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Recommendations of the Immunization Practices Advisory Committee (ACIP) of the U.S. Public Health Service

Varicella-Zoster Immune Globulin for the Prevention of Chickenpox

This is the first statement by the Immunization Practices Advisory Committee (ACIP) on the use of varicella-zoster immune globulin (VZIG). Prior recommendations have been made by the manufacturer in cooperation with the Centers for Disease Control and approved by the Office of Biologics, National Center for Drugs and Biologics, U.S. Food and Drug Administration (FDA). Because of exceedingly limited supplies, VZIG use has been restricted to proven high-risk individuals—for prophylaxis against chickenpox in immunocompromised children and prevention of postnatal chickenpox following intrauterine exposure. With increasing supplies, some of these restrictions can be lifted. This statement includes use of VZIG for immunocompromised individuals of any age, normal adults, pregnant women, and premature and full-term infants. However, because the supply of VZIG is still limited, it continues to be recommended primarily for immunocompromised children and certain neonates exposed in utero. It should not be used indiscriminately.

Introduction

Chickenpox or varicella is usually a benign, highly contagious disease caused by varicella-zoster (V-Z) virus. The disease occurs primarily among preschool and young, school-aged children. More than 90% of

TABLE 1. Determination of susceptibility to varicella in some selected situations*

Group	Immune status	Carefully obtained prior history of varicella	Detectable varicella antibody by a reliable test†	Susceptibility status
Children (< 15 yr)	immuno-comprised	yes	unnecessary to perform	immune
		no or unknown	§	susceptible
Adolescents and adults (≥ 15 yrs)	normal	yes	unnecessary to perform	immune
		no or unknown	not performed	generally consider immune¶
			yes	immune
			no	susceptible
	immuno-compromised	yes	unnecessary to perform	immune
		no or unknown	§	consider susceptible¶

**This table provides general guidelines for determining susceptibility in frequently encountered situations. Not all potential scenarios are considered. In all situations, individual judgment should also be used. See text for details.*
†Reliable tests are discussed in the text.
§Some immunocompromised persons with detectable antibody before VZIG administration, presumably passively transferred by recent transfusions, have developed clinical varicella. Until further evaluation of serologic tests in the immunocompromised has been completed, one may have to rely on a carefully obtained clinical history by an experienced interviewer to determine susceptibility (i.e., the absence of a history of clinical varicella).
¶More than 85% and probably more than 95% of such persons are immune.

cases are reported among persons under 15 years of age. Epidemiologic and serologic studies confirm that susceptibility among adults is substantially lower than among children. Varicella is highly communicable; secondary clinical attack rates of about 90% follow exposure of household contacts (*1*).

The period of communicability of patients with varicella is estimated to range from 1 to 2 days before rash onset through the first 5-6 days after rash onset. Persons with progressive varicella may be communicable for longer periods, presumably because their immune response is to some degree depressed, allowing viral replication to persist.

Because of the large number of varicella cases among normal children, children account for the greatest number of complications from this disease. However, the risk of complications for normal children is small compared to that for immunocompromised* children, whose varicella can frequently be life-threatening. The risk of serious morbidity and mortality from varicella is directly related to host immunodeficiency.

*Immunocompromised persons include individuals with congenital or acquired immunodeficiency diseases and persons with suppressed immune responses, such as those that occur with leukemia, lymphoma, generalized malignancy, and therapy with immunosuppressive drugs, including steroids, alkylating drugs, antimetabolites, or radiation.

Varicella can also be life-threatening to neonates who acquire infection transplacentally just before delivery. Term infants born to women who had onset of varicella rash within 4 days before delivery appear to have an increased mortality rate from varicella. Infants born to mothers with onsets of varicella rash 5 or more days before delivery usually have a benign course, presumably because of passive transfer of maternal antibody.

