A Method for Measuring Physicians' Awareness of Patients' Concerns

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PERHAPS the most difficult task in health services research is an assessment of the quality of care. Ideally, such quality should be measured in terms of an improvement in health status of the recipients of care. The situations in which variation in health outcomes can be measured are sharply limited by the length of time required to detect major changes in health status, the large number of cases required, and the innumerable variables other than the quality of care that can influence this status. The usual alternative to measuring change in health status is some variant of the medical audit whereby the level of technical competence of the service is assessed in terms of generally accepted norms.

Both of these approaches to measurement neglect one element in quality of care, that is, the physician-patient relationship. We label this component of quality the "care" function of service, as distinct from the "cure" function or level of technical competence.

As part of a study of the assessment of the effectiveness and efficiency of primary medical care being conducted jointly by the American Academy of General Practice and the department of epidemiology of the University of North Carolina, we are developing instruments to assess both of these components of the quality of care.

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This paper is concerned with one approach used to assess the care component, that is, the adequacy of the physician-patient relationship. Central to this approach is the notion that the more adequate this relationship the more effective the communication, both verbal and nonverbal, between physician and patient and the greater the compliance with the physician's advice and the higher the level of satisfaction with medical care.

In an earlier paper several of us reported a method for measuring patient satisfaction (*1*). The present paper is concerned with an approach to measuring one aspect of communication between the physician and his patient, that is, the degree to which the physician is aware of his patient's attitudes and concerns. The physician's level of awareness should be a sensitive indicator of the rapport developed in the relationship.

Our initial task, then, was to develop instruments to measure patients' attitudes against which the degree of physicians' awareness of these attitudes and concerns could be tested. For this purpose, two indicator conditions—pregnancy and infancy—were selected, attitudinal scales were devised for administration to both patients and physicians, and a new approach to analyzing the level of physician awareness was developed.

Scale Development

The items developed for each questionnaire are shown in figures 1 and 2. An antecedent clause specifies the content of each item, and the responses are located along a continuum of 20 locations, representing responses ranging from highly negative to highly positive. To clarify the meaning of each item, verbal anchors, ranging from 2 to 5 for each item, are placed along the continuum. When scored, the most positive or healthy response is at the "20" end of the continuum and "1" is the most negative. Items are mixed, when sequenced in the questionnaires, so that the positive end of the scale is placed on either the right- or left-hand side of the page. This is done to avoid a response set in the mind of the respondent.

The content of the items relates to attitudes and concerns which have been expressed by patients and which practicing physicians can be expected to be aware of in their patients. In pregnancy, these concerns include the general emotional reaction to being pregnant, desirability of having the baby, fear of an abnormal baby, concern over personal loss of attractiveness, and concern over events occurring during childbirth. Various pregnancy questionnaires have been developed (*2–4*), primarily for the purpose of correlating attitudes of the mother during pregnancy with the occurrence of subsequent complications (*4, 5*). Several items from the questionnaires cited were revised for use in the current pregnancy questionnaire.

All items for the infancy questionnaire relate to growth and development, the mother's feelings of adequacy or inadequacy, and her attitude toward the baby's behavior and health. In previous studies (*6,7*), parental attitudes and childrearing practices were elicited retrospectively to correlate with the personality development or achievement levels of children. However, the variables employed in these studies were not pertinent to children in the first year of life.

Pretesting of Questionnaires

The pregnancy questionnaire was pretested at a prenatal clinic of the Durham County Health Department and at the North Carolina Memorial Hospital in Chapel Hill. At the health department clinic, the women were predominantly young Negroes; more than 50 percent were unmarried. At the hospital, both private and staff patients from all social classes were interviewed. A separate version of the questionnaire was prepared for unmarried women.

The infancy questionnaire was pretested at the Duke Pediatric Clinic in Durham, where children are predominantly from the lower social classes.

By pretesting, we were able to eliminate items that were not clearly understood or to which peopled hesitated to respond. Items for which the frequency distribution of responses clumped at one end, or which proved not to be unidimensional, were also eliminated. Fourteen items remained in the infancy questionnaire (fig. 1) and 18 in the pregnancy questionnaire (fig. 2).

Application to Medical Practice

The questionnaires were applied to three general practices in three eastern States. Practice A, a solo practitioner, was given the pregnancy questionnaire; practice B, a three-man group, was given the infancy questionnaire; and practice C, a five-man group, was given both infancy and pregnancy questionnaires. (Within group practices, individual patients relate primarily to only one physician; thus a single physician is most knowledgeable about each patient.)

In practices A and B, the questionnaires were

administered to patients by the office nurse. She told each patient that some physicians were participating in a study to learn more about their patients' attitudes and concerns. She also told each patient that her responses would not be revealed to her physician. An attachment to the questionnaire described the method of response and included illustrative examples. The completed form was to be returned to the study group in a preaddressed, stamped envelope. In practice C, a nurse-interviewer administered the questionnaires, which frequently were completed in the office.

