

Effectiveness of Aggressive Follow-up on Navajo Infant Health and Medical Care Use

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ABSTRACT. From among 273 live-born infants at Fort Defiance, Arizona, Indian Hospital between February 1970 and February 1971, half were followed by prevailing health care practices of the Indian Health Service; the other half by aggressive follow-up which included home visits, contact after missed appointments, and periodic record review to determine achievement of health care goals. At approximately 1 year of age, health status of almost all infants was determined by physical examination, Denver Development Test, and laboratory tests and by record review of illnesses experienced and health services received during the first year of life. Study and control infants differed at statistically significant levels in achievement of first-year health care goals (completed immunizations, tuberculin test, number of well child visits) but not in mortality, morbidity, and hospitalization rates; number of visits for health care; and findings on physical, developmental and laboratory examination. These findings were in agreement with those of similar studies and support the conclusion that medical care is only one, and likely not the major, determinant of infant health. *Pediatrics*, 53:721, 1974. NAVAJO INDIAN, FOLLOW-UP, INFANT HEALTH CARE.

In 1968 the health status and medical care of 117 Navajo Indian infants, live-born at an Indian Health Service hospital from September 1966 through August 1967, were studied by examination of hospital and clinic records.¹ The infants were found to have received a large number of medical services during the first year of life, e.g., over 900 outpatient visits for illness; approximately 300 visits for well child care; and a total of almost 1,000 days of hospitalization by the 34% of infants who were hospitalized. Despite the large amount of care, seven infants died, first-year immunization goals were achieved for only half the infants, and there was evidence from medical records that a number of the infants were regarded as not being in good health during and at the end of their first year.

On the basis of these findings, it was decided to apply the health care resources of the Indian Health Service more aggressively with the objective of lowering hospitalization rates and stay, better accomplishing health care goals for the first year of life, and improving the general health (growth, development, correction of defects) of Navajo infants.

This is the report of the health experience and health care utilization in the first year of life of 273 Navajo Indian infants, approximately half of whom received special supportive and follow-up services to promote their health care.

METHODS

The study was supervised by the senior author and the Community Health Officer of the Fort Defiance Service Unit (K.S.R.) of the Indian Health Service. It was conducted over a two-year period by a series of fourth-year medical students during ten-week elective clerkships in Community Medicine.

Selection of Study Infants

From among live-born infants born at Fort Defiance Indian Hospital between February 1970 and February 1971, those whose families resided in the Fort Defiance Service Unit Area were identified. According to sequence of birth, every other infant was selected as a study infant; the alternate served as a control. In the case of twins, both infants were assigned to the same control/study group; the next

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two births were selected as match and assigned to the opposite group.

Hospital Interview

Mothers of study babies were interviewed while still in the hospital to ascertain existence of any problems (e.g., mother's and family's health, finances, transportation, living conditions) which might affect the newborn's health after hospital discharge. When such problems were identified, attempts were made through the hospital Social Service and the Community Health Unit to remedy them. A similar interview was *not* held with control mothers since the interview was regarded as one of the supportive and follow-up measures being applied.

Home Visit

When possible, before the infant was 3 weeks old, a home visit was made by study personnel accompanied by a community health representative (indigenous nonprofessional health worker) or a public health nurse when available. This visit had the purposes of (1) ascertaining the current health of the infant; (2) evaluating the home as to its adequacy for the child's health; (3) reviewing with the mother her knowledge of the importance of regularly bringing the child to a health service facility for supervision and care, the availability of transportation to accomplish this, and the mother's understanding of the signs and appropriate care of respiratory and gastrointestinal tract disease.

Health Care Goals for the First Year of Life

Goals for health care in the first year of life were established. These were at least four health supervisory visits; three DPT, three oral trivalent polio and one rubeola immunization; at least one hemoglobin determination; a tuberculin skin test and a urinalysis.

Subsequent Follow-up

The Fort Defiance Indian Hospital chart of each study infant was specially marked so that when he was seen in the outpatient or other part of the hospital the chart was not refilled before being reviewed by study personnel. Each day, study personnel reviewed charts of study babies who had been seen in the hospital in the preceding 24 hours. The health problems presented were noted on the study infant's record together with any action recommended. Study personnel then accepted responsibility for expediting this action, e.g., determining whether referrals were accomplished and return appointments kept. At least once monthly, records of all study infants were reviewed to as-

certain their status in relation to any special problems or to accomplishment of first-year program goals.

