

Quality of Medical Care in Hospitals

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Can quality of medical care be measured objectively? Experience in this difficult area is limited. Offered here is a method of measuring performance.

✱ This study was undertaken as one of a series designed to devise and test indexes of adequacy and economy of service which would be sufficiently objective to be repeatable by different observers. Adequacy of medical care has two essential components: availability of the full range of services in accordance with current concepts and good quality of service. This study is concerned with the second of these components.

The quality of medical care is based on a complex of factors and does not lend itself to simple units of measurement. This accounts for the large variety of methods of measurement that have been devised, each adapted to the specific purpose of the evaluation.¹ Licensing bodies and accrediting agencies employ systems of standards against which to compare organization, staffing, facilities, and performance of the institution being inspected.² Various statistical measures of phases of quality of medical care have been devised.³ Other measurements have been based on clinical evaluation of medical care either by direct observation, or by review of records.⁴ The medical audit, generally consisting of a combination of statistical indexes of elements of care and retrospective review of cases, has been adopted by hospitals as a method of identifying deficiencies and improving quality of care.⁵ Other studies have been designed to determine patient atti-

tudes toward care.⁶ Each is useful for the specific purpose for which it was designed. Each has its limitations as a measure of quality of care.⁷

Utilization of a system of quality measurements for program evaluation imposes more stringent conditions of objectivity than does its use for administrative control alone. To be ideally suited as an instrument of program evaluation the method of measurement should be: (1) sufficiently sensitive to distinguish differences in the quality of care among units studied; (2) objective in that different observers would arrive at similar ranking of units with similar magnitudes of differences between them; (3) valid in that it would reflect the quality of service in terms of current concepts of good medical practice; (4) based on sufficiently general principles of medical practice to be applicable to the several specialties; and (5) practical of application at costs that are not prohibitive. Analysis of data was carried out in a way to show the degree to which these conditions have been met.

Methodology

The method adopted provides for clinical evaluation of management of selected categories of illness and operation by qualified specialists. Hospital records were used for evaluation, according to procedures prescribed in schedules and written standards.

Lacking valid instruments for measurement of end results of medical care, such as amelioration of suffering and promotion of well-being, we must make measurements in terms of intermediate goals; that is, prompt and adequate provision of appropriate diagnostic and

therapeutic services as indicated by the needs of the patient and in accordance with the best current concepts and practices.

While clinical evaluation is probably more valid, it is less precise than other less direct, but more specific, forms of measurement. It therefore seemed advisable to test the reliability of the method used by arranging for independent review of the cases studied by two observers. This method of study has often been used in evaluating the objectivity of a test or method of measurement.⁸

Medical practice in hospitals was selected as the subject of study for both practical and theoretic reasons. It is assumed that there is a relationship between quality of medical practice within hospitals and in the community at large. Furthermore, intensive community organization of health services is generally focused on organized facilities. In addition, hospital service constitutes an important segment of medical care in the community. Finally, the hospital is an organized medical care facility which provides a practical focus for study. Because evaluation of a sufficient number of cases by direct observation would be very costly, it was decided to use the medical record as the basis for evaluation.

Important in developing an instrument for evaluation of the effects of organization is the question of controls. Obviously, it would not be possible to select a group of study hospitals and a control group, since all hospitals in the community would ultimately be affected by changes in community organization. Instead, a system of internal controls may be used by adopting the performance at teaching hospitals as a standard and comparing performance at community hospitals with this standard. This approach is based on the hypotheses: (1) that medical care rendered in teaching institutions represents a high

standard of performance in the community; and (2) that there is a correspondence in standards of care in the several specialties and for various categories of illness in an institution.

It is assumed that regional organization would improve the quality of care in community hospitals to a level approximating that at teaching institutions. Use of the teaching hospital as a control provides the element of flexibility needed to adjust to the constantly changing scientific basis of the practice of medicine. No specific written standards, no matter how carefully drawn, would be adequate in five years.

A schedule and a set of general standards based on accepted principles of medical practice were devised. These provide for evaluation of essential elements in medical care, including diagnostic procedures, therapeutic procedures, and justification for hospitalization. The standards provide for rating of each item of management as "good," "fair," or "poor." In turn, procedures are prescribed for deriving a total rating on the basis of combinations of individual items of rating. A rating of "superior" is reserved for those cases which, in addition to receiving a rating of "good," have had all screening procedures in accordance with age.* This system of rating was adopted rather than one based on a

* Copies of schedules and standards used in this study, and as revised on the basis of experience are available on request to the author.

