

Measles Hospitalizations, United States, 1977-84: Comparison with National Surveillance Data

LAURI E. MARKOWITZ, MD, ALBERTO TOMASI, MD, BARRY I. SIROTKIN, ROBERT W. CARR, MD, MPH, RONALD M. DAVIS, MD, STEPHEN R. PREBLUD, MD, AND WALTER A. ORENSTEIN, MD

Abstract: Trends in measles discharges from hospitals participating in the Commission on Professional and Hospital Activities, Professional Activities Study (CPHA-PAS) from 1977 to 1984 reflected the rapid decline in measles morbidity indicated by national surveillance data with an 88 per cent decrease in hospitalizations and a 95 per cent decrease in reported cases from 1977 to 1984. Overall trends in number, age, and seasonal distribution were also generally similar. Thirty-four per cent of the hospitalizations listed respiratory complications, 8.5 per cent otitis media, and 3.4 per cent neurologic complications (*Am J Public Health* 1987; 77:866-868.)

Introduction

Since measles vaccine was licensed in the United States in 1963, the incidence of measles in this country has decreased dramatically. In 1978, an initiative to eliminate indigenous measles transmission by 1982 was announced.¹ From 1978 to 1983, the number of measles cases decreased steadily;² in 1984, the number of reported measles cases increased³; and further increases have occurred in 1985 and 1986.

We analyzed trends in measles discharges from hospitals participating in the Commission on Professional and Hospital Activities, Professional Activities Study (CPHA-PAS) from 1977 to 1984 and compared trends with those of the national surveillance system. We also examined the characteristics of hospitalized measles patients during this time period.

Methods

Measles Hospitalizations

CPHA-PAS is a hospital discharge data base of non-federal, short-term, self-selected hospitals in the United States. We obtained from CPHA-PAS abstracts of records of patients with a discharge diagnosis of measles who were discharged between 1977-84 from participating hospitals. Abstracted information included age, sex, state, month of hospitalization, length of stay, discharge status, and complications. Medical diagnoses were coded according to International Classification of Disease, Ninth Edition, Clinical Modification [ICD-9-CM] codes 055-055.9 in 1979-84 and to the Hospital Adaptation of ICDA Second Edition [H-ICDA-2] in 1977-78.

From 1977 to 1984, the percentage of total United States hospital discharges recorded in CPHA-PAS decreased from 38 per cent to 24 per cent. We projected the annual number of measles hospitalizations, by age, for each state by multiplying the number of CPHA-PAS discharges with the diagnosis of measles by the ratio of all hospital discharges in that

From the Division of Immunization, Center for Prevention Services, CDC, Atlanta. Address reprint requests to: Technical Information Services, Freeway Park, Centers for Disease Control, Atlanta, GA 30333. Dr. Tomasi is now with the Ufficio Del Medico Provinciale, Trentino, Italy. Dr. Carr is now with the USAF School of Aerospace Medicine, Brooks Air Force Base, TX. This paper, submitted to the *Journal* July 23, 1986, was revised and accepted for publication January 6, 1986.

state to the number of discharges from hospitals participating in CPHA-PAS.^{4,5}

Measles Surveillance

Each week the Centers for Disease Control (CDC) receives reports of measles cases from 52 reporting areas (50 states, New York City, and the District of Columbia). Prior to 1978, most states had passive surveillance systems for measles. After the measles elimination initiative was announced in 1978, most states initiated stimulated passive or active surveillance systems. In April 1979, a standard clinical case definition of measles was adopted to permit more uniform reporting. Cases were further classified as suspected, probable, or confirmed.⁶ Since 1983, only confirmed cases have been reported.

Cases reported to CDC are grouped in five-year age-intervals. The median age of reported cases was calculated by assuming an equal number of cases in each year of age within a five-year age-group. Hospitalization-to-case ratios were calculated using projected measles hospitalizations from CPHA-PAS and measles cases reported to CDC.

