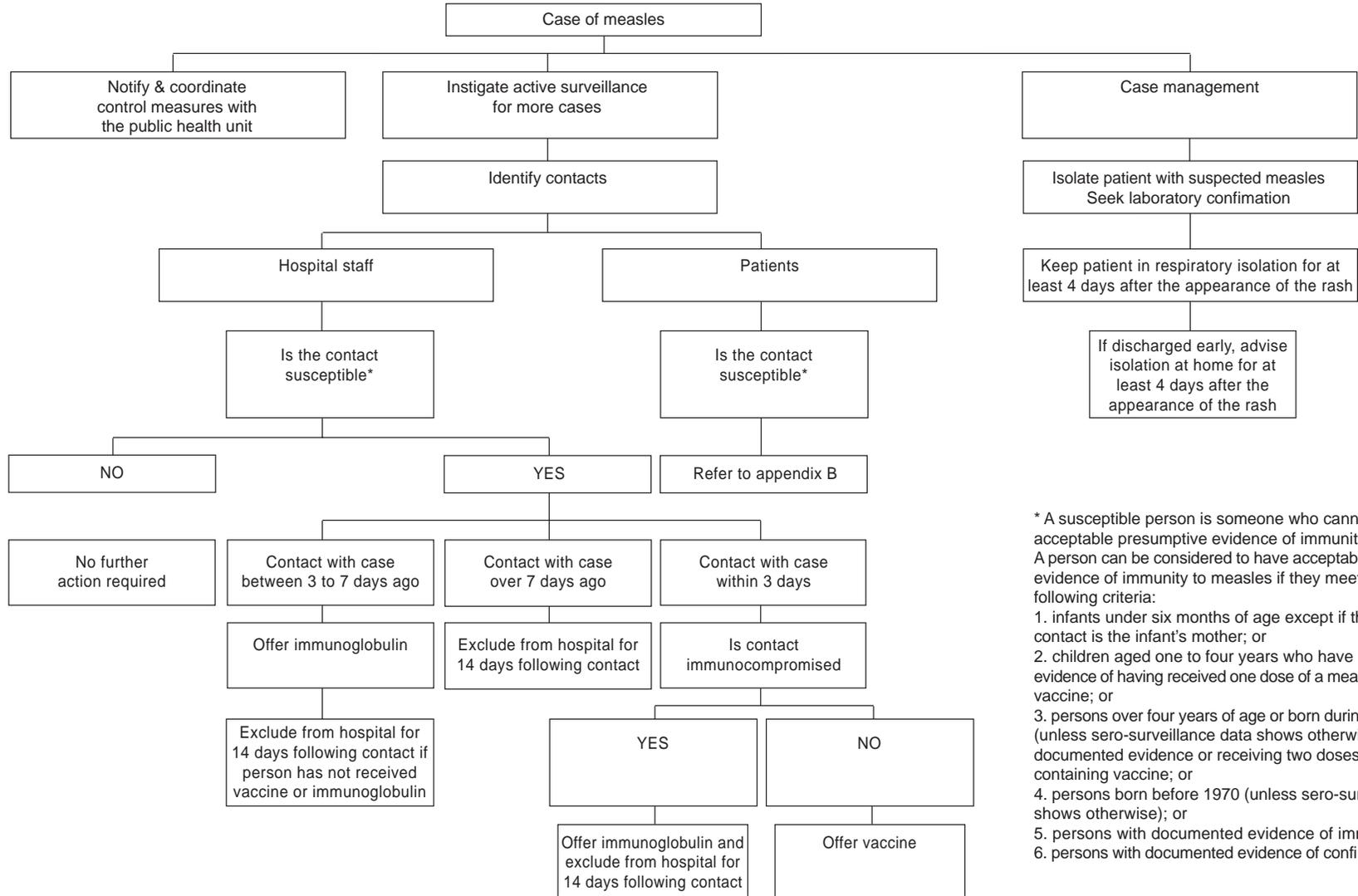
D Measles control in schools



* A susceptible person is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

1. infants under six months of age except if the infected contact is the infant's mother; or
2. children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
3. persons over four years of age or born during or after 1970 (unless sero-surveillance data shows otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
4. persons born before 1970 (unless sero-surveillance data shows otherwise); or
5. persons with documented evidence of immunity; or
6. persons with documented evidence of confirmed measles.

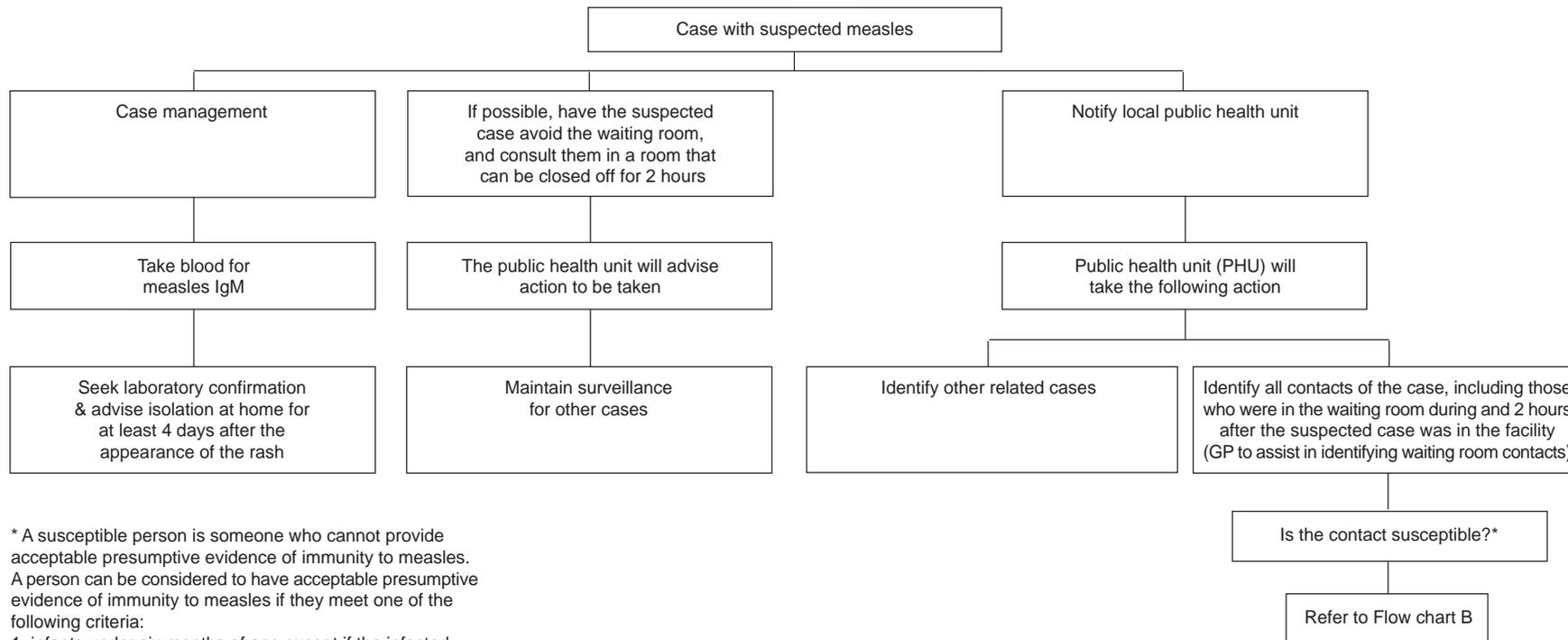
E Measles control in hospitals



* A susceptible person is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

1. infants under six months of age except if the infected contact is the infant's mother; or
2. children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
3. persons over four years of age or born during or after 1970 (unless sero-surveillance data shows otherwise) who have documented evidence or receiving two doses of a measles-containing vaccine; or
4. persons born before 1970 (unless sero-surveillance data shows otherwise); or
5. persons with documented evidence of immunity; or
6. persons with documented evidence of confirmed measles.