Each physician was given a questionnaire to complete for each patient; the forms were identical to those administered to the patients. He was instructed, in writing, to check a response location on the continuum which he considered most representative of his patient's attitudes, and he was also requested to predict for each item which location the patient would be likely to check. We were told that the physicians felt more assured in performing this task when they completed a questionnaire shortly after the patient's visit. Also, arrangements were made to have the patient-physician pairs complete the questionnaire within a few days of each other so that intervening visits, with added patient-physician communication, would not confuse the responses.

Results

Descriptive. Practice A completed the pregnancy form with 21 patients and practice C with 32. For the infancy form, practice B supplied data from 29 mothers and practice C from 35. The distribution of patients among the five physicians in practice C was 3, 3, 9, 5, 12 for the pregnancy form and 5, 14, 10, 4, 2 for the infancy form.

All the patients, or mothers of patients, in the three practices were married. (The questionnaire prepared for unmarried women in the pretest was not used to collect data in this phase of the study.) The racial composition was four Negro, one Indian, and the remainder white women. The respondents were from the middle or working classes, and their minimum education was ninth grade. All could read and complete the questionnaire themselves.

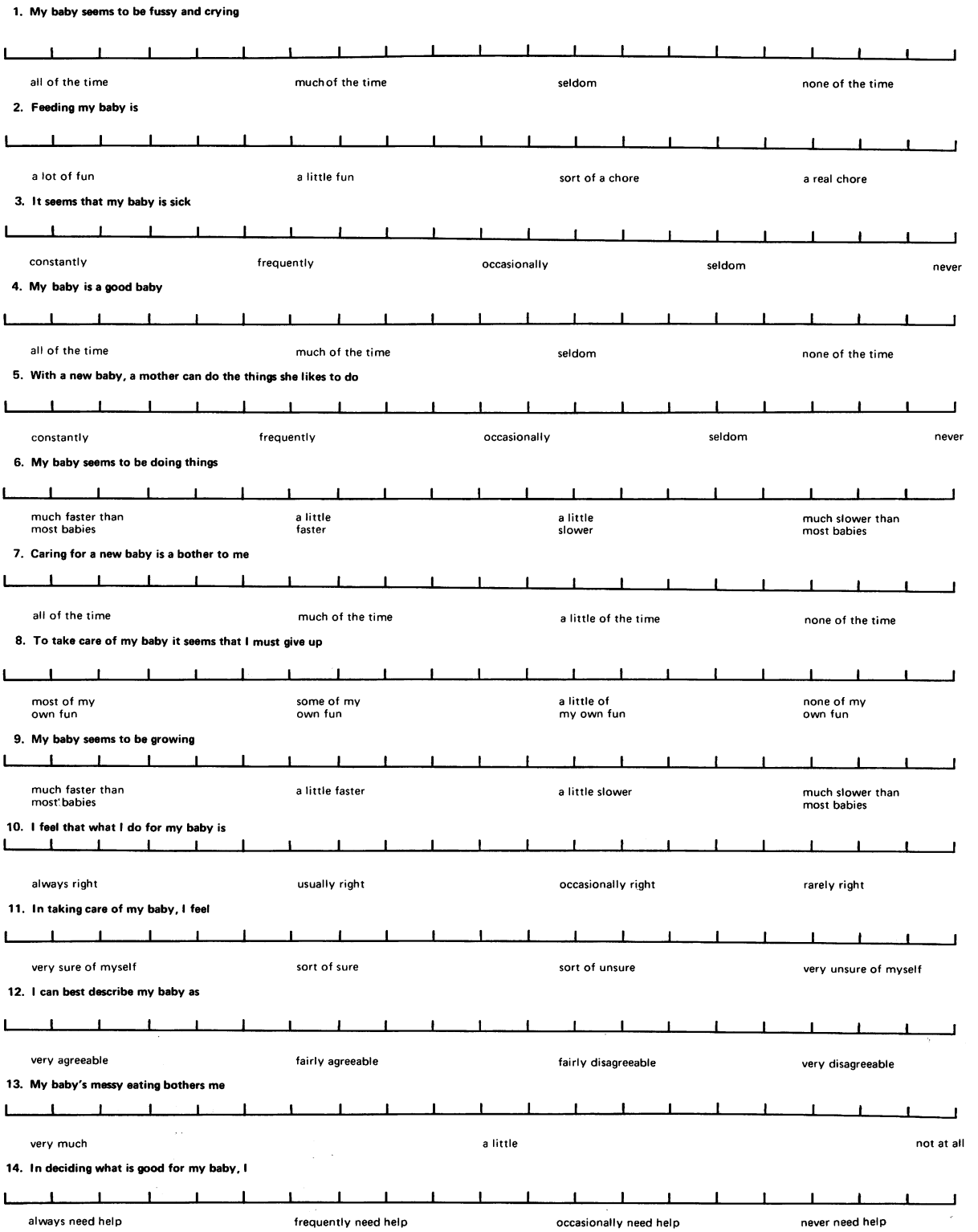
As an initial approach to reviewing the data, differences between patient and physician responses were noted for each item. The algebraic sum of these differences was obtained and divided by the number of physician-patient pairs to get the mean difference for each item. The range in mean differences for the various items, using the data from all practices and both questionnaires, was from (−) 2.94 to (+) 6.10. With the exception of two items these differences were positive, indicating that the patients were more positive (less concerned) in their attitudes than their physicians had predicted.