Results

The CPHA-PAS hospital discharges for measles, projected measles hospitalizations, and reported cases all declined in parallel until 1983, when the number of reported cases decreased, but the number of discharges for measles and projected measles hospitalizations both increased (Figure 1, Table 1). In 1984, when the number of reported cases increased by 70 per cent from the previous year (an increase

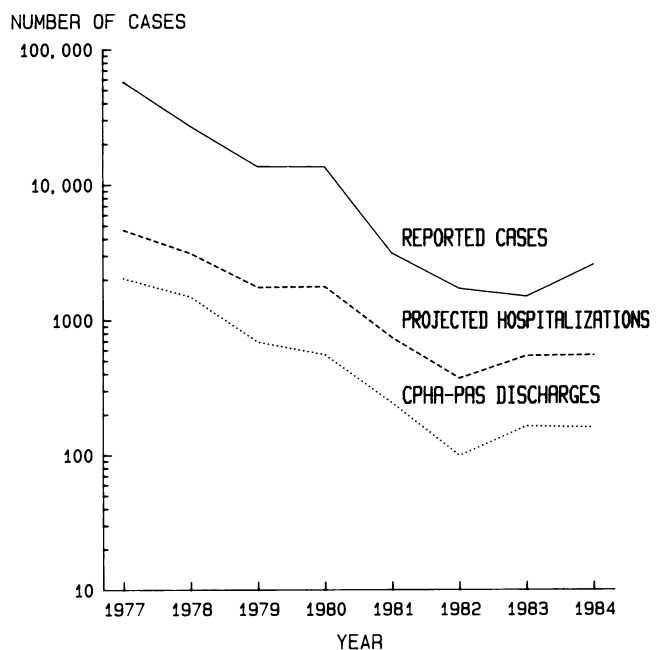


FIGURE 1—Reported Measles Cases, Projected Hospitalizations, and CPHA-PAS Measles Discharges, 1977-84, USA

TABLE 1—Reported Measles Cases and Measles Hospitalizations, United States, 1977–84

Year	Reported Cases*	CPHA-PAS Hospitalizations		Projected Hospitalizations/100 reported cases
		Actual	Projected	
1977	57,345	2,046	4,613	8
1978	26,871	1,490	3,074	11
1979	13,597	688	1,696	12
1980	13,506	555	1,706	13
1981	3,124	244	610	20
1982	1,714	99	369	22
1983	1,497	165	543	36
1984	2,587	161	559	22

*Centers for Disease Control, Atlanta, GA

of 1,090 cases), the numbers of discharges and projected measles hospitalizations were essentially unchanged.

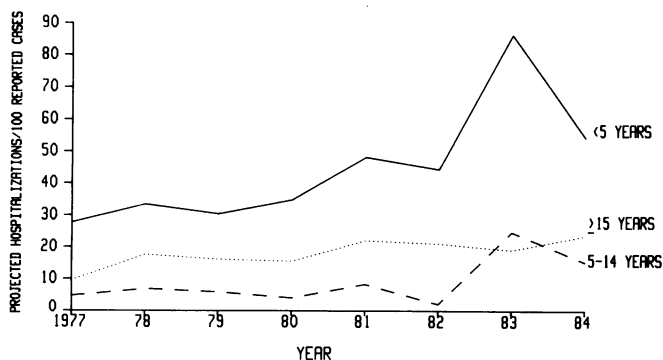
The seasonal distribution of measles hospitalizations and reported cases were similar, with the peaks occurring between April and June. The median age of reported measles cases ranged from 9.5 to 11.9 years. The median age of hospitalized patients ranged from 3.2 to 7.1 years. The greatest difference in the median age between reported cases and hospitalized patients occurred in 1983 (7.7 years).

Ratio of Hospitalizations to Reported Cases

The ratio of projected hospitalizations per 100 reported cases ranged from 8 to 36 (Table 1). There was an abrupt increase in ratio from 13 per 100 to 20 per 100 in 1981. At the same time, reported cases decreased dramatically from over 13,000 cases to approximately 3,000 cases per year. Between 1981 and 1984, the ratio was constant except for 1983, when the ratio increased to 36 per 100. In all years, age-specific ratios of projected hospitalizations to reported cases were highest for the under fives (Figure 2). In 1983, the largest increase in ratio occurred in this age group.

Complications

Overall, 34.0 per cent of measles hospitalizations listed pneumonia or other respiratory complications (ICDA 460–487, 055.1), 8.5 per cent listed otitis media (381.0–382.0, 055.2), and 3.4 per cent listed encephalitis, convulsions, or coma (323.0–323.9, 780.0–780.3, and 055.0 after 1978). The percentage of patients with respiratory complications and otitis media decreased sharply with increasing age; for respiratory infections: under five years (44.3 per cent), 5–14

**FIGURE 2—Projected Measles Hospitalizations per 100 Reported Cases, by Age, 1977–84, USA****TABLE 2—Complications in Hospitalized Measles Patients,* 1977–84**

Year	No.	% of Patients with Complications		
		Neurologic	Respiratory	Otitis Media
1977	2,046	1.3	36.2	7.0
1978	1,490	1.5	33.6	8.7
1979	688	8.6	31.0	7.6
1980	555	6.1	31.2	9.2
1981	244	5.7	35.2	13.5
1982	99	10.1	38.4	12.1
1983	165	7.3	33.9	13.9
1984	161	3.7	29.0	12.4
Total	5,448	3.4	34.0	8.5

*CPHA-PAS

years (30.8 per cent), 15 years and over (21.2 per cent); for otitis media: 15.7 per cent, 4.0 per cent, and 1.3 per cent, respectively. Neurologic complications were reported in 3.4 per cent, 2.2 per cent, and 4.2 per cent of patients in these age groups. Although there was year-to-year variation in the percentage of patients with complications, there were no discernible trends (Table 2).