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numerical score because of the fact that the latter might mask serious deficiencies in management.⁹ With the system adopted the total rating may be reduced to "poor" on the basis of any one of several serious types of deficiency in management. Patient welfare depends on good management all along the way.

Procedure—Random samples of records were selected from certain categories of illness and operation, representing three major specialties: Internal Medicine: myocardial infarction, the pneumonias, and diabetes mellitus; Surgery: appendectomy, gallbladder surgery, and surgery of malignancy; and Obstetrics and Gynecology: cesarean section and hysterectomy.

The groups of illnesses and operations selected are sufficiently common to represent a substantial proportion of the admissions to general hospitals and would require good medical judgment in diagnosis and treatment. Nevertheless, because diagnoses are often multiple, a broad range of medical practice is represented in the sample.

Samples of 40 records from each specialty in each hospital were selected. Four hospitals agreed to participate in the study. Two are major teaching affiliates of medical schools (Hospitals A and B), and two are community hospitals (Hospitals C and D). Two consultants in each specialty were retained. Each is a diplomate in his specialty and has a teaching appointment. Before starting work each consultant was oriented to the study and methods. Records at the first three hospitals were reviewed by two consultants in each specialty, whereas one consultant in each specialty reviewed records in the fourth hospital.

Findings

Sensitivity of Method—The per cent of records rated "superior" and "good" by each consultant at each of the three institutions is shown in Figure 1. The

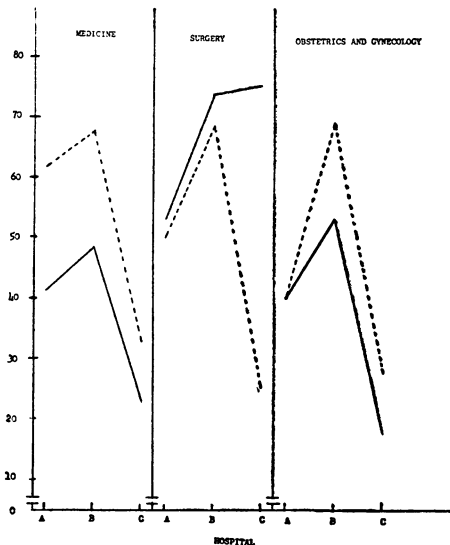


Figure 1—Per cent of Cases in Each Specialty Rated Superior or Good by Two Independent Raters at Each Study Hospital.

distribution of ratings ("superior," "good," "fair," "poor") for each hospital and each consultant is shown in Table 1. Among the hospitals where pairs of consultants were used, each pair of consultants arrived at the same ranking of hospitals, with the exception of one consultant in surgery at Hospital C. Because there is evidence that this consultant was less critical in reviewing records at Hospital C than at the other institutions, his observations are omitted from some of the tabulations.*

* Because of its implication with regard to the objectivity of method, the disagreement of one surgical consultant concerning the ranking of Hospital C was investigated. Before seeing the results of analysis it was his personal impression that the management at Hospital C ranked substantially below that at Hospitals A and B. Whereas, his intuitive ratings at Hospitals A and B were higher than objective ratings, at Hospital C they were substantially lower. In addition, it was found that almost half the disagreement between the two surgical consultants in Hospital C was based on disagreement on facts, a percentage substantially higher than was true of other pairs of consultants. These observations suggest that (whether for lack of time or for

Table 1—Percentage Distribution of Records According to Quality Rating, by Hospital and Consultant

