

## What Factors Are Associated With Achieving High Continuity of Care?

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**Background and Objectives:** Although continuity of care has been found to be associated with improved health outcomes in children, little is known about what factors predict having consistent contact with a pediatric provider. This study explored what patient, family, provider, and system factors are associated with high continuity of both total and well-child care. **Methods:** This cross-sectional study involved 759 patients presenting to a primary care pediatric clinic. Patients completed surveys about demographic variables, attitudes about continuity of care, and family functioning, as well as provider-level information. Outcomes were measured with a continuity of care index that quantified the degree to which a patient experienced continuous care with a provider. **Results:** In Tobit regression models, the variables associated with increased total continuity of care were continuity belief, higher family control, increased provider availability, and better provider rating. Associated with decreased total continuity of care were: number of visits, patient age, and time at clinic. For well-child care, the variables associated with increased continuity of care were continuity belief, increased provider availability, better provider rating, and greater reported household income. Provider availability was the strongest predictor of total continuity of care, and continuity belief was the strongest predictor of well-child continuity of care. **Conclusions:** Increased provider availability may improve overall continuity of care for pediatric patients.

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Continuity is a core component of the Institute of Medicine's definition of primary care.<sup>1</sup> Continuity of care has been found to be associated with improved utilization of health services, improved health outcomes, and preventive care for both healthy children and those with chronic disease.<sup>2-9</sup> Although these associations suggest a benefit to having consistent contact with a provider, we know surprisingly little about how such relationships can be promoted. Continuity of care requires a collaborative partnership among patients, providers, and delivery systems. Each may make critical contributions to achieving continuity of care. A better understanding of what factors predict continuity of care can help direct efforts at improving continuity of care and may help guide intervention efforts.

We conducted a study to explore what factors are associated with achieving high continuity of care with a provider. We were interested in patient and family factors, provider factors, and system factors that might predict greater continuity of care.

### Methods

This was a cross-sectional survey conducted in a pediatric clinic affiliated with the University of Washington. The Institutional Review Board of the University of Washington approved the study protocol.

### Setting

Participants were recruited from the Pediatric Care Center (PCC). The PCC is staffed by four faculty/staff clinicians (two pediatricians and two nurse practitioners) and 23 resident physicians precepted by pediatric faculty. The majority of patients (57%) are assigned to, and the majority of visits (60%) are made to, the group of four faculty/staff clinicians, rather than to the residency group. However, the same patients are seen by both groups of providers, depending on availability.

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Patients therefore do cross over from one panel of providers to the other as needed.

### Patients

All English-speaking patients presenting to the clinic for either well or acute care between February 1, 2001, and June 1, 2001, who had made at least three prior visits to the clinic were eligible for participation. We provided parents with information about the study, and those who gave consent for participation completed a brief questionnaire. The questionnaires were distributed by a research assistant at the time of a visit and collected at the end of the visit. Parents were compensated \$1 for their participation. Only individuals returning completed surveys were counted as participating in the study.

### Outcome Variable

Our primary outcome variable was an index of continuity of care, the COC, which we have used in our previous studies.<sup>2,7-10</sup> A measure of dispersion, the COC is a continuous variable with a range between zero and one.<sup>10</sup> A value of zero signifies maximum dispersion, which occurs when a different provider is seen for every visit. A value of one signifies minimum dispersion, which occurs when the same provider is seen at every visit. To demonstrate the behavior of the COC, several hypothetical patterns, each involving eight visits, are shown in Table 1. Note that as the contacts with providers become more dispersed—from all visits with Provider A to every visit with a different provider—the COC moves from one to zero.

Calculation of COC was based on data from the computerized information system used by our PCC. This system is used for appointment scheduling as well as for billing. It reliably tracks which provider patients see at each visit. Because we were interested in what predicts continuity of primary care, we calculated patients' COC indices based only on visits to primary care providers. Visits to specialists, subspecialists, or emergency departments were not included in computing the COC index. In addition, we excluded visits that were for procedures only (eg, immunizations), since this did not involve face-to-face contact between providers and patients.

