

A New Method for Measuring Continuity of Care in Family Practice Residencies

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Continuity of relationship between physician and patient is a fundamental aspect of the health care provided by family physicians. Measurement of continuity has proved difficult, however. Commonly applied measures, usual provider of care (UPC), continuity of care (COC), and the modified continuity index (MCI), either ignore key aspects of continuity or provide misleading results. Consequently, a new measure of continuity, the modified, modified continuity index (MMCI), with a possible range of 0 to 1, was developed to overcome these problems. It was applied to a residency model practice, in which mean MMCI was found to be 0.59 (range 0.3 to 1.0). Mean COC was .41 and a mean MCI was .44. Thus, unlike COC and MCI, MMCI suggests fairly good continuity of care in this practice while still implying possible improvement. The MMCI should be useful for enhancing training and practice of family medicine.

Continuity of care has not been shown unequivocally to lead to improved health outcomes. Reports of its influence on patient compliance, physician-patient relationships, levels of disability, and cost of health care are inconsistent.¹⁻⁵ Some have suggested that health care providers are more interested in continuity of care than are patients.

Nonetheless, continuity of care has been widely promoted as an important component of family medicine training and practice. The special requirements for residency training in family medicine require evidence that residents provide continuous care. To be eligible for certification by the American Board of Family Practice, residents must have provided ongoing care for a panel of patients from the second through the third year of residency. A maximum of two months away from the primary practice site is permitted during these years.

Residency programs typically assign patients to identified primary physicians, schedule regular resident office hours in a model family practice unit, and encourage residents to follow from their office practices those patients who are hospitalized. These organizational variables may

make continuity possible, but they do not necessarily guarantee that residents or patients actually experience continuity of care. Several authors have developed measures that assess this continuity of care between individual patients and physicians. Unfortunately, each measure fails at least one of two basic criteria for utility of such measures; therefore, new measures are needed. The present report discusses the shortcomings of previously available measures, suggests a modification of one, and demonstrates its use in a residency family practice.

MEASURES OF CONTINUITY

Measures of continuity should exhibit two basic characteristics, especially if they are to be used in residency training settings. First, they should reflect pertinent aspects of the relationship between a patient and his or her primary physician. Second, the meaning of the numerical values generated by the measure should be readily understood by a wide range of users, including residents, program staff, and outside organizations.

Three measures of provider continuity have been applied to family medicine residency practices. Each has serious flaws that limit its use.

The first measure, usual provider of care (UPC), oversimplifies the relationship between patient and providers. UPC is simply the ratio of visits to the assigned pri-

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mary physician to the total number of patient encounters. For example, if a patient is seen for eight visits, four of which are to one physician, the calculated UPC is 0.5 (4/8). UPC does not reflect two key aspects of patient-provider continuity: total number of physicians seen, and total number of visits. In the present example, UPC remains 0.5 if the patient sees from two to five physicians, as long as four visits occur to the assigned primary physician.

A variant of UPC was used by Rogers and Curtis⁶ at the University of North Carolina to assess how often patients in their practice were seen by their own physician, a team member, or another member of the practice. They found that 90 percent of patients making more than one visit were seen exclusively by their own physician. They also found that from 68 to 86 percent of visits to individual physicians were by patients who saw only their assigned physician.^{6,7} This study would seem to imply high continuity of care for this particular practice.

Another measure, continuity of care (COC)^{8,9} incorporates the total number of providers seen into calculation of the final continuity score. If, as in the preceding example, a patient were seen for a total of eight visits, four to one physician, and four to one other, the COC would be 0.429, similar to the UPC of 0.5. If four visits were to one physician and the remaining four visits were each with a different provider, however, COC would be 0.214, while UPC would be unchanged at 0.5. Thus, calculated COC falls with increasing numbers of providers seen, even if the patient sees the primary provider for the same fraction of the total visits. COC therefore better meets the first criterion listed above for assessing measures of continuity.