There was no consistent pattern in the magnitude of differences to indicate that the physicians were either especially perceptive or lacking in perception on specific items or groups of items in a given content area. It was probably a chance occurrence that rather large differences were noted for both practices on items 11 and 7 of the infancy questionnaire. The algebraic differences were (+) 2.38 and (+) 3.80 on item 11 and (+) 3.38 and (+) 3.40 on item 7. The content of both these items refers to feelings about caring for the infant.

Table 1 shows the frequency distributions of patients' responses and the cumulative percentage distributions from the 1 to 20 position for each practice by type of questionnaire. The responses to all items are combined, so that the frequencies represent sums over all patients of the number of items to which each patient responded in a given response location. The cumulative percentage distributions are similar for practices which used the same questionnaire, but are different for the infancy and pregnancy questionnaires. Proportionately fewer responses were in the "negative" range (score of 10 or less) for infancy than for pregnancy. Eleven to 12 percent of the responses were in the lower half of the scale for infancy in contrast to 32 to 33 percent for pregnancy. For both questionnaires 27 to 35 percent of the responses were placed in the most "positive" intervals (locations 17–20). The cumulative percentage distributions are shown in figure 3.

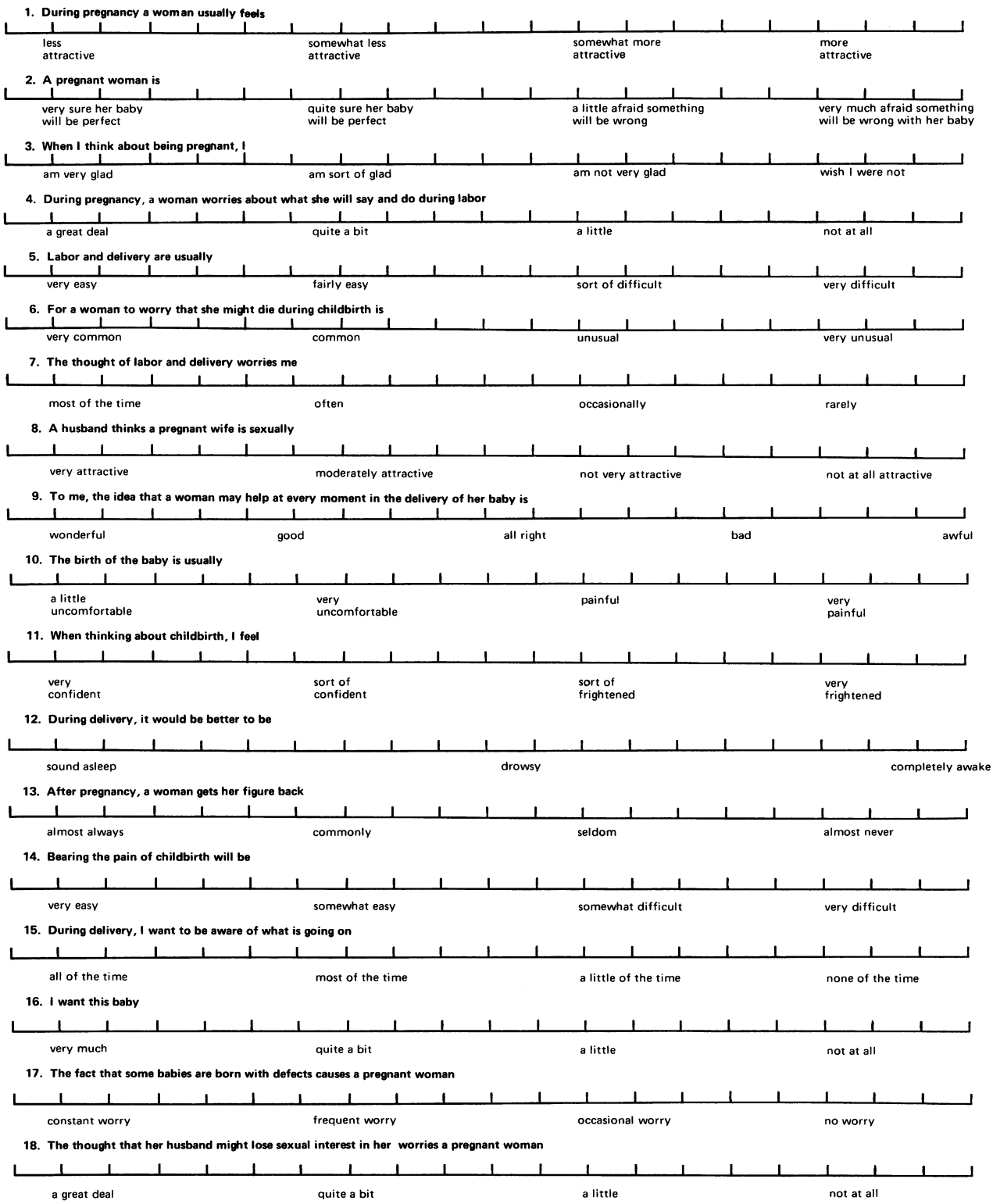
The frequencies and cumulative percentage distributions of absolute differences between responses of physicians and patients on all items are shown in table 2. Figure 4 shows the cumulative percentage distributions of the absolute differences. The possible range of these differences was from 0 to 19, although the maximum observed was 18. A large proportion of small differences indicates good physician awareness of patients' attitudes. The cumulative percentage distributions of physician-patient absolute differences for the two practices which used the pregnancy questionnaire were essentially the same. Both practices had a

