

SPECIAL ARTICLE

THE ECOLOGY OF MEDICAL CARE*

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CURRENT discussions about medical care appear largely concerned with two questions: Is the burgeoning harvest of new knowledge fostered by immense public investment in medical research being delivered effectively to the consumers? Is the available quantity, quality and distribution of contemporary medical care optimum in the opinion of the consumers? In addition, it may be asked: Whose responsibility is it to examine these questions and provide data upon which sound judgments and effective programs can be based?

The traditional indexes of the public's health, such as mortality and morbidity rates, are useful for defining patterns of ill-health and demographic characteristics of populations who experience specific diseases. They are of limited value in describing actions taken by individual patients and physicians about disease and other unclassified manifestations of ill-health. It is the collective impact of these actions that largely determines the demand for and utilization of medical-care resources. To assess the adequacy of the resources, it may be as important to ask questions about medical-care decisions, and to relate the data to clearly defined populations and health facilities, as it is to ask questions about mortality and morbidity for other purposes. In the context of medical care the patient may be a more relevant primary unit of observation than the disease, the visit or the admission. The natural history of the patient's medical care may be a more appropriate concern than the natural history of his disease. Similarly, data for short periods (weeks or months) may be more useful than data for longer periods (a year or more) for relating potential needs and demands to medical-care resources.

Little is known about the process by which persons, perceiving some disturbance in their sense of well-being or health, decide to seek help. Nor is much known about their sources of help,¹ or about the second and third stages of decision-making at which patients and their health advisors, whether physicians, pharmacists or faith healers, seek or advise help and consultations from other medical-care resources. The

available data suggest that patients control the decision-making process with respect not only to seeking but also to accepting and using medical care to a substantial extent.^{2,3} Each practitioner or administrator sees a biased sample of medical-care problems presented to him; rarely has any individual, specialty or institution a broad appreciation of the ecology of medical care that enables unique and frequently isolated contributions to be seen in relation to those of others and to the over-all needs of the community.⁴

The dimensions of these relations may be described quantitatively by estimation of the proportions of defined populations who, within the relatively short period of one month, are "sick," consult a physician, are referred by him to another physician, are hospitalized or are sent to a university medical center.¹ Such information could be a helpful prelude to further studies of the processes by which patients move from level to level up and down the hierarchy of medical-care resources, and of the best ways in which to relate these resources to one another.

AVAILABLE DATA

Reliable data that can be related to defined groups are available from several sources; although not strictly comparable, because of differences in time, place and criteria, they appear adequate for the present purpose and may reflect, not too inaccurately, the dimensions of certain medical-care problems. Only adults sixteen years of age and over (fifteen and over, for certain data) will be considered, first because the data lend themselves most readily to consideration of the adult population, and secondly because most decisions about children's medical care are customarily made by their parents or guardians. A month has been taken as the unit of time, since it is probably a more realistic period than a year for evaluating decisions affecting the prompt and adequate delivery of medical care. This short time has the additional advantage that surveys asking respondents to recall experiences during the previous month or two are apt to be less influenced by memory than those based on longer recall periods.

In a population of 1000 adults (sixteen years of age and over) with an age distribution comparable to those found currently in the United States and England, it would be important to know the number who consider themselves to have been "sick" or "ill" during a month. For the present purpose, "The Survey of Sickness"⁵ reports useful data for a continuing repre-

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month in 1947 per 100 adults (sixteen years of age and over) who were "sick" as defined above. Only 23 per cent of all adults reporting at least one illness or injury during a month consulted a physician at least once; there are no differences in sex and slight differences in age. Expressed in relation to the base population of 100 adults, the mean monthly medical-consultation rate becomes $\frac{23}{100} \times 75$, or 17 per 100 adults (sixteen years of age and over).

Data from the current United States National

ferral to another physician or referral to a university medical center.

The United States National Health Survey¹¹ has published annual rates based on household interviews for patients discharged from short-stay hospitals (including those with obstetric beds) — that is, those in which most patients stay for less than thirty days. From these annual rates, corrected both for under-reporting by respondents and to reflect patients hospitalized, rather than episodes of hospitalization, rates per 100 adults (fifteen years of age and over) may be

TABLE 2. Annual Sickness Rates (Persons Sick One or More Times per Year) from All Causes, According to Sex and Age, per 100 Adults (Fifteen Years of Age and Over) among 8758 Canvassed White Families (22,561 Adults) in 18 States during Twelve Consecutive Months, 1928-31.*

15-44 Yr. of Age		45-64 Yr. of Age		65 Yr. of Age & Over		ALL AGES (15 & Over)		
ANNUAL SICK- NESS RATES FOR MEN	ANNUAL SICK- NESS RATES FOR WOMEN	ANNUAL SICK- NESS RATES FOR MEN	ANNUAL SICK- NESS RATES FOR WOMEN	ANNUAL SICK- NESS RATES FOR MEN	ANNUAL SICK- NESS RATES FOR WOMEN	ANNUAL SICK- NESS RATES FOR MEN	ANNUAL SICK- NESS RATES FOR WOMEN	ANNUAL SICKNESS RATES FOR ALL PERSONS
41	55	44	57	55	65	42	56	49

Adapted from Table 4 of Collins.