Discussion

There are limitations to the CPHA-PAS data: hospitals surveyed are not a random sample of hospitals in the United States. Enrollment of hospitals from a particular region of the country or serving an unrepresentative population may have affected these results. We were not able to use the Hospital Discharge Survey of the National Center for Health Statistics, which is a random survey, because it only includes 1 per cent of hospital discharges and measles is now a rare disease.

The trends in the numbers of projected measles hospitalizations and reported cases were parallel until 1983, when hospitalizations increased but reported cases decreased, resulting in an increased ratio of hospitalizations to reported cases. This could have been due to hospitalization of milder measles cases, a change in age distribution of cases (because younger children are more likely to develop complications and require hospitalization), or misdiagnosis of other rash illnesses as measles now that it is a rare disease. There was no indication from the CPHA-PAS data that milder cases were hospitalized in 1983 and increases in age-specific hospitalization to reported case ratios indicate the overall increase was not due to changes in age distribution alone. It is unlikely that misdiagnosis of measles would have occurred only in 1983.

In 1983 there was a change in the reporting criteria, so that only confirmed cases, rather than confirmed and probable cases, were reported.⁴ This change could have decreased the number of reported cases. Although the ratio returned to the previous level in 1984 when the same criteria were used, it is possible that the criteria were more rigorously applied in 1983. Finally, the ratio may have increased because, with the small number of reported cases and hospitalized patients, small changes in either can affect the ratio.

In the prevaccine era, it was estimated that less than 10 per cent of cases were reported.⁷ However, because of increased emphasis on surveillance with the measles elimination initiative, it has been assumed that reporting is now more complete. In theory, this should have resulted in a

decreased hospitalization to case ratio in more recent years, which we did not find. Studies in other countries using active surveillance to obtain denominator data have estimated that 1–2 per cent of all measles cases require hospitalization.^{8–12} However, these studies may not apply to the United States because of different hospitalization patterns, or different age distribution of measles cases. Investigations of recent outbreaks in the United States, in which there was presumably good case ascertainment, have found between one and 50 hospitalizations per 100 cases, with a median of five per 100.^{13–24} A previous study using the Hospital Discharge Survey and national surveillance data found 9–24 measles hospitalizations per 100 reported cases between 1970 and 1978.²² Because of the factors that affect hospitalization and variation in hospitalization-to-case ratios, reporting efficiency of national surveillance is difficult to estimate from these data.

The overall trends indicated by national surveillance appear to be accurate. Data from CPHA-PAS reflect the rapid decline in measles morbidity indicated by national surveillance data with a 95 per cent decrease in reported cases and an 88 per cent decrease in hospitalizations for measles between 1977 to 1984.

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NIH Consensus Conference to Focus on Geriatric Assessment Methods

A consensus development conference of geriatric assessment methods for making clinical decisions will be held at the National Institutes of Health in Bethesda, Maryland, on October 19–21, 1987.

The care of older persons is becoming an ever increasing responsibility for all but a few physicians and other health care providers. Before practitioners can make reasonable judgments about the best care strategies for each older individual, it is clear that appropriate patient data must be collected.

This conference will bring together physicians and other health care professionals with a special interest in geriatric medicine, social scientists, investigators in the area of health services research, and representatives of the public. Following 1½ days of presentations by leaders in the field and discussion by the audience, a consensus panel will weigh the scientific evidence and formulate a draft statement in response to the following questions:

- What are the goals, structure, processes, and elements of assessment for clinical decision making?
- What are the comparative merits of different methods in carrying out geriatric assessment?
- What is the evidence that a geriatric assessment is effective? If an assessment is effective, in what setting, for whom, and for which outcomes?
- Insofar as geriatric assessment is effective, what linkages to clinical management systems are required?
- What are the priorities for future research in geriatric assessment?

To register to attend the conference, contact Marti Bernstein, Prospect Associates, 1801 Rockville Pike, Suite 500, Rockville, MD 20852, telephone (301) 468-6555.