



## Complete Summary

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### GUIDELINE TITLE

(1) Measles, mumps, and rubella: vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps. Recommendations of the Advisory Committee on Immunization Practices (ACIP).  
(2) Notice to readers: Revised ACIP recommendation for avoiding pregnancy after receiving a rubella-containing vaccine.

### BIBLIOGRAPHIC SOURCE(S)

Centers for Disease Control and Prevention. Measles, mumps, and rubella--vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 1998 May 22; 47(RR-8): 1-57. [229 references] [PubMed](#)

Notice to readers: Revised ACIP recommendation for avoiding pregnancy after receiving a rubella-containing vaccine. MMWR Recomm Rep 2001 Dec 14; 50(49): 1117. [2 references]

## COMPLETE SUMMARY CONTENT

- SCOPE
- METHODOLOGY - including Rating Scheme and Cost Analysis
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## SCOPE

### DISEASE/CONDITION(S)

Measles, mumps, rubella and congenital rubella syndrome

### GUIDELINE CATEGORY

Prevention

### CLINICAL SPECIALTY

Family Practice  
Infectious Diseases  
Pediatrics  
Preventive Medicine

#### INTENDED USERS

Advanced Practice Nurses  
Allied Health Personnel  
Health Care Providers  
Nurses  
Patients  
Physician Assistants  
Physicians  
Public Health Departments

#### GUIDELINE OBJECTIVE(S)

To update recommendations published in 1989 and 1990 by the Advisory Committee on Immunization Practices (ACIP) on the use of the measles-mumps-rubella vaccine, and on the strategies for elimination of measles, rubella and congenital rubella syndrome and for mumps reduction in the United States.

#### TARGET POPULATION

Infants, children, adolescents and adults

#### INTERVENTIONS AND PRACTICES CONSIDERED

1. Measles, mumps, and rubella vaccination using the following live, further attenuated vaccines of the Enders-Edmonston virus strain available in the U.S. at the time the recommendations were developed:
  - monovalent measles (Attenuvax®), rubella (Meruvax®), or mumps (Mumpsvax®)
  - combinations: measles-mumps-rubella (MMR) (M-M-R II®), measles-rubella (MR) (M-R-Vax®), and rubella-mumps (Biavax II®) vaccines.
2. Immune globulin prophylaxis for exposure to measles, rubella or mumps

#### MAJOR OUTCOMES CONSIDERED

Prevention of measles, mumps and/or rubella diseases

## METHODOLOGY

#### METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

#### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

#### NUMBER OF SOURCE DOCUMENTS

Not stated

#### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

#### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

#### METHODS USED TO ANALYZE THE EVIDENCE

Review

#### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Scientific review by the Advisory Committee on Immunization Practices of the safety and efficacy of measles, mumps, and rubella vaccines and the epidemiologic evidence of vaccine impact on prevention and control on disease.

#### METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

#### RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

#### COST ANALYSIS

The benefit-cost analysis assessed the benefits, risks and costs of measles, mumps and rubella vaccine compared with the absence of vaccine. It examined the hypothetical experience in terms of costs and health benefits of the 1992 birth cohort (4.1 million) from birth to 40 years of age. Costs associated with a vaccination program include the vaccine, its administration and its adverse reactions. Benefits of immunization are the health care savings from reduced morbidity and mortality resulting from vaccine use. The analysis was performed from a societal perspective. All costs were expressed in 1992 dollars. Costs occurring in the future were discounted at a three percent rate, and any costs estimates from earlier years were inflated to reflect 1992 dollars. The analysis was conducted separately using direct cost only, and with total (direct and indirect) costs. The data necessary to conduct the analysis were compiled from a variety of sources: the published literature, including earlier benefit-cost studies; Centers for Disease Control and Prevention unpublished data, and large computerized data sets. In addition, an expert panel provided guidance in resolving areas of

uncertainty and assessing the appropriateness of existing data. Overall, when it was necessary to make estimates, the vaccine benefits were intentionally underestimated.

Vaccine costs and vaccine administration costs in both the public and private sectors were considered. Information on resource utilization was obtained from the expert panel. Hospital costs were measured by using hospital charges (obtained from a 16-state hospital discharge data set) for the respective conditions adjusted by the cost-charge ratio. Ambulatory costs were obtained from the 1987 National Medical Expenditure Survey. For measuring indirect costs, estimates of the value of life by two different approaches (Human Capital and Willingness-To-Pay) were considered, along with average earnings. Both were used to estimate indirect costs due to premature mortality, disability, and productivity losses of the caregivers while caring for a sick child.

Overall, the results of the base case and all of the sensitivity analyses consistently indicate that the benefits of measles, mumps and rubella vaccination outweigh the risks and the economic savings outweigh the costs. The benefit-to-cost ratio under the assumption of the base case analysis was 16.3:1 and had a rather narrow range from 13.2:1 to 18.9:1 when direct costs were considered. When indirect costs were included in the calculations the base case ratio increased to 21.3:1 and ranged from 17.2:1 to 23.5:1. The lowest ratios were produced when future cost and benefits were discounted at seven percent, the discount rate recommended by the Office of Management and Budget for this type of analyses. Incremental analysis also demonstrated that each monovalent vaccine more than pays for itself resulting in savings from disease prevention. The benefit to cost ratios for the individual measles, mumps and rubella vaccines were 17.2:1, 6.1:1 and 4.5:1, respectively when only direct costs were considered and when costs of vaccine administration were incurred only once (for the measles vaccine). The ratios increased to 17.2:1 (measles), 13.0:1 (mumps), 11.1:1 (rubella) when the analysis incorporated productivity losses due to morbidity and premature mortality. Finally, the impact of a two-dose measles, mumps and rubella program was also examined. This analysis indicated that the incremental costs of the second dose exceeded the incremental benefits. The direct benefit to costs ratios varied (depending on the assumptions) from 0.2:1 to 0.8:1, and from 0.25:1 to 1.6:1 when indirect benefits were included.

These results are very consistent with those from earlier studies. They demonstrate in strictly analytic terms considerable economic and disease reduction benefits associated with measles, mumps and rubella vaccine use. Clearly, the consideration of the intangible and non-quantifiable elements of human suffering makes a vaccination strategy an even more sound and justifiable societal investment.

See the companion document: Hatziandreu EJ, Brown RE, Halpern MT. A cost-benefit analysis of the measles-mumps-rubella (MMR) vaccine. Final report prepared for National Immunization Program, Centers for Disease Control and Prevention. Arlington (VA): Center for Public Health Research and Education, Battelle Memorial Institute, 1994.

## METHOD OF GUIDELINE VALIDATION

Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

Note from the National Guideline Clearinghouse: On December 14, 2001 the Centers for Disease Control and Prevention published revised recommendations for avoiding pregnancy after receiving rubella-containing vaccine. See sections III.D and V.A below.