Figure 1. Infancy questionnaire



NOTE: In figures 1 and 2, the extreme anchor points for each item should appear flush with the extreme left and right vertical bars.

Figure 2. Pregnancy questionnaire



greater proportion of large differences than the two practices which used the infancy questionnaire. Practice C had the largest proportion of small physician-patient differences for the infancy questionnaire. Of the paired responses, 52 percent differed by 0, 1, or 2 response locations. In practice B, 42 percent of the paired responses to the infancy questionnaire differed by 2 or less.

Method of analysis. A precise method for comparing several practices in terms of physician-patient responses has been developed. The method can be illustrated by using the data from practices B and C on the infancy questionnaire.

First, for each practice the absolute difference in score on each item for each physician-patient pair is calculated. The observed physician awareness score $\bar{O}$ for a practice is the sum of all the absolute differences on all items for all physician-patient pairs divided by the total number of absolute differences. Variance considerations necessitate that each absolute difference be classified according to the value of the patient's response, which may lie in any one of 20 locations on each item. Since there were few patients' responses in locations 1–5, the absolute differences in these locations were pooled to give 16 patient-response categories instead of 20. Using the data in table 3, the observed physician awareness score for practice B is

$$\bar{O}_B = \frac{1}{N}\sum_{\text{all } y} n_y \bar{O}_y$$

$$= \frac{1}{429}[6(7.883) + 5(4.400) + .. + 44(5.409)]$$

$$= 3.862.$$

Obviously, the smaller this number the better the degree of physician awareness.

To determine whether the observed physician awareness score $\bar{O}_B$ is significantly better than that encountered by chance, it is first necessary to