F The general practitioner's response



* A susceptible person is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

1. infants under six months of age except if the infected contact is the infant's mother; or
2. children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
3. persons over four years of age or born during or after 1970 (unless sero-surveillance data shows otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
4. persons born before 1970 (unless sero-surveillance data shows otherwise); or
5. persons with documented evidence of immunity; or
6. persons with documented evidence of confirmed measles.

Appendix 7 Information sheets

Control of measles outbreaks in child-care centres

Measles sounds innocent enough, but it is actually a serious viral illness. It is highly contagious and causes fever, rash, runny nose, cough and conjunctivitis. These symptoms usually worsen over three days. The cough tends to be worse at night. The person may wish to avoid light because the eyes are inflamed. At this stage, there may be small white spots on a red base present on the inside of the cheek (Koplik's spots). Between the third and seventh day of the illness, a rash starts at the hairline and takes one or two days to spread over the body. Once the rash reaches the legs, the rash on the head and face begins to fade. The rash usually disappears after six days. The infection lasts about 10 days, and the cough is usually the last symptom to disappear.

As measles can pose a significant threat to a person's health, every effort must be made to arrest the indigenous transmission of measles in Australia. In response to the high incidence of measles, the Measles Elimination Advisory Committee has developed guidelines for the control of outbreaks in Australia. Child-care centre staff are encouraged to access information on measles and its control by maintaining contact with their State/Territory health department or local public health units. Maintaining records on the Measles Mumps Rubella (MMR) vaccination status of each child at the centre will assist in the identification of susceptible contacts in the event of an outbreak.

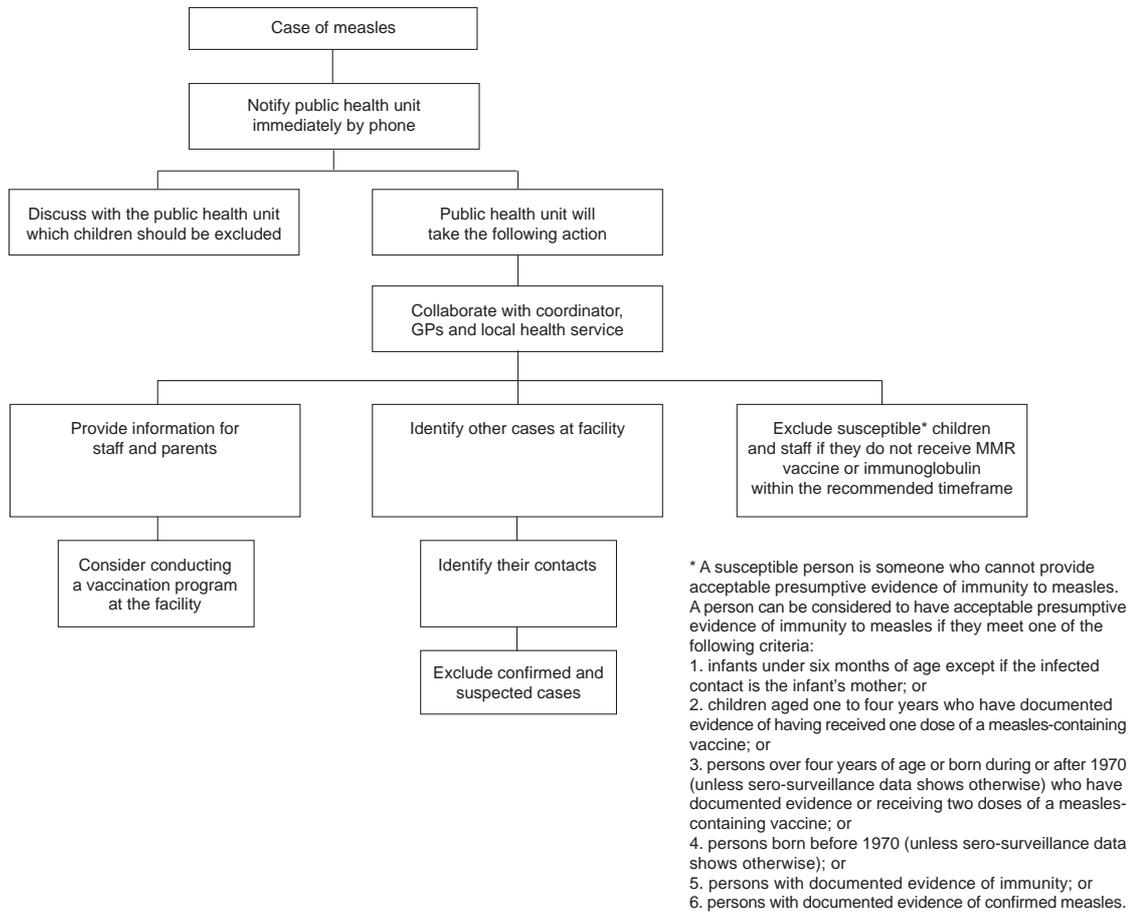
If a case of measles is detected, the following steps should be taken:

- notify the local public health authority.

If the case is confirmed by the public health unit:

- provide staff and parents with written information; and
- exclude susceptible infants, children and staff from the child-care centre; and
- encourage susceptibles to consult an immunisation provider to seek advice regarding receiving a MMR vaccine or immunoglobulin.

Measles control in child-care facilities



Information for parents and staff

Staff and parents should be provided with written information about:

- the symptoms, signs and potential complications of measles;
- the need to alert a doctor's surgery or the Emergency Department of the hospital before taking a child with suspected measles for assessment;
- any plans for a catch-up vaccination clinic at the centre or local health service;
- the need to keep a child with suspected measles at home, isolated, until assessed by a medical practitioner and/or for at least four days after the appearance of the rash;
- the need for any new cases to be notified to the child-care centre and local public health unit by telephone; and
- the reasons why parents/guardians of immunocompromised contacts should be notified of a measles outbreak as a matter of urgency.

Vaccination for susceptible contacts

Age group	Exposure occurred:	
	< 3 days	3–7 days
<6 months	Infants under 6 months of age should not be given MMR. Immunoglobulin should only be given if the infected contact is the infant's mother.	
6–9 months	Infants under 9 months of age should not be given MMR. Immunoglobulin should be given if contact occurred within the last 7 days.	
9–12 months	MMR vaccine — A further dose of MMR should be given at 12 months of age or 4 weeks after the first dose, whichever is later. This second dose does not replace the routine dose of MMR at 4 years.	Immunoglobulin.
1–4 years	MMR vaccine — if the child has never received a dose of measles-containing vaccine. The second dose of MMR can be given early. The child is then considered to have completed their MMR vaccination schedule and does not require another dose at 4 years of age. There should be a minimum of 4 weeks between the first and second dose.	Immunoglobulin — if the child has never received a dose of measles-containing vaccine.
Adults	MMR vaccine should be given to susceptible adults. Immunoglobulin should be given if MMR vaccine is contraindicated.	Immunoglobulin should be given to persons who have never been given measles-containing vaccine.

Exclusion from child-care

- People with measles should be excluded from the child-care centre for at least four days after appearance of the rash.
- Children of one to four years of age who have received one dose of MMR (ie are vaccinated up to date) are not to be considered susceptible. However, during an outbreak it should be strongly recommended that these children receive their second dose of MMR early. These children should not receive immunoglobulin.
- Susceptible contacts who do not receive MMR vaccine within three days of exposure or immunoglobulin within seven days of exposure are to be excluded for 14 days after the appearance of the rash in the last case occurring at the centre and observed for signs and symptoms of measles. Children may return earlier if they receive a MMR vaccination within three days of exposure or receive immunoglobulin within seven days of exposure.
- In consultation with the patients' treating doctors, immunocompromised persons (eg children or staff with malignancies or HIV/AIDS, or those receiving immunosuppressive therapy), should be excluded regardless of their measles vaccination status. If they receive immunoglobulin, it is still advisable to exclude them for their own safety, until 14 days after appearance of the rash in the last case.
- Any potential visitors to an event at an affected child-care centre should be informed of the risk that unvaccinated persons may acquire measles.