Rating	Medicine Consultant		Surgery Consultant		Obstetrics and Gynecology Consultant	
	1	2	3	4	5	6
Hospital A						
All	100.1	100.1	100.0	100.0	100.0	100.0
Superior	20.6	20.6	0.0	3.1	2.5	2.5
Good	20.6	41.2	53.1	46.9	37.5	37.5
Fair	32.4	32.4	43.8	50.0	45.0	40.0
Poor	26.5	5.9	3.1	0.0	15.0	20.0
Hospital B						
All	100.0	99.9	100.0	99.9	100.0	100.0
Superior	9.7	16.1	5.3	7.9	6.2	12.5
Good	38.7	51.6	68.4	60.5	46.9	56.2
Fair	35.5	29.0	23.7	21.0	43.8	9.4
Poor	16.1	3.2	2.6	10.5	3.1	21.9
Hospital C						
All	100.0	100.0	100.0	100.0	100.0	100.0
Superior	2.5	5.0	2.5	5.0	0.0	0.0
Good	20.0	27.5	72.5	20.0	17.5	27.5
Fair	42.5	47.5	22.5	47.5	32.5	25.0
Poor	35.0	20.0	2.5	27.5	50.0	47.5
Hospital D						
All		100.0		100.0		100.0
Superior		0.0		0.0		0.0
Good		20.5		54.8		33.6
Fair		28.2		40.4		40.3
Poor		51.3		4.8		26.0

Using the observations of the three consultants who rated records in all four hospitals tests of significance were done to determine how well the rating procedure discriminates between hospitals. Difference between the ratings of the teaching hospitals (A and B) just borders on significance ($P = 0.02 - 0.05$).

other reasons) the consultant who was not in agreement with the others concerning Hospital C had been less critical in applying standards in that hospital than at the other institutions.

On the other hand, the difference between the average ratings of Hospitals A and B and that of Hospital C is highly significant ($P = < 0.001$). The same is true of the comparison between average ratings of A and B and those of Hospital D. These findings tend to support the hypotheses on which the study is based.

Objectivity—The ideal method of quality measurement would be one which would assure the same evaluation

Table 2—Degree of Agreement in Rating of Pairs of Consultants According to Hospitals

Hospital	1 No. of Records	2 Agreement		4 † Index of Agreement	5 Index of Dispersion ‡
		Expected *	Observed		
All	287	91.1	159	34.6	0.54
A	106	35.8	57	30.2	0.54
B	101	38.2	59	33.1	0.52
C **	80	26.5	43	30.8	0.55

* Expected on the basis of there being no correlation between the ratings of consultants.

† Derived by formula $\frac{3 - 2}{1 - 2} \times 100$.

‡ Average of disagreement between consultants in terms of the number of steps difference on the rating scale.

** Results of surgical ratings in Hospital C omitted.

in any given case when the method is applied by independent observers. An effort was made to test the degree to which this ideal could be achieved. In Table 2 is shown the degree of agreement between pairs of consultants. This table is based on the comparison, on a contingency table, of the paired ratings on groups of records according to hospital (see Figure 2). The expected number of agreements (column 2 in

Table 2) was computed on the basis of marginal distribution of ratings for each consultant. This assumes that the expected distribution of ratings would be random in accordance with marginal totals. In all instances the observed number of agreements in rating was greater than the expected number.

The index of agreement (column 4) represents the distance that the observed number lies between the expected num-

Doctors 2, 4, 6

		TOTAL				
		S	G	F	P	
Doctors 1, 3, 5	S	7		1	8	Hospital A
	G	1	23	15	39	Specialty All
	F		17	22	43	Disease or Operation All
	P	1	4	6	16	
Total:		9	44	43	10	106
		Expected number of agreements				35.8
		Observed number of agreements				57.0
		Index of agreement				30.2
		Index of dispersion				0.54

Figure 2—Example of Contingency Table Used in Computing Indexes of Agreement and Dispersion.

ber and the total number of records. In other words, in establishing the expected number as zero, we are attempting to measure the per cent of the way that the observed number of agreements lies between the expected number and the ideal of 100 per cent agreement. Observed agreement lies approximately one-third of the way between random and perfect agreement.

The index of dispersion (column 5) was designed to measure the magnitude of differences between pairs of consultants. In deriving this index weights were assigned according to the degree of difference in rating. Thus, a rating of "good" by one consultant and "poor" by the other is assigned a weight of two; while a difference from "fair" to "good" is given a weight of one. Perfect agreement would show an index of dispersion of zero while, theoretically, complete disagreement (in which one consultant would rate all records "poor" and the other would rate all record "superior") would show an index of dispersion of three. An average index of dispersion of 0.54 was found. Table 3 shows a similar analysis of agreement according to specialty.

Examination of reasons for major differences in rating individual items reveals that almost half the differences were attributable to situations not covered adequately by the standards, or in

which the standards were ambiguous. In another quarter differences devolved around questions of fact, because one consultant missed a significant item of information in the record. It would therefore appear that with revised standards, and improved methods of orienting consultants, a substantially higher degree of agreement could be achieved.