The following recommendations contain these changes from recommendations published in 1989 and 1990:

- Emphasis on the use of combined measles-mumps-rubella vaccine for most indications
- A change in the recommended age for routine vaccination to 12-15 months for the first dose of measles-mumps-rubella, and to 4-6 years for the second dose of measles-mumps-rubella
- A recommendation that all states take immediate steps to implement a two dose measles-mumps-rubella requirement for school entry and any additional measures needed to ensure that all school-aged children are vaccinated with two doses of measles-mumps-rubella by 2001
- A clarification of the role of serologic screening to determine immunity
- A change in the criteria for determining acceptable evidence of rubella immunity
- A recommendation that all persons who work in healthcare facilities have acceptable evidence of measles and rubella immunity
- Changes in the recommended interval between administration of immune globulin and measles vaccination
- Updated information on adverse events and contraindications, particularly for persons with severe HIV infection, persons with a history of egg allergy or gelatin allergy, persons with a history of thrombocytopenia, and persons receiving steroid therapy

#### I. Vaccine Usage

Two doses of measles-mumps-rubella vaccine separated by at least 1 month (i.e., a minimum of 28 days) and administered on or after the first birthday are recommended for all children and for certain high-risk groups of adolescents and adults. The recommended routinely 1 month interval between successive doses of measles-mumps-rubella or other measles-containing vaccine is based on the principle that live virus vaccines not administered at the same time should be separated by at least 1 month.

Measles-mumps-rubella is the vaccine of choice when protection against any of these three diseases is required on or after the first birthday, unless any of

its component vaccines is contraindicated. The purpose of the two-dose vaccination schedule is to produce immunity in the small proportion of persons who fail to respond immunologically to one or more of the components of the first dose. Studies indicate that two doses of measles vaccine are necessary to develop adequate population immunity to prevent measles outbreaks among school-aged and older persons. Mumps can occur in highly vaccinated populations; in these outbreaks, substantial numbers of cases have occurred among persons who had previously received a single dose of mumps-containing vaccine. Although primary rubella vaccine failure rarely occurs, the potential consequences of failure (i.e., congenital rubella syndrome) are substantial.

Almost all persons who do not respond to the measles component of the first dose of measles-mumps-rubella vaccine will respond to the second dose. Few data regarding the immune response to the rubella and mumps components of a second dose of measles-mumps-rubella vaccine are available, but most persons who do not respond to the rubella or mumps components of the first dose would be expected to respond to the second. The second dose is not generally considered a booster dose because a primary immune response to the first dose provides long-term protection. Although some persons who develop normal antibody titers in response to a single dose of measles-mumps-rubella vaccine will develop higher antibody titers to the three component vaccines when administered a second dose of vaccine, these increased antibody levels typically do not persist.

Use of combined measles-mumps-rubella vaccine for both measles doses and all other indications should provide an additional safeguard against primary vaccine failures and facilitate elimination of rubella and congenital rubella syndrome and continued reduction of mumps incidence. Data also indicate that the favorable benefit/cost ratio for routine measles, rubella, and mumps vaccination is even greater when the vaccines are administered as combined measles-mumps-rubella vaccine.

#### A. Dosage and Route of Administration

The lyophilized live measles-mumps-rubella vaccine (and its component vaccines) should be reconstituted and administered as recommended by the manufacturer. All measles-, rubella-, or mumps-containing vaccines available in the United States should be administered subcutaneously in the recommended standard single-dose volume of 0.5 mL.

#### B. Simultaneous Administration

In general, simultaneous administration of the most widely used live and inactivated vaccines at the same time as measles, mumps, rubella vaccine does not impair antibody responses or increase rates of adverse reactions. The antibody responses of persons vaccinated with measles-mumps-rubella are similar to those of persons vaccinated with single-antigen measles, mumps, and rubella vaccines at different sites or at different times.

The Advisory Committee on Immunization Practices encourages routine simultaneous administration of measles-mumps-rubella, diphtheria and tetanus toxoids and acellular pertussis or diphtheria and tetanus toxoids and whole-cell pertussis vaccine, Haemophilus influenzae type b vaccine, and oral poliovirus vaccine or inactivated poliovirus vaccine to children who are at the recommended age to receive these vaccines. Antibody responses were equivalent for each of these vaccines and no clinically significant increases in the frequency of adverse events occurred when measles-mumps-rubella, diphtheria and tetanus toxoids and acellular pertussis (or diphtheria and tetanus toxoids and whole-cell pertussis), Haemophilus influenzae type b vaccine, hepatitis B vaccine and inactivated poliovirus vaccine or oral poliovirus vaccine were given simultaneously at different sites or at separate times.

Live measles and yellow fever vaccines can be administered simultaneously at separate anatomical sites in separate syringes. Limited data also indicate that the immunogenicity and safety of inactivated Japanese encephalitis vaccine are not compromised by simultaneous administration with live measles vaccine. Limited data exist concerning concurrent administration of measles-mumps-rubella vaccine and other vaccines that are often recommended for international travelers (e.g., meningococcal vaccine, typhoid vaccines). However, neither theoretical considerations nor practical experience indicate that the simultaneous administration at separate anatomic sites of measles-mumps-rubella and other live or inactivated vaccines will produce a diminished immune response or increase the incidence of adverse events among vaccinated persons.

## II. Documentation of Immunity

Only doses of vaccine for which written documentation of the date of administration is presented should be considered valid. Neither a self-reported dose nor a history of vaccination provided by a parent is, by itself, considered adequate documentation. No healthcare worker should provide a vaccination record for a patient unless that healthcare worker has administered the vaccine or has seen a record that documents vaccination. Persons who may be immune to measles, mumps, or rubella but who lack either adequate documentation of vaccination or other acceptable evidence of immunity (see Table 1 of the original guideline document) should be vaccinated. Vaccination status and date of administration of all vaccinations should be documented in the patient's permanent medical record.

Serologic screening for measles, rubella, or mumps immunity generally is neither necessary nor recommended if a person has other acceptable evidence of immunity to the disease (see Table 1 of the original guideline document). Serologic screening can be a barrier to vaccination. With the exception of women who are known to be pregnant (see "Women of Childbearing Age"), persons who lack acceptable evidence of immunity generally should be vaccinated without serologic testing. Serologic screening is appropriate only when persons identified as susceptible are subsequently vaccinated in a timely manner. Screening is most applicable when the return

and vaccination of those tested can be ensured (e.g., hiring of new healthcare workers). If these conditions are not met, serologic screening is inappropriate. Likewise, during an outbreak of measles, rubella, or mumps, serologic screening before vaccination generally is not recommended because waiting for results, contacting, and then vaccinating persons identified as susceptible can impede the rapid vaccination needed to curb the outbreak.

Serologic screening for antibodies to measles, rubella, or mumps alone will not identify persons who are susceptible to the other diseases for which screening is not done. Post-vaccination serologic testing to verify an immune response to measles-mumps-rubella or its component vaccines is not recommended.

The criteria for acceptable evidence of immunity to measles, rubella, and mumps (see Table 1 of the original guideline document) provide presumptive rather than absolute evidence of immunity. Occasionally, a person who meets the criteria for presumptive immunity can contract and transmit disease. Specific criteria for documentation of immunity have been established for certain persons (e.g., healthcare workers, international travelers, and students at post-high school educational institutions) who are at increased risk for exposure to measles, rubella, and mumps (see Table 1 of the original guideline document). Criteria accepted as evidence of immunity for the purpose of meeting school or college entry requirements or other government regulations may vary among state and local jurisdictions.

Documentation of immunity to measles, mumps and rubella is detailed in the original guideline document.