Control of measles outbreaks in schools

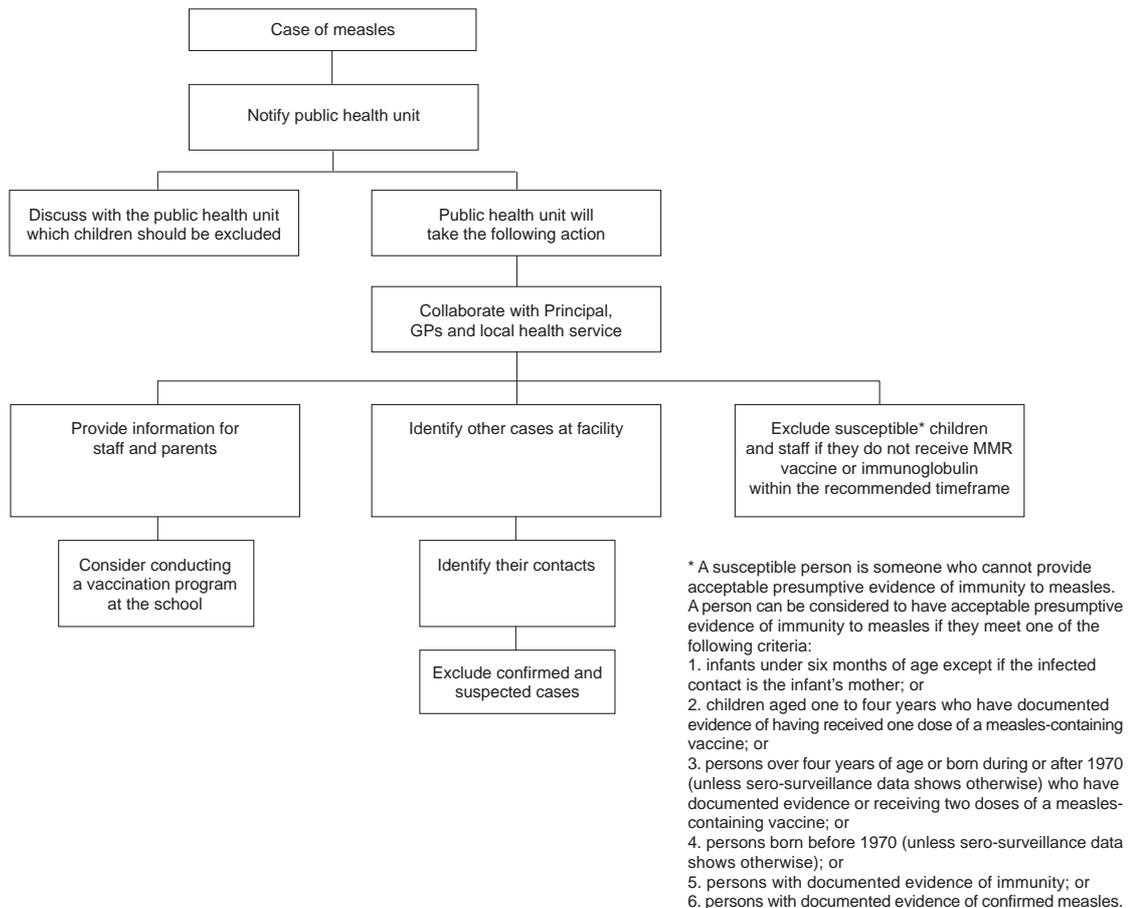
Measles sounds innocent enough, but it is actually a serious viral illness. It is highly contagious and causes fever, rash, runny nose, cough and conjunctivitis. These symptoms usually worsen over three days. The cough tends to be worse at night. The person may wish to avoid light because the eyes are inflamed. At this stage, there may be small white spots on a red base present on the inside of the cheek (Koplik's spots). Between the third and seventh day of the illness, a rash starts at the hairline and takes one or two days to spread over the body. Once the rash reaches the legs, the rash on the head and face begins to fade. The rash usually disappears after six days. The infection lasts about 10 days, and the cough is usually the last symptom to disappear.

As measles can pose a significant threat to a person's health, every effort must be made to arrest the indigenous transmission of measles in Australia. In response to the high incidence of measles, the Measles Elimination Advisory Committee has developed guidelines for the control of outbreaks in Australia. School staff are encouraged to access information on measles and its control by maintaining contact with their State/Territory health departments or local public health units. Maintaining records on the Measles Mumps Rubella (MMR) vaccination status of each child at the school will assist in the identification of susceptible contacts in the event of an outbreak.

If a case of measles is detected, the following steps should be taken:

- notify the local public health authority;
- provide staff and parents with written information;
- exclude susceptible children and staff from the school; and
- encourage susceptibles to consult an immunisation provider to seek advice regarding receiving MMR vaccine or immunoglobulin.

Measles control in schools



Information for parents and staff

Staff and parents should be provided with written information about:

- the symptoms, signs and potential complications of measles;
- the need to alert a doctor's surgery or the Emergency Department of the hospital before taking a child with suspected measles for assessment;
- any plans for a catch-up vaccination clinic at the school or local health service;
- the need to keep a child with suspected measles at home, isolated, until assessed by a medical practitioner and/or for at least four days after the appearance of the rash;
- the need for any new cases to be notified to the school and local public health unit by telephone; and
- the reasons why parents/guardians of immunocompromised contacts should be notified of a measles outbreak as a matter of urgency.

Vaccination for susceptible contacts

Age group	Exposure occurred:	
	< 3 days	3–7 days
1–4 years	MMR vaccine — if the child has never received a dose of measles-containing vaccine. The second dose of MMR can be given early. If a child receives the second dose early they are considered to have completed their MMR vaccination schedule and do not require another dose at 4 years of age. There should be a minimum of 4 weeks between the first and second dose.	Immunoglobulin should be given to persons who have never been given measles-containing vaccine .
Children > 4 years*	MMR vaccine should be given.#	
Adults	Immunoglobulin — if MMR vaccine is contraindicated.	

* It is expected that most children of this age group will have received two doses of MMR vaccine before starting school. Children who have received one dose only should be given their second dose.

If a person receives their first dose during an outbreak they should be encouraged to return in four weeks to receive their second dose.

Exclusion from school

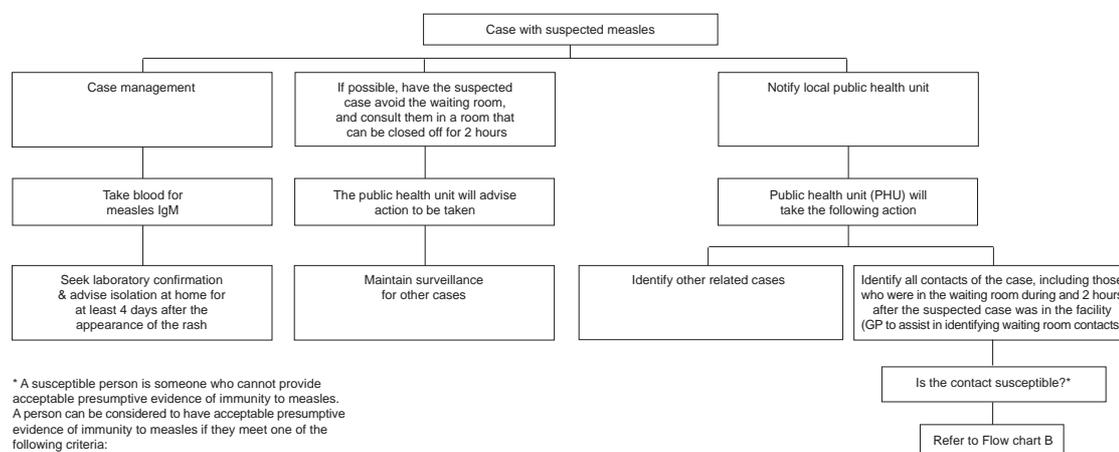
- People with measles should be excluded from the school for at least four days after appearance of the rash.
- Susceptible contacts who do not receive a MMR vaccine within three days of exposure or immunoglobulin within seven days of exposure are to be excluded for 14 days after the appearance of the rash in the last case occurring at the centre and observed for signs and symptoms of measles. Children may return earlier if they receive a MMR vaccination within three days of exposure or receive immunoglobulin within seven days of exposure. In consultation with the patients' treating doctors, immunocompromised persons (eg children or staff with malignancies or HIV/AIDS, or those receiving immunosuppressive therapy), should be excluded regardless of their measles vaccination status. If they receive immunoglobulin, it is still advisable to exclude them for their own safety, until 14 days after appearance of the rash in the last case.
- Any potential visitors to an event at an affected school should be informed of the risk that unvaccinated persons may acquire measles.