Sloane and Egelhoff⁸ used COC in a study that was also conducted at the University of North Carolina, which covered several years and overlapped with the time of the Rogers and Curtis^{6,7} study. For three out of the four years of the study, Sloane and Egelhoff found a majority of their patients obtained COC scores of less than 0.5 (possible range: 0 to 1). This finding would seem to imply a considerably lower continuity of care than the findings of the Rogers and Curtis report.

Patten and Friberg,⁵ at the University of Iowa, used both COC and UPC measures. With a sample of 72 patients, they found an average COC of only 0.205, and UPC of 0.46.

The shortcoming of COC is that the calculated value of this measure falls quite rapidly with increasing numbers of providers. For example, if a patient sees the assigned physician for four out of six visits, COC may be as low as 0.40 (vs UPC of 0.67). Relatively low COC values (<0.50) may therefore be overly subject to misinterpretation by unwary users, such as residents and practice staff members.

The third measure, the modified continuity index (MCI) uses simpler data, provides added sensitivity to the total number of visits by individual patients, and may be easier to apply for purposes of practice management.¹⁰

MCI may be calculated more easily, but its scores may also be easily misinterpreted. For example, two visits to the same provider (perfect continuity) would yield an MCI of 0.524, not the 1.0 that would result from COC or UPC. A practice with a majority of patients with two visits would produce an MCI of less than 1.0, even with all patients seeing their own physician.

Thus, all three of the continuity of care measures commonly used have drawbacks when used in training settings for feedback and improvement in continuity. UPC may inadequately reflect the large numbers of providers who may be seen by individual patients in residency practices. COC is extremely sensitive to large numbers of different providers, but as number of visits and providers increase, COC produces values that seem intuitively very low and are likely to be misinterpreted. The MCI is also difficult to interpret, as it generally will not vary between 0 and 1.0, even with no continuity or perfect continuity.

As a result of the need for a more meaningful measure of continuity, a new measure was developed and tested in the present study. The measure used, the modified, modified continuity index (MMCI), was derived from MCI. To produce a measure that would range from 0 to 1, MCI was calculated, then divided by the maximum possible score for the number of visits. The formula for MMCI is as follows:

$$\text{MMCI} = \frac{1 - (\text{no. of providers} / [\text{n of visits} + 0.1])}{1 - (1 / [\text{n of visits} + 0.1])}$$

A comparison of COC, MCI, and MMCI for several common distributions of encounters is given in Table 1. MMCI is easy to calculate, is not overly sensitive to the large number of providers found in a residency training site, and allows intuitive interpretation of how well continuity is maintained regardless of number of visits.

In the present study, MMCI was applied to patients who had two or more visits during the observation period, thus eliminating inflation of continuity scores that results from including large numbers of patients with only one visit (COC = 1.0). Continuity of care was assessed as it related to basic demographic data (patient age, sex, and socioeconomic status) as well as presence of chronic illness and ability to identify the patient's primary physician.

METHODS

The records of all new patients seen in the Family Practice Office of the University of Arizona during January 1983

TABLE 1. DISTRIBUTION OF CONTINUITY OF CARE (COC), MODIFIED CONTINUITY INDEX (MCI) AND MODIFIED, MODIFIED CONTINUITY INDEX (MMCI) SCORES

Number of Physicians	Number of Visits	Distribution of Visits to Providers	COC	MCI	MMCI
1	2	2	1.00	.52	1.00
2	2	1, 1	0.00	.05	.10
1	3	3	1.00	.68	1.00
2	3	2, 1	.33	.35	.51
3	3	1, 1, 1	0.00	.03	.04
1	4	4	1.00	.76	1.00
2	4	3, 1	.50	.51	.67
2	4	2, 2	.33	.51	.67
3	4	2, 1, 1	.17	.27	.36
4	4	1, 1, 1, 1	0.00	.02	.03
1	5	5	1.00	.80	1.00
2	5	4, 1	.60	.61	.76
2	5	3, 2	.40	.61	.76
3	5	3, 1, 1	.30	.41	.51
3	5	2, 2, 1	.20	.41	.51
4	5	2, 1, 1, 1	.10	.22	.28
5	5	1, 1, 1, 1, 1	0.00	.02	.03

were reviewed. Patients who had been seen only once in the two-year period from January 1983 through December 1985 were excluded from the sample. Data were collected about office visits in this 24-month interval for the remaining 201 patients including demographic information (age, sex, and type of medical coverage), name of assigned primary physician, if any, number of visits, and physician seen for each visit. Visits made outside regular office hours were excluded from analysis. COC, MCI and MMCI were calculated for each patient.