### III. Routine Vaccination

#### A. Preschool-Aged Children

Children should receive the first dose of measles-mumps-rubella vaccine at age 12-15 months (i.e., on or after the first birthday). In areas where risk for measles is high, initial vaccination with measles-mumps-rubella vaccine is recommended for all children as soon as possible upon reaching the first birthday (i.e., at age 12 months). An area where measles risk is high is defined as:

- a county with a large inner city population,
- a county where a recent measles outbreak has occurred among unvaccinated preschool-aged children, or
- a county in which more than five cases of measles have occurred among preschool-aged children during each of the last 5 years.

These recommendations may be implemented for an entire county or only within defined areas of a county. This strategy assumes that the benefit of preventing measles cases among children aged 12-15 months outweighs the slightly reduced efficacy of the vaccine when administered to children aged less than 15 months. In addition, almost all children who do not respond immunologically to the first dose of measles-mumps-rubella vaccine will develop measles immunity after

receiving a second dose. HIV-infected children should receive measles-mumps-rubella vaccine at age 12 months, if not otherwise contraindicated (see "Special Considerations for Vaccination -- Persons Infected with Human Immunodeficiency Virus [HIV]")

## B. School-Aged Children and Adolescents

The second dose of measles-mumps-rubella vaccine is recommended when children are aged 4-6 years (i.e., before a child enters kindergarten or first grade). This recommended timing for the second dose of measles-mumps-rubella vaccine has been adopted jointly by the Advisory Committee on Immunization Practices, the American Academy of Pediatrics, and the American Academy of Family Physicians. Evidence now indicates that (a) the major benefit of administering the second dose is a reduction in the proportion of persons who remain susceptible because of primary vaccine failure, (b) waning immunity is not a major cause of vaccine failure and has little influence on measles transmission, and (c) revaccination of children who have low levels of measles antibody produces only a transient rise in antibody levels.

Because approximately 5% of children who receive only one dose of measles-mumps-rubella vaccine fail to develop immunity to measles, the Advisory Committee on Immunization Practices recommends that all states implement a requirement that all children entering school have received two doses of measles-mumps-rubella vaccine (with the first dose administered no earlier than the first birthday) or have other evidence of immunity to measles, rubella, and mumps (see "Documentation of Immunity"). In addition, to achieve complete immunization of all school-aged children and hasten progress toward measles elimination, states are strongly encouraged to take immediate steps to ensure that, by 2001, all children in grades kindergarten through 12 have received two doses of measles-mumps-rubella vaccine.

As part of comprehensive health services for all adolescents, the Advisory Committee on Immunization Practices, the American Academy of Pediatrics, and the American Academy of Family Physicians recommend a health maintenance visit at age 11-12 years. This visit should serve as an opportunity to evaluate vaccination status and administer measles-mumps-rubella vaccine to all persons who have not received two doses at the recommended ages.

Children who do not have documentation of adequate vaccination against measles, rubella, and mumps or other acceptable evidence of immunity to these diseases (see "Documentation of Immunity") should be admitted to school only after administration of the first dose of measles-mumps-rubella vaccine. If required, the second measles-mumps-rubella dose should be administered as soon as possible, but no sooner than 28 days after the first dose. Children who have already received two doses of measles-mumps-rubella vaccine at least 1

month apart, with the first dose administered no earlier than the first birthday, do not need an additional dose when they enter school.

#### C. Adults

Persons born in 1957 or later who are 18 years of age or older and who do not have a medical contraindication should receive at least one dose of measles-mumps-rubella vaccine unless they have (a) documentation of vaccination with at least one dose of measles-, rubella-, and mumps-containing vaccine or (b) other acceptable evidence of immunity to these three diseases. Persons born before 1957 generally can be considered immune to measles and mumps. In addition, persons born before 1957, except women who could become pregnant, generally can be considered immune to rubella.

Measles-mumps-rubella vaccine (one dose or two doses administered at least 28 days apart) may be administered to any person born before 1957 for whom the vaccine is not contraindicated. Adults who may be at increased risk for exposure to and transmission of measles, mumps, and rubella should receive special consideration for vaccination. These persons include international travelers, persons attending colleges and other post-high school educational institutions, and persons who work at healthcare facilities. In addition, all women of childbearing age should be considered susceptible to rubella unless they have received at least one dose of measles-mumps-rubella or other live rubella virus vaccine on or after the first birthday or have serologic evidence of immunity. Vaccination recommendations for these high-risk groups follow.

#### D. Women of Childbearing Age

Measles-mumps-rubella vaccine should be offered to all women of childbearing age (i.e., adolescent girls and premenopausal adult women) who do not have acceptable evidence of rubella immunity whenever they make contact with the healthcare system. Opportunities to vaccinate susceptible women include occasions when their children undergo routine examinations or vaccinations. The continuing occurrence of rubella among women of childbearing age indicates the need to continue vaccination of susceptible adolescent and adult women of childbearing age, and the absence of evidence of vaccine teratogenicity indicates that the practice is safe. Vaccination of susceptible women of childbearing age should:

- be part of routine general medical and gynecologic outpatient care
- take place in all family-planning settings
- be provided routinely before discharge from any hospital, birthing center, or other medical facility, unless a specific contraindication exists (see "Precautions and Contraindications")

Outbreaks of rubella in the United States recently have occurred among women of Hispanic ethnicity, many of whom were born outside the fifty states. Efforts should be made to ensure that all susceptible women of childbearing age, especially those who grew up outside the fifty states in areas where routine rubella vaccination may not occur, are vaccinated with measles-mumps-rubella vaccine or have other acceptable evidence of immunity. Ascertainment of rubella-immune status of women of childbearing age and the availability of rubella vaccination should be components of the healthcare program in places where the risks for disease exposure and transmission are substantial (e.g., day care facilities, schools, colleges, jails, and prisons).

No evidence indicates that administration of rubella-containing vaccine virus to a pregnant woman presents a risk for her fetus, although such a risk cannot be excluded on theoretical grounds. Therefore, women of childbearing age should receive rubella-containing vaccines (i.e., rubella, mumps-rubella, or measles-mumps-rubella vaccine) only if they state that they are not pregnant and only if they are counseled not to become pregnant for 3 months\* after vaccination. Because of the importance of protecting women of childbearing age against rubella, reasonable practices in any immunization program include (a) asking women if they are pregnant, (b) not vaccinating women who state that they are pregnant, (c) explaining the potential risk for the fetus to women who state that they are not pregnant, and d) counseling women who are vaccinated not to become pregnant during the 3 months\* following measles-mumps-rubella vaccination.

\*Note from the National Guideline Clearinghouse and the Advisory Committee on Immunization Practices: On October 18, 2001, the Advisory Committee on Immunization Practices reviewed data from several sources indicating that no cases of congenital rubella syndrome had been identified among infants born to women who were vaccinated inadvertently against rubella within 3 months or early in pregnancy. On the basis of these data, the Advisory Committee on Immunization Practices shortened its recommended period to avoid pregnancy after receipt of rubella-containing vaccine from 3 months to 28 days. See MMWR Morb Mortal Wkly Rep 2001 Dec 14; 50(49):1117 [2 references].