We calculated two distinct COC indices for each patient. The first included all visits regardless of indication (COC<sub>total</sub>), and the second was limited to well-child visits (COC<sub>wc</sub>). Well-child visits were identified from the *International Classification of Diseases, Ninth Edition* (ICD-9) billing codes. Well-child visits included the codes V20.2 and V70.0.

All relevant visits made by the child to the clinic until the time of survey administration were included in the calculation. However, because COC is both unstable and uninterpretable in the setting of patients with few

Table 1

### Example of the Continuity of Care Index (COC)

Visit Sequence*	COC Index
AAAAAAAA	1.0
AAAABAAA	.75
ABAABAAA	.57
ABAACAAA	.54
ABCBAEFA	.14
ABCDEFGH	0

\* Each letter corresponds to a separate provider

visits, we have limited our analyses to patients who had made at least four visits. For the COC<sub>total</sub> this would include all visits and for the COC<sub>wc</sub> it would only include patients who had made at least four well-child visits.

### Primary Predictors

**Continuity Belief.** We used two items for the continuity belief domain from the Components of Primary Care Index (CPCI), which is a validated instrument that measures the seven components of primary care.<sup>11</sup> Because the questions are written in the first person, we modified them so that they reflect the parents' attitudes about their child's care. The two questions we used were (1) "My child's medical care improves when he/she sees the same doctor that he/she has seen before." (2) "It is very important to me that my child see his/her regular doctor." The CPCI uses five-point Likert scales ranging from 1=strongly disagree to 5=strongly agree, with 3 being defined as neutral. We summed responses to both questions to form a composite score. However, since this score's value has no inherent meaning, we modeled continuity belief as tertiles based on the distribution in our sample with the lowest one (least interest in continuity) serving as a referent.

**Family Function.** We were interested in testing whether organizational and functional attributes of families might predict continuity of care. In particular, this question was important because prior observational studies that have found associations between continuity of care and improved health outcomes have not been able to control for this potential confounding factor.<sup>2-5,8,9</sup>

The Family Environment Scale (FES) is a validated self-report questionnaire that measures family functioning and includes seven domains, three of which we deemed relevant to this study.<sup>12</sup> These are (1) cohesion, which is the degree of commitment, help, and support family members provide for one another, (2) organization, which is the degree of importance of clear organization and structure in planning family activities and

responsibilities, and (3) control, which is how much set rules and procedures are used to characterize family life. All subscales of the FES have been normed on a variety of patient populations. We compared our univariate results to available published norms. However, for our regression models, we computed z scores for each item by dividing each individual's score by the standard deviation (SD) of each item in our population. In this way, a one-unit change can be interpreted as corresponding to one SD.

**Provider Availability.** We calculated the mean number of half days that each provider was in clinic during the study period and rounded this to the nearest half day. This created four strata: 1/2 day per week, 2.5 days per week, 3 days per week, and 5 days per week.

**Covariants.** Our analysis included the number of visits at the time of survey, age of child, reported household income, gender of child, and individual provider rating as covariants. For the provider rating, we used the Consumer Assessment of Health Plan Survey (CAHPS) question that asks respondents to rate the overall quality of their provider on a 10-point scale.<sup>13</sup> In addition, because the period of time that the children had been followed at the PCC might also confound our primary association of interest, we also included a variable, "months at clinic," which was defined as the number of months prior to the date that they completed the survey that a patient had been continuously enrolled at the PCC. Finally, because characteristics of individual providers (including their availability in clinic) may confound the association of interest, our model included a dummy variable for each provider that participants identified as their child's primary provider. Because the coefficients associated with individual provider are not of interest, we do not report them here. It was not possible to include both provider availability and the provider dummy variable concurrently in the model since in some cases the two were perfectly correlated. We therefore included each individually in sequential models.