The general practitioner's response to measles outbreaks

As measles can pose a significant threat to a person's health, every effort should be made to arrest the indigenous transmission of measles in Australia. When a patient with measles attends a medical facility, contacts will be at risk of acquiring the infection. Nosocomial spread can be minimised through:

- maintaining a high level of awareness among staff;
- offering opportunistic vaccinations;
- isolating individuals with fever and rash; and
- encouraging health facility staff to be fully vaccinated.

Flow chart A: The general practitioner's response



* A susceptible person is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

1. infants under six months of age except if the infected contact is the infant's mother; or
2. children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
3. persons over four years of age or born during or after 1970 (unless sero-surveillance data shows otherwise) who have documented evidence or receiving two doses of a measles-containing vaccine; or
4. persons born before 1970 (unless sero-surveillance data shows otherwise); or
5. persons with documented evidence of immunity; or
6. persons with documented evidence of confirmed measles.

The four key components of a rapid response to a case of measles will minimise the risk of transmission of the virus.

1. Isolating the patient with measles

When there is an outbreak in the community:

- Triage patients with fever and rash so that they can be identified and assessed promptly.
- Where possible, examine patients with suspected measles at home.
- Advise the receptionist when booking appointments that the patients should be asked if they have a fever and rash. Furthermore, a sign could be placed outside health facilities instructing patients with fever and rash or parents/guardians accompanying a child with fever and rash to wait outside and to ask another attendee to inform the health-care staff that they have arrived.

If a patient with suspected measles attends a facility:

- If possible have the patient avoid the waiting room, by going directly to a room that can be left for at least two hours after the consultation. The consultation should take place in that room rather than the doctor's normal consulting room, or examine the person as soon as possible.
- It is acknowledged that closing a consultation room following the examination of a patient with suspected measles is difficult for general practitioners, however, this action is considered necessary to interrupt the transmission of measles.

2. Confirm the diagnosis

Laboratory confirmation should be sought, even if the patient is an infant or young child, on:

- all sporadic clinical notifications; and
- at least two cases during a cluster of cases.

However, case investigation should not be delayed pending laboratory results.

The most common criterion for laboratory confirmation is a positive test for measles-specific IgM. Alternatives to this include:

- isolation of wild measles virus from a clinical specimen;
- a diagnostic rise in measles antibody titres in paired sera; or
- a clinical specimen that is positive using a measles-specific polymerase chain reaction (PCR) test.

3. Identify other cases

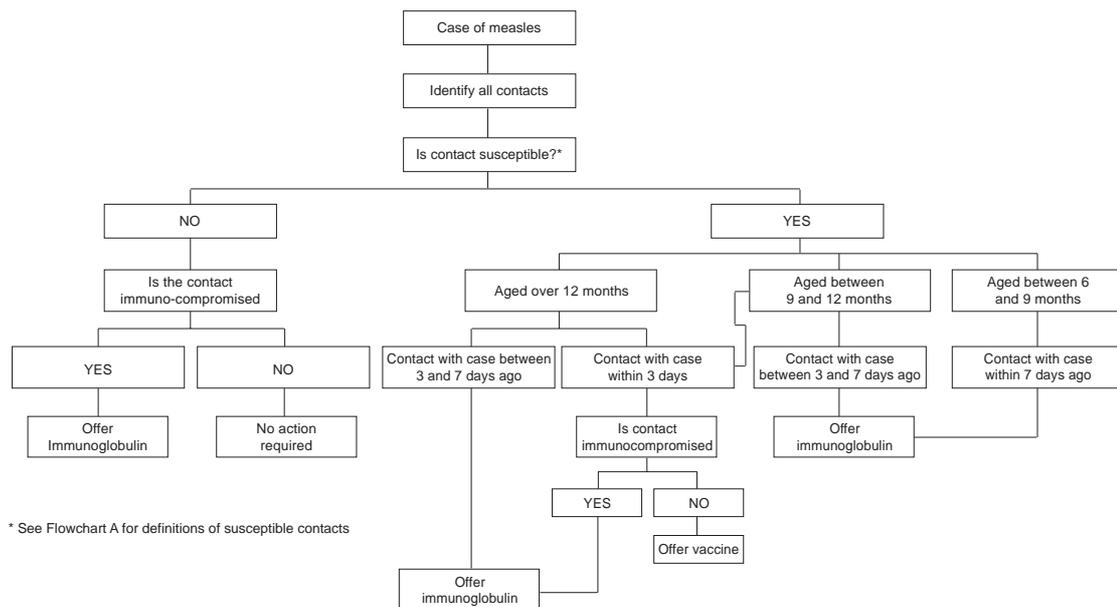
- Notify the suspected case to the State/Territory health department or local public health unit immediately by telephone (ie before the laboratory results are available) so that further investigations and the need for control measures at the community level can be considered.
- Maintain surveillance for more cases, and ensure that patients with fever and rash attending the facility are identified and assessed promptly.

4. Identify and protect susceptible contacts

- Other people who attend the rooms at the same time, or for at least two hours after, are at risk of developing measles and should be treated as contacts. Their stay in the waiting room should be minimised, and any susceptible contacts identified and offered vaccine.
- Contacts include other patients who were in the waiting room with the 'measles case' and who left the facility before the case was seen, those who accompanied patients and staff.

- Provide opportunistic vaccinations for susceptible age-eligible children and young adults attending the facility for any reason.
- Your public health unit will advise any changes to the current MMR vaccination policy regarding lowering the age for vaccination to nine months.

Flow chart B: Assessment and management of contacts of persons with measles



Summary of definitions, interventions and exclusions: Information for general practitioners

Incubation period

The incubation period is the interval between the time of infection and onset of symptoms. For measles, this is usually 7 to 18 days (mean of 10 days) to onset of the prodrome, and a mean of 14 days to appearance of the rash. In the case of vaccine-induced measles, protective antibodies develop in about six days.

Epidemiological linkage

A measles case is epidemiologically linked if:

- there was exposure to a laboratory-confirmed case during their infectious period (five days before to four days after rash onset); and
- this exposure occurred within the expected incubation period of the case under investigation — 7 to 18 days (mean 14 days) before rash onset (Chin 2000).

Exposure must be face to face or in a confined setting such as a classroom.

Infectious period

The infectious period begins five days before the appearance of the rash and continues until four days after the appearance of the rash.

Susceptible persons

A person considered susceptible to measles is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

- infants under six months of age unless the infected contact is the infant's mother; or
- children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
- persons over four years of age and born during or after 1970 (unless sero-surveillance data show otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
- persons born before 1970 (unless serosurveillance data show otherwise); or
- persons with documented evidence of immunity; or
- persons with documented evidence of laboratory confirmation of measles.

Vaccination for susceptible contacts

Age group	Exposure occurred:	
	< 3 days	3–7 days
<6 months	Infants under 6 months of age should not be given MMR. Immunoglobulin should only be given if the infected contact is the infant's mother.	
6–9 months	Infants under 9 months of age should not be given MMR. Immunoglobulin should be given if contact occurred within the last 7 days.	
9–12 months	MMR vaccine — A further dose of MMR should be given at 12 months of age or 4 weeks after the first dose, whichever is later. This second dose does not replace the routine dose of MMR at 4 years.	Immunoglobulin.
1–4 years	MMR vaccine — if the child has never received a dose of measles-containing vaccine. The second dose of MMR can be given early. The child is then considered to have completed their MMR vaccination schedule and does not require another dose at 4 years of age. There should be a minimum of 4 weeks between the first and second dose.	Immunoglobulin — if the child has never received a dose of measles-containing vaccine.
Adults	MMR vaccine should be given to susceptible adults. Immunoglobulin should be given if MMR vaccine is contraindicated.	Immunoglobulin should be given to persons who have never been given measles-containing vaccine.

