Effect of Case Mix on Provider Continuity

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A random sample of 265 patient charts was selected to assess the degree of provider continuity at the University of North Carolina Family Practice Center from July 1, 1983, to June 30, 1984. Continuity was measured using usual provider continuity, the ratio of the number of visits with the assigned physician divided by total visits. Usual provider continuity rates varied as predicted for three types of visits: acute illness (0.55), chronic illness (0.76), and health maintenance (0.86). The average rate of usual provider continuity was 0.68. Case mix had a statistically significantly effect on provider continuity when comparing acute care with either chronic or health maintenance care (P < .01). Because case mix is relevant and varies from site to site, a method of rate standardization was suggested using data on case mix from the National Ambulatory Medical Care Survey. Direct rate adjustment, a standard epidemiologic technique, would make continuity rates directly comparable for sites with different case mixes.

C ontinuity of care is one of the basic premises of primary care. The Institute of Medicine established continuity as one of the five major components of primary care.[1] Numerous family medicine leaders also consider continuity as one of the cardinal elements of primary care.[2-4]

Although there is controversy over the relationship between continuity of care and improved patient outcome, there is some evidence that certain groups of patients benefit from this process.[5] Breslau and Reeb[6] reported an increase in illness visits when continuity declined in a private pediatric clinic after it affiliated with a teaching hospital. Wasson and colleagues[7] reported greater patient satisfaction, shorter hospitalizations, and fewer emergent hospital admissions in the elderly veterans assigned to a continuity of care group compared with elderly veterans who did not receive continuity of care. Other studies reported benefits of continuity that included reductions in hospitalization rates, sickness episodes, laboratory tests,

costs, levels of disability, and increased patient satisfaction.[8,9]

Measurement of provider continuity is affected by frequency of patient visits, the number of different providers seen, the sequence by which different providers are seen, and the main diagnosis for the visit. Steinwachs[10] has compared several different measures of continuity and concluded there is no single measure that accounts for all of these dimensions. The operational definition of continuity for this study is usual provider continuity. It is the ratio of visits with a usual or assigned physician to the total number of visits. Usual provider continuity was chosen because it is conceptually simple, easily computed from most available data, and frequently used. Values of usual provider continuity can range from 0 to 1, with 1 indicating that every visit was with the assigned physician. An obvious limitation is that a patient with only one visit has perfect continuity.

Continuity of care in a setting with multiple providers has been shown to vary with the type of visit or case mix.[6,11] Seeing a usual provider is more likely for visits for chronic problems or health maintenance than for acute illness. In a teaching facility, where faculty and resident physicians spend limited amounts of time seeing patients, a patient with an acute problem must, of necessity, see an alternate physician when the usual provider is unavailable. It is hypothesized that usual provider continuity rates will be lowest for visits for

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TABLE 1. CHARACTERISTICS OF PATIENTS SAMPLED FROM THE UNIVERSITY OF NORTH CAROLINA FAMILY PRACTICE CENTER IN JULY 1984

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Patient Characteristics	No. (%)
Age (years)	
18-29	71 (26.8)
30-45	114 (43.0)
46-55	31 (11.7)
56-65	27 (10.2)
Over 65	22 (8.3)
Race	
White	205 (77.4)
Nonwhite	60 (22.6)
Sex	
Male	96 (36.2)
Female	169 (63.8)

TABLE 2. COMPARISON OF TYPES OF PATIENT VISITS TO THE UNIVERSITY OF NORTH CAROLINA FAMILY PRACTICE CENTER (UNC-FPC) WITH DATA PUBLISHED BY NATIONAL AMBULATORY MEDICAL CARE SURVEY (NAMCS), 1980

Type of Visit	UNC-FPC Percentage	NAMCS Percentage
Health maintenance	13	18
Chronic illness	43	37
Acute illness	44	36
Postsurgical, trauma follow-up*		9

*These were grouped with acute illness for Family Practice Center data

acute illness and highest for health maintenance visits, with rates for visits for chronic problems falling in between.

If type of case mix or reason for visit varies from site to site and affects the level of continuity, then case mix must be controlled when comparing rates from different practices. This paper reports the results of a chart audit of 265 randomly selected patient records and measures provider continuity. It examines the relationship between type of visit and provider continuity and suggests a method of adjusting continuity rates to allow comparison across different sites with different case mixes.