The control infant group was cared for under the usual procedures of the Hospital and Service Unit. These were essentially those which prevailed during the study of 1966-1967, the findings of which initiated the present study. Specifically, study personnel did not interview mothers in the hospital, make follow-up home visits or follow infants in their first year to maximize health care use.

One-Year Assessment

When both study and control infants attained 1 year of age, they were given a complete health appraisal in the hospital pediatric outpatient clinic. Length, weight, head circumference, hemoglobin, hematocrit, serum protein, urinalysis, physical examination and Denver Development Test were performed. Children were classified as excellent, good, fair or poor with respect to their general appearance and nutrition. Uncorrected major health problems also were noted. This assessment was made by study personnel who were aware of the study/control identity of the infant in most instances but who had not themselves provided most of the follow-up care.

Record Study

At the completion of the study, hospital and clinic records were examined to determine health problems presented and health care received by study and control infants in the first year of life. Specifically noted were number of days of hospitalization and causes; number and causes of outpatient, well baby and emergency room visits; and accomplishment of first year goals, e.g., immunization, tuberculin test, hematocrit, etc. Because medical care for the infants was obtained at a number of facilities, it was necessary to inspect records of all hospitals and clinics in the Fort Defiance Service Unit and surrounding area. These facilities included Indian Health Service Hospitals at Gallup,

TABLE I
ACHIEVEMENT OF FIRST-YEAR HEALTH GOALS

Health Goal	Study N = 116		Control N = 119	
	No.	%	No.	%
Three or more DPT vaccine	107	92.2	91	76.5
Three or more oral polio vaccine	99	85.3	87	73.1
One or more rubeola vaccine	86	74.1	64	53.8
PPD given	99	85.3	76	64.7
Four or more well child visits	100	86.3	89	74.8

TABLE II
ILLNESS EXPERIENCE IN FIRST YEAR OF LIFE

Illness Experience	Study N=116		Control N=119	
	No.	%	No.	%
Acute or chronic otitis	78	67.2	79	66.4
Gastroenteritis	83	71.6	82	68.9
Upper respiratory tract infection	104	89.7	108	90.8
Pneumonia	22	19.0	32	26.9
Hospitalization	40	34.5	43	36.1

Fort Defiance, Keams Canyon, Crownpoint, Winslow and Bernalillo County; Sage Memorial Hospital and Rehoboth Hospital; Indian Health Service Clinics at Lower Greasewood, Wide Ruins, Toyei, Tohatchi, Chinle, and Lukachukai.

RESULTS

The comparability of study and control group infants was assessed by analyzing a number of characteristics of the mother during pregnancy and delivery and of the infant during the period of stay in the newborn nursery. Maternal characteristics included age, marital status, gravidity, parity, trimester of first prenatal care, blood pressure, hematocrit, serological test for syphilis, presence of diabetes, and abnormalities of delivery (e.g., blood loss greater than 500 cc, cesarean section). Infant characteristics included birth weight, sex, Apgar score, congenital anomalies, neonatal infection, respiratory distress syndrome, serum bilirubin, serological test for syphilis and neonatal death rate. Data were examined for eight subgroups: male/female, study/control, and first and second half of the study. There were no statistically significant differences among these subgroups in relation to the preceding maternal and infant characteristics. Therefore, in subsequent analyses, only two groups—study and control—were used.

In the first year of life, of 135 study infants, 5 died, 11 moved out of the area, 116 were appraised at 1 year, and 3 were not appraised. Comparable data for the 138 control infants were as follows: 5 died, 8 moved, 119 were appraised and 6 were not appraised.

Health and health care were characterized according to accomplishment of first-year care goals, frequency and cause of illness, number of clinic visits and days of hospitalization, and findings at the time of the one-year health assessment.

