The Role of Provider Continuity in Preventing Hospitalizations

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Objectives: To examine the association between provider continuity and future hospitalization in a Medicaid population, and to determine if this association is greater for ambulatory care–sensitive conditions.

Design: Analysis of paid claims to the Delaware Medicaid program during a 2-year period (July 1, 1993, to June 30, 1995). Continuity with a single provider during year 1 of the study was computed for each participant.

Participants: A total of 13,495 continuously enrolled fee-for-service Medicaid patients aged 0 to 64 years who had made at least 3 ambulatory physician visits during the first year of the study.

Main Outcome Measure: Likelihood of hospitalization in year 2 of the study for all conditions and for ambulatory care–sensitive conditions.

Results: The mean continuity score was 0.50 in year 1 and 11.9% of patients were hospitalized in year 2. After controlling for demographics, number of ambulatory visits, and case mix, higher provider continuity was associated with a lower likelihood of hospitalization for any condition (odds ratio [OR] = 0.56; 95% confidence interval [CI], 0.46-0.69). For chronic ambulatory care–sensitive conditions there was a similar association between provider continuity and hospitalization (OR = 0.54; 95% CI, 0.34-0.88), but for acute ambulatory care–sensitive conditions there was no significant association (OR = 0.80; 95% CI, 0.48-1.34).

Conclusions: Continuity of care with a provider is associated with a decreased future likelihood of hospitalization in the Delaware Medicaid population. This suggests that policies that encourage patients to concentrate their care with a single provider may lead to lower hospitalization rates and possibly lower health care costs. This study does not support the hypothesis that a certain set of conditions are particularly ambulatory care sensitive.

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THERE HAS been increasing emphasis on the importance of primary care as the focal point of health care delivery. One of the hallmarks of primary care is continuity of care,1 which is defined by seeing the same health care provider over time. It is thought that higher provider continuity can have a positive effect on health care utilization and outcomes.2 Studies have shown that patients with high provider continuity are more satisfied with their care,3,4 more likely to take medications correctly,3 and more likely to have problems identified by their physician.3 An additional suggested benefit of continuity is that it can reduce health care costs, partly by reducing the need for inpatient hospitalizations.2 In particular, continuity might be especially effective in decreasing hospitalizations for conditions that are more amenable to primary care interventions. These conditions are often called ambulatory care–sensitive conditions (ACSCs).5

While the hypothesized link between high continuity and low hospitalization rates makes intuitive sense, the evidence supporting this hypothesis is scant. Only 1 previous study has examined the effect of provider continuity on hospitalizations, and this was limited to elderly men in a Veterans Administration clinic.4 Other studies have examined whether hospitalization rates are lower for persons who have an identified regular source of care,6,7 but have not examined the level of continuity patients had with their regular source of care. No studies have examined the effect of provider continuity on hospitalizations for ACSCs.

This issue is particularly relevant for the Medicaid population. Medicaid is one of the largest and fastest growing components of state budgets.8-10 One reason is that Medicaid patients have high hospitalization rates, particularly for ACSCs.11 Medicaid patients are also more likely to seek care in hospital emergency departments and clinics, where continuity with the same

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This study analyzed paid claims to the Delaware Medicaid program during a 2-year period (July 1, 1993, to June 30, 1995). There were approximately 70,000 total Delaware Medicaid recipients at the midpoint of the study, although the exact number changes from day to day. We selected Delaware Medicaid patients aged 0 to 64 years who were continuously enrolled for the 2-year period (allowing administrative breaks in enrollment of up to 30 days per year). This was done so that claims data would most accurately reflect total utilization, because claims are not available for services rendered when patients are disenrolled or when full payments are made by alternative payors (eg, Medicare). Patients were included if they were noninstitutionalized and were enrolled through Aid to Families With Dependent Children (AFDC), Supplemental Security Income (SSI), or extended eligibility for pregnant women and children. Patients were excluded if they enrolled in Medicaid’s voluntary pediatric managed care program during any part of the study period (4096 patients), because claims data do not include office visits for managed care patients. Patients were also excluded if they had made fewer than 3 ambulatory physician visits during the first year of the study, because it was felt that continuity would be difficult to measure for patients with few visits. All of the remaining patients were included in the study, which resulted in a study sample of 13,495 patients.