Exclusion

- People with measles should be excluded from the child-care centres, schools or the work place for at least four days after appearance of the rash.
- Child contacts of one to four years of age who have received one dose of MMR (ie are vaccinated up to date) are not to be considered susceptible. However, during an outbreak it should be strongly recommended that these children receive their second dose of MMR early. These children should not receive immunoglobulin.
- Susceptible contacts who do not receive MMR vaccine within three days of exposure or immunoglobulin within seven days of exposure are to be excluded for 14 days after the appearance of the rash in the last case occurring at the centre/school/work place and observed for signs and symptoms of measles. A person may return earlier if they receive a MMR vaccination within three days of exposure or receive immunoglobulin within seven days of exposure.
- In consultation with the patient's treating doctors, immunocompromised persons (eg persons with malignancies or HIV/AIDS, or those receiving immunosuppressive therapy), should be excluded from the child care centre/school/work place regardless of their measles vaccination status. If they receive immunoglobulin, it is still advisable to exclude them for their own safety, until 14 days after appearance of the rash in the last case.
- Any potential visitors to an event at an affected child-care centre/school/workplace should be informed of the risk that unvaccinated persons may acquire measles.

Glossary

Active surveillance

Active seeking out of new cases of measles in the community, particularly among contacts of measles patients. This includes the systematic collection of data at pre-defined intervals from general practitioners, hospitals, public and private laboratories, schools, child-care facilities and parents.

Contact

A person exposed to a person with measles from 5 days before the onset to 4 days after the onset of the rash.

Elimination of infection

Reduction to zero of the incidence of infection caused by a specific agent in a defined geographic area as a result of deliberate efforts; continued measures to prevent re-establishment of transmission are required.

Eradication

Permanent reduction to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts; intervention measures are no longer needed.

Exclusion

The removal of a person to a place of isolation specified by the Medical Officer of Health in that State or Territory.

Imported measles

A person who has confirmed measles and whose rash onset was within 18 days of arrival in Australia or another State/Territory is classified as an international or interstate importation respectively.

Incubation period

The interval between the time of infection and onset of symptoms. For measles, this is usually 7 to 18 days (mean of 10 days) to onset of the prodrome, and a mean of 14 days to appearance of the rash. In the case of vaccine-induced measles, protective antibodies develop in about six days.

Index case

The first case in a family or other defined group that comes to the attention of the investigator.

Indigenous transmission

Measles cases are classified as indigenous if the person becomes infected in Australia and can be further classified as:

- epidemiologically linked to an internationally imported case; or
- not linked epidemiologically to an internationally imported case (CDC 1998a)

Infectious period

The infectious period begins five days before the appearance of the rash and continues until four days after the appearance of the rash.

Isolation

The separation of an ill person from others to prevent the spread of an infection. Persons diagnosed with measles during the infectious period should not come in contact with persons who are susceptible to measles.

Koplik's spots

Small red spots with bluish-white centres on the tongue or on the oral mucosa. The rash of measles usually erupts one or two days after the appearance of Koplik's spots.

MMR

The combined measles, mumps and rubella vaccine.

Measles — suspected (clinical) case definition

An illness characterised by all of the following features:

- morbilliform rash;
- cough; and
- fever present at the time of the rash onset.

Measles — laboratory-confirmed case

Criteria for laboratory confirmation:

- a positive test for measles-specific IgM; or
- isolation of wild measles virus from a clinical specimen; or
- a diagnostic rise in measles antibody titres in paired sera; or
- a clinical specimen that is positive using a measles-specific PCR test.

A laboratory-confirmed case does not need to meet any clinical criteria (except for serologically diagnosed cases who received a measles-containing vaccine eight days to eight weeks prior to testing [Helfand et al 1999; see Section 2.1]).

Measles — definition of a confirmed case

A person with signs and symptoms consistent with measles and any one of the following:

- a laboratory-confirmed case (Serologically diagnosed cases who received a measles-containing vaccine eight days to eight weeks (Helfand et al 1999) before testing should be classified as confirmed measles cases only if they are also linked epidemiologically to another laboratory-confirmed case (CDC 1996)); or
- history of contact with a laboratory-confirmed case.

Morbilliform

Describing a skin condition that resembles the erythematous, maculopapular rash of measles.

Outbreak

A measles outbreak is defined as the occurrence of any number of measles cases including only one locally acquired case. Control and evaluation measures may vary according to the number of cases, the number of susceptible contacts and the period of time over which the cases are diagnosed. It is up to the judgement of the local State/Territory health department as to the level of action required.

Opportunistic vaccination

The first or second dose of measles vaccine offered to age-eligible subjects attending a health-care facility for any reason.

Preventable case of measles

All confirmed cases of measles should be classified as preventable or non-preventable cases.

A preventable case of measles is when a person is diagnosed with measles who:

- was born during or after 1970; and
- lacks documented evidence of age-appropriate vaccination against measles; or
- had no medical contraindication to receiving the vaccine; or
- had no documented episodes of confirmed measles previously.

A case is classified **non-preventable** if the person does not meet these criteria.

Prodrome

A non-specific illness preceding more specific symptoms and signs. For measles, this includes fever, conjunctivitis, coryza and cough which may precede the skin rash by three to seven days.

Secondary case

Measles arising in a contact of a case within one incubation period of contact with the index case.

Susceptible person

A susceptible person is someone who can not provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

- infants under six months of age except if the infected contact is the infant's mother; or
- children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
- persons over four years of age and born during or after 1970 (unless sero-surveillance data show otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
- persons born before 1970 (unless serosurveillance data show otherwise); or
- persons with documented evidence of immunity; or
- persons with documented evidence of laboratory confirmation of measles.

Where acceptable presumptive evidence of immunity to measles is not available, the attending practitioner will have to balance the risk of accepting a history that the person may be immune against the risk of not offering MMR vaccine.

All susceptible persons aged over four years should be encouraged to receive the scheduled two doses of MMR vaccine. In particular, persons who receive their first dose during an outbreak should be encouraged to return in four weeks to receive their second dose.

Children of one to four years of age who have received one dose of MMR (ie are vaccinated up to date) are not to be considered susceptible. However, during an outbreak it should be strongly recommended that these children receive their second dose of MMR early. Hence, exclusion legislation would not/could not be applied to these children. Special consideration should be given to infants under 12 months (see Chapter 6).

Vaccine-induced measles

A modified clinical picture of measles occurring five to ten days after the measles vaccine. Note that the incubation period of the vaccine strain (four to six days) is shorter than that for infection with the wild virus (10 to 14 days). Vaccine-induced measles is not transmissible.

Abbreviations and acronyms

ACIR	Australian Childhood Immunisation Register
CDC	Centers for Disease Control and Prevention (United States)
CDNANZ	Communicable Diseases Network of Australia New Zealand
CFT	complement fixation test
EDTA	ethylenediaminetetraacetic acid
EIA	enzyme immunoassay
HAI	haemagglutination inhibition
HHV6	human herpes virus 6
HIC	Health Insurance Commission
MCC	Measles Control Campaign
MEAC	Measles Elimination Advisory Committee
mL	millilitre
MMR	Measles Mumps Rubella
NCIRS	National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases
NHMRC	National Health and Medical Research Council
PAHO	Pan American Health Organization
PCR	polymerase chain reaction
PRN	plaque reduction neutralisation
RNA	ribonucleic acid
RT-PCR	reverse transcription polymerase chain reaction
SSPE	sub-acute sclerosing panencephalitis

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Control of measles outbreaks in child-care centres

Measles sounds innocent enough, but it is actually a serious viral illness. It is highly contagious and causes fever, rash, runny nose, cough and conjunctivitis. These symptoms usually worsen over three days. The cough tends to be worse at night. The person may wish to avoid light because the eyes are inflamed. At this stage, there may be small white spots on a red base present on the inside of the cheek (Koplik's spots). Between the third and seventh day of the illness, a rash starts at the hairline and takes one or two days to spread over the body. Once the rash reaches the legs, the rash on the head and face begins to fade. The rash usually disappears after six days. The infection lasts about 10 days, and the cough is usually the last symptom to disappear.