Health Survey⁸ are also helpful in this regard, although the sampling period for the relevant published data covers only three months (July to September, 1957) in contrast to the English sickness survey, which covers one year and therefore reflects seasonal fluctuations. Monthly Medical-Consultation Rates calculated from the published data vary from 13 to 26, with an over-all monthly rate of 19 adult patients (fifteen years of age and over) consulting at least once per 100 adults (Table 4). In the English sickness survey,⁸ the July-September quarter has lower mean monthly medical-consultation rates than the other quarters. In the United States National Health Survey data,⁹ the physician visit rates per person during a two-year period tend to be lower in the July-September quarters than in the other three quarters for less than half the adult age-sex classifications reported.

The circumstances under which the English data were collected tend to diminish the under-reporting of persons consulting a physician each month, but the United States National Health Survey data could be more substantially biased in this respect. A preliminary study, comparing data from records of the Health Insurance Plan of Greater New York with those from the National Health Survey household interviews, suggests that the latter could under-report the number of persons consulting a physician during a two-week period by as much as a third.¹⁰

Considering the available data, as well as possible sources of bias, it seems reasonable to estimate the mean monthly medical-consultation rate at about 25 patients per 100 adult population. In an average month, in a population of 1000 adults (sixteen years of age and over) it may be expected that about 250 adults will consult a physician at least once. It is this population that is at risk of hospitalization, re-

estimated¹² (Table 5). Rates by age and sex groups vary between 0.35 and 1.06, with an over-all rate of 0.61. Younger women admitted for delivery or related problems are reflected in the 1.06 rate; there are no differences in the rates for men and women in the other broad age groups.

TABLE 3. Mean Monthly Medical Consultation Rates (Persons Consulting a Physician), According to Sex and Age, per 100 "Sick" Adults (Sixteen Years of Age and Over) Who Suffered from any Illness or Injury, 1947.*

MEAN NO. OF MEDICAL CON- SULTA- TIONS/MO.	16-64 Yr. of Age		65 Yr. of Age & Over		ALL AGES (16 & Over)
	MONTHLY MEDICAL CONSULTA- TION RATES FOR MEN	MONTHLY MEDICAL CONSULTA- TION RATES FOR WOMEN	MONTHLY MEDICAL CONSULTA- TION RATES FOR MEN	MONTHLY MEDICAL CONSULTA- TION RATES FOR WOMEN	
0	77	78	72	73	77
1	9	9	12	12	10
2	5	5	7	6	5
3	3	2	2	2	2
4	3	3	5	4	3
5-9	2	2	1	2	2
10 or more	1	1	1	1	1
Mean	23	22	28	27	25

*Adapted from Stocks.⁷

More accurate mean monthly rates can be calculated from data developed by Forsyth and Logan¹³ for a defined population served by the Barrow and Furness Group of Hospitals in England, a group that includes among its 9 hospitals, 2 for the "chronic sick" and 4 with obstetric beds. The monthly hospitalization rates for adults (sixteen years of age and over) during a period of twelve months vary between 0.59 and 0.77 per 100 adults, with a mean monthly hospitalization rate based on the twelve-month period of 0.70 (Table 6).

average, 250 adults per 1000 consult a physician at least once a month, approximately 5 adult patients are referred per 1000 adult population (sixteen years of age and over) per month.

Other published referral data¹⁸⁻²² do not permit calculation of rates for short periods (such as a month) for patients referred, in contrast to rates for numbers of referrals. The risks of a given patient being referred to either another physician or a university medical

TABLE 6. *Monthly Hospitalization Rates (Patients Recommended for Admission) per 100 Adults (Sixteen Years of Age and Over) in the Barrow and Furness Group of Hospitals, 1957.**

MONTH	PATIENTS 16 Yr. OF AGE & OVER RECOMMENDED FOR HOSPITALIZATION	
	NUMBER	RATE
Jan.	595	0.66
Feb.	656	0.73
Mar.	656	0.73
Apr.	690	0.77
May	677	0.75
June	586	0.65
July	602	0.67
Aug.	567	0.63
Sept.	659	0.73
Oct.	675	0.75
Nov.	534	0.59
Dec.	646	0.72
Means	628	0.70

Population at risk (16 yr. of age & over) in area served by Barrow & Furness Group of Hospitals (1951 census), 89,400.

*Adapted from Part II, Page 79, & Appendix III, Forsyth & Logan.¹⁸

center increase the longer he is under the care of a given physician. Annual patient-referral rates, like annual patient-hospitalization rates, will be higher than monthly rates, but the latter probably more accurately reflect the decision-making process as it affects current utilization of medical-care resources.