#### Statistical Analysis

Our dependent variable in the analyses is the COC variable which, as noted, is bounded between zero and one. The distribution of this variable is composed of approximately normally distributed values less than one, plus a spike of a number of patients with a COC value of exactly one. Using ordinary least squares (OLS) linear regression to analyze such data can result in estimated coefficients biased toward zero, and Tobit regression is generally used to correct for such bias.<sup>14,15</sup> We thus used Tobit regression, which explicitly models and corrects for the censoring (or ceiling effect) of a bounded dependent variable such as our COC index.

Its results are interpreted exactly as would be those of an OLS linear model, namely as the expected difference in COC given a one-unit change in each predictor variable. In this way, the relative magnitude of each covariant can be assessed.

#### Results

A total of 1,457 eligible patients were seen in clinic during the study period, and 759 parents completed surveys (participation rate 52%). All of these patients comprised the COC total sample. Only 320 patients had made at least four well-child visits, and they comprised the COC<sub>wc</sub> sample.

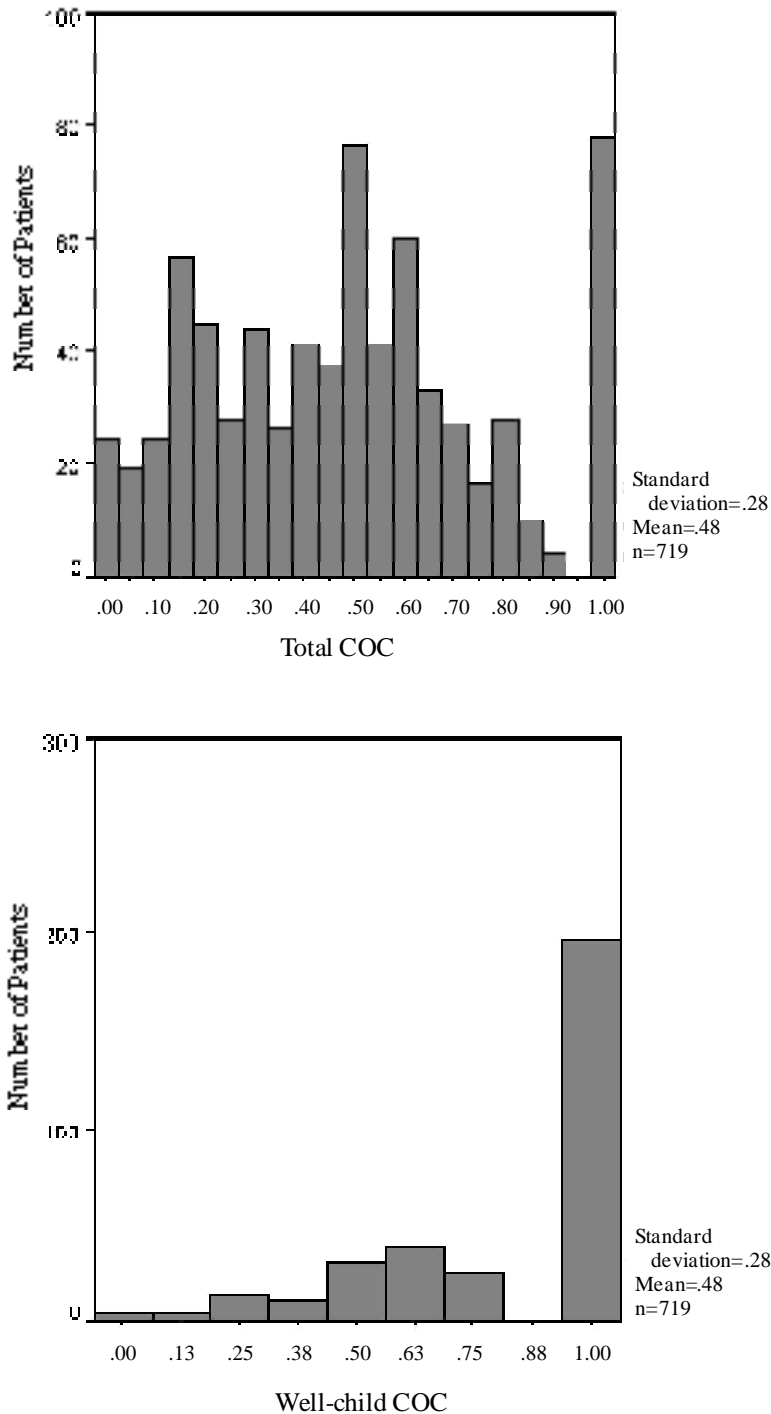
There were no significant differences between respondents and nonrespondents with respect to age, insurance type, provider, or race. The mean age of patients whose parents participated was 4.5 years. They had made an average of 10 visits to the clinic and had been enrolled there for an average of just under 2 years. In general, the overall COC provided was good (mean COC=.48), and the well-child COC was excellent (mean=.82). The mean continuity belief score was 8.34 (SD=1.51). The full distributions of each COC are presented in Figure 1. The mean FES measures for the entire sample were: cohesion (7.78 [SD=1.84]), organization (6.15 [SD=2.25]), control (4.05 [SD=1.92]). These results are broken down by the overall COC group and the COC<sub>wc</sub> in Table 2.