Although intrauterine infection acquired shortly before delivery increases the risk of neonatal complications, infection of mothers during the first 16 weeks of pregnancy only rarely leads to fetal damage (low birth weight, hypotrophic limbs, ocular abnormalities, brain damage, and mental retardation). This "syndrome" is so uncommon that two large studies of pregnancies complicated by varicella have not shown an increased incidence rate of congenital defects compared with controls (*2,3*). However, review of available case records clearly supports its existence.

Although few adults are susceptible to varicella, those who develop the disease are more likely to experience complications. Persons 20 years of age or older account for a disproportionate amount of encephalitis and death. Although less than 2% of reported cases occur among individuals 20 years of age or older, almost a quarter of all the mortality is reported in this age group. Pneumonia also appears to be more common among adults with varicella.

Following chickenpox, V-Z virus may persist in latent form without clinical manifestations. Upon reactivation, the latent virus can cause zoster or "shingles," a painful, vesicular, pustular eruption in the distribution of one or more sensory-nerve roots. Zoster is more common among the elderly and among immunocompromised patients, who are also more prone than the general population to develop disseminated zoster with generalized skin eruptions and central nervous system, pulmonary, hepatic, and pancreatic involvement.

Prevention of Varicella by Varicella-Zoster ImmuneGlobulin

In 1969, zoster immune globulin (ZIG), prepared from patients convalescing from herpes zoster, was shown to prevent clinical varicella in susceptible, normal children if administered within 72 hours after exposure. Subsequent uncontrolled studies of immunocompromised patients who received ZIG after exposure to V-Z virus showed that they also tended to have lower-than-expected clinical attack rates and higher-than-expected rates of subclinical infection when ZIG was administered no later than 96 hours after exposure. Patients who became ill tended to have modified illnesses with a low complication rate. The efficacy of ZIG in immunocompromised persons was further demonstrated by a study comparing the use of low-titer versus high-titer lots; patients who received the high-titer ZIG had significantly lower risks of complications.

In 1978, VZIG became available. Both serologic and clinical evaluations have demonstrated that the product is equivalent to ZIG in preventing or modifying clinical illness in susceptible, immunocompromised patients exposed to varicella. VZIG has been licensed by FDA's Office of Biologics. VZIG is prepared from plasma found in routine screening of normal, volunteer blood donors to contain high antibody titers to V-Z. VZIG (Human) is a sterile, 10%-18% solution of the globulin fraction of human plasma, primarily immunoglobulin G (lgG) in 0.3M glycine as a stabilizer and 1:10,000 thimerosol as a preservative. It is prepared by Cohn cold ethanol precipitation.

ZIG was in short supply because of the continuous need to find new donors convalescing from herpes zoster. Because of the method of routinely screening plasma from regular blood donors for high titers of V-Z antibody and using those units to prepare VZIG, supplies became substantially greater.

Indications for Use

When deciding whether to administer VZIG, the clinician must determine whether the patient is likely to be susceptible, whether the exposure is likely to result in infection, and whether the patient is at greater risk of complications from varicella than the general population. Whereas risks of VZIG administration appear to be negligible, costs of administration can be substantial (approximately $75 per 125 units,† or $375 for persons over 40 kg [88 lbs] of body weight, i.e., for the maximum recommended dose). In addition, it is not known whether modified infection will lead to lifelong immunity or whether modified infections will increase or decrease the risk of later developing zoster. The following recommendations are made taking these factors into account. In some instances, VZIG is routinely recommended; in others, administration should be evaluated on an individual basis.

†VZIG is, however, distributed free-of-charge to Massachusetts residents.

Determination of Susceptibility

Both normal and immunocompromised adults and children, who are

believed to have had varicella based on a carefully obtained history by an experienced interviewer, can be considered immune§ (Table 1). Reports of second attacks of clinical varicella are rare.