For each patient we measured provider continuity in the first year of the study and hospitalizations in the second year. This lag time helped to ensure that continuity occurred prior to hospitalization (therefore addressing the question of whether higher continuity can prevent hospitalization), rather than as a result of hospitalizations (as would occur with follow-up visits after a serious illness). Provider continuity was measured using a previously published continuity index. The equation for this index is:

\[
\text{Continuity Score} = \frac{1 - (\text{No. of Ambulatory Providers} / \text{No. of Ambulatory Visits})}{1 - (1 / (\text{No. of Ambulatory Visits} + 0.1))}
\]

This continuity score ranges from approximately 0 (if each visit is to a different provider) to 1 (if all visits are to the same provider). We chose this index rather than the more commonly used “usual provider continuity” index because it accounts for the total number of providers seen rather than being a simple ratio of the visits to the predominant provider, but does not overcompensate for the number of providers. We also conducted an additional analysis using the usual provider continuity index, but the results did not differ significantly from the main results and are not reported.

Ambulatory care visits were defined as face-to-face encounters with physicians or physician extenders (nurse practitioners and physician assistants). We included visits to physician offices, clinics, and emergency departments but excluded special procedures (eg, outpatient surgery) and visits to nonphysician providers (eg, chiropractors, optometrists, and psychologists). Visits were identified if there was either a physician’s Health Care Financing Administration (HCFA)-1500 claim with an appropriate Current Procedural Terminology (CPT) code or a facility’s UB-92 claim with an appropriate revenue code. These 2 types of claims were cross-checked to ensure that visits were not counted twice. Individual providers were identified by the “performing provider” on the Medicaid claims.

Because of the limitations of claims data in accurately identifying providers, we conducted the analysis using 2 different sets of alternative assumptions. First, we were not able to identify an individual provider for 25,446 ambulatory visits (18.5% of total) that had no performing provider listed on the claim. Therefore we ran the analysis using both an “optimistic” assumption (which would tend to overestimate continuity) and a “pessimistic” assumption (which would tend to underestimate continuity). In the optimistic assumption we considered the performing provider to be the same person for all visits to the same site (as determined by the billing provider on the claim). In the pessimistic assumption we considered that when the performing provider was not listed, the true provider was different from the provider for any other visit. We thought that the pessimistic assumption was likely closer to reality because most cases of missing performing providers were from hospital emergency departments, where patients are not seen by a single provider.

As presented in Table 1, the study population consists primarily of children, women, nonwhites, and AFDC patients. This is consistent with the demographics of the Medicaid population. During the first year of the study, 33% of patients made 3 to 4 ambulatory visits, 22% made 5 to 6 visits, 19% made 7 to 9 visits, and 26% made more than 9 visits. The mean continuity score for the population was 0.50.

Overall, 11.9% of patients were hospitalized during the second year of the study. In the bivariate analyses, the mean continuity score was lower for persons with a hospitalization compared with those who were not hospitalized (0.48 vs 0.51; P < .01). After stratifying by the number of ambulatory visits, the difference between the groups became much greater, as given in Table 2. Figure 1 shows that for all visit categories, the percentage of persons hospitalized decreased with increasing continuity scores. A logistic regression model that controlled for the number of ambulatory visits indicated that the likelihood...
unlikely to see the same provider on different occasions. Therefore we used this assumption as our primary analysis. When we used the optimistic assumption, the final results did not change substantially and are not reported.

Second, for visits to residency teaching sites, patient care is often provided primarily by a resident physician. However, the claim always listed the supervising attending physician as the performing provider, even if that physician did not provide most of the direct care. Our primary analysis used the optimistic assumption that this attending physician was the true provider, because the HCFA rules require that the attending physician of record direct the care of the patient. However, in some cases it could be that the attending physician's involvement was too peripheral to accurately consider him or her as the true provider. We ran an alternative analysis using the pessimistic assumption that the true provider was unknown, and therefore each visit to a residency site was considered to be to a different provider. The results did not change substantially using this alternative assumption and are therefore not reported.

The main outcome variable was a dichotomous variable indicating whether each patient had an acute inpatient hospital admission during the second year of the study. Hospitalizations were defined by having a provider code for an "acute inpatient hospital" on a UB-92 claim. Claims separated by fewer than 2 days were considered to be for the same hospitalization. We measured hospitalizations for all conditions as well as for ACSCs. Ambulatory care-sensitive conditions are defined by the Institute of Medicine (IOM) as conditions for which good access to primary care should reduce the need for hospitalization.1

The IOM defines 2 different types of ACSCs, which we analyzed separately: chronic conditions (angina, asthma, grand mal seizures, other convulsions, chronic obstructive pulmonary disease, congestive heart failure, diabetes mellitus, hypoglycemia, and hypertension) and acute conditions (bacterial pneumonia, cellulitis, dehydration, gastroenteritis, urinary tract infections, severe ear, nose, and throat infections, and dental conditions). Diagnoses were defined by the primary diagnosis on the first claim for the hospitalization. We did an additional analysis including all hospitalizations except deliveries (either abortions, stillbirths, or live newborns), because of the hypothesis that these admissions should not be affected by continuity. However, the results for this analysis were similar to those for total hospitalizations and are not reported.