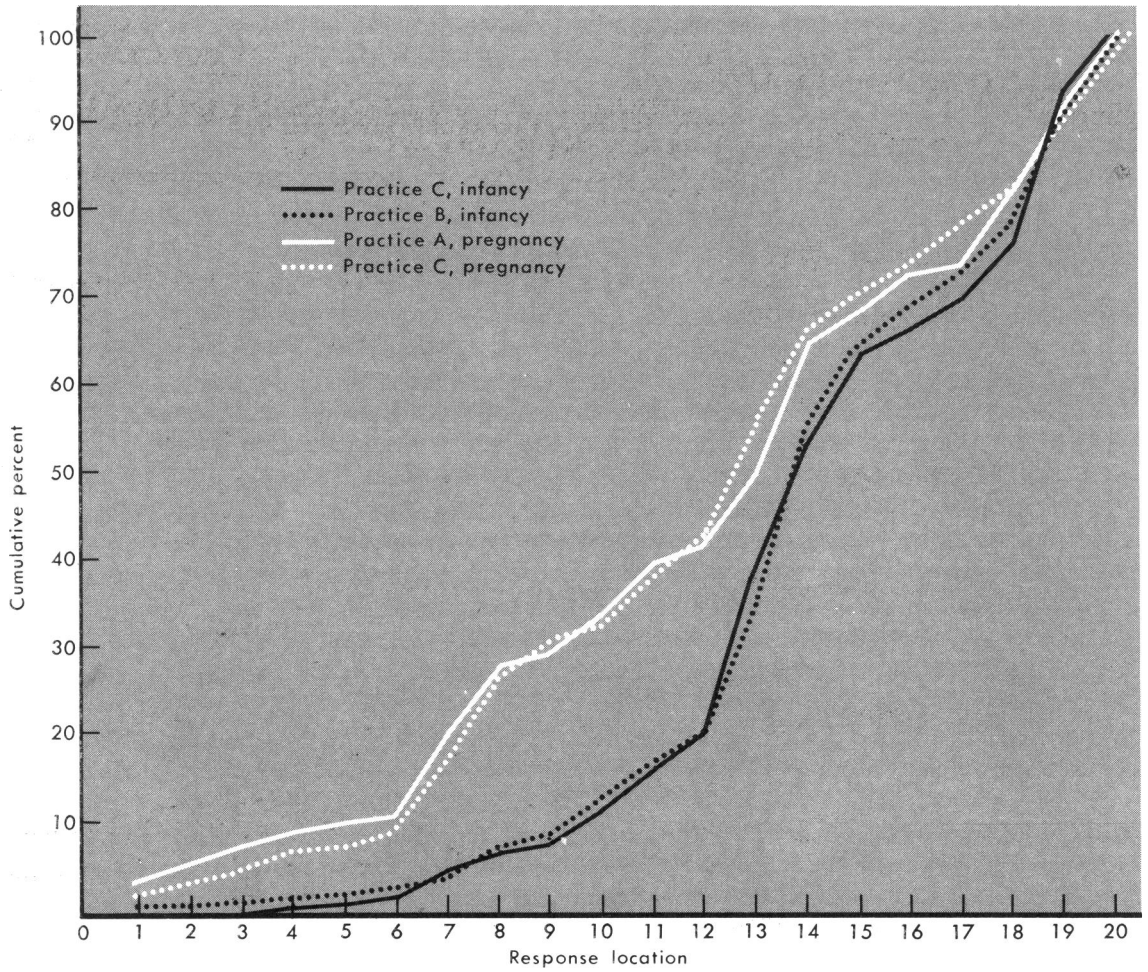
Table 1. Frequencies and cumulative percentage distributions of patients' responses, by practice and type of questionnaire

Response location	Pregnancy questionnaire				Infancy questionnaire			
	Practice A		Practice C		Practice C		Practice B	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1,2	6	2.9	33	5.7	0	0.0	3	0.7
3,4	8	6.7	7	6.9	2	.4	3	1.4
5,6	4	8.6	17	9.9	7	1.8	5	2.6
7,8	35	25.2	90	25.5	23	6.5	22	7.7
9,10	14	31.9	42	32.8	2	11.2	17	11.7
11,12	17	40.0	40	39.8	40	19.4	31	18.9
13,14	54	65.7	132	62.7	152	50.4	152	54.3
15,16	16	73.3	43	70.1	71	64.9	59	68.1
17,18	14	80.0	39	76.9	48	74.7	37	76.7
19,20	42	100.0	133	100.0	124	100.0	100	100.0

Table 2. Frequencies and cumulative percentage distributions of physician-patient absolute differences in responses, by practice and type of questionnaire

Absolute difference	Pregnancy questionnaire				Infancy questionnaire			
	Practice A		Practice C		Practice C		Practice B	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0	30	14.3	88	15.1	97	19.4	64	14.9
1	34	29.5	81	29.2	97	39.6	68	30.8
2	18	39.1	41	36.3	59	51.6	48	42.0
3	17	47.1	57	46.2	36	59.0	44	52.2
4	15	53.8	41	53.3	47	68.6	31	59.4
5	26	66.7	57	63.2	64	81.6	47	70.4
6	25	78.1	68	75.2	34	88.6	48	81.6
7	15	85.7	31	80.6	28	94.3	25	87.4
8	1	86.2	20	84.0	7	95.7	16	91.1
9	3	87.6	23	88.0	9	97.6	13	94.2
10	3	89.1	14	90.5	7	99.0	8	96.0
>10	23	100.0	55	100.0	5	100.0	17	100.0

Figure 3. Cumulative percentage distributions of patients' responses, by practice and type of questionnaire



determine the expected physician awareness score $E_R(\bar{O}_B)$ assuming the situation in which physcians have no knowledge of their patients' attitudes; that is, when the probability of the physician's checking any of the 20 spaces on any item is equally likely. The assumption of no knowledge (equal probability) is used since sufficient empirical data from which to evolve more realistic probabilities are not available. The method of calculating an expected physician awareness score can be illustrated under this assumption as well as any other, although its actual value would change depending on the particular probabilities assigned to each of the response locations.

