

Public health nurses discover an outbreak of staphylococcus in a New York State hospital nursery through a 10-month surveillance of newborn infants at home.

Staphylococcal Outbreaks in Infants Detected after Hospital Discharge

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IN HOSPITALS in upstate New York, most newborn infants stay only 4 days. Since this stay is shorter than the average 6-day incubation period of hospital-acquired staphylococcal disease in newborns (1-6), a nursery outbreak may be detected only by examination of infants after discharge.

The feasibility of having public health nurses examine infants after discharge was explored during a 10-month survey in one city served principally by three hospitals. When the survey began in May 1958, there was no reason to believe that any of the hospitals had a staphylococcal disease problem in their nurseries.

The city's resident population was 97,999 on July 1, 1958, as estimated by the New York State Department of Health. Its 3 hospitals, which also serve the surrounding suburban and rural areas, have nursery units with a maximum capacity of 12 bassinets in each unit. The nurseries are not overcrowded, and they were inspected and approved during the preceding year as complying with the provisions of the

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New York State Sanitary Code. This code establishes standards for physical features and nursing and medical management of nurseries. The three hospitals are identified here as "A," "B," and "C."

Methods

The public health nurses employed by both official and voluntary agencies were told the purpose of the study at a series of meetings.

No effort was made to select a random sample of infants or to add to the current caseload of the visiting nurses. Infants were already being visited as part of the maternal and child health program. The policy was to visit all infants of primiparae within 1 to 2 weeks after birth. The nurses were asked to take a history and record their observations of the presence or absence of pustules, vesicles, bullae, and other types of skin infections. Information recorded for each infant included the nurse's description of the skin infection and the date of the nurse's visit, in addition to the infant's name, date of birth, and hospital of birth.

An infant was classified as positive on the basis of a history or presence of skin pustules or more severe suppurative disease. Suppuration was felt to be a more specific index of staphylococcal disease than the vesicular bul-

lous, erythematous, or papular rashes which are fairly common in the newborn. Suppuration was also more easily identified and described by the mother and the nurse.

A preliminary analysis was made to determine the relationship between the age of the infants at the time of the nurse's visit and the possible dates of onset of staphylococcal disease. Of 344 routine neonatal visits during a 3-month period, 316 visits were made between the 6th and 20th day following birth; 177 of these were made between the 9th and 12th day. It was felt that this timing was optimal, since our previous experience in New York State nursery outbreaks had shown that the onset of pyoderma occurred most commonly before 10 days of age (1). It was recognized that some cases which have longer incubation periods, such as breast abscess or pneumonia, might be missed.

Outbreak Findings

The attack rates for each hospital for the entire survey period were not significantly different (see table). The salient finding was the detection of a previously unidentified outbreak of staphylococcal disease in a sample of the newborn infants discharged from hospital B. The presence of an epidemic was suspected when 2 infants among 13 born in hospital B during the first week of November were discovered through the survey method to have signs of suppurative disease.

Neonatal suppurative disease in a sample of discharged hospital-born infants examined by public health nurses, May 1958-February 1959

Hospital of birth	Estimated total births	Number of infants visited	Number ill	Percent of sample ill
A-----	1, 150	157	3	1. 9
B-----	1, 530	391	12	3. 1
C-----	800	56	3	5. 3
Other ¹ -----	-----	6	-----	-----
Total-----	3, 480	610	18	2. 9

¹ Resident births in hospitals in other cities.

NOTE: $n=2$, $x^2=1.66$

The suspicion was confirmed when subsequent visits to an enlarged sample of 46 infants born in this hospital discovered 6 infants with signs of suppurative disease. The suspect diagnoses were confirmed by a physician's examination. Phage typing identified the etiological agent isolated from the lesions as type 80/81 staphylococcus. Examination of all 233 infants born in hospital B during the epidemic period revealed a total of 20 cases of suppurative lesions including 1 death, and an attack rate of 8.6 percent. The types of clinical disease discovered are shown below:

Lesion	Number of infants
One or more skin pustules-----	11
Impetigo-----	4
Omphalitis-----	1
Conjunctivitis-----	1
Abscesses-----	2
Septicemia-----	1

The epidemic occurred in a 55-day interval November 1 to December 25, reaching its peak in 30 days and declining in 25 days. One mother developed a breast abscess.

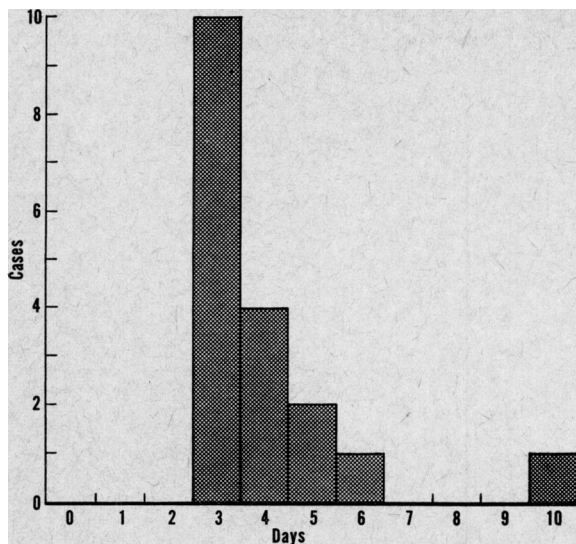
The only death occurred in an infant born November 18 who developed pustules on the buttocks 4 days following birth, an upper respiratory syndrome after 1 month, and died with a type 80/81 staphylococcal septicemia when 8 weeks of age.

