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Staff Meeting Report

The Efficacy of Poliomyelitis Vaccine With Special Reference to Its Use in Minnesota, 1955-56*

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Prior to the application of the Salk poliomyelitis vaccine in 1954 in what may have been the largest field trial in history, sufficient concern as to its safety on the one hand and doubt as to its efficacy on the other existed in many quarters as to engender serious question of the propriety of such a large scale application, at least until more nearly adequate tests of safety could be developed. Some investigators were of the opinion that only live virus vaccines could be efficient antigens and that a highly efficient vaccine might, therefore, contain live virus. Since Salk[1] was not working with attentuated strains but rather applying formalin to demonstrably highly virulent strains of poliovirus and claiming complete killing, efficacy also remained in doubt. On the other hand, a voluminous literature existed emphasizing the role which certain autarceologic or innate host factors might play in resistance irrespective of antibody level. Would vaccination in a recently tonsillectomized individual, or in a pregnant woman with temporarily altered hormonal balance, or in an individual recently inoculated with other antigens, protect against clinical poliomyelitis? This, coupled with the fact that clinical poliomyelitis occurred but once for each 100 to 1,000 infections[2, 3] made it abundantly clear that proof of efficacy of any poliomyelitis vaccine would ultimately have to be derived from field studies and that these would have to be of considerable size.

With the successful completion of the 1954 Field Trial and its demonstration of the reasonably good efficiency and safety of the vaccines employed that year[4], formalinized poliomyelitis vaccine was removed overnight from its experimental status and its use limited only by the difficulties of its mass production. Despite this development a few epidemiologists retained their concern for the continued safety and

* This is an address given at the Staff Meeting of the University of Minnesota Hospitals on February 1, 1957.

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efficacy of the Salk vaccine and justifiably so. It was felt that constant surveillance of all poliomyelitis cases correlated with vaccinal history was necessary to maintain vigilance on safety. Even before the accident of inoculation poliomyelitis in the spring of 1955, the several states had adopted such surveillance programs. In fact, it was the operation of the program on a state and national scale that detected the first case in Chicago and the outbreaks in California and Idaho. Minnesota began its surveillance program with the first administration of vaccine in the state in May, 1955. Furthermore, changes in the procedures of vaccine production from those employed in the 1954 trials had already taken place in 1955 and further changes could be anticipated.

Change in production methods were necessitated by at least two phenomena: destruction of antigenicity of Type 1 formalinized virus by merthiolate in storage and the presence of live virus in certain lots of vaccine early in the spring of 1955. The vaccines utilized since October 1955 cannot be considered the same as those employed in the field trials of 1954 or in the mass applications late in the spring and in the early summer of 1955. It may logically be argued that removal of merthiolate would operate toward improving the antigenicity of the vaccine; however, there are those who would question the maintenance of antigenicity when additional filtration procedures are applied to guarantee the removal of the last vestiges of live virus aggregates. Although Salk's recent laboratory studies[5] would deny this possible loss of antigenicity, ultimate proof of maintenance of antigenicity and efficiency of the vaccine would reside in field evaluations.

Finally, the Salk vaccine had had a carefully controlled field trial of adequate magnitude in a non-epidemic year. The question remained whether the vaccine's efficiency would be maintained in epidemic situations and, in fact, afford a rapid decline of poliomyelitis with increasing use.

For these several reasons we, in Minnesota, deemed it necessary to conduct a continuous study of vaccine evaluation. In addition to the surveillance program, which would provide constant awareness of vaccine safety, collateral studies were initiated and are continuing on the secular trend of the disease, age distribution of the cases, paralytic ratios, severity among vaccinated and unvaccinated persons and the vaccinal status of the population by age. Beginning with the low point of the seasonal cycle of poliomyelitis in April, 1955, every case of

poliomyelitis occurring in the state has been investigated intensively for epidemiologic and clinical data and vaccinal status. Although the diagnostic level for paralytic cases was found to be gratifyingly high, all reported cases irrespective of diagnostic category were, wherever possible, subjected to laboratory confirmation. This included attempts at virus isolation from stools, poliomyelitis antibody titrations on acute and convalescent bloods and exclusion tests for mumps, St. Louis and Western equine encephalitis, and lymphocytic choriomeningitis. The laboratories of the Minnesota Department of Health and of the Department of Bacteriology and Immunology of the Medical School processed these specimens. Cytopathogenic agents, when isolated in any case, were submitted to the latter laboratory for identification. These latter tests as well as the exclusion tests for the encephalitides assisted greatly in proper designation of non-paralytic poliomyelitis. Physicians of the state as well as hospitals admitting poliomyelitis patients cooperated to an extremely high degree in submitting specimens and providing clinical data to assist in the final diagnosis. This aspect of the study involved personal or telephone communication with attending physicians, visits to major hospitals, and follow-up of patients with regard to residual lesions for severity studies. These studies have yielded interesting information on many aspects of the epidemiology and clinical character of the disease, such as virus types and their geographic distribution, frequency of isolation correlated with age and diagnostic category, contact infection rates, and correlation with symptoms in family contacts to name but a few. The data to be reported on today will deal exclusively, however, with vaccine efficiency in the 2 years of its application.

With the success of the field trials in 1954 and the consequent relatively universal use of vaccine which followed, rigid control studies of vaccine efficacy were no longer possible, though the need for such evaluation obviously remained as indicated above. Methods short of rigid experimental control had to be used, therefore, and several of these have been explored in our evaluation.

Total Poliomyelitis Incidence

If a poliomyelitis vaccine is effective in preventing the disease, it may be argued that its expanding use would naturally affect the total case-rate in the population. Consideration of any decline in total incidence must be related to the incidence in an immediately preceding, reasonably long period of time when change in diagnostic criteria or

in reporting activity will have been at a minimum. By the end of 1955, approximately 28,000,000 cc. of vaccine had been distributed in the United States[6] with 13.5 million cc. channeled into the National Foundation for Infantile Paralysis (N.F.I.P.) program for first and second doses for those participating as controls in the 1954 trials and second doses for those who had received first inoculations in the spring of 1955. Data on actual utilization of vaccine for 1955 are not available for the country as a whole and the several states had, by the end of the year, developed diverse age priorities. Even if all 28 million cc. had been used, however, this would have represented but one dose for less than half of the estimated 65,000,000 persons in the 0-19 year age group and pregnant women. In Table 1 there is presented the reported incidence of poliomyelitis in the nation for the period 1946 to 1956, inclusive. In 1955, 28,983 cases were reported for a rate

TABLE 1
REPORTED INCIDENCE OF POLIOMYELITIS
United States 1946 - 1956

Year	*Cases*†	*Rate/100,000*
1946	25,698	17.9
1947	10,827	7.5
1948	27,726	18.9
1949	42,033	28.2
1950	33,300	22.1
1951	28,386	18.5
1952	57,879	37.1
1953	35,592	22.4
1954	38,476	23.8
1955	28,983	17.6
1956	15,400*	9.2*

* Provisional
† Source: Annual Supplement, Morbidity and Mortality Weekly Report, National Office of Vital Statistics, Department of H.E.W., Vol. 4, No. 53, September 27, 1956

of 17.6 per 100,000. In some quarters this was pointed to as a decline due to vaccine and apologies made for the relatively small change on the basis that but a small proportion of the population at risk had been inoculated. Certainly no evidence can be found for a vaccine effect when the 1955 rate was not significantly different from the rate in 1946, 1948, and 1951. By November 30, 1956, an additional 67 million cc. of vaccine[7] had been distributed and could have represented two doses of vaccine for 30 million and one dose for the remaining 35 million of the 65 million persons at greatest risk for the 2-year period. In 1956 there were but 15,400 cases of poliomyelitis reported for a national rate of 9.2. This figure, in line with the trend, could be provocative were it not for the rate of 7.5 per 100,000 in 1947.

What of the experience in Minnesota? Extremely accurate records of the Minnesota Department of Health reveal that in the spring of

1955, 112,115 children in the first and second grades of school had been given single doses of Salk vaccine under the program of the N.F.I.P., and by the end of the year 189,838 children under 10 years of age (29% of those eligible) had received at least one dose of vaccine while 111,116 (17% of those eligible) had receiveed two doses[8]. In addition 6,796 persons between the ages of 10 and 19 and 6,062 pregnant women had received at least one inoculation. In Table 2 the reported incidence of poliomyelitis in Minnesota for the period 1946-56, inclusive, is presented. In 1955, 510 cases were accepted as poliomyelitis for an overall attack rate of 17.1 per 100,000 which was not significantly different from the rates in 1950 and 1951 and more than twice the rate for 1947. By December 1, 1956, 814,443 persons or 64.4% of the population aged 0-19 years and pregnant women eligible for vaccine had received at least one dose with 595,113 receiving two injections[8]. Table 2 reveals the 1956 rate to be 5.6 per 100,000 which, though lowest for the period under consideration, still is not significantly different from the attack rate in 1947. It must also be emphasized that in 1955 and 1956 the total attack rates do not include cases which in earlier years would have been classed as non-paralytic poliomyelitis but which in the study period have been excluded by antibody titrations, encephalitis exclusion tests, and the finding of other cytopathogenic agents. Collateral studies[9] reveal this category to be a significant proportion of the total reported cases. Thus total attack rate data at this time are not reliable and at best may merely portray the marked fluctuations in annual incidence, a well known characteristic of poliomyelitis.