In the fully adjusted COC<sub>total</sub> analysis, compared to parents in the lowest tertile for COC belief, those in the middle tertile (.08 [.03, .12]) and high tertile (.16 [.11, .21]) were more likely to have increased COC<sub>total</sub>. Control was also associated with higher COC<sub>total</sub> (.04 [.01, .06]), as was provider rating (.033 [.017, .05]). The strongest predictor of increased COC<sub>total</sub> was provider availability. Compared to parents who identified as their primary provider someone who averaged 1/2 day per week in clinic, COC was higher for those who identified one with 2.5 days (.17 [.11, .22]), 3 days (.15 [.08, .18]), and 5 days (.29 [.21, .35]) in clinic. The variables associated with decreased COC<sub>total</sub> were number of visits at time of survey (-.003 [-.007, -.000]), age in years (-.008 [-.013, -.002]), and months enrolled at the clinic (-.033 [-.003, -.000]) (Table 3). The adjusted R<sup>2</sup> for the full model was .32.

In the fully adjusted COC<sub>wc</sub> analysis, compared to parents in the lowest tertile for COC belief, only those in the high tertile (.33 [.02, .52]) were more likely to have increased COC<sub>wc</sub>. Organization (but not control) was associated with higher COC<sub>wc</sub> (.08 [.00, .16]) as was provider rating (.033 [.004, .06]). Provider availability was again important but less so than for COC<sub>total</sub>. Compared to parents who identified as their primary provider someone who averaged 1/2 day per week, only those who identified one with 3 days (.19 [.005, .37]) and 5 days (.18 [.02, .44]) had greater COC<sub>wc</sub>. Income

Figure 1

## Full Distributions of Each Continuity of Care Index



was also a significant predictor of  $COC_{wc}$ . Compared to those patients with household incomes less than \$10,000, all other income strata were more likely to have higher  $COC_{wc}$ . The beta coefficients ranged from .25–.45. Neither age, number of visits, nor time at clinic were significant for  $COC_{wc}$  (Table 3). The adjusted  $R^2$  for the full model was .19.

None of these results differed when the dummy variable for provider was included in lieu of the provider availability variable.

### Discussion

We found that parental beliefs about continuity, family control, provider rating, and provider availability are associated with increased overall continuity of care. Of all of these, the factor most strongly associated with COC was provider availability. Having a provider who is in clinic 5 full days a week was associated with a .27 unit increase in the COC compared to one who is there only 1/2 day per week. To put that number in perspective, consider that the mean COC for this sample is .48 and that the SD was .28. Full-time availability (compared to 1/2 day per week) is therefore equivalent to a full SD difference in expected overall COC.