Since subclinical primary infections appear rare (less than 5% of infections among normal children), children (under 15 years old) without histories of clinical varicella should be considered susceptible unless proven otherwise (see below). On the other hand, most normal adults with negative or unknown histories of varicella are probably immune, since attack rates of varicella in such adults after household or hospital exposure have ranged from only 5% to 15%.¶

Antibody Assays: Laboratory determination of susceptibility to varicella is often impractical. The most commonly available serologic assay for varicella antibodies, the complement-fixation (CF) test, is insensitive and may not be specific, particularly at low titers. One year after clinical varicella, approximately two of three patients will lack detectable CF antibody to varicella.

Other antibody assays are more sensitive and specific indicators of varicella immunity in normal hosts but are not generally available. These tests include fluorescent antibody against membrane antigen (FAMA), immune adherence hemagglutination (IAHA), enzyme-linked immunosorbent assay (ELISA), and neutralizing antibody. Commercial kits are available that utilize these sensitive antibody detection methods, although they have not been fully evaluated, particularly in immunocompromised populations.** When sensitive tests are available, they can be used when a determination of susceptibility is necessary.

In some instances, there have been difficulties in interpreting results of some current sensitive antibody assays in immunocompromised persons. Low levels of such antibodies have been detected in the sera of some immunocompromised persons lacking histories of chickenpox who subsequently developed clinical varicella. While present, these antibodies did not prevent illness. Presumably, most if not all these persons had passively acquired antibodies as a result of recent transfusions of blood, blood derivatives, or blood products containing antibody. Investigation of other immunocompromised persons has demonstrated that serum antibodies are frequently present following transfusions. In addition, some of these sensitive antibody assays may be measuring nonspecific activity rather than antibody. Little is known about the cellular immune status of immunocompromised individuals. Therefore, until data are collected that allow further evaluation of serologic tests in the immunocompromised, in routine circumstances, one may need to rely primarily on a carefully obtained history of prior clinical chickenpox to define susceptibility. The history should be taken by an experienced interviewer. Additional studies to evaluate serologic tests of immunocompromised patients are in progress.

In addition, sensitive antibody assays may not be useful in assessing the likelihood that neonates and young infants exposed to varicella will develop clinical disease. Some infants have developed varicella after exposure, despite the presence of detectable antibody, although in most circumstances, such illnesses have been of modified severity.

Bone Marrow Recipients: Because data correlating a prior history of varicella in the bone marrow donor or recipient with actual immunity to chickenpox in the recipient are lacking, children or adults who have received bone marrow transplants should be considered susceptible, regardless of prior histories of clinical chickenpox either in themselves or in the transplant donor. However, bone marrow recipients who develop varicella or zoster following transplantation can subsequently be considered immune.

§Except bone marrow recipients.

¶Susceptibility rates of adults who were raised in some tropical areas, such as Puerto Rico, and particularly remote areas may be somewhat higher.

**Some research laboratories have used experimental varicella skin-test antigens on a limited basis in selected populations, but their utility in routine screening programs has not been established.

Types of Exposure

Several types of exposure are likely to place a susceptible person at risk for varicella (Table 2); persons continuously exposed in the household to patients with varicella are at greatest risk. Approximately 90% of such exposed, susceptible patients contract varicella after a single exposure. Data are not available from immunocompromised susceptible populations to directly compare the risk of varicella after playmate or hospital exposure with the risk after household exposure. However, clinical attack rates among immunocompromised patients treated with VZIG allow some comparison; approximately one-third to one-half of VZIG-treated immunocompromised children with negative histories of prior varicella become ill after household exposure. The risks of disease following playmate and hospital exposure are approximately

TABLE 2. Exposure criteria for which varicella-zoster immune globulin (VZIG) is indicated*

1. One of the following types of exposure to persons with chickenpox or zoster:
   a. Continuous household contact.
   b. Playmate contact (generally > 1 hour of play indoors).
   c. Hospital contact (in same two- to four-bed room or adjacent beds in a large ward or prolonged face-to-face contact with an infectious staff member or patient).
   d. Newborn contact (newborn of mother who had onset of chickenpox 5 days or less before delivery or within 48 hours after delivery).

   AND
2. Time elapsed after exposure is such that VZIG can be administered within 96 hours but preferably sooner.