**Routine Vaccination of Women Who Are Not Pregnant.** Women of childbearing age who do not have documentation of rubella vaccination or serologic evidence of rubella immunity should be vaccinated with measles-mumps-rubella if they have no contraindications to the vaccine. Birth before 1957 is not acceptable evidence of immunity for women who could become pregnant. The use of measles-mumps-rubella vaccine provides the potential additional benefit of protection against measles and mumps. Serologic testing before vaccination is not necessary and might present a barrier to timely vaccination. Routine testing for rubella antibody during clinic visits for routine health care, premarital evaluation, family planning, or diagnosis and treatment of sexually transmitted diseases may identify women who are not immune to rubella before they become pregnant.

Such routine serologic testing is not useful unless it is linked to timely follow-up and vaccination of women who are susceptible.

**Prenatal Screening and Postpartum Vaccination.** Prenatal serologic screening of women who have acceptable evidence of rubella immunity is generally not necessary, but is indicated for all pregnant women who lack acceptable evidence of rubella immunity. Upon completion or termination of their pregnancies, women who do not have serologic evidence of rubella immunity or documentation of rubella vaccination should be vaccinated with measles-mumps-rubella before discharge from the hospital, birthing center, or abortion clinic. They should be counseled to avoid conception for 3 months after vaccination. Postpartum rubella vaccination of all women not known to be immune could prevent up to half of congenital rubella syndrome cases.

#### E. Colleges and Other Post-High School Educational Institutions

Risks for transmission of measles, rubella, and mumps at post-high school educational institutions can be high because these institutions may bring together large concentrations of persons susceptible to these diseases. Therefore, colleges, universities, technical and vocational schools, and other institutions for post-high school education should require that all undergraduate and graduate students have received two doses of measles-mumps-rubella vaccine or have other acceptable evidence of measles, rubella, and mumps immunity before enrollment.

College entry requirements for measles immunity substantially reduce the risk for measles outbreaks on college campuses where they are implemented and enforced. State requirements for pre-enrollment vaccination ensure the best protection against widespread measles transmission among students at college campuses and other post-high school educational institutions. States are strongly encouraged to adopt such regulations. Students who do not have documentation of live measles, rubella, or mumps vaccination or other acceptable evidence of immunity at the time of enrollment should be admitted to classes only after receiving the first dose of measles-mumps-rubella vaccine. These students should be administered a second dose of measles-mumps-rubella vaccine 1 month (i.e., at least 28 days) later. Students who have documentation of having received only one dose of measles-containing vaccine on or after the first birthday should receive a second dose of measles-mumps-rubella before enrollment, provided at least 1 month has elapsed since the previous dose. Students who have a medical contraindication to receiving any of the components of measles-mumps-rubella vaccine should be given a letter of explanation to present to the health officials of their educational institution.

#### F. Healthcare Facilities

When measles virus is introduced into a community, persons who work in healthcare facilities are at increased risk for acquiring measles

compared with the general population. [See surveillance data reported in the original guideline document.] Although similar surveillance data are not available for rubella, outbreaks have occurred in healthcare settings, and healthcare workers have transmitted rubella to patients.

All persons who work in healthcare facilities should be immune to measles and rubella (see Table 1 of the original guideline document). Because any healthcare worker (i.e., medical or nonmedical, paid or volunteer, full- or part-time, student or nonstudent, with or without patient-care responsibilities) who is not immune to measles and rubella can contract and transmit these diseases, all healthcare facilities (i.e., inpatient and outpatient, private and public) should ensure that those who work in their facilities are immune to measles and rubella (see Table 1 of the original guideline document).

Healthcare workers have a responsibility to avoid transmitting these diseases and thereby causing harm to patients. Adequate vaccination for healthcare workers born during or after 1957 consists of two doses of a live measles-containing vaccine and at least one dose of a live rubella-containing vaccine (see Table 1 of the original guideline document). Healthcare workers who need a second dose of measles-containing vaccine should be revaccinated 1 month (at least 28 days) after their first dose.

Although birth before 1957 is generally considered acceptable evidence of measles and rubella immunity (see Table 1 of the original guideline document), healthcare facilities should consider recommending a dose of measles-mumps-rubella vaccine to unvaccinated workers born before 1957 who do not have a history of physician-diagnosed measles or laboratory evidence of measles immunity AND laboratory evidence of rubella immunity.

Rubella vaccination or laboratory evidence of rubella immunity is particularly important for female healthcare workers who could become pregnant, including those born before 1957. In addition, during rubella outbreaks, healthcare facilities should strongly consider recommending a dose of measles-mumps-rubella vaccine to unvaccinated healthcare workers born before 1957 who do not have serologic evidence of immunity. [For further details, see the discussion in the original guideline document.]

Serologic screening need not be done before vaccinating for measles and rubella unless the medical facility considers it cost-effective. Serologic testing is appropriate only if persons who are identified as susceptible are subsequently vaccinated in a timely manner. Serologic screening ordinarily is not necessary for persons who have documentation of appropriate vaccination or other acceptable evidence of immunity (see Table 1 of the original guideline document). During outbreaks of measles or rubella, serologic screening before vaccination is not generally recommended because rapid vaccination is necessary to halt disease transmission.

Transmission of mumps has occurred in medical settings. Therefore, immunity to mumps is highly desirable for all healthcare workers (see Table 1 of the original guideline document). Adequate mumps vaccination for healthcare workers born during or after 1957 consists of one dose of live mumps-containing vaccine.

Measles-mumps-rubella vaccine generally should be used whenever any of its component vaccines is indicated. However, if the prospective vaccinee has acceptable evidence of immunity to one or two of the components of measles-mumps-rubella vaccine (see Table 1 of the original guideline document), a monovalent or bivalent vaccine can be used.

#### G. International Travel

Measles, rubella, and mumps are endemic in many countries. Protection against measles is especially important for persons planning foreign travel, including adolescents and adults who have not had measles disease and have not been adequately vaccinated, and infants aged 6-11 months. Similarly, protection against rubella is especially important for women of childbearing age who are not immune to the disease. Although proof of vaccination is not required for entry into the United States, persons traveling or living abroad should ensure that they are immune to measles, rubella, and mumps.

Persons who travel or live abroad and who do not have acceptable evidence of measles, rubella, and mumps immunity (see Table 1 of the original guideline document) should be vaccinated with measles-mumps-rubella. [See the original guideline document for suggestions on when to administer the vaccine to the child traveling or living abroad and discussion on parents traveling or residing abroad with infants aged less than 12 months.]

### IV. Special Considerations For Vaccination

#### A. Persons Infected with Human Immunodeficiency Virus (HIV)

Measles-mumps-rubella vaccination is recommended for all asymptomatic HIV-infected persons who do not have evidence of severe immunosuppression and for whom measles vaccination would otherwise be indicated. Measles-mumps-rubella vaccination should also be considered for all symptomatic HIV-infected persons who do not have evidence of severe immunosuppression. Testing asymptomatic persons for HIV infection is not necessary before administering measles-mumps-rubella or other measles-containing vaccine.