As measles can pose a significant threat to a person's health, every effort must be made to arrest the indigenous transmission of measles in Australia. In response to the high incidence of measles, the Measles Elimination Advisory Committee has developed guidelines for the control of outbreaks in Australia. Child-care centre staff are encouraged to access information on measles and its control by maintaining contact with their State/Territory health department or local public health units. Maintaining records on the Measles Mumps Rubella (MMR) vaccination status of each child at the centre will assist in the identification of susceptible contacts in the event of an outbreak.

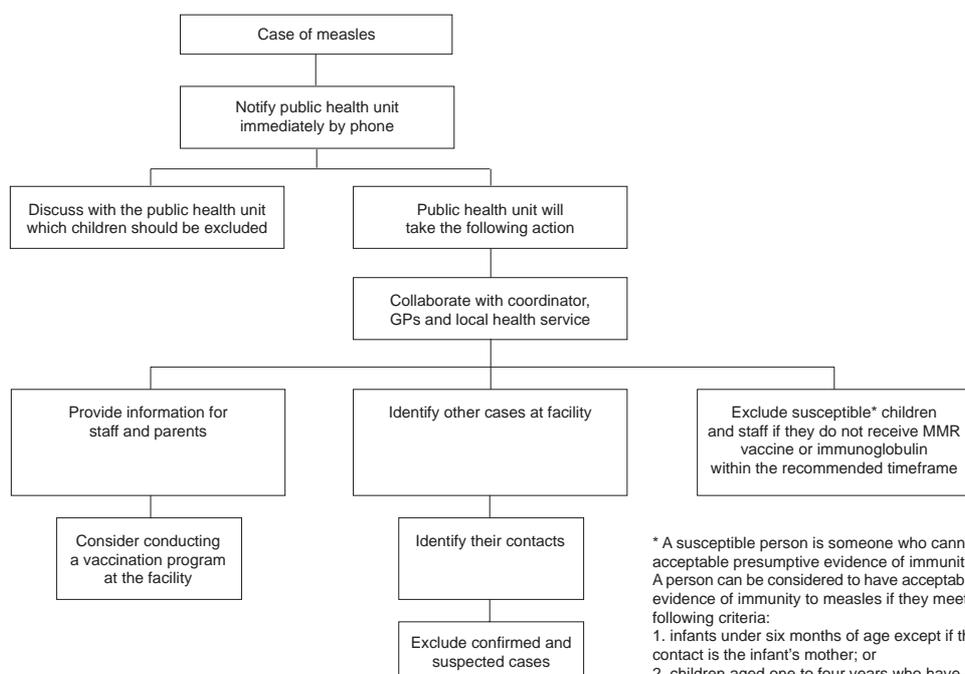
If a case of measles is detected, the following steps should be taken:

- notify the local public health authority.

If the case is confirmed by the public health unit:

- provide staff and parents with written information; and
- exclude susceptible infants, children and staff from the child-care centre; and
- encourage susceptibles to consult an immunisation provider to seek advice regarding receiving a MMR vaccine or immunoglobulin.

Measles control in child-care facilities



Information for parents and staff

Staff and parents should be provided with written information about:

- the symptoms, signs and potential complications of measles;
- the need to alert a doctor's surgery or the Emergency Department of the hospital before taking a child with suspected measles for assessment;
- any plans for a catch-up vaccination clinic at the centre or local health service;
- the need to keep a child with suspected measles at home, isolated, until assessed by a medical practitioner and/or for at least four days after the appearance of the rash;
- the need for any new cases to be notified to the child-care centre and local public health unit by telephone; and
- the reasons why parents/guardians of immunocompromised contacts should be notified of a measles outbreak as a matter of urgency.

Vaccination for susceptible contacts

Age group	Exposure occurred:	
	< 3 days	3–7 days
<6 months	Infants under 6 months of age should not be given MMR. Immunoglobulin should only be given if the infected contact is the infant's mother.	
6–9 months	Infants under 9 months of age should not be given MMR. Immunoglobulin should be given if contact occurred within the last 7 days.	
9–12 months	MMR vaccine — A further dose of MMR should be given at 12 months of age or 4 weeks after the first dose, whichever is later. This second dose does not replace the routine dose of MMR at 4 years.	Immunoglobulin.
1–4 years	MMR vaccine — if the child has never received a dose of measles-containing vaccine. The second dose of MMR can be given early. The child is then considered to have completed their MMR vaccination schedule and does not require another dose at 4 years of age. There should be a minimum of 4 weeks between the first and second dose.	Immunoglobulin — if the child has never received a dose of measles-containing vaccine.
Adults	MMR vaccine should be given to susceptible adults. Immunoglobulin should be given if MMR vaccine is contraindicated.	Immunoglobulin should be given to persons who have never been given measles-containing vaccine.

Exclusion from child-care

- People with measles should be excluded from the child-care centre for at least four days after appearance of the rash.
- Children of one to four years of age who have received one dose of MMR (ie are vaccinated up to date) are not to be considered susceptible. However, during an outbreak it should be strongly recommended that these children receive their second dose of MMR early. These children should not receive immunoglobulin.
- Susceptible contacts who do not receive MMR vaccine within three days of exposure or immunoglobulin within seven days of exposure are to be excluded for 14 days after the appearance of the rash in the last case occurring at the centre and observed for signs and symptoms of measles. Children may return earlier if they receive a MMR vaccination within three days of exposure or receive immunoglobulin within seven days of exposure.
- In consultation with the patients' treating doctors, immunocompromised persons (eg children or staff with malignancies or HIV/AIDS, or those receiving immunosuppressive therapy), should be excluded regardless of their measles vaccination status. If they receive immunoglobulin, it is still advisable to exclude them for their own safety, until 14 days after appearance of the rash in the last case.
- Any potential visitors to an event at an affected child-care centre should be informed of the risk that unvaccinated persons may acquire measles.