*Patients should meet both criteria.

one-fifth the risk after household exposure. Significant playmate contact generally consists of longer than 1 hour of play indoors. Significant exposure for hospital contacts consists either of sharing the same two- to four-bed hospital room with an infectious patient or of prolonged, direct face-to-face contact with an infectious person (e.g., nurses or doctors who care for the patient). Transient contacts (e.g., x-ray technicians and maintenance personnel) are less likely to result in transmission than more prolonged contacts.

The clinical attack rate in VZIG-treated, normal infants who have been exposed in utero shortly before delivery is as high as 30%-40%, which is not substantially different from reported rates without VZIG. However, complications are much lower in VZIG-treated infants.

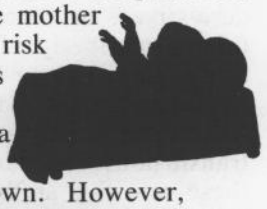
Recommendations for Use of VZIG

Infants and Children

Immunocompromised Children: The most important use of VZIG is for passive immunization of susceptible, immunocompromised children after significant exposure to chickenpox or zoster (Table 3). This includes children with primary immune deficiency disorders and neoplastic diseases and children currently receiving immunosuppressive treatment.

Newborns of Mothers with Varicella Shortly before Delivery: VZIG is indicated for newborns of mothers who develop chickenpox within 5 days before and 48 hours after delivery. VZIG is probably not necessary for newborns whose mothers develop varicella more than 5 days before delivery, since those infants should be protected from complications of varicella by transplacentally-acquired maternal antibody. There is no evidence to suggest that infants born to mothers who develop varicella more than 48 hours after delivery are at increased risk of complications of disease.

Postnatal Exposure of Newborn Infants: Premature infants who have significant postnatal exposure should be evaluated on an individual basis. Most premature infants of 38 weeks' gestation or more will have transplacentally-acquired maternal antibodies and are protected from complications of disease if the mother is immune. The risk of complications of postnatally-acquired varicella in the premature infant is unknown. However, since their immune systems may be compromised, it seems prudent to administer VZIG to exposed premature infants whose mothers have negative or uncertain histories of varicella. Such infants should be considered at risk as long as they require continued hospital care. Exposed infants of less than 28 weeks' gestation or birth weight of 1,000 g or less probably should receive VZIG regardless of maternal history, because they may not yet have acquired transplacental maternal antibody.



Normal-term infants who develop varicella following postnatal exposure are not known to be at any greater risk from complications of chickenpox than older children. VZIG is not recommended for normal-term infants exposed postnatally even if their mothers do not have a prior history of varicella.

Adults

Immunocompromised Adults: The complication rate for immunocompromised adults who contract varicella is likely to be substantially greater than for normal adults. Most (85%-95%) immunocompromised adults with negative or unknown histories of prior varicella are likely to be immune. After careful evaluation, adults who are believed susceptible and who have had significant exposures should receive VZIG to prevent complications.

Normal Adults: Chickenpox can be severe in normal adults. Based on available epidemiologic and clinical data, normal adults who develop varicella have a ninefold to 25-fold greater risk of complications, including death, than normal children. The estimated risk of death following varicella in normal adults is 50/100,000, compared with an estimated 2/100,000 among normal children. The decision to administer VZIG to an adult should be evaluated on an individual basis. Approximately 85%-95% of adults with negative or uncertain histories of varicella will be immune. The objective is to modify rather than prevent illness in hopes of inducing lifelong immunity. The clinician should consider the patient's health status, type of exposure, and likelihood of previous infection when deciding whether to administer VZIG. Adults who are older siblings of large families and adults whose children have had varicella are probably immune. If sensitive laboratory screening tests for varicella are available, they might be used to determine susceptibility, if time permits. If, after careful evaluation, a normal adult with significant exposure to varicella is believed susceptible, VZIG may be administered. However, it should be noted that VZIG supplies are still limited and that the cost of VZIG is substantial (an adult dose costs $375).