HIV-infected infants without severe immunosuppression should routinely receive measles-mumps-rubella vaccine as soon as possible upon reaching the first birthday (i.e., at age 12 months). Consideration should be given to administering the second dose of measles-mumps-rubella vaccine as soon as 28 days (i.e., 1 month) after the first dose rather than waiting until the child is ready to enter

kindergarten or first grade. In addition, if at risk for exposure to measles, HIV-infected infants who are not severely immunocompromised should be administered single-antigen measles vaccine or measles-mumps-rubella vaccine at age 6-11 months. These children should receive another dose, administered as measles-mumps-rubella vaccine, as soon as possible upon reaching the first birthday, provided at least 1 month has elapsed since the administration of the previous dose of measles-containing vaccine. An additional dose of measles-mumps-rubella vaccine can be administered as early as 1 month after the second dose. If otherwise indicated, newly diagnosed HIV-infected children and adults without acceptable evidence of measles immunity (see Table 1 of the original guideline document) should receive measles-mumps-rubella vaccine as soon as possible after diagnosis, unless they have evidence of severe immunosuppression (see Table 2 of the original guideline document). Data indicate that, of the HIV-infected infants born in the United States annually, approximately 5% (i.e., 50 children per year) would be classified as severely immunocompromised at age 12 months, when the first dose of measles-mumps-rubella vaccine is recommended.

Measles vaccine is not recommended for HIV-infected persons with evidence of severe immunosuppression (see Table 2 of the original guideline document) for several reasons:

- a case of progressive measles pneumonitis occurred in a person with AIDS and severe immunosuppression to whom measles-mumps-rubella vaccine was administered
- evidence indicates a diminished antibody response to measles vaccine among severely immunocompromised HIV-infected persons
- morbidity related to measles vaccination has been reported among persons with severe immunosuppression unrelated to HIV infection
- in the United States, the incidence of measles is presently very low

Serious illness associated with administration of rubella or mumps vaccines to HIV-infected persons has not been reported. Measles-mumps-rubella vaccine is not contraindicated for the close contacts of immunocompromised persons. All family and other close contacts of HIV-infected persons should be vaccinated with measles-mumps-rubella vaccine, unless they have acceptable evidence of measles immunity.

Severely immunocompromised patients and other symptomatic HIV-infected patients who are exposed to measles should receive immune globulin prophylaxis regardless of vaccination status because they may not be protected by the vaccine. For patients receiving intravenous immune globulin therapy, a standard dose of 100-400 mg/kg should be sufficient to prevent measles infection after exposures occurring within 3 weeks after administration of intravenous immune globulin;

for patients exposed to measles more than 3 weeks after receiving a standard intravenous immune globulin dose, an additional dose should be considered. Although no data are available concerning the effectiveness of intravenous immune globulin in preventing measles, high dose intravenous immune globulin may be as effective as immune globulin administered intramuscularly. Persons receiving regular (e.g., monthly) intravenous immune globulin therapy for HIV infection or other indications may not respond to measles-mumps-rubella or its component vaccines because of the continued presence of high levels of passively acquired antibody (see "Precautions and Contraindications," "Recent Administration of Immune Globulin"). If indicated, measles-mumps-rubella vaccine should be administered at least 2 weeks before beginning intravenous immune globulin therapy.

B. Use of Vaccine and Immune Globulin Among Persons Exposed to Measles, Rubella or Mumps

Exposure to measles is not a contraindication to vaccination. Measles-mumps-rubella or measles vaccine, if administered within 72 hours of initial measles exposure, may provide some protection. For most persons 12 months of age or older who are exposed to measles in most settings (e.g., day care facilities, schools, colleges, healthcare facilities), administration of measles-mumps-rubella or measles vaccine is preferable to using immune globulin. For susceptible persons 6 months of age or older who are household contacts of measles patients, use of vaccine within 72 hours of initial exposure is also acceptable. However, measles often is not recognized as such until greater than 72 hours after onset. Therefore, administration of immune globulin to susceptible household contacts who are not vaccinated within 72 hours of initial exposure is recommended (see "Use of Immune Globulin"). Infants vaccinated before age 12 months must be revaccinated on or after the first birthday with two doses of measles-mumps-rubella vaccine separated by at least 28 days (see "Routine Vaccination"). Measles-containing vaccine is not recommended for postexposure measles prophylaxis in immunocompromised persons or pregnant women (see "Contraindications").

Postexposure measles-mumps-rubella vaccination does not prevent or alter the clinical severity of rubella or mumps. However, widespread vaccination during a mumps outbreak may help terminate such outbreaks.

If exposure to measles, rubella, or mumps does not cause infection, postexposure vaccination with measles-mumps-rubella should induce protection against subsequent infection. If the exposure results in infection, no evidence indicates that administration of measles-mumps-rubella vaccine during the presymptomatic or prodromal stage of illness increases the risk for vaccine-associated adverse events.

Use of Immune Globulin. If administered within 6 days of exposure, immune globulin can prevent or modify measles in a nonimmune

person. However, any immunity conferred is temporary unless modified or typical measles occurs. The usual recommended dose of immune globulin is 0.25 mL/kg (0.11 mL/lb) of body weight (maximum dose = 15 mL). However, the recommended dose of immune globulin for immunocompromised persons is 0.5 mL/kg of body weight (maximum dose = 15 mL). For persons receiving intravenous immune globulin therapy, administration of at least 100 mg/kg within 3 weeks before measles exposure should be sufficient to prevent measles infection.

Immune globulin is indicated for susceptible household contacts of measles patients, particularly those for whom the risk for complications is increased (i.e., infants 12 months of age or younger, pregnant women, or immunocompromised persons). Infants younger than 6 months of age are usually immune because of passively acquired maternal antibodies. However, if measles is diagnosed in a mother, unvaccinated children of all ages in the household who lack other evidence of measles immunity should receive immune globulin. Immune globulin prophylaxis is not indicated for household contacts who have received a dose of measles vaccine on or after the first birthday, unless they are immunocompromised. Only if administered within 72 hours of initial measles exposure is measles-mumps-rubella vaccine acceptable for postexposure prophylaxis in household contacts 6 months of age or older except pregnant women, immunocompromised patients, and others for whom vaccine is contraindicated (see "Use of Vaccine"). Immune globulin should not be used to control measles outbreaks.

Any person exposed to measles who lacks evidence of measles immunity (see Table 1 of the original guideline document) and to whom immune globulin is administered should subsequently receive measles-mumps-rubella vaccine, which should be administered no earlier than 5-6 months after immune globulin administration, provided the person is then 12 months of age or older and the vaccine is not otherwise contraindicated. Passively acquired measles antibodies can interfere with the immune response to measles vaccination (see "Recent Administration of Immune Globulins"). The interval required to avoid such interference varies (see Table 3 of the original guideline document).

Immune globulin does not prevent rubella or mumps infection after exposure and is not recommended for that purpose. Although administration of immune globulin after exposure to rubella will not prevent infection or viremia, it may modify or suppress symptoms and create an unwarranted sense of security. Therefore, immune globulin is not recommended for routine postexposure prophylaxis of rubella in early pregnancy or any other circumstance. Infants with congenital rubella have been born to women who received immune globulin shortly after exposure. Administration of immune globulin should be considered only if a pregnant woman who has been exposed to rubella will not consider termination of pregnancy under any circumstances. In such cases, intramuscular administration of 20 mL of immune globulin

within 72 hours of rubella exposure may reduce -- but will not eliminate -- the risk for rubella.

C. Revaccination of Persons Vaccinated According to Earlier Recommendations

Some persons vaccinated according to earlier recommendations for use of measles, rubella, mumps, and measles-mumps-rubella vaccines should be revaccinated to ensure that they are adequately protected. Unless one of its component vaccines is contraindicated, measles-mumps-rubella vaccine should be used for this purpose.