METHODS

Patient care in the Family Practice Center at the University of North Carolina is delivered by physicians and residents organized into three teams. Each team is composed of three faculty physicians and six residents, two from each year of residency training. Residents remain on the same team throughout their three years of training. Each team has its own nurse and uses the same set of examining rooms. Patients are assigned to one physician, and residents follow their own panel of patients throughout their three years of training. When the assigned physician is unavailable, the patient is seen by another member of the same team.

During July and August of 1984, a medical student retrospectively audited 265 charts for the year prior to July 1. Charts were selected from a computerized file using a computer program that generates random samples. Patients had to have been aged 18 years or older

and to have made at least one visit during the year to be eligible for inclusion in the sample. For each patient the following information was abstracted from the chart and recorded on a standardized data form: total visits, the reason for each visit, the physician seen, and the physician assigned.

The unit of analysis was the patient. For each patient, usual provider continuity ratios were calculated for (1) total visits, (2) visits for acute care, (3) visits for chronic care, and (4) health maintenance visits. Acute conditions were defined as self-limiting conditions expected to last less than three months, chronic conditions were those expected to last more than three months, and health maintenance visits were those for general physical examinations and other preventive types of care. When a visit encompassed more than one type of care, or the main diagnosis was not clearly stated, a conference was held with a physician on the research team, and the primary reason for the visit was estimated. (An estimate of the main diagnosis was made for 37 of 835 visits.) To get overall measures of continuity for the practice, individual patient ratios were averaged over the entire sample for each of the four categories. Not all patients had visits in all categories; therefore, usual provider continuity averages are based on subsamples of differing sizes. Differences between average usual provider continuity rates for each type of visit were tested for statistical significance using a difference of proportions test.

As a reliability check, a 10 percent subsample of 28 charts was selected and reaudited by a faculty physician. The data recorded by the physician were compared with the data recorded by the medical student. A coefficient of reproducibility, a measure of how closely the two chart auditors agreed on the interpretation of the data in a patient's chart, was calculated.[12]

Case mix data were obtained from the National

TABLE 3. INDIVIDUAL PHYSICIAN CONTINUITY FOR THREE TYPES OF VISITS MEASURED BY USUAL PROVIDER CONTINUITY (UPC) IN THE FAMILY PRACTICE CENTER

Type of Visit	Number of Patients*	Number of Visits	Average Visits per Patient	Average UPC
Acute illness	170	366	2.15	0.55
Chronic illness	130	362	2.78	0.76
Health maintenance	96	107	1.11	0.86
Overall	265	835	3.15	0.68

*Patients may have had more than one of each type of visit

Ambulatory Medical Care Survey (NAMCS), which defined acute illness as conditions lasting less than three months and chronic conditions as lasting more than three months, consistent with the definitions used in this study.[13]

RESULTS

Table 1 shows the characteristics of the 265 patients whose charts were audited in the Family Practice Center. These patients made a total of 835 visits, an average of 3.15 visits per patient during the year preceding July 1, 1984. Using the main diagnosis as the criterion, patients made 366 visits for acute illness, 362 for chronic illness, and 107 for health maintenance. The proportions for the National Ambulatory Medical Care Survey of 1980, with their postsurgical follow-up and trauma visits combined with acute visits to match the categories in this study, are compared in Table 2.

Table 3 displays the usual provider continuity rates for physician continuity for each type of visit. The differences between the acute and chronic rates and between the acute and health maintenance rates were statistically significant ($P < .01$), lending support to the hypothesis that type of visit affects the level of continuity. Visits for acute illness tend to reduce the usual provider continuity rate more than visits for chronic illness or health maintenance. This predicted pattern appears in the data shown in Table 3. However, the difference between usual provider continuity rate for health maintenance visits and usual provider continuity rate for chronic illness visits was not statistically significant.

The average usual provider continuity rate for the practice (0.68) is the rate that should be adjusted when comparing it with rates from other practices. When this rate is adjusted for case mix using the NAMCS standard proportions, it remains the same (0.68) because the case mix in the Family Practice Center is similar to the case mix from the standard population.

A comparison of the data in the subsample of 28 charts indicated that the data-recording process was highly reliable. The coefficient of reproducibility was 0.91.