The expected awareness score depends on the distribution of patients' responses. In particular, if the patients' responses tend to cluster at either end of the scale, $E_R(\bar{O}_B)$ will be large compared with the value obtained if their responses group near the middle. The method of calculating the expected awareness score $E_R(\bar{O}_B)$ and the variance $Var_R(\bar{O}_B)$ under the hypothesis of randomness may be illustrated using the data in the fifth and sixth columns of table 3. Consider the values in table 3 corresponding to $Y = 7$. In this instance, the possible values of $|X - 7|$ are 0, 1, . . . 13, since the physician's response X can take the values 1, 2, . . 20. The values 1 through 6 can each arise in two possible ways, while the values 0 and 7 through 13 can occur in only one way. Under the hypothesis of randomness, the entry in the appropriate position of table 3 is simply the mean of these 20 values, namely

$$E_R(\bar{O}_7) = \frac{1}{20}\,[2(1 + 2 + \ldots + 6) + (0 + 7 + \ldots 13)] = 5.60.$$

Figure 4. Cumulative percentage distributions of physician-patient differences, by practice and type of questionnaire

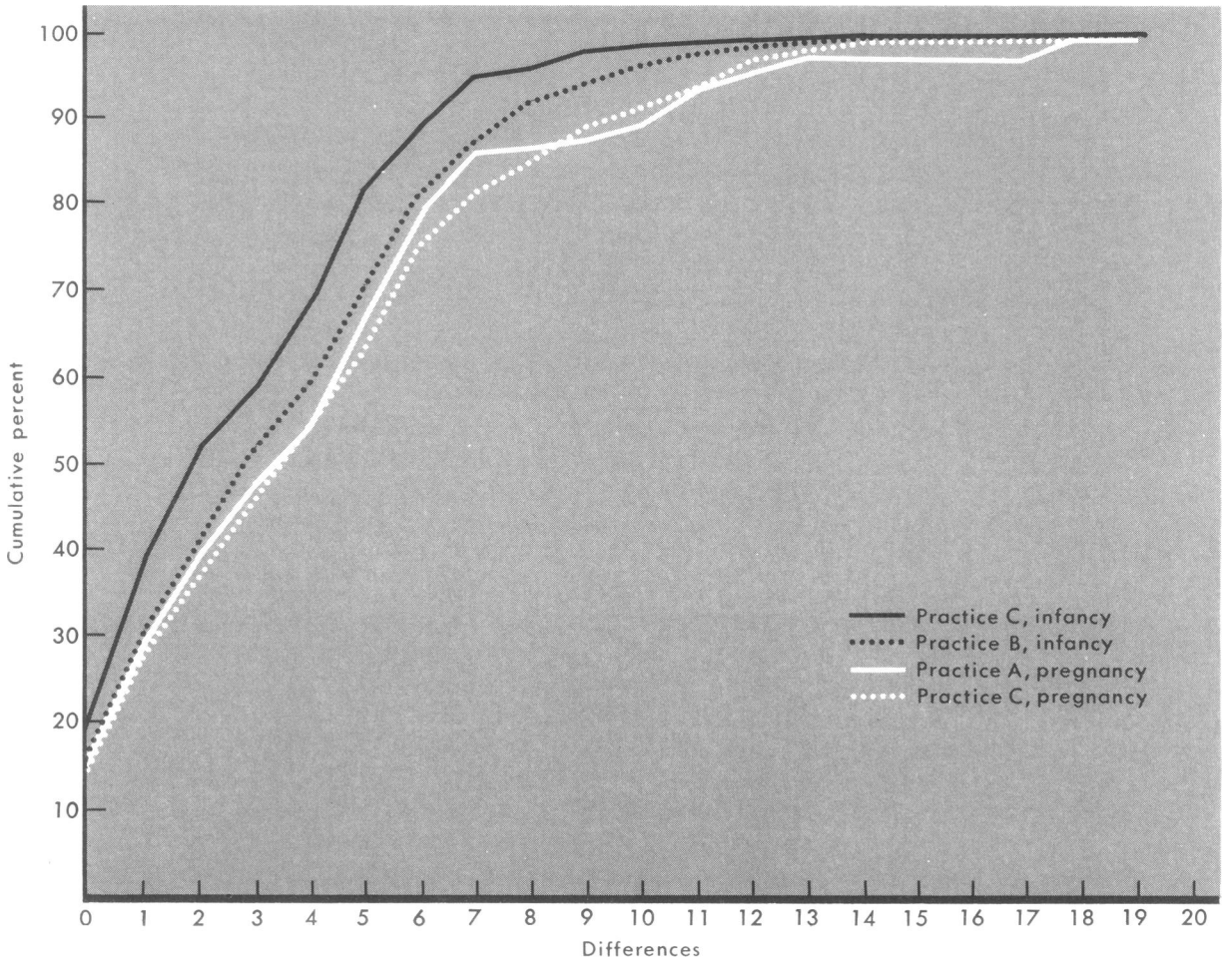


Table 3. Data for practice B, infancy questionnaire

Patient response location $Y = y$	Number of patient responses n_y at $Y = y$ (N = 429)	Observed mean awareness $\bar{O}_y$ at $Y = y$	Sample variance S^2_y at $Y = y$	$E_R(\bar{O}_y)$	$E_R(S^2_y)$
1-5 [1]	6	7.833	38.967	8.12	29.20
6	5	4.400	.800	6.00	17.50
7	8	4.500	17.143	5.60	14.14
8	14	3.214	9.104	5.30	11.41
9	3	7.000	19.000	5.10	9.49
10	14	3.929	11.764	5.00	8.50
11	17	2.235	5.066	5.00	8.50
12	14	3.500	8.423	5.10	9.49
13	64	3.047	5.887	5.30	11.41
14	88	2.693	5.801	5.60	14.14
15	39	3.103	7.673	6.00	17.50
16	20	3.700	7.168	6.50	21.25
17	14	4.643	10.709	7.10	25.09
18	23	5.043	11.589	7.80	28.66
19	56	5.321	12.331	8.60	31.54
20	44	5.409	15.643	9.50	33.25

[1] Pooled responses.

The variance of $|X - 7|$ is calculated in the standard way as

$$E_R(S_7^2) = \frac{1}{20}[2(1 - 5.6)^2 + 2(2 - 5.6)^2 + \ldots + 2(6 - 5.6)^2 + (0 - 5.6)^2 + (7 - 5.6)^2 + \ldots + (13 - 5.6)^2] = 14.14.$$

Finally, it follows that

$$E_R(\bar{O}_B) = \frac{1}{N}\sum_{\text{all } y} n_y E_R \bar{O}_y = 6.559,$$

and

$$Var_R(\bar{O}_B) = \frac{1}{N^2}\sum_{\text{all } y} n_y E_R(S^2{}_y) = .0450.$$

The significance of the difference between these observed and expected awareness scores can be assessed by calculating a standard score:

$$Z = [E_R(\bar{O}_B) - \bar{O}_B]/\ [Var_R(\bar{O}_B)]^{1/2} = (6.559 - 3.862)/(.0450)^{1/2} = 12.722.$$

Since a Z score of 2.33 or greater implies significance at the 1 percent level with a 1-tailed test, agreement between patients' attitudes and physician awareness of these attitudes is much greater than could be expected by chance.