Control of measles outbreaks in schools

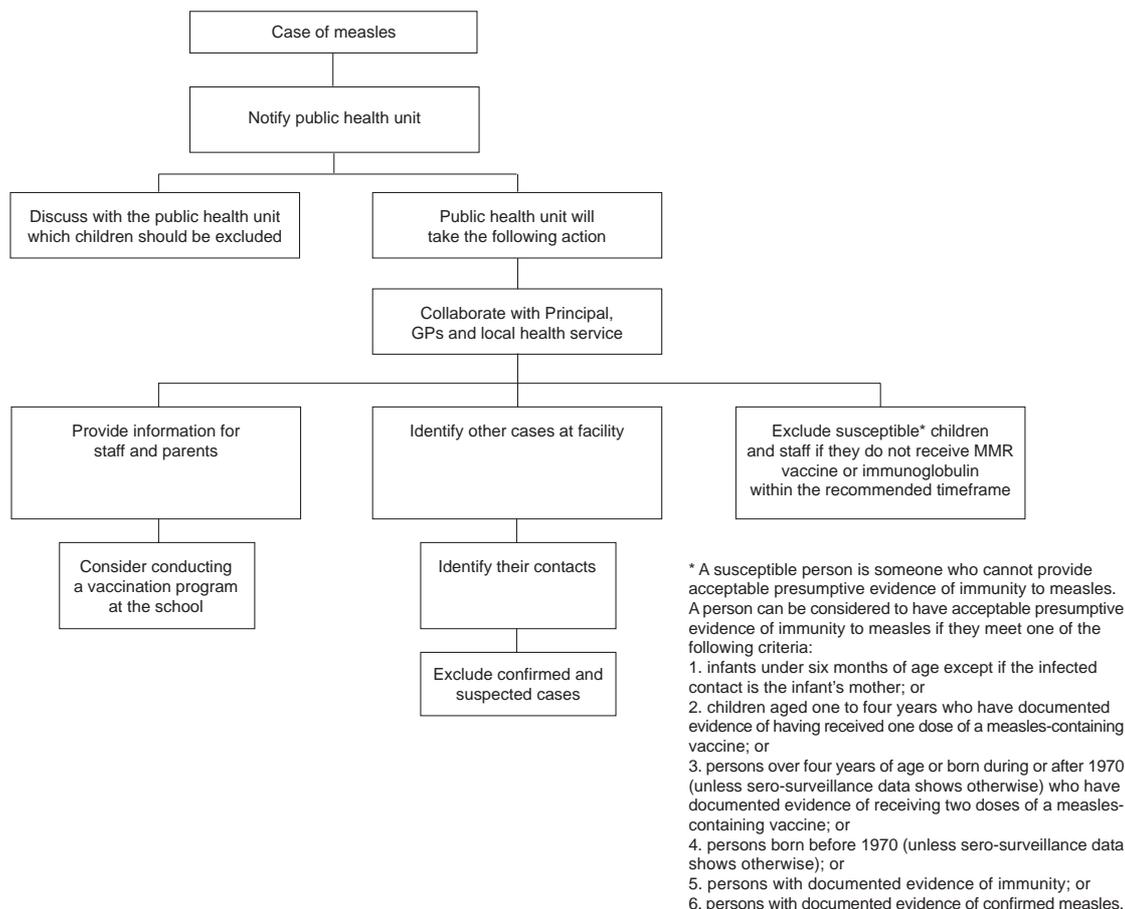
Measles sounds innocent enough, but it is actually a serious viral illness. It is highly contagious and causes fever, rash, runny nose, cough and conjunctivitis. These symptoms usually worsen over three days. The cough tends to be worse at night. The person may wish to avoid light because the eyes are inflamed. At this stage, there may be small white spots on a red base present on the inside of the cheek (Koplik's spots). Between the third and seventh day of the illness, a rash starts at the hairline and takes one or two days to spread over the body. Once the rash reaches the legs, the rash on the head and face begins to fade. The rash usually disappears after six days. The infection lasts about 10 days, and the cough is usually the last symptom to disappear.

As measles can pose a significant threat to a person's health, every effort must be made to arrest the indigenous transmission of measles in Australia. In response to the high incidence of measles, the Measles Elimination Advisory Committee has developed guidelines for the control of outbreaks in Australia. School staff are encouraged to access information on measles and its control by maintaining contact with their State/Territory health departments or local public health units. Maintaining records on the Measles Mumps Rubella (MMR) vaccination status of each child at the school will assist in the identification of susceptible contacts in the event of an outbreak.

If a case of measles is detected, the following steps should be taken:

- notify the local public health authority;
- provide staff and parents with written information;
- exclude susceptible children and staff from the school; and
- encourage susceptibles to consult an immunisation provider to seek advice regarding receiving MMR vaccine or immunoglobulin.

Measles control in schools



Information for parents and staff

Staff and parents should be provided with written information about:

- the symptoms, signs and potential complications of measles;
- the need to alert a doctor's surgery or the Emergency Department of the hospital before taking a child with suspected measles for assessment;
- any plans for a catch-up vaccination clinic at the school or local health service;
- the need to keep a child with suspected measles at home, isolated, until assessed by a medical practitioner and/or for at least four days after the appearance of the rash;
- the need for any new cases to be notified to the school and local public health unit by telephone; and
- the reasons why parents/guardians of immunocompromised contacts should be notified of a measles outbreak as a matter of urgency.

Vaccination for susceptible contacts

Age group	Exposure occurred:	
	< 3 days	3–7 days
1–4 years	MMR vaccine — if the child has never received a dose of measles-containing vaccine. The second dose of MMR can be given early. If a child receives the second dose early they are considered to have completed their MMR vaccination schedule and do not require another dose at 4 years of age. There should be a minimum of 4 weeks between the first and second dose.	Immunoglobulin should be given to persons who have never been given measles-containing vaccine .
Children > 4 years*	MMR vaccine should be given.#	
Adults	Immunoglobulin — if MMR vaccine is contraindicated.	

* It is expected that most children of this age group will have received two doses of MMR vaccine before starting school. Children who have received one dose only should be given their second dose.

If a person receives their first dose during an outbreak they should be encouraged to return in four weeks to receive their second dose.

Exclusion from school

- People with measles should be excluded from the school for at least four days after appearance of the rash.
- Susceptible contacts who do not receive a MMR vaccine within three days of exposure or immunoglobulin within seven days of exposure are to be excluded for 14 days after the appearance of the rash in the last case occurring at the centre and observed for signs and symptoms of measles. Children may return earlier if they receive a MMR vaccination within three days of exposure or receive immunoglobulin within seven days of exposure. In consultation with the patients' treating doctors, immunocompromised persons (eg children or staff with malignancies or HIV/AIDS, or those receiving immunosuppressive therapy), should be excluded regardless of their measles vaccination status. If they receive immunoglobulin, it is still advisable to exclude them for their own safety, until 14 days after appearance of the rash in the last case.
- Any potential visitors to an event at an affected school should be informed of the risk that unvaccinated persons may acquire measles.

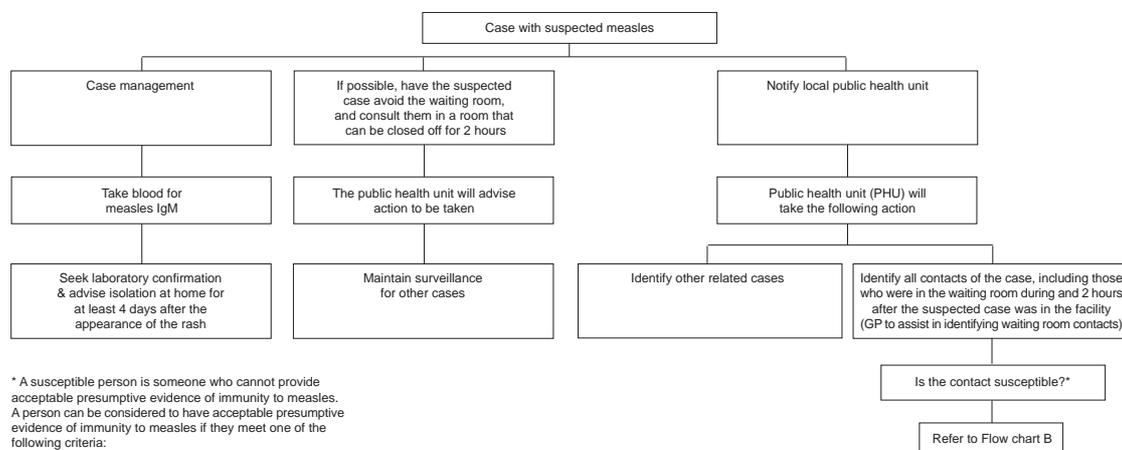
The general practitioner's response to measles outbreaks

As measles can pose a significant threat to a person's health, every effort should be made to arrest the indigenous transmission of measles in Australia. When a patient with measles attends a medical facility, contacts will be at risk of acquiring the infection. Nosocomial spread can be minimised through:

- maintaining a high level of awareness among staff;
- offering opportunistic vaccinations;
- isolating individuals with fever and rash; and
- encouraging health facility staff to be fully vaccinated.

The four key components of a rapid response to a case of measles will minimise the risk of transmission of the virus.

Flow chart A: The general practitioner's response



* A susceptible person is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

1. infants under six months of age except if the infected contact is the infant's mother; or
2. children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
3. persons over four years of age or born during or after 1970 (unless sero-surveillance data shows otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
4. persons born before 1970 (unless sero-surveillance data shows otherwise); or
5. persons with documented evidence of immunity; or
6. persons with documented evidence of confirmed measles.