The final court of appeal, both for investigation of obscure medical problems and for specialized treatments, and one of the central sources of new medical knowledge and personnel, is the university medical center or teaching hospital. The composition of the patient population seen in each medical center will depend on the ecology of medical care in the region in which it is located, the demographic characteristics of the community it serves, and its own acceptance and admission policies. There may be wide differences between adjacent medical centers, between regions and between countries, but since in theory, and frequently in practice, such centers constitute the apices of referral hierarchies, it should be helpful to estimate the over-all proportion of sick persons in the community referred to them by physicians. Where primary, continuing medical care (in contrast to episodic or consultant care) is provided by university hospitals to groups of patients, or where a large proportion of self-referred patients are accepted, the compositions of the patient populations seen may differ materially from those seen at centers accepting predominantly physician-referred patients.

From the two North Carolina studies, it is possible to estimate the referral rate of general practitioners to the three university medical centers serving that state and its population of over 4,000,000 persons. The 93 North Carolina general practitioners surveyed,^{16,17} as discussed above, referred 96 adult pa-

TABLE 7. *Hospitalization Rates (Persons Hospitalized) per 100 Persons (All Ages) for New York City, 1952.**

BASES OF STUDY	8-WK. HOSPITALIZATION RATES	MONTHLY HOSPITALIZATION RATES†
Health Insurance Plan enrollees	1.4	0.70
New York City sample:		
Total	1.6	0.80
Insured	1.7	0.85
Uninsured	1.6	0.80

*Adapted from report by Committee for Special Research Project in Health Insurance Plan of Greater New York.¹⁴

†8-wk. rates $\times 2$.

tients (sixteen years of age and over) to the three university medical centers during two-week sampling periods in 1957-59, with a mean of about 1 patient per two-week period. The mean monthly university medical-center patient-referral rate of North Carolina general practitioners may be estimated as follows:

$\frac{1}{250} \times 100$, or 0.4 patients, are referred per 100 adult patients seen, and since other estimates suggest that, on the average, 250 adults consult a physician at least once a month, approximately 1 adult patient is referred to a university medical center per 1000 adult population (sixteen years of age and over) per month.

"Hard" data on the "natural history of medical care" are in short supply. Studies such as those described only suggest the broad dimensions of relative utilization for several important medical-care resources. In summary, it appears that within an average month in Great Britain or the United States, for every 1000 adults (sixteen years of age and over) in the population, about 750 will experience what they recognize and recall as an episode of illness or injury. Two hundred and fifty of the 750 will consult a physician at least once during that month. Nine of the 250 will be hospitalized, 5 will be referred to another physician, and 1 will be sent to a university medical center within that month. Expressed in other terms, 0.75 of the adult population experience sickness each month, 0.25 consult a physician, 0.009 are hospitalized, 0.005 are referred to another physician, and 0.001 are referred to a university medical center. In an average month, $\frac{0.009}{0.75}$, or 0.012 of the "sick" adults in the community, are seen on hospital wards, and $\frac{0.001}{0.75}$, or 0.004, are seen at university medical centers. These relations are shown in Figure 1.

DISCUSSION

The relations reflected in the data presented are subject to wide variations. All the surveys referred to

little to data, ideas or proposals developed in university medical centers. Over the years, individual physicians and groups have concerned themselves with the profession's social responsibilities, but with rare exceptions the substantive problems of medical care have not been a continuing concern of either schools of medicine or schools of public health. It is one of the purposes of this communication to suggest that it is now time for schools of medicine, schools of public health and teaching hospitals to address themselves to the urgent need for medical-care research and education. It is now time for the health professions, and particularly for faculty members with clinical interests, to join their colleagues from the other disciplines, and to accord to medical-care research and teaching the same priority they have accorded research in the fundamental mechanisms of pathologic processes. Investigation and teaching directed at improved understanding of the ecology of medical care and ways of favorably modifying it eventually should reduce the time lag between developments in the laboratory and delivery to the consumers of new knowledge accruing from the vast sums of money that the latter are currently paying for disease-oriented research.

SUMMARY AND CONCLUSIONS

Data from medical-care studies in the United States and Great Britain suggest that in a population of 1000 adults (sixteen years of age and over), in an average month 750 will experience an episode of illness, 250 of these will consult a physician, 9 will be hospitalized, 5 will be referred to another physician, and 1 will be referred to a university medical center. The latter sees biased samples of 0.0013 of the "sick" adults and 0.004 of the patients in the community, from which students of the health professions must get an unrealistic concept of medicine's task in both Western and developing countries.

Medical-care research is defined, and the need for according it equal priority with research on disease mechanisms is discussed. Recognizing medicine as a social institution, in addition to disease as a cellular aberration, the objective of medical-care research is reduction of the time lag between advances in the

laboratory and measurable improvement in the health of a society's members.

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