Paralytic Incidence

Recalling that the Salk vaccine was statistically shown in 1954 to be effective only against paralytic poliomyelitis, would a comparison of attack rates for the paralytic disease for the periods under consideration reveal a vaccine effect? Unfortunately, data on paralytic attack rates for the United States as a whole are not available for earlier than the last few years. Data for Minnesota are available, however, and these are presented in Table 2 also. The rate for 1955 was 7.3 per 100,000. This would appear promising in comparison to the rates for 1952-54, inclusive, but represents twice the rate of paralytic polio in 1947 when but 3.7 cases per 100,000 were recorded. In 1956, the first provocative clue is obtained. The rate of 1.8 paralytic cases per 100,000 is half the lowest rate recorded in the preceding 10-year

period. Although it is essentially true that prior to the delineation of certain polio-like diseases and the availability of laboratory tests for their differentiation, a certain number of paralytic cases reported in

TABLE 2
REPORTED INCIDENCE AND RATES OF POLIOMYELITIS
Minnesota 1946 - 1956

Year	*All Cases*	*Rate/100,000*	*Paralytic Cases*	*Rate/100,000*
1946	2,881	96.6	1,824	61.2
1947	201	6.7	110	3.7
1948	1,387	46.5	683	22.9
1949	1,715	57.5	880	29.5
1950	502	16.8	293	9.8
1951	511	17.1	262	8.8
1952	3,926	131.6	2,041	68.4
1953	2,137	71.7	1,137	38.1
1954	640	21.5	309	10.4
1955	510	17.1	218	7.3
1956	177*	5.6	57	1.8

* Provisional with respect to non-paralytic cases only.

earlier years were not due to poliovirus, the significant disparity between attack rates for 1956 and 1947 cannot be totally explained on this basis for our studies in 1955 revealed that but 6.5% of cases initially reported as paralytic poliomyelitis were ultimately found to have been non-paralytic disease or other entities such as Guillain-Barre syndrome, transverse myelitis, etc.[9] The extreme variability in paralytic attack rates over the preceding 10-year period in Minnesota, however, makes it difficult to accept the disparity between the rates for 1947 and 1956, as due solely to the introduction of the vaccination factor in 1956. At least such incidence data cannot reveal what the rate would have been without vaccine.

Ratio of Paralytic to Non-Paralytic Disease

Assuming that the ratio of paralytic cases to non-paralytic cases would be reversed in favor of non-paralytic cases as a vaccine effect, an evaluation of vaccine efficiency might be made on the basis of *proportion* of paralytic cases. Table 3 presents the annual proportions of paralytic cases for Minnesota in the period 1946-1956 and for the entire nation in the period 1951-1956. The values for the United States as a whole are not reliable since large proportions of the reported cases were undesignated as to type of disease. The data for Minnesota, however, are complete. In the period prior to 1947 the proportion of paralytic cases was much higher than in the past 10 years. An increasing trend in reporting of non-paralytic cases was noted then, and this trend became stabilized from 1947 onward. Thus it can be

noted that in the vaccine years 1955-56 the proportions of paralytic cases were significantly lower. This trend correlates well with the increasing use of Salk vaccine in the two-year period. It should be noted

TABLE 3

PERCENTAGE OF REPORTED CASES DESIGNATED AS PARALYTIC BY YEAR OF REPORT
Minnesota 1946-1956; United States 1951-1956

Year	*Minnesota*	*U. S.* *
1946	63.3	---
1947	55.2	---
1948	51.4	---
1949	51.2	---
1950	58.3	---
1951	51.5	64.7
1952	52.0	62.4
1953	53.1	56.3
1954	48.4	58.1
1955	42.7	52.7
1956	32.2	53.4

* Source: Annual Supplements, Morbidity and Mortality Weekly Reports, National Office of Vital Statistics, Department of H.E.W., 1953-56 inclusive.

that the only comparable years in the series are 1955 and 1956. From the inception of the surveillance program in 1955, classification of cases has involved more rigid criteria than in the preceding 9-year period. It is obvious, then, that if polio-like disease without paralysis had been included in 1955 and 1956 the proportions of paralytic cases would actually have been still smaller. A comparison of 1955 and 1956 is valid since identical criteria for clinical and laboratory diagnosis were utilized. Although a few cases of reported non-paralytic poliomyelitis remain to be processed in the laboratory, examination of our data reveals that the few cases which might then have to be excluded will not alter the ratio to any significant degree. The reduction in the paralytic attack rates in 1956 is statiscally significant and correlates well with the application of at least one dose of vaccine to approximately 65% of the Minnesota population 0-19 years of age and two doses to at least 47% of that population. Although providing a somewhat firmer clue to vaccine efficacy, this indirect approach is at best only inferential.

Age-Distribution Studies

In 1955 vaccine had been given primarily to Minnesota children within the age group 5-9 years. (Only late in October were inoculations begun in children under 5 and, in December, in persons in the age group 10-19. See Table 4.) Evidence for vaccine efficiency might be sought in an age shift in paralytic attack rates away from the 5-9

TABLE 4
REPORTED INOCULATIONS WITH SALK VACCINE
AMONG PERSONS 0-19 YEARS OF AGE AND PREGNANT WOMEN
Minnesota 1955 - 56

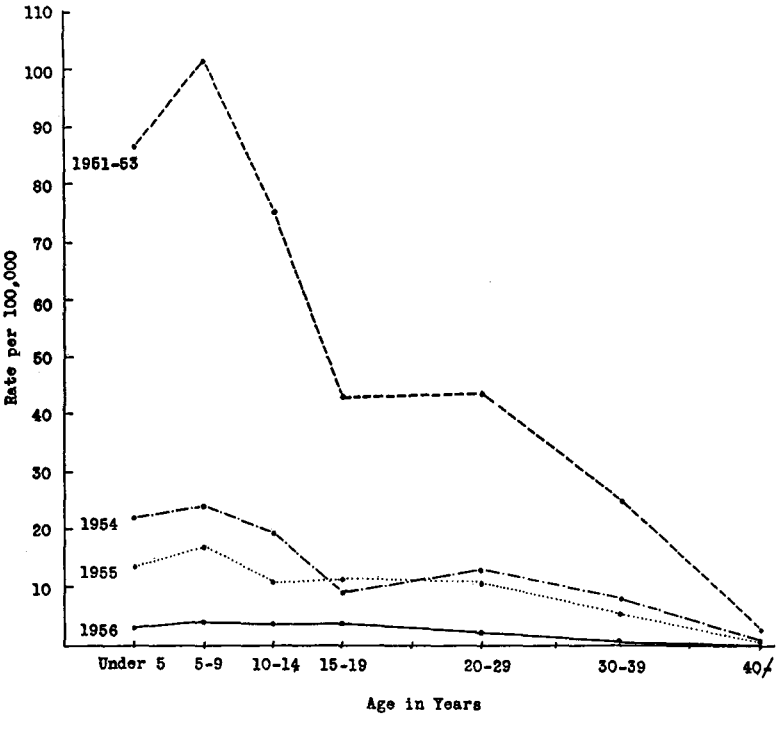
Period	*Age Group*	*Inoculation* *First*	*Second*	*Third*	*Total Inoculations*
May - June 1955	1st & 2nd Grades	112,115	---	---	112,115
Sept. - Oct. 1955	1st & 2nd Grades	---	106,753	---	106,753
Oct. 17-Dec. 31, 1955	Under 5	42,870	2,571	7	45,448
	5 - 9	26,222	1,631	3	27,856
	10 - 14	5,118	140	---	5,258
	15 - 19	1,515	23	---	1,538
	Pregnant women	5,612	449	1	6,062
Jan. 1-Dec. 31, 1956	Under 5	237,323	214,669	22,228	474,220
	5 - 9	137,383	138,503	27,532	303,418
	10 - 14	129,873	111,194	10,307	251,374
	15 - 19	59,255	46,370	3,289	108,914
	Pregnant women	51,626	39,219	218	91,063
Total 1955-56	---- ---	808,912	661,522	63,585	1,534,019

year group, especially since this group had yielded higher paralytic attack rates than all other age groups in the preceding 9 years with the exception of 1951. In Figure 1, age-specific attack rates for paralytic poliomyelitis in Minnesota have been plotted as average rates for the period 1951-53 and as individual rates for 1954, 1955, and 1956. The curve for 1955, though showing a moderate tendency to flatten, nevertheless revealed a continuing peak at age 5-9. This, of course, would be expected in view of the fact that in Minnesota in 1955 only 112,115 children, predominantly 6 and 7 years of age, out of 287,158 in the 5-9 year age group had received but a single dose of vaccine in May and June. In consolidated age distribution data from 33 states in 1955, there was noted an unprecedented and significant lowering of the paralytic attack rates among 7- and 8-year-olds. This discontinuity was even more striking when the curve was superimposed on that for 1952[10]. These ages represent the bulk of children vaccinated in the field trials of 1954, with boosters in 1955, as well as those in the N.F.I.P. programs of 1955. A similiar finding on hospital admission data was reported by the N.F.I.P.[11].

For 1956, the tendency to flattening of the age-specific paralytic attack rate curve for Minnesota is greatly exaggerted. The minor differences in age-specific attack rates among the groups under 20 years of age are very insignificant. This would be expected if due to a vaccine effect, since more than 95% of the 5-9 year age group in the state

Fig. 1. AGE-SPECIFIC ATTACK RATES - PARALYTIC POLIOMYELITIS

MINNESOTA 1951 - 1956



have had at least one dose of vaccine and more than 77% have had two doses. (Table 5.)

TABLE 5

ESTIMATED VACCINATION COVERAGE OF SELECTED AGE GROUPS

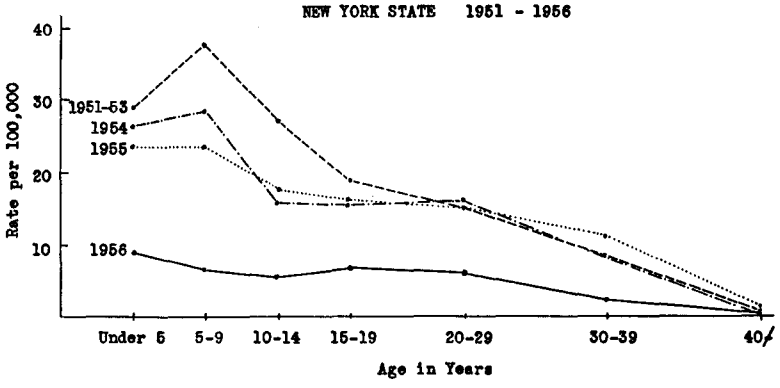
Minnesota, December 31, 1956

Age Group	*% With 1 Dose*	*% With 2 Doses*	*% With 3 Doses*	*% With Any Vaccine*
0 - 4 years	17.0	52.7	6.0	75.7
5 - 9 year	10.0	76.4	9.6	96.0
10 - 14 years	9.3	39.6	4.0	52.9
15 - 19 years	6.4	18.0	1.5	25.9
0 - 19 years	11.4	49.2	5.6	66.2

No comparable data are as yet available for the nation at large. Two other states, New York and California, have compiled and released data similar to that of Minnesota. The New York data are graphically

portrayed in Figure 2. Not only has the curve of age-specific paralytic attack rates been flattened, but the rates for the age groups 5-9 and 10-14 are significantly lower than for the group under 5 years. Cali-

Fig. 2. AGE-SPECIFIC ATTACK RATES - PARALYTIC POLIOMYELITIS



Source: C.D. Bulletin, N.Y. State Health Dept., December 28, 1956.

fornia, with an increase in cases over that of 1955, a trend distinctly different from that of New York and Minnesota, noted a shift in age incidence from the 5-14 year group to the group under 5 years of age. These data for the three states seem to correlate well with the proportions inoculated in the several age groups.