Excluding two premature infants with prolonged hospital stays starting before the epidemic period, the range of incubation period, as measured by the interval from the birthdate to the onset date of disease, was 2 to 10 days. The distribution of incubation periods is consistent with a common source outbreak (see chart). The modal incubation period was 3 days.

A bacteriological and phage-typing survey of the nares of personnel and infants ruled out both an infant nasal reservoir of type 80/81 staphylococci and carriers among hospital personnel working in the nursery. Nasal cultures were taken from 30 persons. Six persons were found to be carriers of coagulase positive strains, but none had the epidemic strain.

Two nurseries, equally affected, were on separate air supplies. A common airborne source such as dust or droplet nuclei was believed to

Interval in days from birth date to onset date of staphylococcal disease, hospital B epidemic cases¹



¹ Data exclude two cases of premature infants born before epidemic period.

be unlikely. One nursery contained only isolate units and the other, conventional single infant bassinets of an approved design. The equipment used in the two nurseries was different and a common fomite source was also considered unlikely.

A source lesion among nursery personnel and a resulting spread of staphylococci by direct contact was suspected. However, physical examination of all personnel in contact with the nursery, conducted by hospital staff physicians, did not reveal any source lesions.

The reasons for the cessation of the detected epidemic were not discovered. Two factors may have been involved: the special attention given to aseptic principles as a result of the concern of the staff about the outbreak, or the spontaneous recovery or departure from the nursery staff of a worker with an unrecognized lesion discharging staphylococci.

Other Findings

In addition to the detected epidemic, examinations by visiting nurses provided an estimate of the nonepidemic levels of suppurative disease. Exclusive of the epidemic period in hospital B, 12, or 2.1 percent, of 564 infants visited

after discharge from the three hospitals were found to have evidence of suppurative disease. Of the 12 cases, 9 had only few or solitary skin pustules, 2 were classified as impetigo, and 1 had a purulent conjunctivitis. No bacteriological studies were made on these infants.

The nonepidemic level of infant suppurative disease, 2.1 percent, observed in this survey of primiparous births differs from that reported in the literature. Williams (7) reports endemic levels of 5 to 15 percent based on daily hospital observation of newborn infants for evidence of pustules, conjunctivitis, or other suppurative disease. Ravenholt (8) conducted a telephone survey of a sample of infants born in a hospital. Excluding 1 hospital with an epidemic, he found a pyoderma attack rate of 15.5 percent in a sample of 642 newborn infants discharged from 12 hospitals. Other investigators have found nonepidemic attack rates for infant pyoderma ranging from 5.5 percent to 22.0 percent, with most attack rates falling between 13 and 17 percent (9-14).

Aftermath

The survey technique using public health nurses is being followed in 12 counties in New York State, where 2,472 infants have been examined during the period July 1958 to April 1959. Eighty-three infants, or 3.3 percent, were observed to show evidence of suppurative disease.

This lower level of suppurative disease may be attributable to the enforcement of regulation 35 in chapter II of the New York State Sanitary Code, entitled "Precautions To Be Observed for Control of Diarrhea of the Newborn." Annual inspection of nurseries and adequate enforcement have eliminated to a great extent the hazards of overcrowding, neglect of handwashing, and other factors which encourage contact transmission of any communicable disease.

Conclusion and Summary

The rationale of the examination of infants after hospital discharge as a means of detecting nursery outbreaks of hospital-acquired staphylococcal disease is based on the assumption that

the incubation period is longer than the hospital stay. This study demonstrated that the technique will be applicable, even when the modal day of onset of disease coincides with the next-to-the-last day of hospital stay. In practice, minor pustular manifestations are not considered as a barrier to scheduled discharge. The removal of the cases from the hospital forestalls the detection of an epidemic unless someone initiates an intrahospital reporting system which can be used to develop data on attack rates of suppurative disease.

Surveillance of infants by public health nurses for evidence of suppurative disease after hospital discharge detected an outbreak of the disease in a hospital in one city. Exclusive of this outbreak, the nonepidemic level of staphylococcal disease in infants measured by the presence of suppuration was 3.3 percent in a group of 2,472 infants visited in 12 counties in New York State, and 2.1 percent in a group of 564 infants visited in 1 city.

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Application forms and further information can be obtained from the Chief, Nursing Section, Epidemiology Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street NE., Atlanta 23, Ga., or from the directors of public health nursing of State health departments. Applications should reach the center no later than February 8, 1960.