RESULTS

The 201 patients included in the sample made 1,154 visits in the two-year period studied, with an average of 5.7 visits per patient. Fifty-nine percent were female; the average age was 28 years with a range from 1 year to 80 years. Thirty-six percent of the patients were covered by Arizona's plan for providing health care for the medically indigent, the Arizona Health Care Cost Containment System (AHCCCS), with the remainder either having private insurance, Medicare, or no insurance. A majority of the patients (65 percent) had an assigned physician, but absence of an identifiable assigned physician for the remainder precluded use of UPC.

MMCI ranged from 0.3 to 1.0 with a mean of 0.59. Fifty percent of the patients had a COC of less than 0.60, and mean COC was 0.41. Twenty-six percent of the patients had all encounters with the same physician. Using a one-way analysis of variance, there were no significant relationships ($P > .05$) between MMCI and sex of the

patient, whether the patient had an assigned physician, or whether the patient had AHCCCS coverage. MMCI was also not significantly related either to the number of visits the patient had in the two years or to the patient's age.

DISCUSSION

Continuity of care has been defined on seven dimensions: chronological, geographic, interdisciplinary, relationship, informational, accessibility, and stability.⁴ Measurable components of continuity have been described as the provider, consumer, encounter type, knowledge base, and continuity environment.⁴ Each of these measures, however, may only be a proxy for the basic relationship, feelings, or contract between physician and patient that constitute the most essential aspect of continuity. Lacking measurement of such attitudes, continuity is assessed by the behavioral outcomes that are more readily measured.

The crudest behavioral measure is the presence of physicians in the outpatient family practice setting at preset intervals over a defined period of time. This scheduling type of measure is used by the American Board of Family Practice (ABFP); it does not in any way, however, guarantee or even measure actual continuity of relationship between physician and patient. It has also proved a source of frequent difficulty to applicants for the ABFP examination and to the board as it attempts to enforce this rule.¹¹

Unfortunately, more direct measurements of physician-patient continuity, while providing the appearance of

precision, may introduce a tendency to errors of interpretation. Steinwachs¹ has demonstrated the variable sensitivity of quantitative measures of continuity to various potentially important components. This variation in sensitivity can lead to large numerical differences in reported continuity for the same patients, depending on which measure is calculated. Patten and Friberg,⁵ for example, in their report of UPC and COC in a family medicine residency model practice unit, found that use of UPC calculated continuity scores of more than twice those calculated with COC.

The reports of the Rogers and Curtis study from the University of North Carolina^{6,7} introduce two additional problems of interpretation. First, they do not report either standard UPC or COC calculations. Rather, they describe the fractions of patients achieving three levels of continuity in their office-hours contacts with physicians in the model practice unit.

In addition, they report that "an illness-visit ratio of one occurred in 75 percent of the contacts. Only 12 percent of patients made two visits per illness episode and eight percent made three visits."⁶ One possible interpretation is that they had a small number of patients with chronic problems requiring regular encounters with their physician. If so, a decrease in the continuity achieved would be expected, as continuity tends to be lower for acute than for chronic problems. Thus, interpretation of these results is difficult, and comparison to other studies problematic.

Such considerations suggest that measures of continuity should be comparable between different practices. Measures chosen should reflect the issues of particular concern in the institutions being analyzed, while also being readily interpreted by users. UPC ignores pertinent variables.

COC is difficult for family medicine training programs to use effectively because of its excessive sensitivity to number of physicians seen. MCI is easy to calculate, but provides results that may mislead users. The measure suggested herein addresses variables pertinent to provider-patient continuity while also providing meaningful information to users.

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