1. Isolating the patient with measles

When there is an outbreak in the community:

- Triage patients with fever and rash so that they can be identified and assessed promptly.
- Where possible, examine patients with suspected measles at home.
- Advise the receptionist when booking appointments that the patients should be asked if they have a fever and rash. Furthermore, a sign could be placed outside health facilities instructing patients with fever and rash or parents/guardians accompanying a child with fever and rash to wait outside and to ask another attendee to inform the health-care staff that they have arrived.

If a patient with suspected measles attends a facility:

- If possible have the patient avoid the waiting room, by going directly to a room that can be left for at least two hours after the consultation. The consultation should take place in that room rather than the doctor's normal consulting room, or examine the person as soon as possible.
- It is acknowledged that closing a consultation room following the examination of a patient with suspected measles is difficult for general practitioners, however, this action is considered necessary to interrupt the transmission of measles.

2. Confirm the diagnosis

Laboratory confirmation should be sought, even if the patient is an infant or young child, on:

- all sporadic clinical notifications; and
- at least two cases during a cluster of cases.

However, case investigation should not be delayed pending laboratory results.

The most common criterion for laboratory confirmation is a positive test for measles-specific IgM. Alternatives to this include:

- isolation of wild measles virus from a clinical specimen;
- a diagnostic rise in measles antibody titres in paired sera; or
- a clinical specimen that is positive using a measles-specific polymerase chain reaction (PCR) test.

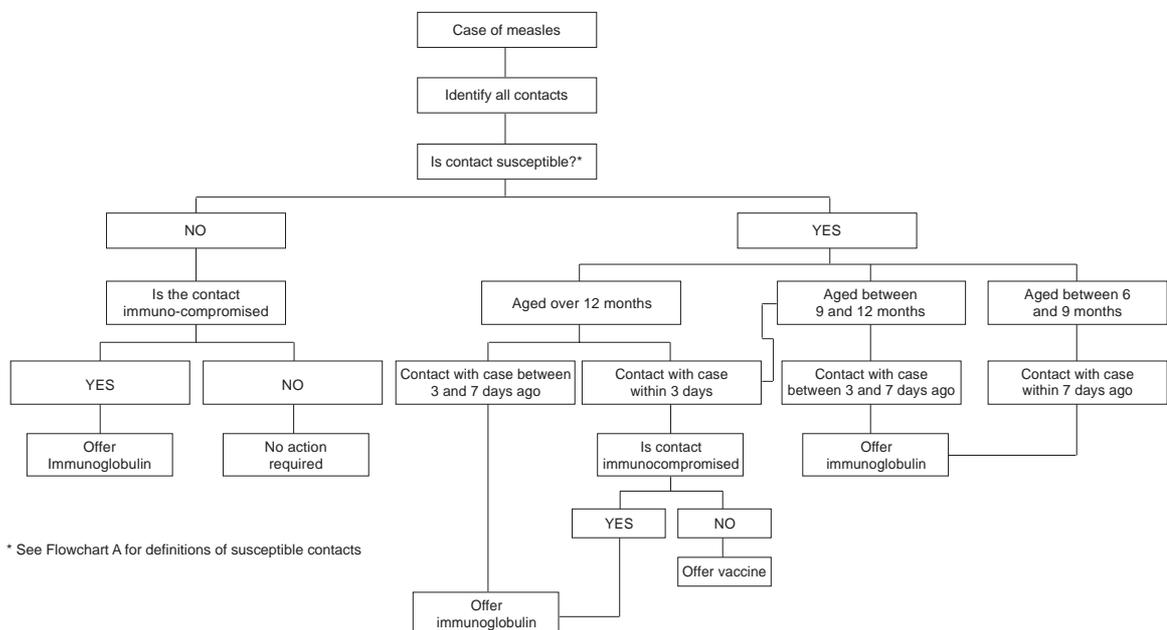
3. Identify other cases

- Notify the suspected case to the State/Territory health department or local public health unit immediately by telephone (ie before the laboratory results are available) so that further investigations and the need for control measures at the community level can be considered.
- Maintain surveillance for more cases, and ensure that patients with fever and rash attending the facility are identified and assessed promptly.

4. Identify and protect susceptible contacts

- Other people who attend the rooms at the same time, or for at least two hours after, are at risk of developing measles and should be treated as contacts. Their stay in the waiting room should be minimised, and any susceptible contacts identified and offered vaccine.
- Contacts include other patients who were in the waiting room with the 'measles case' and who left the facility before the case was seen, those who accompanied patients and staff.
- Provide opportunistic vaccinations for susceptible age-eligible children and young adults attending the facility for any reason.
- Your public health unit will advise any changes to the current MMR vaccination policy regarding lowering the age for vaccination to nine months.

Flow chart B: Assessment and management of contacts of persons with measles



* See Flowchart A for definitions of susceptible contacts

Summary: Definitions, interventions and exclusions

Information for general practitioners

Incubation period

The incubation period is the interval between the time of infection and onset of symptoms. For measles, this is usually 7 to 18 days (mean of 10 days) to onset of the prodrome, and a mean of 14 days to appearance of the rash. In the case of vaccine-induced measles, protective antibodies develop in about six days.

Epidemiological linkage

A measles case is epidemiologically linked if:

- there was exposure to a laboratory-confirmed case during their infectious period (five days before to four days after rash onset); and
- this exposure occurred within the expected incubation period of the case under investigation — 7 to 18 days (mean 14 days) before rash onset (Chin 2000).

Exposure must be face to face or in a confined setting such as a classroom.

Infectious period

The infectious period begins five days before the appearance of the rash and continues until four days after the appearance of the rash.

Susceptible persons

A person considered susceptible to measles is someone who cannot provide acceptable presumptive evidence of immunity to measles. A person can be considered to have acceptable presumptive evidence of immunity to measles if they meet one of the following criteria:

- infants under six months of age unless the infected contact is the infant's mother; or
- children aged one to four years who have documented evidence of having received one dose of a measles-containing vaccine; or
- persons over four years of age and born during or after 1970 (unless sero-surveillance data show otherwise) who have documented evidence of receiving two doses of a measles-containing vaccine; or
- persons born before 1970 (unless serosurveillance data show otherwise); or
- persons with documented evidence of immunity; or
- persons with documented evidence of laboratory confirmation of measles.

Vaccination for susceptible contacts

Age group	Exposure occurred:	
	< 3 days	3–7 days
<6 months	Infants under 6 months of age should not be given MMR. Immunoglobulin should only be given if the infected contact is the infant's mother.	
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Adults	MMR vaccine should be given to susceptible adults. Immunoglobulin should be given if MMR vaccine is contraindicated.	Immunoglobulin should be given to persons who have never been given measles-containing vaccine.

Exclusion

- People with measles should be excluded from the child-care centres, schools or the work place for at least four days after appearance of the rash.
- Child contacts of one to four years of age who have received one dose of MMR (ie are vaccinated up to date) are not to be considered susceptible. However, during an outbreak it should be strongly recommended that these children receive their second dose of MMR early. These children should not receive immunoglobulin.
- Susceptible contacts who do not receive MMR vaccine within three days of exposure or immunoglobulin within seven days of exposure are to be excluded for 14 days after the appearance of the rash in the last case occurring at the centre/school/work place and observed for signs and symptoms of measles. A person may return earlier if they receive a MMR vaccination within three days of exposure or receive immunoglobulin within seven days of exposure.
- In consultation with the patient's treating doctors, immunocompromised persons (eg persons with malignancies or HIV/AIDS, or those receiving immunosuppressive therapy), should be excluded from the child care centre/school/work place regardless of their measles vaccination status. If they receive immunoglobulin, it is still advisable to exclude them for their own safety, until 14 days after appearance of the rash in the last case.
- Any potential visitors to an event at an affected child-care centre/school/workplace should be informed of the risk that unvaccinated persons may acquire measles.