Indiscriminate use of VZIG in normal adults would quickly exhaust supplies and prevent prophylaxis of known high-risk individuals, such as

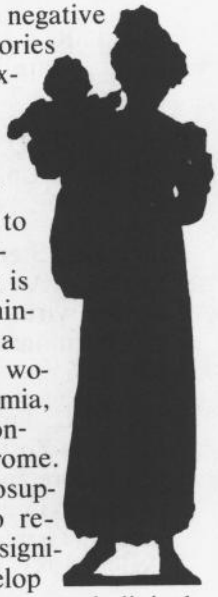
TABLE 3. Candidates for whom varicella-zoster immune globulin (VZIG) is indicated.*

1. Susceptible to varicella-zoster (see text and Table 1).
2. Significant exposure (see Table 2).
3. Age of < 15 years, with administration to immunocompromised adolescents and adults and to other older patients on an individual basis (see text).
4. One of the following underlying illnesses or conditions:
   a. Leukemia or lymphoma.
   b. Congenital or acquired immunodeficiency.
   c. Immunosuppressive treatment.
   d. Newborn of mother who had onset of chickenpox within 5 days before delivery or within 48 hours after delivery.
   e. Premature infant (≥ 28 weeks' gestation) whose mother lacks a prior history of chickenpox.
   f. Premature infants (< 28 weeks' gestation or ≤ 1,000 g) regardless of maternal history.

*Patients should meet the four criteria for VZIG candidates.

immunocompromised children and high-risk neonates. Persons in the latter two groups who develop varicella have estimated death-to-case ratios of at least 7,000/100,000 and 31,000/100,000, respectively, compared with 50/100,000 for normal adults.

Pregnant Women: Pregnant women should be evaluated the same way as other adults. Some experts have recommended VZIG administration for pregnant women with negative or uncertain prior histories of varicella who are exposed in the first or second trimester to prevent congenital varicella syndrome or in the third trimester to prevent neonatal varicella. However, there is no evidence that administration of VZIG to a susceptible, pregnant woman will prevent viremia, fetal infection, or congenital varicella syndrome. Because most immunosuppressed persons who receive VZIG after a significant exposure develop modified clinical disease or subclinical infection, it is theoretically possible that VZIG may prevent or suppress clinical disease in the normal mother without preventing fetal infection and disease. In the absence of evidence that VZIG can prevent congenital varicella syndrome or neonatal varicella, the primary indication for VZIG in pregnant women is to prevent complications of varicella in a susceptible adult patient rather than to prevent intrauterine infection. Neonates born to mothers who develop varicella within the 5 days preceding or 48 hours after delivery should receive VZIG regardless of whether the mother received VZIG.



Hospital Settings

Personnel: After exposure, hospital personnel with negative or uncertain prior histories of chickenpox should be evaluated in the same manner as other adults. When deciding whether to give VZIG to exposed hospital personnel, types of exposure and histories of prior exposure to patients with varicella should be taken into account. If available, sensitive laboratory tests for determining susceptibility can be used to assess candidacy for VZIG and whether work restrictions are necessary during the incubation period.

Hospital Management of Varicella

Ideally, health-care personnel caring for patients with chickenpox or zoster should be immune to varicella. Proper control measures to prevent or control varicella outbreaks in hospitals should include strict isolation precautions,†† cohorting of exposed patients,§§ early discharge when possible, and the use of immune staff.¶¶ Potentially susceptible hospital personnel (Table 1) with significant exposure should not have direct patient contact from the 10th through the 21st day after exposure, if they do not develop varicella. This is the period during which chickenpox may occur. If they develop varicella, they should not have direct patient contact until all lesions have dried and crusted, generally 6 days after rash onset.***

In general, the same control measures should apply regardless of whether potentially susceptible personnel or patients receive VZIG. Data on clinical attack rates and incubation periods of varicella following VZIG administration to normal adults are lacking. Studies of immunocompromised children with negative histories of previous varicella treated with VZIG, who have had intense exposures, such as in the household setting, demonstrate that approximately one-third to one-half will develop clinical varicella and could be infectious. Many of the remaining susceptibles develop subclinical infections that theoretically may be infectious. In addition, VZIG may prolong the average incubation period in immunocompromised patients from 14 to 18 days. The vast majority of cases occur within 28 days of exposure in immunocompromised, VZIG-treated patients. Because of the potential of a prolonged incubation period, personnel who receive VZIG should probably not work in patient areas for 10-28 days following exposure if no illness occurs.