Less dramatic, but still important, was parental belief in continuity. Because of the cross-sectional nature of this study, it is not possible to know the direction of the association. That is, do parents who value continuity make an effort to see the same provider, or do those who have high continuity of care come to value it? The same is true for ratings of providers. It may well be the case that thinking highly of one's provider leads parents to preferentially seek appointments with that provider, but it is also plausible that knowledge and trust of providers is born of consistent contact with them.

It is also noteworthy that number of visits, age of child, and months at clinic were all associated with lower overall COC. This may reflect the reality that greater contact with the clinic and advancing age are correlated with a greater proportion of sick visits for which continuity of care is difficult to ensure.<sup>16</sup> This is supported by the fact that none of these variables were significant in the  $COC_{wc}$  analysis.

There are some pertinent negative findings to this study. Neither family organization nor cohesion was associated with increased

Table 2  
Characteristics of Survey Respondents

Variable	COC <sub>total</sub> (n=759)		COC <sub>wc</sub> (n=320)	
	Mean	(SD)	Mean	(SD)
Age	4.5 years	(4.4)	1.99 years	(1.49)
Male	47%		47%	
Number of visits	10.32	(7.13)	13.27	(7.37)
Enrollment at PCC	665 days	(341)	673 days	(293)
COC <sub>total</sub> at time of survey	.48	(.28)	NA	
COC <sub>wc</sub> at time of survey	NA		.81	(.25)
Family Environment Subscale				
Cohesion	7.78	(1.84)	7.95	(1.97)
Organization	6.15	(2.25)	6.20	(2.12)
Control	4.05	(1.92)	3.67	(1.84)
Continuity belief	8.34	(1.51)	8.68	(1.29)
Income				
Missing	48	(6%)	24	(7%)
<\$10,000	66	(9%)	27	(9%)
\$10,000–\$24,999	123	(16%)	49	(16%)
\$25,000–\$49,999	166	(22%)	74	(23%)
\$50,000–\$74,999	118	(16%)	44	(14%)
>\$75,000	238	(32%)	102	(32%)

COC<sub>total</sub>—all visits regardless of indication  
COC<sub>wc</sub>—well-child visits  
PCC—Pediatric Care Center

COC<sub>total</sub>. This may partially address a limitation of prior cross-sectional studies. Those studies were hampered by the possibility that family function might confound the association between continuity of care and health outcomes. We found little evidence that this is the case. Of the three family function constructs we examined, only one was a significant predictor of COC, and its effect size was small.

Limitations

There are some limitations to this study that warrant consideration. First, it was conducted in a single clinic, and its generalizability to other settings is uncertain. However, the mean FES scores for our sample were identical to those reported in a normative sample of 1,164 families.

In addition, the fact that most of the providers who worked 1/2 day were residents introduces a potential confounder since they are different from other providers both by dint of training and because of turnover every 3 years. Nevertheless, availability remains an important predictor of COC since 5 days/week is still significantly different from 3 days/week.

Second, although the R<sup>2</sup>s of our models are moderately high, there remains a great deal of unexplained