Previous vaccination with live measles, rubella, and mumps vaccines. Persons vaccinated with live measles, rubella, or mumps vaccines before the first birthday who were not revaccinated on or after the first birthday should be considered unvaccinated. Unless they have other acceptable evidence of immunity to measles, rubella, and mumps, these persons should be revaccinated with measles-mumps-rubella.

Live attenuated Edmonston B measles vaccine (distributed from 1963 to 1975) was usually administered with immune globulin or high-titer measles immune globulin (no longer available in the United States). Vaccination with this product, administered on or after the first birthday, is considered an effective first dose of vaccine. If indicated, a second dose of measles-mumps-rubella vaccine should be administered (see "Documentation of Immunity").

Immune globulin or measles immune globulin administered simultaneously with further attenuated measles vaccines (i.e., vaccines containing the Schwarz or Moraten virus strains) may have impaired the immune response to vaccination. Persons who received measles vaccine of unknown type or further attenuated measles vaccine accompanied by immune globulin or measles immune globulin should be considered unvaccinated and should be administered two doses of measles-mumps-rubella vaccine. Persons vaccinated with other previously licensed live rubella vaccines that were not administered with immune globulin or measles immune globulin (i.e., HPV-77 or Cendehill vaccines) need not be revaccinated against rubella.

Previous vaccination with inactivated measles vaccine or measles vaccine of unknown type. Inactivated (killed) measles vaccine was available in the United States only from 1963 to 1967 but was available through the early 1970s in some other countries. It was frequently administered as a series of two or three injections. Because persons who received inactivated vaccine are at risk for developing severe atypical measles syndrome when exposed to the natural virus, they should receive two doses of measles-mumps-rubella or other live measles vaccine, separated by at least 28 days. Persons who received inactivated vaccine followed within 3 months by live virus vaccine should also be revaccinated with two more doses of measles-mumps-

rubella or other live measles vaccine. Revaccination is particularly important when the risk for exposure to natural measles virus is increased (e.g., during international travel).

Persons vaccinated during 1963-1967 with vaccine of unknown type may have received inactivated vaccine and also should be revaccinated. Persons who received a vaccine of unknown type after 1967 need not be revaccinated unless the original vaccination occurred before the first birthday or was accompanied by immune globulin or measles immune globulin. However, such persons should receive a second dose before entering college, beginning work in a healthcare facility, or undertaking international travel.

Some recipients of inactivated measles vaccine who were later revaccinated with live measles vaccine have had adverse reactions to the live vaccine; the percentage who reported adverse reactions ranges from 4% to 55%. In most cases, these reactions were mild (e.g., local swelling and erythema, low-grade fever lasting 1-2 days), but rarely more severe reactions (e.g., prolonged high fevers, extensive local reactions) have been reported. However, natural measles infection is more likely to cause serious illness among recipients of inactivated measles vaccine than is live measles virus vaccine.

Previous vaccination with inactivated mumps vaccine or mumps vaccine of unknown type. A killed mumps virus vaccine was licensed for use in the United States from 1950 through 1978. Although this vaccine induced antibody, the immunity was transient. The number of doses of killed mumps vaccine administered between licensure of live attenuated mumps vaccine in 1967 until the killed vaccine was withdrawn in 1978 is unknown but appears to have been limited.

Revaccination with measles-mumps-rubella should be considered for certain persons vaccinated before 1979 with either killed mumps vaccine or mumps vaccine of unknown type who are at high risk for mumps infection (e.g., persons who work in healthcare facilities during a mumps outbreak). No evidence exists that persons who have had mumps disease or who have previously received mumps vaccine (killed or live) are at increased risk for local or systemic reactions upon receiving measles-mumps-rubella or live mumps vaccine.

## V. Precautions and Contraindications

### A. Pregnancy

Measles-mumps-rubella and its component vaccines should not be administered to women known to be pregnant. Because a risk to the fetus from administration of these live virus vaccines cannot be excluded for theoretical reasons, women should be counseled to avoid becoming pregnant for 30 days after vaccination with measles or mumps vaccines and for 3 months\* after administration of measles-mumps-rubella or other rubella-containing vaccines. Routine

precautions for vaccinating postpubertal women with measles-mumps-rubella should be followed in all vaccination programs (see "Routine Vaccination -- Women of Childbearing Age"). If a pregnant woman is vaccinated or if she becomes pregnant within 3 months\* after vaccination, she should be counseled about the theoretical basis of concern for the fetus, but measles-mumps-rubella vaccination during pregnancy should not ordinarily be a reason to consider termination of pregnancy. Rubella-susceptible women who are not vaccinated because they state they are or may be pregnant should be counseled about the potential risk for congenital rubella syndrome and the importance of being vaccinated as soon as they are no longer pregnant.

\*Note from the National Guideline Clearinghouse and the Advisory Committee on Immunization Practices: On October 18, 2001, the Advisory Committee on Immunization Practices reviewed data from several sources indicating that no cases of congenital rubella syndrome had been identified among infants born to women who were vaccinated inadvertently against rubella within 3 months or early in pregnancy. On the basis of these data, the Advisory Committee on Immunization Practices shortened its recommended period to avoid pregnancy after receipt of rubella-containing vaccine from 3 months to 28 days. See MMWR Morb Mortal Wkl Rep 2001 Dec 14;50(49):1117 [2 references].

Breast feeding is not a contraindication to vaccination. Although a woman can excrete rubella vaccine virus in breast milk and transmit the virus to her infant, the infection remains asymptomatic. Otherwise, persons who receive measles-mumps-rubella or its component vaccines do not transmit measles, rubella, or mumps vaccine viruses. Thus, measles-mumps-rubella vaccine can be administered safely to susceptible children or other persons with household contacts who are pregnant to help protect these pregnant women from exposure to wild rubella virus.

#### B. Severe Illness

Because of the importance of protecting susceptible children against measles, mumps, and rubella, medical personnel should use every opportunity to vaccinate susceptible persons. The decision to vaccinate or postpone vaccination of a person who currently has or recently has had an acute febrile illness depends largely on the cause of the illness and the severity of symptoms. Minor illnesses, with or without fever (e.g., diarrhea, upper respiratory infection, otitis media) are not contraindications for vaccination and vaccination should not be postponed because of them. Similarly, performing routine physical examinations or measuring temperatures are not prerequisites for vaccinating person who appear to be in good health. Appropriate procedures in childhood vaccination programs include (a) asking the patient or guardian if the child is ill, (b) postponing vaccination of children who have moderate or severe febrile illnesses, and (c) vaccinating children who do not have other contraindications.

Vaccination of persons with moderate or severe febrile illnesses should generally be deferred until they have recovered from the acute phase of their illness. This wait avoids superimposing adverse effects of vaccination on the underlying illness or mistakenly attributing a manifestation of the underlying illness to the vaccine.

Persons under treatment for tuberculosis have not experienced exacerbations of the disease when vaccinated with measles-mumps-rubella. Although no studies have been reported concerning the effect of measles-mumps-rubella vaccine on persons with untreated tuberculosis, a theoretical basis exists for concern that measles vaccine might exacerbate tuberculosis. Consequently, before administering measles-mumps-rubella to persons with untreated active tuberculosis, initiating antituberculous therapy is advisable. Tuberculin testing is not a pre-requisite for routine vaccination with measles-mumps-rubella or other measles-containing vaccines.