USE

Administration

VZIG is of maximum benefit when administered as soon as possible after the presumed exposure but may be effective given as late as 96 hours after exposure. VZIG has not been evaluated more than 96 hours after initial exposure.

VZIG is not known to be useful in treating clinical varicella or zoster or in preventing disseminated zoster, and it is not recommended for such use. The duration of protection after VZIG administration is unknown, but it seems reasonable that protection should last for at least one half-life of immune globulin—approximately 3††† weeks. To be safe, high-risk susceptibles who are again exposed more than 3 weeks after a prior dose of VZIG should receive another full dose.

TABLE 4. Varicella-zoster immune globulin regional distribution centers

Service area	Regional center and 24-hour telephone
Virginia	American Red Cross Blood Services Tidewater Region 611 W. Brambleton Ave. P.O. Box 1836 Norfolk, VA 23501 (804) 446-7708 or Richmond Metropolitan Blood Service 2201 Westwood Ave. Richmond, VA 23230 (804) 359-5100
Washington, D.C., Maryland, Virginia, West Virginia	American Red Cross Blood Services Washington Region 2025 E Street, N.W. Washington, DC 20006 (202) 728-6426

††Whenever possible, patients should be in a negative-pressure room.
§§Exposed persons can share a room.
¶¶Most studies indicate that almost all adults with prior histories of varicella are immune. Thus, staff with positive histories should be considered immune. Serologic screening may be useful in defining immunity of staff with negative or uncertain histories.
***It should be remembered that staff with varicella may be contagious 1-2 days before onset of rash.
†††In the absence of increased loss or turnover of immunoglobulin (e.g., nephrotic syndrome or Wiskott-Aldrich syndrome).

Dosage

VZIG is supplied in vials containing 125 units per vial (volume is approximately 1.25 cc). The recommended dose is 125 units per 10 kg (22 lbs) body weight, up to a maximum of 625 units (i.e., five vials). The minimum dose is 125 units. Fractional doses are not recommended. Some experts recommend 125 units per 10 kg of body weight without limiting the total dose to 625 units. VZIG has not been evaluated as a prophylactic measure for prevention or attenuation of varicella in normal or immunocompromised adults. Therefore, data do not exist with which to calculate the appropriate dose in adults. However, it seems likely that 625 units should be sufficient to prevent or modify infection in normal adults. Higher doses may be needed in immunocompromised adults.

Route

VZIG should be administered intramuscularly as directed by the manufacturer. IT SHOULD NEVER BE ADMINISTERED INTRAVENOUSLY.

Supply

VZIG is produced by the Massachusetts Public Health Biologic Laboratories. Outside Massachusetts, distribution is arranged by the American Red Cross Blood Services—Northeast Region, through other centers (Table 4).

Adverse Reactions and Precautions

The most frequent adverse event following VZIG is local discomfort at the injection site. Pain, redness, or swelling occurs at the injection site in about 1% of patients. Less frequent adverse rections are gastrointestinal symptoms, malaise, headache, rash, and respiratory symptoms that occur in approximately 0.2% of recipients. Severe reactions, such as angio-neurotic edema and anaphylactic shock, are rare (less than 0.1%).

When VZIG is indicated for patients with severe thrombocytopenia or any other coagulation disorder that would ordinarily contraindicate intramuscular injections, the expected benefits should outweigh the risks.

Adapted from MMWR 1984; 33: 84-90, 95-100.