This type of evidence is highly suggestive of a vaccine effect, and we would be prone to accept it unequivocally as indicative of vaccine activity but for the epidemiologic history of poliomyelitis. Our reluctance to do so, minor though it may be, is based on the fact that early in the history of the disease the greatest risk of attack occurred among children under the age of 5. Since we do not understand all the natural factors which produced a shift in attack to older age groups, it would be folly to assume these factors could not provide for a reversal of age incidence trends. Slight though this possibility may be, the significance of these shifts must await long-term analyses and, wherever possible, comparisons between communities with high and low levels of immunization in the same period of time.

Rates Among Vaccinated and Unvaccinated

The most nearly adequate proof of vaccine efficacy must, therefore, reside in the comparison of attack rates for vaccinated and unvaccinated groups of similar ages and under similar circumstances of exposure.

The conditons for such continued field testing presented themselves in Minnesota in 1955 when vaccine, in short supply, was restricted to first and second grade school children. In Minnesota, which did not participate in the 1954 field trials, a virgin population was available for a pure study of effectiveness of a single dose of vaccine. In the last week of May and first week of June 1955, 112,115 of 145,374 eligible school children received a single dose of Salk vaccine. The evaluation period was selected to begin on June 1 since the vast majority of eligible children had by then had the first dose sufficiently long for antibody stimulation. The closing date was October 1. By this time the peak incidence of the disease had passed and second doses had just been given. In this period there occurred 20 cases among the inoculated and 9 cases among the uninoculated first and second graders. An additional or check control of unvaccinated 6-to-9-year-olds was also utilized since it was felt that cases occurring among unvaccinated first or second grade children older than 7 years might not be brought to our attention as part of the study group for this latter group was grade—rather than age—designated. Since an independent survey showed that the proportions of 5-year-olds in the first grade and 10-year-olds in the second grade in May, 1955, were negligible, the auxiliary control group was limited to 6-to-9-year-olds. In this later group 37 cases occurred. Table 6 presents the case rates of the study and control groups for the period June 1 to October 1 according to type of disease. Pertinent

TABLE 6

POLIOMYELITIS CASE RATES PER 100,000
AMONG CHILDREN IN THE FIRST AND SECOND GRADES
Minnesota, 1955
(Onsets June 1 - October 1)

	Number of	*Total*		*Non-Paralytic*		*Paralytic*	
Group	*Children*	*Cases*	*Rate*	*Cases*	*Rate*	*Cases*	*Rate*
Vaccinated (1 dose) 1st & 2nd grades__	112,115	20	17.8	16	14.3	4	3.6
Control: Non-vaccinated 1st & 2nd grades__	33,259	9	27.0	5	15.0	3	9.0
Control: non-vaccinated 6 - 9 year olds__	141,023	37	26.2	25	17.7	12	8.5
Protection Afforded__	---	-	34%	-	5%	-	60%

to our discussion are the paralytic attack rates which revealed a distinct protective effect by a single dose of vaccine. The virtually identical rates for the two types of control are of interest.

Although the figures for Minnesota are small and the group differences not of high statistical significance, the collective experiences of

special studies in other states in 1955, especially those with epidemics, support these findings[12]. No evidence to the contrary was educed in 1955. States with adequate data for single dose evaluations included California, Massachusetts, New York (Upstate), and Wisconsin. California, with a paralytic attack rate among non-vaccinates comparable to the Minnesota experience, showed a 59% reduction among vaccinates. New York State (exclusive of New York City) with a slightly higher paralytic rate revealed a 76% reduction. Massachusetts and Wisconsin both experienced Type 1 epidemics in 1955. A paralytic rate of 157 per 100,000 among unvaccinated in Massachusetts[13] may be compared with a rate of 63 among vaccinates for a reduction of 60%. Wisconsin, with the second highest case rate in the nation,[12] showed a 72% reduction (from 102 to 29 per 100,000) among vaccinates. These and other states revealed greater percentages of effectiveness with two doses of vaccine: California, 88%; Canada (selected provinces), 100%; Louisiana, 89%; Massachusetts, 65%; New York, 86%; North Carolina, 60%; and Wisconsin, 84%. Thus, in 1955, the collective experience with one and two doses of vaccine yielded consistent evidence of continued efficacy of the vaccine.

As discussed earlier, since changes in procedure of vaccine production were continuing, it was deemed necessary to establish continuous evaluation of vaccine efficiency. As vaccine supplies were increased after September, 1955, broader age groups were encompassed and by early 1956, the group 0-19 years of age and pregnant women of any age were included among the eligible priorities. The situation after October 17, 1955, was quite different from that which prevailed in the spring of 1955 when a single dose was given to a large group in a short period of time. Vaccinations were being performed at various times of the year before, during, and after the seasonal peak of the disease. Some individuals were receiving their second and even third doses while others were still receiving their first. Thus the several age groups as well as individuals within an age group were subjected to varying risk of attack, first as non-vaccinates then as recipients of one, two or three doses of vaccine. It is apparent that the vaccination status of the population was, and continues to be, a continuously varying quantity. It is immediately obvious that the simple analysis applied to the 1955 data was no longer valid under such circumstances. A "pure" group, with constant vaccinal status to be carried through a poliomyelitis season intact, no longer existed.

To compensate for this, a "life-table" approach was utilized in com-

puting case rates. The denominators were no longer stable segments of the population but rather person-months or person-years of experience in categories of unvaccinated, one-dose, and two-dose rank. A case of poliomyelitis occuring in any of the categories was considered as leaving that category. Similarly, those receiving a second dose of vaccine were considered as leaving the one-dose category and those receiving a first dose as leaving the unvaccinated category. Figure 3

Fig. 3. *Calculation of Person-Months at Risk for Any Category*

$$\text{Person-months}^{*} \text{ at risk in a certain category} = \text{number present in category at beginning of month} + \left\{ \frac{\text{number entering category during month} - \text{number leaving category during month}}{2^{**}} \right\}$$

* To obtain person-years value, divide by 12.

** Division by 2 to compensate for fact that individuals do not leave or enter en masse on first day of month but do so continuously throughout the month.

presents the relatively simple computation for each of the categories. To obtain the vaccinal status of members of the population month by month, continuous tabulations of all vaccine inoculation reports from physicians and clinics were maintained. These were on a mandatory basis for the duration of the distribution of state-purchased vaccine and on a voluntary reporting basis after commercial supplies were available in September. In Minnesota 100% of available vaccine was state-purchased through August of 1956. Although no restrictions on age use were placed on commercially purchased vaccine, only the 0-19 year group was studied for vaccine efficiency. Furthermore, vaccinal status was arbitrarily deemed to change 14 days after date of inoculation to provide for adequate vaccinal effect. Thus, if the date of onset of a case was within 14 days of the date of last dose of vaccine, that dose was discounted.

In Table 7 there are presented the data on person-months of experience or risk, by immunization status. It will be noted that the first and second grade groups have been included in our most recent calculation since they not only are obviously part of the 0-19 group, but have had second doses of vaccine since the summer of 1955 and have had two seasons of exposure to poliomyelitis. The total person-months and person-years for each category from which attack rates have been

TABLE 7

PERSON - MONTHS OF EXPERIENCE BY IMMUNIZATION STATUS
Minnesota, June 1, 1955 - December 1, 1956

Month	*No Vaccine*	*1 Dose*	*2 Doses*	*Age Groups Considered*
June, 1955	33.3	112.1	---	1st & 2nd Grades
July	33.3	112.1	---	1st & 2nd Grades
August	33.3	112.1	---	1st & 2nd Grades
September	33.3	112.1	53.4	1st & 2nd Grades
October	140.7	5.7	106.8	6 - 9 years
November	169.5	10.9	106.8	5 - 9 years
December	498.4	50.0	108.9	0 - 9 years
January, 1956	888.4	121.8	125.7	0 - 19 years
February	796.1	186.6	153.3	0 - 19 years
March	743.9	214.7	177.3	0 - 19 years
April	690.0	240.1	205.9	0 - 19 years
May	609.4	288.7	237.5	0 - 19 years
June	534.5	294.1	307.4	0 - 19 years
July	487.2	243.7	405.2	0 - 19 years
August	454.2	200.2	481.6	0 - 19 years
September	432.5	186.4	507.5	0 - 19 years
October	419.2	168.2	542.5	0 - 19 years
November	400.5	143.4	568.6	0 - 19 years
Total person - months	7397.7	2802.9	4088.4	------
Person - years	616.5	233.6	340.7	------

All figures in thousands.

calculated are also noted. In Table 8, there is presented the distribution of cases of poliomyelitis occurring in the study period according to clinical type, vaccinal status, and period of occurrence. Utilizing these data as numerators and the data from Table 7 as denominators, attack rates by vaccinal and clinical status are derived and expressed

TABLE 8

CASES OF POLIOMYELITIS WITH ONSET BETWEEN JUNE 1, 1955 AND DECEMBER 1, 1956 BY VACCINATION STATUS, CLINICAL TYPE AND IN SELECTED AGE GROUPS
Minnesota