The same calculations were made for the responses to the infancy questionnaire from practice C. The observed physician awareness score was found to be $\bar{O}_C = 1{,}502 \div 490 = 3.065$. Under the hypothesis of randomness, $E_R(\bar{O}_C) = 6.569$ and $Var_R(\bar{O}_C) = .0396$. Conversion to a Z score showed a highly significant difference between expected and observed awareness scores.

To compare practices B and C on physician awareness of patients' concerns, which is the primary purpose of this analysis, estimates of $Var(\bar{O}_B)$ and $Var(\bar{O}_C)$ are required. These can be obtained by first calculating for each patient response location the sample variance of the associated set of observed absolute differences. These variances for practice B are presented in the fourth column of table 3. One reason that an estimate of variance is needed at each patient response location is that the set of possible values of the random variable $|X - Y|$ depends on Y. The estimate of $Var(\bar{O}_B)$ is then calculated as

$$\hat{Var}(\bar{O}_B) = \frac{1}{N^2}\sum_{\text{all } y} n_y S^2{}_y = \frac{1}{(429)^2}[6(38.967) + 5(.800) + \ldots + 44(15.643)] = .0220.$$

The estimate of $Var(\bar{O}_C)$ is obtained in a like manner. A Z score can now be calculated to compare practices B and C. In particular, we have

$$Z = (\bar{O}_B - \bar{O}_C)/(\hat{Var}\bar{O}_B + \hat{Var}\bar{O}_C)^{1/2} = 3.862 - 3.065)/(.0220 + .0114)^{1/2} = 4.362.$$

The difference in physician awareness between practices B and C on the infancy questionnaire is highly significant.

Similar calculations were made to compare practices A and C using the pregnancy questionnaire, as well as to make comparisons within practice C on the two different questionnaires. A summary of the findings is presented in table 4. All observed scores are significantly smaller than the expected scores calculated on the assumption of randomness in physician response. A comparison of practices A and C on the pregnancy questionnaire gave a Z score of 0.320 indicating no differ-

Table 4. Summary of four sets of physician-patient data from three practices

Practice and type of questionnaire	Sample size [1]	Observed physician awareness $\bar{O}$	$\hat{Var}(\bar{O})$	$E_R(\bar{O})$	$Var_R(\bar{O})$	$\lvert Z \rvert$
A, pregnancy	210	4.471	0.0663	6.495	0.0891	[2] 0.320
C, pregnancy	576	4.566	.0220	6.671	.0343	[3] 8.216
C, infancy	490	3.065	.0114	6.569	.0396	[4] 4.362
B, infancy	429	3.862	.0220	6.559	.0450	

[1] Number of patients times number of completed items.
[2] Results from comparison of observed physician awareness between practices A and C on pregnancy questionnaire.
[3] Results from comparison of observed physician awareness within practice C on the pregnancy and infancy questionnaire.
[4] Results from comparison of observed physician awareness between practices C and B on the infancy questionnaire.

ence in awareness, whereas, within practice C, physician awareness was significantly better on the infancy than on the pregnancy questionnaire.