### C. Allergies

Among persons who are allergic to eggs, the risk for serious allergic reactions such as anaphylaxis following administration of measles- or mumps-containing vaccines is extremely low and skin-testing with vaccine is not predictive of allergic reaction to vaccination. Therefore, skin testing is not required before administering measles-mumps-rubella (or other measles- and mumps-containing vaccines) to persons who are allergic to eggs. Similarly, the administration of gradually increasing doses of vaccine is not required. In the past, persons with a history of anaphylactic reactions (i.e., hives, swelling of the mouth or throat, difficulty breathing, hypotension, and shock) following egg ingestion were considered to be at increased risk for serious reactions after administration of measles- or mumps-containing vaccines, which are produced in chick embryo fibroblasts. Although protocols have been developed for skin testing and vaccination of persons who experience anaphylactic reactions to egg ingestion, data indicate that most anaphylactic reactions to measles- and mumps-containing vaccines are not associated with hypersensitivity to egg antigens but to other components of the vaccines.

The literature contains several case reports of persons with an anaphylactic sensitivity to gelatin who had anaphylactic reactions after receiving measles-mumps-rubella vaccine. Measles-mumps-rubella and its component vaccines contain hydrolyzed gelatin as a stabilizer. Therefore, extreme caution should be exercised when administering measles-mumps-rubella or its component vaccines to persons who have a history of an anaphylactic reaction to gelatin or gelatin-containing products. Before administering measles-mumps-rubella or its component vaccines to such persons, skin testing for sensitivity to gelatin can be considered. However, no specific protocols for this purpose have been published.

Because measles-mumps-rubella and its component vaccines contain trace amounts of neomycin (25 micrograms), persons who have

experienced anaphylactic reactions to topically or systemically administered neomycin should not receive these vaccines. However, neomycin allergy is most often manifested as a delayed or cell-mediated immune response (i.e., a contact dermatitis), rather than anaphylaxis. In persons who have such a sensitivity, the adverse reaction to the neomycin in the vaccine is an erythematous, pruritic nodule or papule appearing 48-96 hours after vaccination. A history of contact dermatitis to neomycin is not a contraindication to receiving measles-mumps-rubella vaccine. Measles-mumps-rubella vaccine does not contain penicillin and therefore a history of penicillin allergy is not a contraindication to measles-mumps-rubella vaccination.

Although anaphylaxis after vaccination is extremely rare and no anaphylaxis deaths associated with administration of measles-mumps-rubella vaccine have been reported, this adverse event can be life threatening. Epinephrine should be available for immediate use at any site where vaccines are administered in case symptoms of anaphylaxis occur.

#### D. Thrombocytopenia

Children who have a history of thrombocytopenia or thrombocytopenic purpura may be at increased risk for developing clinically significant thrombocytopenia after measles-mumps-rubella vaccination. Although thrombocytopenia can be life threatening, no deaths have been reported as a direct consequence of vaccine-induced thrombocytopenia. The decision to vaccinate with measles-mumps-rubella should depend on the benefits of immunity to measles, mumps, and rubella and the risks for recurrence or exacerbation of thrombocytopenia after vaccination or during natural infection with measles or rubella. The benefits of primary immunization are usually greater than the potential risks, and administration of measles-mumps-rubella vaccine is justified, particularly with regard to the even greater risk for thrombocytopenia after measles or rubella disease. However, avoiding a subsequent dose of measles-mumps-rubella vaccine may be prudent if an episode of thrombocytopenia occurred within approximately 6 weeks after a previous dose of the vaccine. Serologic evidence of measles immunity among such persons may be sought in lieu of measles-mumps-rubella vaccination.

#### E. Recent Administration of Immune Globulins

Recent evidence indicates that high doses of immune globulins can inhibit the immune response to measles and rubella vaccine for 3 or more months. The duration of this interference with the immune response depends on the dose of immune globulin administered. The effect of immune globulin preparations on the response to mumps vaccine is unknown. Blood (e.g., whole blood, packed red blood cells, and plasma) and other antibody-containing blood products (e.g., immune globulin, specific immune globulins, and intravenous immune globulin) can reduce the immune response to measles-mumps-rubella or its component vaccines. Therefore, these vaccines should be

administered to persons who have received an immune globulin preparation only after the recommended intervals have elapsed. However, postpartum administration of measles-mumps-rubella or rubella vaccine to women who are susceptible to rubella should not be delayed because anti-Rho(D) immune globulin (human) or any other blood product was received during the last trimester of pregnancy or at delivery. Such rubella-susceptible women should be vaccinated immediately after delivery and tested at least 3 months later to ensure that they are immune to rubella and measles.

Immune globulin preparations generally should not be administered simultaneously with measles-mumps-rubella or its component vaccines. If administration of an immune globulin preparation becomes necessary because of imminent exposure to disease, measles-mumps-rubella or its component vaccines can be administered simultaneously with the immune globulin preparation, although vaccine-induced immunity may be compromised. Usually, vaccine virus replication and stimulation of immunity will occur 1-2 weeks after vaccination. Thus, if the interval between administration of any of these vaccines and administration of an immune globulin preparation is less than 14 days, vaccination should be repeated after the recommended interval, unless serologic testing indicates that the vaccinated person's immune system has produced antibodies to each vaccine component (i.e., measles, rubella, and mumps). The vaccine should be administered at an anatomic site remote from that chosen for the immune globulin injection.

#### F. Altered Immunocompetence

Enhanced replication of vaccine viruses may occur in persons who have immune deficiency diseases and in other persons who are immunosuppressed. Ultimately, the patient's physician must assume responsibility for determining whether the patient is severely immunocompromised based on clinical and laboratory assessment.

Case reports have linked vaccine-associated measles infection to the deaths of some severely immunocompromised persons. Therefore, measles-mumps-rubella vaccine should not be administered to severely immunocompromised persons. To reduce the risk for measles, rubella, and mumps exposure of immunocompromised patients, their susceptible close contacts should be vaccinated with measles-mumps-rubella. No case reports exist linking measles-mumps-rubella or mumps- or rubella-containing vaccines with clinically significant infection caused by mumps or rubella vaccine virus among immunocompromised vaccine recipients

#### HIV-Infected Persons

Among asymptomatic and symptomatic HIV-infected patients who are not severely immunosuppressed, measles-mumps-rubella vaccination has been associated with variable antibody responses but not with severe or unusual adverse events. Asymptomatic persons do not need

to be evaluated and tested for HIV infection before measles-mumps-rubella and other measles-containing vaccines are administered. Measles-mumps-rubella vaccine is recommended for all asymptomatic HIV-infected persons who are not severely immunosuppressed and who lack evidence of measles immunity. Measles-mumps-rubella vaccination of symptomatic HIV-infected persons should be considered if they (a) do not have evidence of severe immunosuppression and (b) lack evidence of measles immunity. Measles-mumps-rubella and other measles-containing vaccines are not recommended for HIV-infected persons with evidence of severe immunosuppression (see "Special Considerations for Vaccination -- Persons Infected with Human Immunodeficiency Virus [HIV]) (see Table 2 of the original guideline document).