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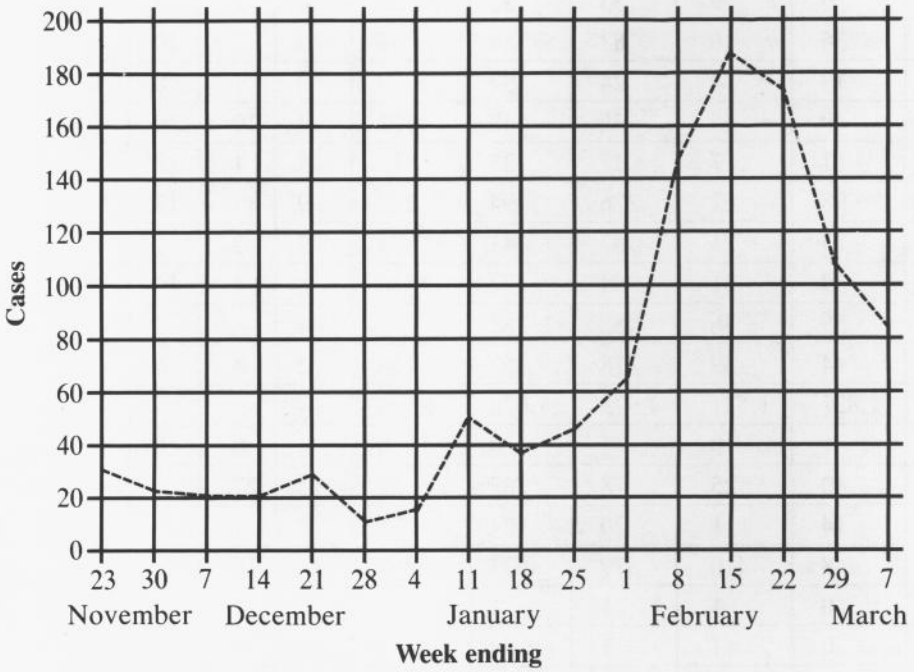
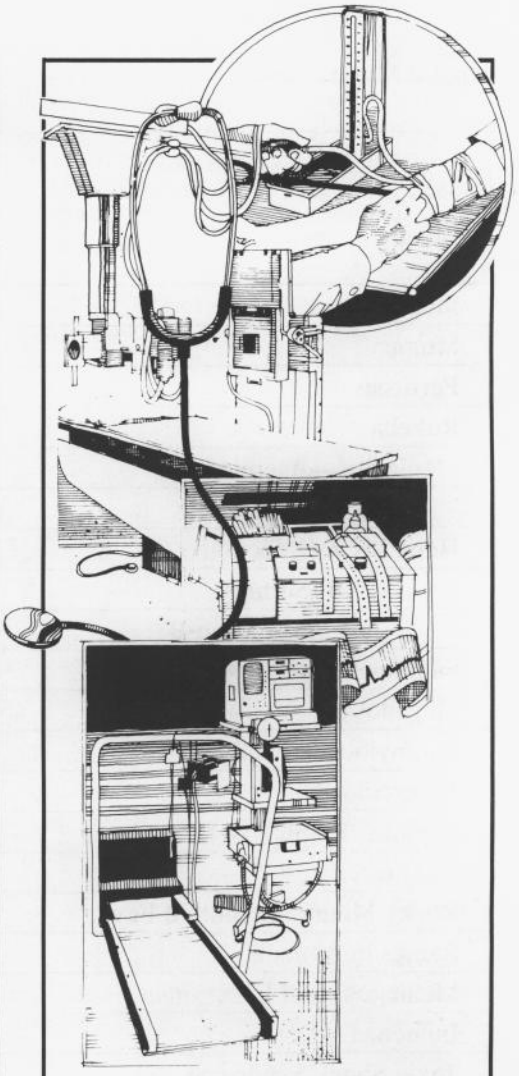
Reports of Flu-like Illness Declining

As seen in Figure 1, cases of flu-like illness reported by 35 sentinel physicians in Virginia peaked during the week ending February 15, 1984. Subsequent weekly reports have shown a steady decline in the number of cases treated.