The numbers of infants accomplishing health care goals by the end of the first year are shown in Table I. Study group infants exceeded control infants in all items. These differences were statis-

TABLE III
HEALTH CARE UTILIZATION IN FIRST YEAR OF LIFE

	Study N=116	Control N=119
Mean number, well child visits	4.8	4.4
Mean number, illness visits	8.1	7.9
Mean number, hospitalizations	0.6	0.5
Mean days, hospitalization*	9.7	7.4

* Excludes newborn.

tically significant by chi square test at a .05 level of probability or less. Routine urinalysis was found to have been performed rarely in either study or control infants and was omitted from analysis of first-year goals.

The illness experience during the first year of life is shown in Table II by percent of infants hospitalized and percent having one or more hospital- or clinic-treated episodes of otitis, gastroenteritis, upper respiratory tract infection, or pneumonia. There was no statistically significant difference between study and control infants with respect to these experiences.

Neonatal deaths in study babies were due to respiratory distress syndrome (two infants) and auto accident. In control babies, neonatal deaths were due to multiple congenital anomalies, tracheoesophageal fistula, and unknown cause. Postneonatal deaths in study babies were due to gastroenteritis (two infants) and in control babies to Down's syndrome and respiratory tract infection.

The health care utilization by infants during the first year of life is shown in Table III. There was no statistically significant difference between study and control infants with respect to this utilization.

TABLE IV
FIRST-YEAR HEALTH APPRAISAL

	Study N=116		Control N=119	
	No.	%	No.	%
Length <50th percentile	67	61.2	66	55.5
Weight <50th percentile	66	56.9	64	53.8
Head circumference <50th percentile	77	66.4	71	59.7
General appearance (fair or poor)	12	10.4	10	8.4
Nutrition (fair or poor)	9	7.8	8	6.7
Uncorrected major abnormalities	2	1.7	3	2.5
Hemoglobin <12 gm/100 ml	29	25.0	27	22.7
Hematocrit <35%	23	19.8	22	18.5
Serum protein ≤5.5 gm/100 ml	0	0.0	0	0.0
Stands without support	60	51.7	67	56.3
Walks	32	27.6	37	31.1

Because of difficulty in communicating with parents and of transportation problems (especially in bad weather), all one-year evaluations were not performed exactly on the infant's first birthday. A total of 73% of infants were evaluated within one month of their first birthday and most of the remaining infants within two months. There was no statistically significant difference in ages of study and control children at the time of first-year evaluation. Classification by growth chart percentiles was made on the basis of age at time of evaluation.

Findings at time of health assessment of approximately 1 year of age are shown in Table IV. Serum protein determinations were made of only 99 study and 102 control infants. In addition to the 50th percentile data displayed in Table IV, the proportions of study and control infants below the 25th percentile for length, weight and head circumference also were identified. These values were between 25% and 35% and were similar for study and control infants. Because infants resided at 6,000 and 7,000 feet above sea level, standards for adequate hematocrit and hemoglobin levels were increased to 35% and 12 gm, the same standards used in the National Nutrition Survey sponsored study of Navajos in the Fort Defiance area.²

Physical examination findings were listed in 17 organ categories (e.g., eyes, ears, heart, lungs, etc.) and were summarized as normal, suspicious for abnormality or abnormal. A total of 1,972 observations were recorded for 116 study infants and 2,023 for 119 control infants. Only 30 observations of study infants and 40 of control infants were classified abnormal. A total of 94 observations of study and 86 of control infants were classified as suspect. The remainder were normal. A total of 43 (37.1%) study infants and 56 (47.0%) control infants were judged normal in all 17 organ categories. None of these differences was statistically significant.

DISCUSSION

The study reported here tested the hypothesis that provision of more medical care would favorably affect the health of Navajo Indian infants. It was assumed that the population studied had a sufficiently high prevalence of disorders amenable to medical care to test this hypothesis. The absolute frequency of infectious disease in both study and control infants was high—probably higher than in other groups of infants. In comparison to inner-city black infants in Pittsburgh, Pennsylvania, who were studied by similar methods, the morbidity rates for all causes in the Navajo infants were higher. Chappell and Drogos,⁴ reporting the Pittsburgh experience, noted that in 1971, 110 black infants made 338 clinic visits (average 3.0) during the

first year of life at which they received care for respiratory illness—this category chiefly composed of upper respiratory tract infection and otitis media. Navajo infants in the present study averaged 5.4 visits for care of similar illness. Among inner-city black infants there were only 53 visits (average 0.5) for which care for gastroenteritis was given as contrasted with 1.6 visits for Navajo infants. Hospitalization rates, while much greater in Navajo infants (5% for black infants; 35% for Navajo), were not directly comparable because of different criteria used for hospitalization in the two groups.