Validity—Probably the best way of determining the validity of the methods used would be by means of direct observation of the management of cases by one consultant and rating of records by another. Since this was not possible, other indications of the validity of the method were explored. One of these was the comparison of objective ratings based on the standards, with the intuitive ratings formulated by consultants after review of the record, but before deriving an over-all rating according to the procedure prescribed. Although these ratings are not completely independent, they reflect a measure of consultant satisfaction with the system. For all records the index of agreement between intuitive and objective ratings was 56.4, while the index of dispersion was 0.32.

In a further effort to assess the validity of standards, reasons for "poor" ratings on individual items were examined. Deficiencies on which these

Table 3—Degree of Agreement in Ratings of Pairs of Consultants According to Specialty

Specialty	1 No. of Records	2 Agreement		4 Index of Agreement	5 Index of Dispersion
		Expected	3 Observed		
All specialties	287	91.1	159	34.6	0.54
Medicine	105	29.4	54	32.5	0.64
Surgery *	70	31.4	44	32.6	0.44
Obstetrics and Gynecology	112	34.5	61	34.2	0.50

* Results of surgical ratings in Hospital C omitted.

assessments were based seemed to fall into two categories. One was composed of those that might reflect inadequacy in recording alone and not necessarily important omissions or mistakes in diagnosis or treatment. These were classified as "presumptive" evidence of deficiency in management. Classified in this manner are such things as inadequate record of history or physical examination; inadequate summary of diagnostic findings prior to admission; failure to obtain or adequately record consultations; and inadequate justification for surgery in the record.

The second category of deficiency was made up of instances of omission of essential diagnostic or therapeutic procedures which would be recorded routinely if they had been done, or use of contraindicated therapy, or unacceptable surgical procedures. This group was classified as "substantial" evidence of deficiency. Following are a few examples drawn from the records:

Hemoglobin of 6.3 gm preoperatively in a case of elective surgery—in which no transfusion was given nor further exploration before operation done.

Performance of GI series and barium enema 10 days after confirmed myocardial infarction.

Use of supracervical hysterectomy without justification. In one such case, a cervix with carcinoma in situ was left behind.

Reasons for ratings of "poor" in eight items of management (history, physical examination, laboratory, x-ray, other diagnostic examination, consulta-

tion, and medical and surgical management) were classified according to the type of deficiency "presumptive" or "substantial." The results of this analysis are shown in Table 4.

There is a correlation between frequency of items rated "poor" showing "presumptive" evidence and the frequency of those showing "substantial" evidence of deficiency. This would seem to give additional support to the thesis that hospital records provide a valid picture of the quality of care.

It may be argued that, in a hospital setting, a number of individuals are concerned with the care of the patient and the record is the principal medium of communication. The record becomes particularly important when the patient is readmitted to the same hospital or is admitted to another hospital. Failure to record adequately may place the patient in serious jeopardy, even though individual episodes of management may be competently handled.¹⁰

Correspondence in Standards Among Specialties—Findings suggest that there is a correspondence in the standards of care among the several specialties in an institution. Agreement, however, is not complete. It is reasonable to expect that there should be some correspondence in standards of care in the several departments in a hospital, as common hospital policies concerning staff appointments, case review, and control measures would apply to all services.

Table 4—Per cent of Items Showing "Presumptive" and "Substantial" Evidence of Poor Management

Hospital	No. Cases	No. of Items	Per cent of Items Rated "Poor"		
			Total	"Presumptive"	"Substantial"
All	446	3,568	8.6	4.1	4.5
A	106	848	4.4	2.5	1.9
B	101	808	3.2	1.4	1.9
C	120	960	13.6	7.0	6.7
D	119	952	11.7	5.0	6.0

The findings suggest that the standards are similarly applicable to the three specialties.

Costs—Costs of such a study would be controlled by the size of the sample. Using a sample of 120 records per hospital, and a single consultant in each specialty, it requires about 40 hours of consultant time to study a hospital. At the rate of remuneration of \$10 per hour the cost of record review at a hospital comes to approximately \$400. In addition, costs of tabulation and analysis must be added. Once routinized it is estimated that costs of these operations should amount to about one-third of the costs of medical review.