Figure 1. Cases of flu-like illness reported by 35 sentinel physicians in Virginia, by week, 1983-1984.



The 34th Annual Educational Conference of the Virginia Public Health Association will be held at the Westpark Hotel in Williamsburg, Virginia on May 9-11, 1984. The theme of the conference is "Marketing Public Health in Virginia." Among the topics to be discussed are health legislation, rabies control in Virginia, the current status of AIDS in Virginia, public health financing and neonatal screening. For a conference brochure and further information contact Paul M. Boyton, VPHA Program Committee Chairman 5220 Powhatan Avenue Norfolk, Virginia 23508 Phone: 804-461-1236



The eleventh Annual Educational Conference of the Association for Practitioners in Infection Control (APIC) will be held at the Washington Hilton Hotel in Washington, D.C. on June 3-7, 1984. The conference is designed to provide the Infection Control Practitioner in both acute and long term care facilities with the opportunity to participate in sessions dealing with topics of current interest, original research and the fundamentals of infection control. For further information contact the APIC National Office, 23341 N. Milwaukee Ave., Half Day, IL 60069 Phone: 312-634-1403

Month: March, 1984

Disease	State				Mean 5 Year To Date	Regions				
	This Month	Last Month	Total to Date 1984	1983		This Month N.W.	N.	S.W.	C.	E.
Measles	1	1	2	2	43	0	0	1	0	0
Mumps	3	1	5	9	30	1	1	0	0	1
Pertussis	2	1	7	18	6	2	0	0	0	0
Rubella	0	0	0	1	6	0	0	0	0	0
Meningitis—Aseptic	6	9	33	32	25	0	2	3	0	1
*Bacterial	35	16	83	81	61	3	2	10	9	11
Hepatitis A (Infectious)	13	4	24	37	59	2	1	8	0	2
B (Serum)	49	45	135	148	122	4	10	10	10	15
Non-A, Non-B	11	7	27	25	**15	5	1	2	0	3
Salmonellosis	98	62	226	194	202	9	17	13	27	32
Shigellosis	25	21	87	41	75	2	2	1	2	18
Campylobacter Infections	39	31	94	77	**36	8	4	10	8	9
Tuberculosis	59	36	82	82	—	—	—	—	—	—
Syphilis (Primary & Secondary)	44	39	118	153	156	2	6	6	12	18
Gonorrhea	1,827	1,521	4,973	4,628	4,938	—	—	—	—	—
Rocky Mountain Spotted Fever	1	0	1	0	0	0	0	0	0	1
Rabies in Animals	40	25	78	187	59	12	27	1	0	0
Meningococcal Infections	14	1	20	24	25	3	1	0	5	5
Influenza	448	410	879	633	1,261	21	18	371	0	38
Toxic Shock Syndrome	0	1	1	1	1	0	0	0	0	0
Reyes Syndrome	0	1	1	4	7	0	0	0	0	0
Legionellosis	3	1	4	4	3	2	0	1	0	0
Kawasaki's Disease	2	3	5	13	7	0	0	1	0	1
Other:	—	—	—	—	—	—	—	—	—	—

Counties Reporting Animal Rabies: Alexandria 6 raccoons; Arlington 3 raccoons; Culpeper 1 raccoon; Fairfax 1 bat, 10 raccoons; Fauquier 1 raccoon; Frederick 1 raccoon; Greene 1 raccoon; Loudoun 7 raccoons; Louisa 1 cow, 2 raccoons; Orange 2 raccoons; Spotsylvania 3 raccoons; Washington 1 fox.

Occupational Illnesses: Occupational hearing loss 3; occupational pneumoconiosis 7; Asbestosis 9; mesothelioma 2; Carpal tunnel syndrome 17.

**4 year mean
*other than meningococcal

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