Table 3  
Linear Regression of Continuity of Care (COC) Index

Variable	TOTAL COC		WELL-CHILD COC	
	Unadjusted Beta (95% CI)	Adjusted Beta (95% CI) <sup>*</sup>	Unadjusted Beta (95% CI)	Adjusted Beta (95% CI) <sup>*</sup>
<b>Continuity belief</b>				
Low	Referent	Referent	Referent	Referent
Medium	.14 (.10, .19)	.08 (.03, .12) <sup>††</sup>	.14 (.07, .20) <sup>††</sup>	.15 (.01, .33)
High	.34 (.21, .50)	.36 (.21, .51) <sup>††</sup>	.24 (.09, .34) <sup>††</sup>	.33 (.13, .52) <sup>††</sup>
<b>FES Subscale</b>				
Cohesion	.01 (-.001, .02)	.007 (-.024, .034)	.005 (-.01, .02)	.01 (-.02, .04)
Organization	-.000 (-.01, .02)	-.000 (-.02, .02)	.01 (0, .02) <sup>†</sup>	.08 (0, .16) <sup>†</sup>
Control	.02 (.01, .03)	.035 (.01, .056) <sup>††</sup>	-.007 (-.02, 0)	-.01 (-.03, .04)
<b>Provider availability</b>				
1/2 day/week	Referent	Referent	Referent	Referent
2.5 days/week	.20 (.13, .26)	.17 (.11, .22) <sup>††</sup>	.10 (.02, .18) <sup>†</sup>	.13 (-.01, .34)
3 days/week	.19 (.14, .23)	.15 (.08, .18) <sup>††</sup>	.15 (.10, .22) <sup>††</sup>	.19 (.005, .37) <sup>†</sup>
5 days/week	.27 (.20, .34)	.29 (.21, .35) <sup>††</sup>	.09 (.00, .20) <sup>†</sup>	.18 (.02, .34) <sup>†</sup>
Number of visits at survey	.004 (-.007, .001)	-.002 (-.007, -.000) <sup>†</sup>	-.001 (-.005, .002)	.003 (-.04, .01)
Age (years)	-.017 (-.021, -.013)	-.008 (-.013, -.002) <sup>††</sup>	-.02 (-.04, -.05) <sup>†</sup>	-.003 (-.006, .002)
Months at clinic	-.0006 (-.0003, -.0013)	-.003 (-.003, .000) <sup>††</sup>	-.0013 (-.0016, .0003) <sup>†</sup>	-.002 (-.007, .001)
Male	.02 (-.016, .05)	.02 (-.016, .05)	.00 (-.14, .08)	.013 (-.006, .05)
Provider rating	.05 (.04, .07)	.033 (.017, .05) <sup>††</sup>	.06 (.05, .08) <sup>†</sup>	.023 (.004, .06) <sup>†</sup>
<b>Household income</b>				
<\$10,000	Referent	Referent	Referent	Referent
\$10,000 to \$24,999	-.01 (-.03, .07)	.04 (-.04, .12)	.06 (-.05, .17)	.25 (.01, .53) <sup>††</sup>
\$25,000 to \$49,999	.01 (-.07, .09)	.02 (-.04, .11)	.12 (.01, .23) <sup>†</sup>	.31 (.04, .57) <sup>††</sup>
\$50,000 to \$74,999	.06 (-.03, .14)	.04 (-.03, .13)	.22 (.10, .33) <sup>††</sup>	.44 (.14, .72) <sup>††</sup>
>\$75,000	.07 (-.01, .15)	.02 (-.00, .02)	.22 (.12, .32) <sup>††</sup>	.45 (.13, .74) <sup>††</sup>

CI—confidence interval      \* Adjusted R<sup>2</sup> = .32      † Significant at P < .05  
FES—Family Environment Scale      \*\* Adjusted R<sup>2</sup> = .19      †† Significant at P < .01

variance in COC, and there may be other unidentified features of family function that are associated with continuity of care. That is, we may not have identified the correct constructs for predicting it. Third, we measured associations cross-sectionally and therefore cannot draw causal conclusions. The possibility that the causality is reversed was already discussed. However, it is worth noting that in either case, these findings are important. For example, if rating one's provider highly causes one to establish a consistent relationship with them, then consumer choice in optimizing fit between parent and providers may still be important. If, however, higher ratings come with consistent contact, then ensuring continuity of care may improve CAHPS scores.

Finally, our information system does not permit us to know whether the provider that parents identified and rated as their primary provider was in fact the one that they saw the most frequently. Although this seems likely to be the case, this uncertainty provides another limitation to our study.

### Conclusions

Despite these limitations, some meaningful conclusions can be drawn from this work. First, provider availability is an important component of achieving continuity of care. Although it is increasingly common for providers to work part-time, sharing panels of patients between two providers who work complementary schedules rather than having a single identified primary provider may be an effective means to increase COC. No providers in our study had such an arrangement. Second, parental attitudes are also important. These too may be modifiable since achieving COC may help one come to value it. Lastly, our finding that COC for well-child care may be of less interest for the lowest income families is unexplained and needs further research.

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