		Paralytic			*Non-Paralytic*		
Time Period	*Age Group*	*No Vaccine*	*1 Dose*	*2 Doses*	*No Vaccine*	*1 Dose*	*2 Doses*
June 1, 1955 - Sept. 30, 1955	1st & 2nd Grades	3	4	--	5	16	--
Oct. 1, 1955 - Oct. 31, 1955	6 - 9 years	3	--	--	1	--	2
Nov. 1, 1955 - Nov. 30, 1955	5 - 9 years	4	--	--	--	--	--
Dec. 1, 1955 - Dec. 31, 1955	0 - 9 years	1	--	--	--	--	--
Jan. 1, 1956 - Nov. 30, 1956	0 - 19 years	32	7	4	42	9	31
Totals	----	43	11	4	48	25	33

in cases per 100,000 person-years of experience. These are summarized in Table 9. It can be seen that reductions in paralytic incidence occurred both in the population with single doses of vaccine and in

that with two doses of vaccine. Reduction in rate or protection afforded by one dose was 32.9%, a difference found not to be significant. With

TABLE 9

POLIOMYELITIS ATTACK RATES, PER 100,000 PERSON-YEARS OF EXPERIENCE BY CLINICAL TYPE AND VACCINATION STATUS
Minnesota, June 1, 1955 - November 30, 1956

Vaccinal Status	*Total Cases*	*Total Rate*	*Non Par. Cases*	*Non Par. Rate*	*Paralytic Cases*	*Paralytic Rate*
No. vaccine	91	14.8	48	7.8	43	7.0
1 dose	56	15.4	25	10.7	11	4.7
2 doses	37	10.9	33	9.7	4	1.2

two doses, however, the reduction was 82.9%, a highly significant difference. (Although followup on severity of paralytic cases in 1956 is not complete, it is of additional interest that available data for 1955 reveal a distinctly milder degree of paralysis among vaccinated cases compared to the unvaccinated. These data and those for 1956 will be presented elsewhere.)

Thus it may be concluded that Salk vaccine as utilized in Minnesota maintained relatively high protective efficiency when two doses were given. The percentage reduction in paralytic attack with a single dose of vaccine for the experience as a whole, though statistically not significant, was smaller than the protection afforded by a single dose in the 1955 season. Whether this implies a moderate decline in antigenicity in present vaccines over those utilized early in 1955 cannot be stated with assurance from these data. It is significant, however, that two doses provided a degree of protection comparable to that provided by three doses in the field trials of 1954. This is not surprising in view of Salk's subsequent investigations in which it was shown[14] that the third inoculation in the 1954 field trials, one month after the second inoculation which had been given a week after the first, was, indeed, not a booster dose; and antibody levels following this third injection were not significantly higher than the levels following the second inoculation. In 1955 and 1956, immunization schedules in Minnesota and elsewhere followed Salk's recommendation of a month's interval between first and second inoculations and no less than 7 months between second and third inoculations. The practical application of vaccine efficiency to epidemic theory is pertinent since the occurrence of outbreaks in the face of intensive immunization programs in some areas could prompt premature judgment of vaccine failure. Doubt of vaccine efficacy could be expressed in considering the outbreak of poliomyelitis in Chicago early in the season in 1956. When incidence began to rise early in July, sufficient vaccine had already been used to

provide for two inoculations in slightly less than 50% of the eligible population under 20 years of age, the group at greatest risk. In an upstate New York county with a population of 100,000, the attack rate by September of 1956 had reached 100 per 100,000. It was estimated that close to 50% of the eligible population had been vaccinated.

Do these instances of increased poliomyelitis incidence signify vaccine failure? It will be recalled that in Massachusetts during the large outbreak of 1955 a single dose of vaccine was proven to effect a 60% reduction in paralytic attack rates[13] from 157 per 100,000 among unvaccinated to 63 per 100,000 among the vaccinated. In Wisconsin, under epidemic conditions a similar reduction in rate was achieved. The rates for vaccinated were nevertheless higher than those for unvaccinated populations in non-epidemic states. Where, then, does the explanation of this seeming discrepancy lie?

Poliomyelitis vaccination apparently does not prevent infection with the virus. In animal studies extremely high titers of antibody are necessary to reduce multiplication of virus[15]. In man virus continues to multiply and to be excreted from the stool after vaccination and antibody rise although there is some evidence that the period of excretion may be shortened. The dynamics of poliomyelitis epidemics are not entirely understood. Favorable balance between susceptibles and immunes in the population provides an oversimplified explanation for a phenomenon which must involve, among other factors, the quantity of virus in a community and its rapidity of spread. The history of poliomyelitis in any community reveals swings of incidence, total and paralytic, from extreme lows to extreme highs. The number of paralytic cases which will occur in a community is an unpredictable quantity. In 1955, the attack rates in many communities were low. In Minnesota this was also true. Since only 10% of the population at greatest risk (0-19 years of age) had received but a single dose of vaccine, certainly the low paralytic attack rate cannot be attributed to vaccine. In Massachusetts a corresponding percentage of the same aged population had received vaccine but the overall rate was much higher. A difference in effective spread of virus must have occurred. With so small a fraction of the population at risk vaccinated with an antigen providing but 60-70% protection against only the paralytic form of the disease and not preventing infection *per se,* the ubiquitous virus obviously came into contact with large numbers of susceptible unvaccinated individuals. To these must be added the vaccine failures, for,

at best, a 60-70% or even 80% effective vaccine allows the development of paralytic cases in an amount equal to 20-40% of the paralytic cases which would have occurred had vaccine not been given in the community.

At what level of vaccination could we be sure that outbreaks would no longer occur? The answer to this is not available at the present time nor is it simple to derive on theoretical grounds. In Minnesota, only 49% of the population 0-19 years of age had received two doses of vaccine by the end of 1956 (Table 5), and 34% of this population group remained without a single dose. The Chicago and upstate New York experiences would indicate that immunization of 40-50% of the population at greatest risk is not adequate. The low paralytic attack rate in Minnesota in 1956 must in part have been due to vaccine; but the greatest part of this rate and virtually all of the rate in 1955, also quite low, may have been but manifestations of a more or less cyclic phase in the dynamic balance between natural immunes and susceptibles.

Will vaccination of a community virtually approaching 100% ultimately lead to a reduction in carrier infections or at least in their duration and thus reduce the opportunities for transfer of virus? Will communities, achieving such a state of affairs, and maintaining antibody levels on a continuing basis, by early infancy immunization and boosters, ultimately rid themselves of epidemic threats and by-pass the phenomenon of vaccine failures so that paralytic cases will occur but rarely? These are among the problems which the ensuing years of observation may resolve. At the present time, and pending the development of even more efficient polio-virus vaccines, vaccine coverage of an even larger proportion of the population is an immediate goal.

Summary

1. The use of trends in total and paralytic attack rates as measures of poliomyelitis vaccine efficiency has been found inadequate.
2. Paralytic attack ratios and age-distribution comparisons have been found only suggestive of vaccine efficacy.
3. The most nearly adequate measure of vaccine efficiency, short of placebo control studies, appears to be comparison of paralytic attack rates between comparable vaccinated and unvaccinated groups.

4. To permit the comparison of paralytic attack rates among vaccinated and unvaccinated groups constantly varying in a population, a "life-table" method has been presented.
5. By this method, analysis has revealed the use of two doses of Salk poliomyelitis vaccine in Minnesota in 1955-56 to have been 83% protective against paralytic poliomyelitis.
6. The continuing evaluation of vaccine efficiency will depend on co-operation of all physicians in the voluntary vaccination reporting system.

REFERENCES

1. Salk, Jonas, Bennett, B. L., Lewis, L. J., Ward, E. N., and Youngner, J. S.: Studies in Human Subjects on Active Immunization Against Poliomyelitis. I. A Preliminary Report of Experiments in Progress, J.A.M.A. 151:1081-1098, 1953.
2. Howe, Howard H.: Epidemiology of Poliomyelitis in the Light of Modern Research, Am. J. Med. 6:537-550, May, 1949.
3. Hammon, Wm. McD., Coriell, L. L., Wehrle, P. F., and Stokes, J., Jr.: Evaluation of Red Cross Gamma Globulin as a Prophylactic Agent for Poliomyelitis. IV. Final Report of Results Based on Clinical Diagnosis, J.A.M.A. 151:1272-1284, Apr. 11, 1953.
4. Francis, T., Jr., Korns, R. F., Voight, R. B., Boisen, Morton, Hemphill, F. M., Napier, J., and Tolchinsky, E.: An Evaluation of the 1954 Poliomyelitis Vaccine Trials, Summary Report, Polio Vaccine Evaluation Center, University of Michigan, Ann Arbor, Michigan, Apr. 12, 1955.
5. Salk, Jonas: Poliomyelitis Vaccine in the Fall of 1955, Am. J. Pub. Health 46: 1-14, Jan. 1956.
6. Public Health Service Progress Report on the Poliomyelitis Vaccine Program, U.S. Dept. of Health, Education, and Welfare, Washington, D. C. Jan. 24, 1956.
7. Poliomyelitis Surveillance Reports, Poliomyelitis Surveillance Unit, Communicable Disease Center, Public Health Service, U. S. Dept. of Health, Education, and Welfare, Washington, D. C. Dec. 14, 1956.
8. Data of the Minnesota Department of Health.
9. Unpublished studies of the authors and Doctors H. Bauer and J. T. Syverton.
10. Langmuir, A. D., Nathausen, N., and Hall, W. J.: Surveillance of Poliomyelitis in United States in 1955, Am. J. Pub. Health 46: Jan. 1956.
11. Poliomyelitis, 1955. Annual Statistical Review, the National Foundation for Infantile Paralysis, N. Y.
12. Van Riper, H. E.: New Information for Physicians on the Salk Poliomyelitis Vaccine, N.F.I.P. No. 3, June 1956, N. Y.
13. Pope, A. S., Feemster, R. F., Rosengard, D. E., Hopkins, F.R.B., Vanadzin, B., and Pattison, E. W.: Evaluation of Poliomyelitis Vaccination in Massachusetts, New England J. Med. 254:110-117, Jan. 19, 1956.
14. Salk, J. E.: Vaccination Against Paralytic Poliomyelitis Performance and Prospects, Am. J. Pub. Health 45:575-596, May 1955.
15. Bodian, D.: Concepts and Problems of Immunization Against Poliomyelitis, Federation Proc. 13:685, June 1954.