DISCUSSION

Assuming that continuity of care is desirable, what is an acceptable level of continuity? British and Canadian studies of private practitioners report provider continuity rates of 0.80 to 0.83.[14,15] Goldberg and Dietrich[11] found an average usual provider continuity rate of 0.80 in three private medical subspecialty practices that provided primary care. Breslau and Reeb[6] reported data for a pediatric clinic not only for case mix, but also under two conditions, private and teaching affiliated. The overall usual provider continuity rate declined from 0.84 to 0.68 when the pediatric clinic became affiliated with a teaching program. Breslau and Reeb reported continuity rates for acute and well-child visits but not for visits for chronic illness. Their data show that continuity of care for acute illness was more seriously affected when the clinic was affiliated with the teaching program.

Although the overall rates of continuity reported by Breslau and Reeb (0.68) and the Family Practice Center at North Carolina Memorial Hospital (0.68) appear identical, they cannot be compared directly because of the difference in case mix. Had they calculated rates for all three categories of visits, data would have been sufficient to use a formula for the direct adjustment of rates to standardize for type of visit. The overall rates for the two clinics could then have been compared.

Although there have been reported studies that used usual provider continuity as a measure of continuity and studies that use case mix, few studies have used both.[6,11,16] In a study at North Carolina Memorial Hospital's outpatient medicine clinic, usual provider continuity rates ranging from 0.26 for a walk-in clinic to 0.93 for the medicine clinic were reported. The 0.93

represented scheduled visits, whereas the 0.26 represented unscheduled visits or emergency visits. The medicine clinic population was described as having "multiple, relatively complicated medical problems" and did not include pediatric patients. Although the authors of that study are in agreement on the importance of case mix in interpreting continuity, their data did not record the reason for the visit in a manner that would have allowed a direct comparison with Family Practice Center data.[16]

CONCLUSIONS

This study found that continuity of care as measured by usual provider continuity rate was significantly affected by case mix or type of visit. Acute illness visits had significantly lower provider continuity rates than either chronic illness or health maintenance visits. Few directly comparable studies were found that reported both provider continuity and case mix. The paucity of such data made it difficult to make a normative judgment about good or poor continuity rates. To make valid comparisons with usual provider continuity rates from other studies, it is important to adjust for case mix. This adjustment can be made by direct rate adjustment using case-mix proportions from a standard population.

References

1. Institute of Medicine: A Manpower Policy for Primary Health Care. Washington, DC, National Academy of Sciences, 1978

2. McWhinney IR: Teaching the principles of family medicine. Can Fam Physician 1981; 27:801-804
3. Shahady EF: Teaching the principles of family medicine. NZ Fam Physician 1982; 10:24-26
4. Brown DC: Family practice—What's the difference? Can Fam Physician 1979; 25:1484-1487
5. Lewis C: Does comprehensive care make a difference? What is the evidence? Am J Dis Child 1971; 122:469-474
6. Breslau N, Reeb KG: Continuity of care in a university-based practice. J Med Educ 1975; 50:965-969
7. Wasson JH, Sauvigne AE, Mogielnicki RP, et al: Continuity of outpatient medical care in elderly men. JAMA 1984; 252:2413-2417
8. Heagerty MC, Robertson LS, Kosa J, et al: Some comparative costs in comprehensive versus fragmented pediatric care. Pediatrics 1970; 46:596-603
9. Alpert J, Robertson LS, Kosa J, et al: Delivery of health care for children: Report of an experiment. Pediatrics 1976; 57:917-930
10. Steinwachs DM: Measuring provider continuity in ambulatory care: An assessment of alternative approaches. Med Care 1979; 17:551-565
11. Goldberg HI, Dietrich AJ: The continuity of care provided to primary care patients: A comparison of family physicians, general internists, and medical subspecialists. Med Care 1985; 23:63-73
12. Kerlinger FN: Foundations of Behavioral Research. New York, Holt, Rinehart & Winston, 1967
13. National ambulatory medical care survey: 1980 summary. In National Center for Health Statistics (Hyattsville, Md): Advance Data, No. 77. DHHS publication No. (PHS) 82-1250. Government Printing Office, 1982
14. Hill M, McAuley RG, Spaulding WB, et al: Validity of the term family doctor: A limited study in Hamilton, Ontario. Can Med Assoc J 1968; 98:734-738
15. Cobb JS, Baldwin JA: Consultation patterns in a general practice. J R Coll Gen Pract 1976; 26:599-609
16. Fletcher RH, O'Malley MS, Fletcher SW, et al: Measuring the continuity and coordination of medical care in a system involving multiple providers. Med Care 1984; 22:403-411