Discussion of Method

The issue may be raised that the testing of $\bar{O}$ against $E_R(\bar{O})$ is not valid, since all physicians through their training and experience have some opinion concerning the attitudes toward pregnancy and infancy of the "average woman" in their practice or women in general. Therefore, in the event that the physician has no knowledge of a specific patient he will tend to respond in terms of his general feelings about patients' response patterns rather than totally at random. If this is true, the hypothesis of randomness, which states that the probability of a physician checking any one of the 20 response locations is equally likely, is not appropriate. We are in sympathy with this argument. When empirical data have been collected from large numbers of physicians who care for patients with varying demographic characteristics, these data can be used to provide a better estimate of physicians' expected response patterns than that provided by the hypothesis of no knowledge of the individual patient. This would probably result in unequal weightings for each of the 20 response locations. Without these data the hypothesis of randomness has been chosen to illustrate the method of comparing observed with expected awareness for the individual practice.

A further consideration arises concerning the effects of the physician's "learning" during the period of study. Does the physician intentionally or unintentionally become more perceptive and take more interest in the patient as he becomes increasingly aware of study expectations? This possibility certainly exists and can be tested when a large number of physicians have cooperated with many of their patients in completing the forms. It will then be possible to observe whether physician awareness of patients' attitudes is significantly better at the end of the study period than at the beginning.

At present, we have insufficient data to test this hypothesis. However, in conversations with the physicians participating in the current study they indicated that they did not intentionally change their behavior patterns with patients. The physicians did not increase the amount of time spent with each patient nor did they alter their usual questioning patterns. Considering the numerous unsuccessful efforts that have been made to change physician behavior through postgraduate education, it would be most unlikely that we have stumbled upon a tool that would have this effect. If, however, it is subsequently demonstrated that the questionnaire does change behavior, we would be most gratified to accept its lesser value as a research tool in return for its advantages as an educational device.

Interpretation of Results

The comparison presented here illustrates a technique that is suitable for demonstrating differences in communication from patients to physicians. The findings indicate that physicians are aware of their patients' concerns—but to varying degrees in different practices. Also, practicing physicians consider patients' concerns worthy of physicians' attention and research investigation. The feasibility of measuring physician awareness of patients' attitudes with the quesionnaires used in the study also was demonstrated.

This questionnaire technique is useful in comparing different methods for the organization of medical care. It is equally applicable to making comparisons between physicians in a group practice or a clinic. Physician awareness may also differ within a practice for different conditions. For example, if awareness is better for infancy than for pregnancy many questions may be raised concerning physicians' preferences in caring for patients with different conditions or concerning variation in questionnaire "difficulty."

All the physicians compared in this study were general practitioners in private practice. Although the population densities served varied from small town to moderate-sized city, the characteristics of respondents were quite similar. Therefore it is not surprising that among these practices the cumulative frequency distributions of patients' responses on a given questionnaire were similar. In the future these questionnaires and analytic methods will be used in different types of practices serving populations with varying characteristics. This will be of value in determining variation in response patterns of patients as well as in evaluating the effect of patients' characteristics on physician awareness.

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Patients' attitudes and physicians' awareness of these attitudes were hypothesized as a criterion in a model for the evaluation of primary medical care. Pregnancy and infancy were used as indicator conditions to which the model was applied, and scales were developed, in a questionnaire form, to measure patients' attitudes and concerns and physicians' awareness of these concerns.

Patients and physicians in three separate medical practices completed the questionnaires. Each physician was asked to predict the location of his patient's response on the continuum of 20 locations on the scales. On the pregnancy questionnaire, 53 patient-physician pairs were obtained, and 64 were obtained on the infancy questionnaire.

For each practice the observed physician awareness was simply the mean of all the absolute differences in physician-patient paired responses on all items. Expected physician awareness scores were calculated under the hypothesis of randomness, that is, under the assumption that the physician had no knowledge of his patient's attitudes. To compare practices, a Z score was calculated as the difference in observed physician awareness scores divided by the estimated standard error of that difference.

By these methods all practices exhibited significantly better observed physician awareness scores than those expected by chance. Differences in scores were demonstrated between practices on the same questionnaire and within a practice on different questionnaires.

The technique is useful in demonstrating differences between physicians as well as differences between the various organizational patterns for the delivery of health care. Further application of this method should also illustrate the effect of patients' characteristics on physician awareness. Assuming that communication from patient to physician is a desirable element in the "care" function of medicine, physicians' awareness of their patients' attitudes can provide an additional criterion for the assessment of primary medical care.