Staff Meeting Report

Early Objective Personality Evaluation in Medical Diagnosis*

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Introduction

During recent years there have appeared numerous articles from all branches of clinical medicine stating that in many patients seen by doctors emotional factors constitute the significant basis for their somatic complaints and symptoms. This is now recognized as the area of psychosomatic medicine. Surgeons, obstetricians, gynecologists, internists, dermatologists, and allergists alike have attested that many of the problems they see are rooted in the patients' attitudes toward life and their emotional reactions to living. Although acceptable statistics are hard to come by in this field, the figure of 50 per cent has often been mentioned, i. e., in at least half of all patients these psychological problems are primary factors in their illnesses.

In a recent article Kaufman and Bernstein[6] stated that 81.4 per cent of 1000 consecutive patients referred to a consultation clinic had psychological or emotional problems which were etiological factors in their illnesses. This is the highest percentage figure we have seen that comes from anything beyond clinical impression. Whether or not this estimate is accurate, the concensus appears to remain that the problem is significant and that proper treatment in this area is a respectable part of the practice of medicine.

We are aware that our language in this discussion appears to indicate our acceptance of a duality, psyche and soma. This is unavoidable because it is awkward to describe the problems with proper emphasis upon the monistic view of illness that we really hold. We consider the

* This is a report given at the Staff Meeting of the University of Minnesota Hospitals on February 8, 1957.

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words emotional, psychological, and the like, to signify those aspects of the patient that relate to observations and symptoms dependent upon human, verbal report as contrasted to the observations and symptoms manifested in physical and chemical procedures. Psychosomatic illnesses exhibit crucial symptoms observable only in psychological reports, like tiredness and complaints of pain, as well as physical or chemical signs such as anemia, bacterial organisms, or ulcers. In spite of the dual approach, we consider these various observations to have fundamental unity in diagnostic significance.

Psychiatrists, on their side, have seen a sort of missionary challenge in psychosomatic medicine and have seemed too often to preach at their medical colleagues with such admonitions as "Look to the patient as well as the disease!", "Consider the carrier!", and "People are whole units and cannot be treated as pieces and parts!" It is safe to say that psychiatry has not been timid about drawing these matters to the attention of others. If our historical perspective is correct, however, the missionary aspects have become somewhat tarnished as medicine in general, psychiatry included, has heard the sermon and has moved on to research projects and programs which are beginning to provide new understanding in the psychosomatic field. The issues have become so complex that the pristine zeal is being replaced by sober realization that even if the message gets across, the results will not be dramatic.

One specific problem has arisen as we have come to evaluate the everyday psychosomatic realities of medical practice through discussion with family physicians and other medical specialists. If so many patients have psychosomatic disorders, how can the busy practicing doctor recognize them without spending more time than he has available in interviews, detailed personal history, and the other time-consuming requisites of proper psychiatric evaluation? Further, not all physicians by any means are temperamentally suited to the patient and sensitive interviewing of their patients and to form the relatively close interpersonal relationships that are required for good treatment.

If relatively simple aids were available to help physicians estimate the emotional aspects of the patient's illness, presumably a forward step would have been taken. Both patient and doctor would save time because modifications of diagnosis and treatment significant for the correct management of the illness might be suggested. From the standpoint of the hospital or clinic administrator, there should also be value in early recognition of these psychosomatic illnesses, since often these patients are serious diagnostic puzzles and make the rounds from

specialty clinic to specialty clinic. In large medical centers with correspondingly large outpatient departments, such patients sometimes get lost and wander for months or years in the jungle of diagnostic indecision. A change of the guard in the form of a new resident or staff man often sees the whole process begin over again. This accumulation of a heavy chart costs money; in fact, it costs lots of money. Each time a patient is seen by the University of Minnesota Outpatient Clinic it costs in excess of $5.78, and this amount does not include the laboratory work that may be ordered. If objective testing can increase diagnostic and treatment efficiency, it would make an important contribution to better and more economical medicine.

We will not spend much time on the historical background of the objective tests that have been devised to help the physician in differential diagnosis by measuring clinically recognized characteristics of personality. This is an extensive field and, as you know, a great deal of work has been done and is in process [4, 5, 7, 8, 9, 10]. Some of this research has been done at Minnesota and resulted in the Minnesota Multiphasic Personality Inventory (MMPI)[7] which is the instrument most often and widely applied to the purpose. The University of Minnesota is internationally known in this field, and the various contributions have brought a great deal of credit to the Medical School. Personality testing is still in a pioneer stage, and the available tests are not much more than rough indicators.

Several years ago a group at Cornell [1, 2] devised a set of questions that has come to be known as the Cornell Medical Index (CMI). This device was intended to provide a comprehensive objective survey of the patient's presenting complaint and symptom picture. There are 195 questions in all, and they are loosely grouped according to organ systems. The symptomatic questions are in lay language. There are two forms, one for men and one for women. These differ only in six complaints that relate to the genito-urinary and reproductive systems. A few questions ask about medical history while others ask about present symptoms. The patient simply checks the items "yes" or "no." This inventory was not intended to replace medical history taking but only to augment efficiently the doctor's knowledge about his patient. For example, a patient might consul a physician about a trivial matter, perhaps a sprained ankle. The medical history done in a busy practice might not inquire about hemoptysis; yet if the patient coughs blood, it is of obvious importance that the physician be aware of it, regardless of what may have brought the patient to the office or clinic.

The CMI requires little time by the patient and yet covers all important symptomatic areas.

There is another value of such a check list that can be filled out by the patient. This relates to a dilemma that is common in medical practice; namely, the patient who is worried and troubled by one set of symptoms and who finds that the doctor either is unaware of what these are or does not pay much attention to them. For example, a 53-year-old laundress came to the clinic with stomach trouble which was probably on an emotional basis. The only positive finding to physical examination was a small mass in the upper outer quadrant of her right breast. Biopsy showed it was non-malignant and the patient was discharged. This was a painless nodule of which the patient was unaware, but the resources of the hospital understandably became focused on ruling in or out cancer of the breast. This, from a doctor's point of view, completely over-shadowed a complaint such as "nervous stomach." Yet from her point of view, she was never treated for what she had come. The physician properly felt gratified in having done a thorough medical work-up. The patient felt resentful that she had received no help. This, in one form or another, is a common medical dilemma. The Cornell Medical Index can contribute by assuring that the physician is at least aware of the gamut of the patient's complaints, and the patient is allowed to signify them.

Method

To lay a foundation for some objective data bearing on the value of objective tests preliminary to general medical diagnosis and treatment, we selected the CMI and MMPI as objective instruments. As we have described above, the CMI was developed with the intent to provide an objective summary of the symptoms significant to diagnosis. The items relate to the major organ systems, and there are also items that can indicate nervousness and emotional instability. The MMPI was primarily developed for psychiatric evaluation and provides empirically derived scales for the major neurotic and psychotic syndromes. No scoring system was provided for the CMI; it was expected that the clinician would read the "yes" responses, which are the claimed symptoms, and from the pattern and particular significance of these get preliminary insight as to how the patient might be best approached for diagnosis and treatment.

MMPI profiles readily permit recognition of at least two major

neurotic patterns, the hypochondriac and the hysteric. The identification of these can be done statistically by arbitrarily setting cutting points for the shape and elevation of the profiles or it can be done by clinical judgments by experienced MMPI profile readers. We have same data on neurotic patients based on both methods of subdivision.

The two tests were administered to 479 patients admitted to the Medical Outpatient Department of the University of Minnesota Hospitals in a 5-month period, February to June, 1954. These 479 patients were consecutive admissions with the exception of patients who could not be tested because they were illiterate or because emergencies left no time. Otherwise the two tests were administered in a routine way during the initial contacts with the patients and before the staff of the clinic could have had appreciable influence on the patients' complaint patterns. The two tests were filed away until the initiation of the present analysis of the data. None of these test data were available to the clinicians. The findings that we are presenting here represent a follow-up with an elapsed time from admission to the Medical Clinic of a minimum of 20 months. The reason for this interval was that we wished to allow time for the clinical assessments to crystallize and the diagnostic paths to be clarified.

Table 1 shows the sex and age distribution of the total sample. These data are interesting in that they are probably fairly characteristic of all admissions to the clinic. Forty-one per cent of patients were

TABLE 1

AGE AND SEX OF 479 PATIENTS CONSECUTIVELY ADMITTED

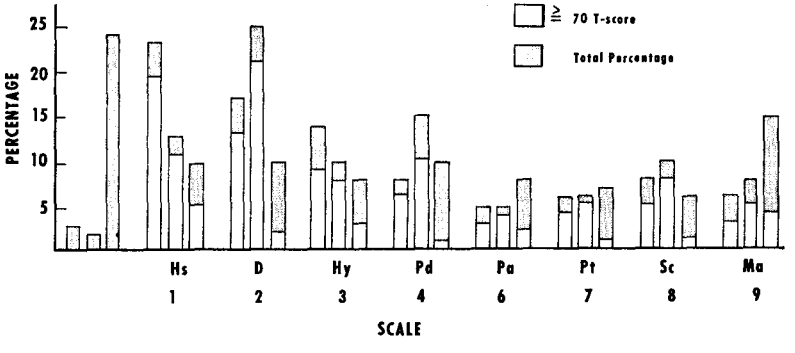
	Males		*Females*		*M and F*	
Age	*No.*	*%*	*No.*	*%*	*No.*	*%*
Less than 30	38	19	63	22	101	21
30 - 45	48	24	77	27	125	26
46 - 65	72	36	105	37	177	37
over 65	40	20	36	13	76	16
Total	198	99	281	99	479	100

male and 59% female. Of the whole group 47% were younger than 46 and 53% were older. As a first step in analysis of the data, all 479 valid MMPI profiles were given to three experienced clinical psychologists who were asked to divide them into patients who seemed likely to have a definite functional element in their presenting complaints as contrasted to those not so involved functionally. With two or three of the raters agreeing, this arbitrary division resulted in an almost exact 50-50 split of the males and a split into 47% organic to 53% functional for the females. Thus among our medical clinic admissions a blind diagnostic reading of the MMPI profiles indicated

that about 50% of both males and females show definite evidence that they have neurotic elements significant in their presenting complaint patterns.