At approximately 1 year of age, Navajo infants in the present study were smaller than infants comprising the Boston-Iowa growth standards, but not markedly so. Navajo infants were considerably smaller than middle-class black and white infants currently cared for by the Permanente Medical Group in California.⁵ However, the first-year assessment did not reveal a large number of health problems in either the study or control group.

The significant differences between study and control groups in the present investigation were identified only in the category of health goal accomplishment, and even in this category the differences were modest, although statistically significant. When experience with the present study was compared with that of the experience in 1966-1967 in a similar population of Navajo infants from the same hospital,¹ immunization completion rates and average number of well child visits were considerably higher in both present study and the present control groups than in the 1966-1967 groups, even though there were no obvious differences in routine management of infants in the two time periods. The magnitude of difference between the 1966-1967 study infants and the present control infants was approximately the same as that between the control study groups in the present investigation. Of the 1966-1967 study infants, 54% completed DPT immunization and 49% completed poliomyelitis immunization in the first year. Only 30% made four or more well child visits, and the group averaged 2.8 well child visits in the first year.

In the present study, the differences in achievement of first-year goals between study and control infants required a heavy investment of time, i.e., full-time services of a medical student and additional time of the Community Health Service physician, community health representatives, public health nurses, and driver/interpreters throughout most of the two-year period. This experience was similar to that of others who reported modest change in appointment keeping, immunization completions, and similar process measures following major efforts. When studies of health program modifications have used health outcome measures as end

points, change has not been demonstrated usually. Elinson⁶ reviewed what he regards as well-designed studies of the impact of social action programs on health and welfare. Only ten studies met his rigorous criteria for design and none of these indicated "striking positive results." Lewis⁷ published evidence from designed or naturally occurring experiments which supported the hypothesis that comprehensive health care was causally related directly to outcome measures of health or indirectly to illness. He concluded that such evidence was scarce and implied that when it existed, the demonstrated relationships often were not strong. McDermott, Deuschle, and Barnett⁸ reported the effects on health of Navajo Indians of a model system of primary health care which they developed and operated from 1956 to 1961 in the Many Farms area of the Navajo Reservation. Despite a heavy investment of personnel and sophisticated medical technology, they did not demonstrate major changes in the diseases of infants, such as pneumonia and diarrhea. They concluded that these diseases were influenced by environmental and cultural factors more than by available technology of modern medical care. Certainly, both study and control infants in the present investigation were repeatedly exposed to acceptable levels of health care. Infants in the present study averaged approximately eight visits per year for illness and five for well child care. The care was provided in adequate facilities by recently trained physicians with consultation by a pediatrician. Thus, it does not appear that high illness prevalence was due entirely to unavailability of care of acceptable quality. The observations of the significant difference in first-year goal achievement for infants in the 1966-1967 period and the control group in the present study are consistent with the hypothesis that the marked improvement in general living conditions of Navajos (environmental and cultural) in the last decade is responsible for at least some of this change.

The objectives of the present study were to determine the effectiveness of aggressive follow-up and supporting services in lowering hospitalization rates and hospital stay, improving health, and better accomplishing health care goals of the first year of life for Navajo infants. Only the last of these three goals was accomplished. It is not possible to judge whether the cost of attaining the improvements in first-year goal accomplishment was worth the expenditure of resources. This question has been raised by others. Perhaps more to

the point would be to consider the question of whether a similar improvement in goal achievement could have been accomplished by other methods. Specifically, whether fuller exploitation of the many visits made by both study and control infants for care of minor illness during the first year might have led to accomplishment of these goals. It would appear in the light of the present experience and that of others who have made similar studies, that it is unrealistic to expect major changes in health outcomes of infants from only the addition of medical care. Because health is resultant of a complex interaction of multiple social-educational-physical and other factors, it appears simplistic to view it as largely a direct consequence of medical care.

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