Although costs of surveying all hospitals in a metropolitan area would be substantial, the several types of hospitals might be sampled. Furthermore, hospitals might be willing to contribute toward the costs of such a study. Increasing numbers of hospitals are now having medical audits conducted at considerably higher costs.

Screening Procedures—One of the items of rating was completion of screening procedures appropriate to the patient's age. Wide variations were found among hospitals and among specialties with regard to screening practices (Table 5). It would appear that this is a question of policy worthy of consideration by hospital boards and medical staffs.

Table 5—Per cent Cases with All Screening Procedures Done, According to Hospital and Specialty

Specialty	Hospital			
	A	B	C	D
All specialties	10	19	3	2
Medicine	21	31	3	0
Surgery	9	3	6	6
Obstetrics and Gynecology	2	14	0	0

Accommodation—The distribution of qualitative ratings according to accommodation for Hospitals A, B, and C (each of which have substantial numbers of public ward, as well as private and semiprivate, patients) was examined. In internal medicine there is relatively little difference in the proportion of private and public ward cases in which management was considered "superior" or "good." Results suggest that management of ward cases in surgery and obstetrics is better than that of private cases. How much of this difference is due to differences in recording practices is not clear.

Discussion

The primary objective of medical care organization, whether in a single institution or in the community at large, is the efficient utilization of available resources in order to achieve good standards of care. Any evaluation of the effects of a program of medical care organization should include provision for measurement of quality as one of the essential components of adequacy of service. The instrument should be designed to isolate the effects of organization from those changes which would inevitably occur as a result of influences operating generally.

Although various approaches to the evaluation of quality of medical care in hospitals have been used in the past, few efforts have been made to determine their reliability, validity, and limitations, and to develop a valid basis of comparison of standards in several institutions. This study was designed to test these attributes of a method of measuring the quality of medical care which would be suitable to evaluation of the effects of community organization of health services. Findings thus far seem sufficiently promising to merit further exploration. The experience has made it possible to identify certain

shortcomings in the method and to suggest ways in which these shortcomings can be met at least in part.

In addition to limitations in reliability of clinical evaluation, there are other serious limitations in this approach imposed by current standards of medical practice and methods of exploring psychologic and social aspects of illness. Records of social and psychiatric status were found to be generally deficient, in spite of the great emphasis currently being placed in medical education and in the medical literature on these aspects of care. Possibly, there is need for re-study of the form and content of the medical history.

The observations of this study suggest that standards similar to those developed may have several areas of usefulness. Its most immediate application may be as a method for self-evaluation by medical staffs. Such standards should be useful to record committees and tissue committees, as well as to those responsible for medical audits. It provides a system for case review which could be applied to samples of cases in conducting continuing or periodic evaluations. The approach offers some promise as a method of comparing performance among institutions. Should the direction of research described be judged to have merit, the study should be repeated using revised standards to determine whether greater reliability can be achieved.

Our aggregate experience with evaluation of quality of care has been limited. This fact cannot be accepted, however, as an indication of the relative importance of the problem. Hospitals, payment agencies, and the public at large are deeply concerned with the quality of medical care. Without a valid measure of quality we cannot determine the relative values of different organizational and administrative methods. The fact that existing methods do not meet

the need is indicated by Myers' statement that ". . . no other organization (than the hospital) exists in which management is so truly frustrated and so ineffective because of its incapacity to judge the quality of its product."¹¹

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Reorganization in Missouri

The Division of Health of the Missouri Department of Public Health and Welfare has been reorganized. The previous 18 bureaus have been consolidated into five sections—Local Health, Personal Health, Environmental Health, Hospital, and General Services. The first two are designed to be directed by public health physicians, the third by a sanitary engineer, the last two, respectively, by a medical administrator and a business administrator.

The May issue of the department's "News" shows the organization chart for the department and for each section, including both present and proposed positions. The staff currently assigned to director positions are each designated as acting until a permanent health officer is selected. E. M. Hardwicke, M.D., former consultant, Medical-Health Civil Defense Bureau, is currently acting director of health.

A new salary scale has gone into effect as of July 1. The "News" says that in the past salaries of the division for the most part have not been competitive. The new scales should facilitate recruitment. Permanent appointments are to be made on the basis of competitive, unassembled examinations that were held during June.