Another way of looking at these MMPI profiles is to tabulate the number of profiles in which each of the eight major diagnostic scales occurs as the highest point of the profile. In Figure 1 the relative frequencies of codes of these various profile types are shown graphically.

Figure 1



Column 1 - General Medical Outpatient Admission Group

Column 2 - Neuropsychiatric Inpatient Population

Column 3 - General Norm Group

For comparative purposes, data on psychiatric inpatients and general normals are also given in Figure 1. The first group of three bars (unlabeled) shows that 25 per cent of the normals (column 3) obtained no codeable score; that is, all the T scores of these profiles were clearly normal. The adjacent bars show that only 2 per cent of our medical outpatient group and only 3 per cent of the psychiatric inpatient population had such normal profiles. The succeeding sets of bars show the frequencies of occurrence of each scale as highest (most abnormal) point among profiles from the three groups. In the present context, the data on scales 1, 2, and 3 are more interesting, since these scales indicate neurosis. Scale 1 (hypochondriasis) is the most frequent high score among our medical outpatients at 25 per cent, with the psychiatric patients at 12 and the normals at 10 per cent. If one looks only at the frequency of more abnormal scores (open columns indicating the per cent of scores 70 and greater), the contrast with the normals is still greater. Similar differences show up on scale 3 (hysteria).

These two scales show comparative dominance of neurosis among the medical group. On scale 2 (depression), deviant scores are more frequently obtained by the medical patients and the psychiatric inpatients with the psychiatric group most frequent at 25 per cent. These frequencies of depression are related to the symptom pattern of depression itself, since depressions have mixed clinical significance. Depression is a form of neurosis, but it is also a common reactive symptom with physical and mental illness; depression can also be the major element in a psychosis. As a neurotic or reactive symptom, it is frequently dominant in all groups, even normals.

Summary of Figure 1 data suggests that neurosis and psychosis were least indicated in normals, neurosis most characteristic of medical outpatient admissions, and psychosis most characteristic of inpatient psychiatry patients.

Although the CMI does not permit any scoring system for evaluation of the data, the whole outpatient sample showed an average of about 31 complaints per patient. This is about 16% of all the complaints offered to the patient by the CMI. Clinical evaluation by inspection of the CMI records did not seem at all rewarding because of this large average number of symptomatic claims. The chief reaction from inspection of most of the record blanks was that there had to be some complex element of organic or neurotic involvement for the patient to have so many symptoms that defied simple diagnostic summary. This problem was probably accentuated by the fact that the CMI does not provide any mechanism for one to know which symptoms were most significant to the patient.

As we have said in introducing this subject, it is hard in any case to know what the most definitive complaints of a patient may be. His presenting verbalized complaints can be distorted aspects of his real fears or disabilities. This is true in the case of expressed organic symptoms, such as referred pain or secondary weakness and malaise, but it is even more true in the psychological picture. A patient who is fundamentally troubled by a functional disorder very often emphasizes some organic items either as a "ticket" for medical attention or to defend himself from admission that he is psychologically weak. These considerations have deterred us from experimental study by blind clinical diagnoses based on the CMI. So far we have been unable to duplicate the original work on the CMI in which comparisons were made between diagnoses from the CMI alone and from the hospital records[1]. In fact, we do not comprehend how this study was done. It was re-

ported that CMI diagnosis reached or exceeded the effectiveness of the whole routine clinical procedure.

To provide a preliminary sample for exploratory study of the effects upon the medical record of a neurotic condition as indicated in the MMPI profiles, three subsamples were drawn from the whole sample. These samples of patients were arbitrarily selected to represent normal (no positive indication of neurosis), hypochondriacal, and hysterical patients on the basis of the MMPI profiles. In this case the classification was made statistically. The requirement for the normal patients was that they showed no profile deviation as great as T-score 70 or no score so large as to be coded. The hypochondriacal sample was chosen from those profiles that showed a T-score of 70 or above on scales 1 and 2 or both. The hysteria cases were chosen from those profiles with elevations on scales 1 and 3. In MMPI jargon these cases showed a "conversion V" type curve, the scales hypochondriasis and hysteria being considerably elevated in contrast to the rest of the profile and somewhat elevated above the depression score.

Selecting relatively clear instances of each of these MMPI abnormalities and eliminating patients whose records were for one reason or another obviously incomplete because of early termination of contact, we were left with 47 normal patients, 44 hypochondriacs, and 42 hysterics, all judged solely by MMPI standards.

Table 2 shows the distribution of these subsamples by sex and age. As would be expected from clinical experience, the hypochondriacs were relatively more often males and the hysterics relatively more often females, but the data are not statistically reliable. Variations according to age are also not statistically reliable, but one expects hypochondriasis in older patients and hysteria in younger ones. According to routine MMPI interpretation, the normal group should have been

TABLE 2

AGE AND SEX OF PATIENTS IN SUBSAMPLES

	Normal				*Hypo*				*Hyst*			
Age	*M*	*%*	*F*	*%*	*M*	*%*	*F*	*%*	*M*	*%*	*F*	*%*
under 46	7	32	17	68	6	21	3	20	8	57	15	54
over 45	45	68	8	32	23	79	12	80	6	43	13	46
Total	22	100	25	100	29	100	15	100	14	100	28	100

relatively free of obvious neurosis; the hypochondriacs should have shown multiple physical complaints; and the hysteria group, while having equally functional complaints in the organic field, would have been expected to show more clear simulation of ordinary organic syndromes than the hypochondriacs. Another way of saying this, relative to the

two groups, is that the dominant pattern in the hypochondriac is physical tiredness and general organic insufficiency with little defense against admitting neurosis, whereas the hysteric presents a concentration of symptoms upon organs or organ systems with overt denial of neurosis.

There are several ways in which the hypotheses indicated by these interpretations may be tested; one is to compare the frequency and nature of claimed complaint items in the CMI for the three groups. Disregarding items about loss of teeth and eye glasses which are so popular that they are repeated in every subgrouping, the male normals claimed only one symptom with a popularity of 50 per cent or more. That is to say, there was only one of the 192 CMI items that was claimed by 11 or more of the 22 males in the normal group. This item was the one related to getting up nights to urinate, and it was claimed by exactly 50 per cent of normal males; 36 per cent of the female normals claimed it.

The 25 female normals had three times that reached or exceeded the 50 per cent level. These were: "eats sweets before meals", 60 per cent; "constant, severe hot flashs and sweats", 52 per cent; and "feelings easily hurt", 56 per cent. On the latter item the frequency for the normal males was only 5 per cent. This sensitivity item appears as one of the most constant differences over and over again in studies of male-female differences.

In the hysteria subsample, the number of 50 per cent or more popular items was increased and there were elements suggesting typical conversion hysteria. Among the 14 males in the hysteria group, there were seven popular items, claimed by 50 per cent or more. Three of these definitely referred to heart symptoms, "thumping", "racing", and "pain", and a fourth related to "difficult breathing". The other three items were "sensitive skin", "complete tiring out at work", and "frequent urination during the day". The female hysteria group of 28 patients showed 15 popular items. The heart again got attention with "thumping" and "racing", and there were two breathing items, "difficulty in breathing", and "get out of breath more readily than other people do". Being "tired", increased in frequency in this group along with "exhaustion", "complete tiring at work", "tired in the morning", and "difficulty in taking regular exercise". "Frequent day" and "night" urination, "hot and cold spells", "bad headaches", and "weak or sick with menstrual periods" constituted a group of mildly neurotic type items. There was also an item relating to "difficulty in sleeping".

From MMPI theory we expected that these hysteria items would be

closely related to organ systems and usually the psychology of hysteria involves a vigorous denial of psychological weaknesses as such. The hysteria patient accepts organic sources for weaknesses such as tiredness and difficulty of sleeping, and the like, but rejects the possibility that his feelings are easily hurt or that he is more than others subject to worry and psychological stress. It is interesting in this connection that the item ordinarily popular among women relating to hurt feelings occurred among these hysteria women with a frequency of only 38 per cent.

Hypochondriasis is fundamentally based on feeling tired but is characterized by multiple and indefinite complaints. The 29 hypochondriacal men did not actually show many popular complaints. Four most frequently claimed were "frequently clear throat", "get up at night to urinate", "frequent urination during the day", and "completely tired out at work". In addition there was the complaint of "definitely underweight" which occurred with a frequency of 55 per cent as against 9 per cent in the normal group. Only 9 per cent of the normal group complained of being tired out completely at work as against 55 per cent of the hypochondriac males.

The 15 hypochondriacal women were the most prolific of all in popular symptoms. There were 21 symptoms that reached the 50 per cent popularity level. They included the ones claimed by the hysteria group but with added items indicating low resistance to admission of psychological weaknesses. The item on easily hurt feelings showed up again with a 67 per cent frequency, and there were others similar such as being "easily upset by criticism", "considered touchy", "easily upset or irritated by little things", and more of the same sort.