### Steroids

Although the immunosuppressive effects of steroid treatment vary, many clinicians consider a steroid dose that is equivalent to or greater than a prednisone dose of 2 mg/kg of body weight per day or a total of 20 mg per day sufficiently immunosuppressive to raise concern about the safety of administration of live virus vaccines. Persons who have received systemic corticosteroids in these or greater doses daily or on alternate days for an interval of 14 days or longer should avoid vaccination with measles-mumps-rubella and its component vaccines for at least 1 month after cessation of steroid therapy. Persons who have received prolonged or extensive topical, aerosol, or other local corticosteroid therapy that causes clinical or laboratory evidence of systemic immunosuppression should also avoid vaccination with measles-mumps-rubella for at least 1 month after cessation of therapy. Persons who receive doses of systemic corticosteroids equivalent to a prednisone dose of 2 mg/kg or more of body weight or 20 mg or more total daily or on alternate days during an interval of less than 14 days generally can receive measles-mumps-rubella or its component vaccines immediately after cessation of treatment, although some experts prefer waiting until 2 weeks after completion of therapy. Measles-mumps-rubella or its component vaccines generally should not be administered to persons who have a disease that, in itself, suppresses the immune response and who are receiving either systemic or locally administered corticosteroids.

### Leukemia

Persons with leukemia in remission who were not immune to measles, rubella, or mumps when diagnosed with leukemia may receive measles-mumps-rubella or its component vaccines. At least 3 months should elapse after termination of chemotherapy before administration of the first dose of measles-mumps-rubella vaccine.

## G. Management of Patients with Contraindication to Measles Vaccine

If immediate protection against measles is required for persons with contraindications to measles vaccination, 0.25 mL/kg (0.11 mL/lb) of body weight (maximum dose = 15 mL) of immune globulin should be administered as soon as possible after known exposure (See "Use of Vaccine and Immune Globulin Among Persons Exposed to Measles, Rubella, or Mumps"). Exposed symptomatic HIV-infected and other immunocompromised persons should receive immune globulin regardless of their previous vaccination status. Because immune globulin in usual doses may not be effective for immunocompromised persons, the recommended dose is 0.5 mL/kg of body weight if immune globulin is administered intramuscularly (maximum dose = 15 mL). This corresponds to a dose of IgG protein of approximately 82.5 mg/kg (maximum dose = 2,475 mg). Intramuscular immune globulin may not be needed if a patient is receiving at least 100-400 mg/kg intravenous immune globulin at regular intervals and exposure occurs within 3 weeks after administration of the last dose of intravenous immune globulin. Because the amounts of protein administered are similar, high-dose intravenous immune globulin may be as effective as intramuscular immune globulin. However, no data are available concerning the effectiveness of intravenous immune globulin in preventing measles.

The effectiveness of immune globulin or intravenous immune globulin for preventing mumps or rubella is unknown. These products should not be used for prophylaxis among immunocompromised persons exposed to these diseases.

#### CLINICAL ALGORITHM(S)

None provided

### EVIDENCE SUPPORTING THE RECOMMENDATIONS

#### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is not specifically stated for each recommendation, but the safety and efficacy of the vaccine is discussed and cited in the references (of the full-text original guideline document).

### BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

#### POTENTIAL BENEFITS

Overall

- Elimination of measles, rubella and congenital rubella syndrome from the United States and measles from the Western Hemisphere.
- Reduction in the incidence of mumps.

Specific benefits include

- The two-dose measles-mumps-rubella vaccine recommendation provides an additional safeguard against primary vaccine failures and helps to facilitate the elimination of measles, rubella and congenital rubella syndrome and continued reduction of mumps incidence.
- Data also indicate a more favorable benefit/cost ratio for routine measles, rubella, and mumps vaccination when the vaccines are administered as combined measles-mumps-rubella vaccine verses the use of individual monovalent measles, mumps and rubella vaccines.
- Favorable benefit/cost ratio for routine vaccination than cost of diseases.

#### POTENTIAL HARMS

- Adverse events associated with administration of measles-mumps-rubella vaccine range from local pain, induration, and edema to rare systemic reactions such as anaphylaxis. Side effects tend to occur among vaccine recipients who are nonimmune and therefore are very rare after revaccination. Expert committees at the Institute of Medicine recently reviewed all evidence concerning the causal relationship between measles-mumps-rubella vaccination and various adverse events. The Institute of Medicine determined that evidence establishes a causal relation between measles-mumps-rubella vaccination and anaphylaxis, thrombocytopenia, febrile seizures, and acute arthritis.

### CONTRAINDICATIONS

#### CONTRAINDICATIONS

The precautions and contraindications are stated in the "Major Recommendations" field, and described in detail in the guideline document. Briefly, precautions and contraindications apply to pregnant women, persons with severe illness or allergies, children with a history of thrombocytopenia or thrombocytopenia purpura, patients who have recently received administration of immune globulins, and those with altered immunocompetence (such as HIV-infected persons, those on steroid treatment, and patients with leukemia).

### IMPLEMENTATION OF THE GUIDELINE

#### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

#### IOM CARE NEED

Staying Healthy

#### IOM DOMAIN

Effectiveness  
Safety

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Centers for Disease Control and Prevention. Measles, mumps, and rubella--vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 1998 May 22; 47(RR-8): 1-57. [229 references] [PubMed](#)

Notice to readers: Revised ACIP recommendation for avoiding pregnancy after receiving a rubella-containing vaccine. MMWR Recomm Rep 2001 Dec 14; 50(49): 1117. [2 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

1998 May 22

### GUIDELINE DEVELOPER(S)

Centers for Disease Control and Prevention - Federal Government Agency [U.S.]

### SOURCE(S) OF FUNDING

United States Government

### GUIDELINE COMMITTEE

Advisory Committee on Immunization Practices (ACIP)

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### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

#### GUIDELINE STATUS

This is the current release of the guideline.

These revised recommendations of the Advisory Committee on Immunization Practices (ACIP) on measles, mumps, and rubella prevention supersede recommendations published in 1989 (Measles prevention. MMWR Morb Mortal Wkly Rep 1989 Dec 29;38 Suppl 9: 1-18) and 1990 (Rubella prevention. Recommendations of the Immunization Practices Advisory Committee [ACIP]. MMWR Morb Mortal Wkly Rep 1990 Nov 23;39[RR-15]: 1-18).

An update is not in progress at this time.

#### GUIDELINE AVAILABILITY

Electronic copies of "Measles, mumps, and rubella: vaccine use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps. Recommendations of the Advisory Committee on Immunization Practices (ACIP)" are available from the [Centers for Disease Control and Prevention \(CDC\)](#).

Electronic copies of "Notice to readers: Revised ACIP recommendation for avoiding pregnancy after receiving a rubella-containing vaccine" are available from the [Centers for Disease Control and Prevention \(CDC\)](#).

Print copies: Available from the Centers for Disease Control and Prevention, MMWR, Atlanta, GA 30333. Additional copies can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; (202) 783-3238.

#### AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Hatziandreu EJ, Brown RE, Halpern MT. A cost-benefit analysis of the measles-mumps-rubella (MMR) vaccine. Final report prepared for National Immunization Program, Centers for Disease Control and Prevention. Arlington (VA): Center for Public Health Research and Education, Battelle Memorial Institute, 1994.

#### PATIENT RESOURCES

None available

#### NGC STATUS

This summary was completed by ECRI on October 25, 2000. The information was verified by the guideline developer as of January 31, 2001.

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