Since many of the items of the CMI are related to neurotic patterns of illness, it seemed more interesting to study the responses of these three groups to the obviously organic items of the CMI. Running through and selecting only what appeared to be definite organic symptoms such as "nose bleeds" and "swollen ankles," we found 94 such items out of the total of 195 on the men's form and 90 of 195 on the women's form of the CMI. It now was more instructive to emphasize items that had a lower popularity; i. e., organic symptoms that were claimed with a frequency greater than only 10 per cent. Table 3 shows these frequencies. The normal men selected only 40 per cent of the 94 organic items with a frequency of greater than 10 per cent. The hypochondriasis men selected 78 per cent, and the hysteria patients selected 63 per cent. The same general findings are true of the women

TABLE 3

FREQUENCY OF ORGANIC SYMPTOMS CLAIMED

	Per cent of all items claimed by more than half the patients		*Per cent of organic items claimed by more than one-tenth the patients*	
	M	*F*	*M*	*F*
Normal	.5	1.6	40	60
Hypo	2.5	10.9	78	73
Hyst	4.2	7.8	63	79

except that relatively more items were claimed with a 10 per cent frequency among all three groups. These findings are marked and significant and are, of course, not out of accord with common clinical experience. Essentially, they suggest that the patient in whom a positive diagnosis of neurosis can be made is prone to claim a higher frequency and variety of what would ordinarily seem to be solid organic-type symptoms (or that the concept of neurosis is alloyed with complex organicity).

Table 4 gives data on another effect (not statistically reliable) that has been reported in a previous study[4] and that may be more clearly

TABLE 4

COMPARISON OF CHART WEIGHTS

Weight of Chart	*% Normal*	*% Hypo*	*% Hyst*
Less than ¼ pound	41	20	21
Greater than 1 pound	6	16	17

developed in our further analysis of the whole of our data. This table shows the relative frequency among the three groups for charts weighing less than one-quarter pound and weighing more than one pound. There is a trend toward lightweight charts among the MMPI normals who contrast most with the hypochondriacs in this respect, and the heavy charts are seen to be more common in the two neurotic groups. This device of using chart weight is a crude measure when one recognizes the varied contributions to chart weight. For example, some of these patients died in the hospital and acquired heavy charts in the course of an organic disorder. Nevertheless the objectively identified neurotics are active competitors for heavy charts to an extent approaching statistical significance even in this small sample.

As a final preliminary analysis, we have begun to have the records of these subsample patients analyzed by medical staff members who are familiar with the hospital. These readers have indicated from study of the chart the ideal procedures, laboratory tests, and other investigative moves that they think would have most efficiently clarified the appar-

ent problem of the patient. The data from this part of the experiment are not easily handled, and we have not prepared any preliminary report on them. These readers also gave us a rating for each chart, representing the reader's best judgment about the general nature of the patient's disorder evaluated on a scale. At one end of the scale is the definite and relatively uncomplicated organic disorder which is given a rating of one and at the other end the more complicated and functional or neurotic problem which is rated nine. The scale reads as follows:

1. Organic, simple, without complications. Into this category are placed all patients who present with a relatively clear cut, straightforward medical problem which is diagnosed and treated. The patient then returns to his community where he functions satisfactorily within the mores of his family, social, and vocational circles. This includes early, treatable carcinoma, without post-operative complications or recurrence; acute appendicitis; simple fractures; etc.

2. Organic, complex, with functional symptoms secondary to chronicity. In this group of patients are those who have had fairly serious illnesses, such as chronic glomerulonephritis, recurrent carcinoma, uncontrolled diabetes mellitus; or a successive number of illnesses not necessarily related, which have interfered with their capacity to fulfill adequately their usual role in life. Because of their chronic illness they may have developed certain behavioral reactions both toward themselves and others, which may not be regarded as optimal in terms of their established mores of individual and group behavior.

3. Organic, acute or chronic, with a definite psychological reaction known to accompany the disease. This group includes patients who have diseases which are known to present with both prominent organic and psychological symptoms, sometimes severe enough to be diagnosed as a full-blown psychosis. Examples of such diseases are disseminated lupus erythematosus, acute intermittent porphyria, etc. Included here would be patients with a disease being treated with ACTH or cortisone who develop an acute psychosis. Included also is adrenal hyperplasia.

4. Organic and functional of equal severity. These patients present with both a clear cut medical problem and a psychological-behavioral problem. The two conditions are not obviously related and may include such things as symptomatic rheumatic heart disease in a patient with paranoid schizophrenia. Treatment of the one condition often has little or no effect on the course of the other.

5. Psychosomatic. This category included those patients who are diagnosed and/or treated for those disorders which are often considered in the psychosomatic group such as duodenal ulcer, ulcerative colitis, or bronchial asthma, coronary artery disease.

6. Organic problem secondary to a functional problem. The patients in this group are those with a relatively serious personality problem, who present with a medical problem which seems to be a direct result of them. An example of this would be cirrhosis of the liver secondary to chronic alcoholism.

7. Organic complaints with non-diagnostic studies, and no organic diagnosis. This group includes those patients who present with symptoms relating to one or more organ systems and in whom thorough investigation yields no definitive organic diagnosis to explain these complaints.

8. Functional problem with non-related minor, organic symptoms. Into this category fall those patients who come with a psychological problem of relatively serious nature, but in whom are found (in the course of the routine medical work-up) non-contributory, minor medical problems such as a mild hernia or varicose veins, which may be treated without sequelae. The treatment of these does not bear any direct relationship to the course of the behavior problem.

9. Functional. Patients in this group are those who are referred in because of a definite psychological problem and who on routine medical work-up present no related evidence of physical dysfunction.

We have ratings available for a total of 114 patients drawn from the three MMPI groups, and these are shown in Table 5. Because a very large per cent of the ratings fall in the first three classes on the

TABLE 5

MEDICAL RATINGS OF PATIENTS IN THE VARIOUS MMPI GROUPS

Scale / *Ratings*	*Normal* M & F		*Hypo* M & F		*Hyst* M & F	
	No.	*%*	*No.*	*%*	*No.*	*%*
1 - 3	30	73	25	66	18	51
4 & 5	6	15	7	18	8	23
6 - 9	5	12	6	16	9	26
	41	100	38	100	35	100

organic end of the scale, the numbers in the other cells of this table are too small to be statistically significant. The percentages vary in the expected directions, however. This method of estimation of the functional component in the complaints of a patient is cumbersome, and there are difficulties that cannot be overcome. For example,

a neurotic patient with multiple organic complaints often manages to titillate the physician or any other rater who is properly concerned with the danger of neglecting a threatening organic condition. In consequence, as the complaint list grows longer and the charts heavier, there is a double implication. On the one hand, as soon as he sees a long list of symptoms, one is tempted to accept high probability that the patient is mostly neurotic, but for certain systemic disorders usually considered to be clearly without large functional component, the usual organic symptoms are widespread and pervasive. Most careful physicians choose to err in the direction of depreciating the functional component in favor of checking for one of these complicated organic syndromes. This is consistent with the ethical approach of organic medicine, and however likely it may be that the slant encourages undesirable depreciation of the presence of neurosis in many patients, we would hesitate to advocate abandoning the bias.

Summary

The findings indicate that objective testing, as described, aids in the early recognition of those patients whose complaints rest upon common neurotic patterns. When these neurotic patterns are expressed by the patient as physical complaints, as they frequently are, the physician has a valuable tool in these tests, by crude analogy comparable to the x-ray, in visualizing that which is not visible on the surface. The results we were able to obtain, however, were not so clear cut and provocative as those which have been reported in the literature and indicate that these tests must be used in the same light as any other laboratory test, i.e., they contribute to clinical judgment but do not replace it. There seems little doubt, however, that the proper use of these two relatively simple tests, neither of which requires the expenditure of the physician's time in obtaining, can often, but not always, direct the physician's attention to data about his patient which would take some hours of medical time to arrive at by the unstructured interview or history-taking method. The physician is thus aided in arriving at a positive diagnosis of concurrent or primary neurotic illness. If this statement is true, and we believe it is, it follows that the more extensive and judicious use of these tests in medical practice could effect some economies in the cost of medical care by more speedy diagnosis and by the saving of physicians' time.

REFERENCES

1. Brodman, K., Erdman, A. J., Lorge, I., and Wolff, H. G.: Cornell Medical Index Health Questionnaire as a Diagnostic Instrument, J.A.M.A. 145:152-157, 1951.
2. Brodman, K., Erdman, A. J., Lorge, I., and Wolff, H. G.: The Cornell Medical Index—An Adjunct to Medical Interview, J.A.M.A. 140:530-534, 1949.
3. Hathaway, S. R., and McKinley, J. C.: *The Minnesota Multiphasic Personality Inventory.* Minneapolis, U. of Minn. Press, 1943.
4. Hathaway, S. R.: Multiphasic Personality Inventory, Modern Hospital 66, No. 4, 1946.
5. Kamman, G. R., and Kram, C.: Value of Psychometric Examinations in Medical Diagnosis and Treatment, J.A.M.A. 158:555-560, 1955.
6. Kaufman, R. M., and Bernstein, S.: A Psychiatric Evaluation of the Problem Patient, J.A.M.A. 163:108-111, 1957.
7. McKinley, J. C., and Hathaway, S. D.: The Identification and Measurement of the Psychoneuroses in Medical Practice, J.A.M.A. 122:161-167, 1943.
8. Poser, E. G.: The Use of Psychological Tests in Psychosomatic Research, Canadian J. Psychol. 7:177-182, 1953.
9. Ruesch, J.: Psychophysiological Relations in Cases with Head Injuries, Psychosomatic Med. 8:158-168, 1945.
10. Scodel, A.: Passivity in a Class of Peptic Ulcer Patients, Psychol, Monogr. 67, No. 360, 1953.

Editorial

Publish or Perish

"Publish or perish!" In the strange and wonderful world of academic medicine, this is a guiding principle which no would-be academician can afford to overlook. The bibliography becomes the measure of a man. A position is to be filled. "What has he published?" we ask concerning a candidate. An individual's promotion in academic rank is under consideration. "How productive has he been?" we ask, meaning, of course, "How many papers does he have to his credit?" Publication, which should be merely the means of dissemination of information, becomes an end in itself. Writings take on the aspect of a sort of academic currency. Those who accumulate enough "wealth" are admitted to certain "clubs" which, in their own way, are as exclusive as those with admission requirements based on money or social position.

Is this emphasis on publication, which seems to us to be increasing, beneficial to medical teaching and to medicine in general? We believe that it is—to the extent that it promotes sound investigation. We are firmly convinced that research is an absolute essential in a teaching program, an integral part of it. Teaching in an atmosphere devoid of an active, forward-looking investigative program can only be sterile, uninspired, and uninspiring.

This push to publish is attended by certain drawbacks and dangers, however. Among the drawbacks one may include some of the strange and near-comic characteristics of today's burgeoning medical literature: multiple authorship (A dozen authors may be listed on a two-or three-page paper.); multiple reporting (One may get a lot of mileage from a good serviceable set of data with a little rewriting and with judicious selection of journals to which the slightly altered manuscripts are to be submitted.); and fragmentation or serialization (A paper labeled No. XXIX of a series is most impressive, to be sure, and will add length if not necessarily substance to anybody's bibliography. A junior author of paper No. XVII, for example, can, in listing his bibliography, convey a vague impression that he has also been associated with papers No. I through XVI.). Quests for priority which sometimes reach absurd proportions are also frequent phenomena.

One of the dangers of this situation is that bibliographies may be

judged on a quantitative rather than on a qualitative basis, that the tape measure and the adding machine may become instruments for determining academic worth. This danger we minimize. Those responsible for appointments and promotions with whom we have been privileged to be associated have invariably looked beyond mere numbers of publications to determine, insofar as possible, quality of research. This is an obligation our colleagues take most seriously.

The greatest danger, in our opinion, is the seemingly prevalent assumption that a capable investigator is, *pari passu,* a capable teacher. Actually one may assume this with no more assurance than one may assume that an outstanding pole-vaulter is also a champion distance runner. This "correlate abilities hypothesis" results in appointments and promotions made almost exclusively on the basis of investigative activity, and most faculties will include a certain proportion of scholars with distinctly limited ability to communicate with their students.

Ideally, of course, our faculties would be made up of people who are both skilled investigators and excellent teachers. Fortunately, there are a good many such individuals but, unfortunately, not enough to fill *all* academic positions. Under the prevailing system, what happens to the talented teacher whose research efforts are considered limited, unoriginal, or superficial? Few will be found on medical school faculties. Such an individual may, on occasion, be appointed to a lower echelon academic position, but his chances for promotion to a tenure rank are exceedingly slim.

It is our contention that the stairway up the ivory tower should not be barricaded at the first landing for the truly skilled teacher of modest investigative ability, that there *should* be a place for him in the academic setting. A distinguished medical educator[1] recently stated, "Communication is the most difficult of the arts," and we agree wholeheartedly. Outstanding capacity for communication should be recognized and rewarded commensurate with outstanding capacity for investigation. The fact that it is difficult to assay a person's teaching ability — probably even more difficult than it is to determine his research ability — must not be allowed to deter us from making the effort.

Let no one infer that we are advocating "practical" teaching in place of "scientific" teaching, that we would deemphasize in any way the experimental approach in the teaching of medicine. On the contrary,

1 Berry, George Packer: Informal remarks, Chicago, Feb. 11, 1957.

it is our thesis that there are circumstances where the talented and experienced teacher can communicate to students the nature and significance of the results of research better than can the researcher himself. It is still not necessary for one to have laid an egg in order to explain the nature of an omelet. The conscientious physician with an innate ability to teach, placed in an academic atmosphere and properly encouraged, will be continuously stimulated by the research activities of his more scholarly but perhaps less articulate colleagues. Although his own publications may be limited to a few rather pedestrian chart review studies, he can still be an inspiring teacher, whose talents can be used for the benefit of students and faculty alike. Let us not let him perish!

Medical School Activities

Changes in Staff at Minneapolis General Hospital

DR. CLAUDE R. HITCHCOCK, *Associate Professor,* Department of Surgery, has been named *Chief* of Surgery at Minneapolis General Hospital, succeeding DR. O. J. CAMPBELL, *Clinical Professor,* Department of Surgery, who has been appointed to a new position, *Chairman* of the Surgery Department. Dr. Hitchcock will have direct responsibility for the surgical service at M.G.H. and for the teaching program. DR. MALVIN J. NYDAHL, *Clinical Assistant Professor,* Division of Orthopedic Surgery, has been appointed *Chief* of Orthopedics, replacing DR. JOHN H. MOE who recently became *Professor and Director* of the Division of Orthopedic Surgery at the Medical School.

Faculty News

DR. ANCEL KEYS, *Professor and Director,* Laboratory of Physiological Hygiene, gave the principal address at a Symposium on Arteriosclerosis sponsored by the Southeastern Pennsylvania Heart Association on February 12 in Philadelphia. His subject was "The Epidemiology of Coronary Heart Disease." He also presented a series of four lectures for the Maumee Valley Hospital Trust and the Northern Ohio Heart Association which covered the general topics of obesity, metabolism, and heart disease on February 14 and 15.

DR. H. E. MICHELSON, *Professor and Director,* Division of Dermatology, has been invited to give the dermatological oration before the New York State Medical Society at their 150th anniversary celebration on February 20. His subject will be "Comparison of Diagnostic Approaches in Dermatology and Internal Medicine."

MISS KATHARINE J. DENSFORD, *Professor and Director* of the School of Nursing, attended a meeting of the Executive Committee of the International Council of Nurses in London, England, on January 6 to 8. She also attended a meeting of the Finance Committee of the same organization while there. These meetings were preparatory to the Congress of the International Council in Rome, May, 1957.

Postgraduate Education

Internal Medicine for Internists

The University of Minnesota announces a continuation course in Recent Advances in Internal Medicine for Internists to be held at the Center for Continuation Study on the University Campus March 4 to 6, 1957. As in previous years, fundamental advances related to clinical practice will be stressed. Areas to be covered this year include infectious diseases, neurology, cardiology, and gastroenterology. Guest speakers will be DOCTORS MAX B. LURIE, *Professor* of Experimental Pathology, Henry Phipps Institute, University of Pennsylvania, Philadelphia, and CARLETON B. CHAPMAN, *Professor* of Medicine, Southwestern Medical School, Dallas, Texas. The remainder of the faculty will include members of the faculties of the University of Minnesota Medical School and of the Mayo Foundation. The course will be presented under the direction of DR. WESLEY W. SPINK, *Professor,* Department of Medicine.

Pediatrics for General Physicians

A continuation course in Pediatrics for General Physicians will be presented from March 18 to 20, 1957, at the Center for Continuation Study on the University of Minnesota campus. The course will consist of formal lectures and informal round table discussions. The visiting staff will include DR. JAMES AREY, *Associate Professor* of Pathology, Temple University School of Medicine, and *Director* of Laboratories, St. Christopher's Hospital for Children, Philadelphia, Pennsylvania; and DR. LEE FORREST HILL, *Chief* of Pediatrics, Blank Memorial Hospital and Iowa Methodist Hospital, Des Moines, Iowa. The course will be presented under the direction of DR. JOHN A. ANDERSON, *Professor and Head,* Department of Pediatrics. The remainder of the faculty will include members of the faculties of the University of Minnesota Medical School and of the Mayo Foundation.

Coming Events

February 19 ---------MINNESOTA PATHOLOGICAL SOCIETY AND E. P. LYON LECTURE; "Internally-Deposited Radioactive Isotopes in Relation to Radioactive Fallout;" *Dr. Wright H. Langham,* Los Alamos Scientific Laboratory, Los Alamos, New Mexico; Mayo Memorial Auditorium; 8:00 p.m.

February 21 ---------E. STARR JUDD LECTURE; "Some Problems of Dysphagia;" *Dr. Philip R. Allison,* Professor of Surgery, Radcliffe Infirmary, Oxford University, Oxford, England; Mayo Memorial Auditorium; 8:15 p.m.

February 26 ---------STUDENT A.M.A. LECTURE; "Total Treatment;" *Dr. A. B. Baker,* Professor and Director, Division of Neurology, University of Minnesota Medical School; Room 125, Mayo Memorial; 8:00 p.m.

March 4-6 ----------Continuation Course in Internal Medicine for Internists

March 5 ----------C. M. JACKSON LECTURE; "The Contrasting Effects of Cortisone and levo-Triiodothyronine on Resistance to Tuberculosis;" *Dr. Max B. Lurie,* Professor of Experimental Pathology, Henry Phipps Institute, University of Pennsylvania, Philadelphia; Mayo Memorial Auditorium; 8:15 p.m.

March 14 ----------Society for Experimental Biology and Medicine Meeting; Owre Amphitheater; 8:00 p.m.

March 18-20 --------Continuation Course in Pediatrics for General Physicians

March 21-23 --------Continuation Course in Obstetrics for Specialists

WEEKLY CONFERENCES OF GENERAL INTEREST

Physicians Welcome

Monday,	9:00 to 10:50 A.M.	OBSTETRICS AND GYNECOLOGY Old Nursery, Station 57 University Hospitals
	12:30 to 1:30 P.M.	PHYSIOLOGY- PHYSIOLOGICAL CHEMISTRY 214 Millard Hall
	4:00 to 6:00 P.M.	ANESTHESIOLOGY Classroom 100 Mayo Memorial
Tuesday,	12:30 to 1:20 P.M.	PATHOLOGY 104 Jackson Hall
Friday,	7:45 to 9:00 A.M.	PEDIATRICS McQuarrie Pediatric Library, 1450 Mayo Memorial
	8:00 to 10:00 A.M.	NEUROLOGY Station 50, University Hospitals
	9:00 to 10:00 A.M.	MEDICINE Todd Amphitheater, University Hospitals
	1:30 to 2:30 P.M.	DERMATOLOGY Eustis Amphitheater, University Hospitals
Saturday,	7:45 to 9:00 A.M.	ORTHOPEDICS Powell Hall Amphitheater
	9:15 to 11:30 A.M.	SURGERY Todd Amphitheater, University Hospitals

For detailed information concerning all conferences, seminars and ward rounds at University Hospitals, Ancker Hospital, Minneapolis General Hospital and the Minneapolis Veterans Administration Hospital, write to the Editor of the BULLETIN, 1342 Mayo Memorial, University of Minnesota, Minneapolis 14.