Control variables were defined during the same period as continuity (the first year of the study), and included age (categorized as 0-4, 5-14, 15-24, 25-44, or 45-64 years), sex, county of residence (New Castle, Kent, or Sussex), Medicaid eligibility category (SSI or AFDC/extended eligibility), number of ambulatory visits, and case mix. Case mix was defined by ambulatory diagnostic groups (ADGs).10 Each of 34 ADGs represents a group of related medical conditions. Patients are dichotomized according to whether they had a diagnosis in each ADG during the first year of the study. Detailed information on the algorithms used for ADGs as well as those used to count ambulatory visits, hospital admissions, and ACSCs are available from the authors on request.

Bivariate analyses were conducted to determine whether continuity in year 1 of the study was associated with the probability of hospitalization in year 2. This was done for each of the 3 types of hospitalizations: total hospitalizations, chronic ACSCs, and acute ACSCs. We compared the mean continuity score for persons with and without a hospitalization, using the Student t test. We found that the number of ambulatory visits was a strong negative confounder of the association between continuity and hospitalization; thus, we conducted this and all subsequent analyses after stratifying by the number of ambulatory visits in year 1 (3-4, 5-6, 7-9, or ≥9). Next we determined whether the percentage of patients hospitalized decreased as continuity increased, using the Mantel-Haenszel test for linear association. Finally we determined whether the probability of a hospitalization decreased with increasing continuity, using a logistic regression to estimate odds ratios (ORs) and 95% confidence intervals (CIs). This was done controlling only for the number of ambulatory visits, and again after additionally controlling for patient age, sex, race, county, eligibility category, and ADGs. For all analyses, we used the statistical package SPSS PC +.18 P<.05 was considered statistically significant.

This study shows that for the Medicaid population in Delaware, high continuity is associated with a lower likelihood of future hospitalization. This was true even after controlling for other predictors of hospitalization, such as age, disability (as determined by SSI eligibility), number of ambulatory visits, and case mix. This finding may seem obvious, given the widely held belief that continuity is beneficial. However, only 1 previous study has directly examined this issue,4 and found that improved continuity had no effect on hospitalization rates for elderly men in a Veterans Administration clinic. Our study pro-

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vides the first direct evidence that we know of to support the hypothesis that continuity can be beneficial in reducing hospitalizations.

There are several reasons why continuity may reduce the likelihood of hospitalization. First, the decision to hospitalize a patient is complex and involves an assessment not only of the patient’s current medical condition but also his or her previous medical problems, risk of worsening, and ability to understand and adhere to an outpatient treatment regimen. A physician who sees the patient regularly is more likely to have this knowledge, and would be better able to determine whether the patient can be managed at home. Previous studies have found that when patients have a continuity physician, they are more likely to adhere to outpatient medication recommendations and their physicians are more likely to recognize problems. Also, patients with high continuity tend to be more satisfied with their care. This higher satisfaction may result in a greater trust in the physician and a greater willingness to manage serious medical problems at home.

Given these reasons why continuity may reduce hospitalizations, our findings on hospitalizations for ACSCs may seem surprising. If continuity leads to fewer hospitalizations, then one would assume that the effect would be greatest for those conditions that are the most amenable to primary care interventions. However, we found continuity to have a significant effect on hospitalization only for chronic ACSCs, and this effect was no greater than what we found for total hospitalizations.

While these findings may seem surprising on the surface, it is not so surprising when one looks at the previous literature on ACSCs. The IOM’s concept of ACSCs is intuitively appealing but has not been well validated. One study found fewer ACSC hospitalizations in regions where more patients had a regular source of care, but studies using a patient-level analysis have not found a similar association. Another study found lower ACSC hospitalization rates in areas with more family physicians or general practitioners, but not in areas with more general internists and pediatricians. A larger study using Medicare data found the supply of generalist physicians to have no effect on ACSC hospitalizations. This study casts further doubt on the validity of ACSCs as a measure of access or quality of care. Before ACSCs can be considered a well-validated construct, studies are needed to determine which components of ambulatory care ACSCs may be sensitive to (if any) and whether specific individual conditions may be more sensitive than

Table 1. Characteristics of Study Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (% of Patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>4322 (32.0)</td>
</tr>
<tr>
<td>5-14</td>
<td>3762 (27.9)</td>
</tr>
<tr>
<td>15-24</td>
<td>1805 (13.4)</td>
</tr>
<tr>
<td>24-44</td>
<td>2448 (18.1)</td>
</tr>
<tr>
<td>45-64</td>
<td>1158 (8.6)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5131 (38.0)</td>
</tr>
<tr>
<td>Female</td>
<td>8364 (62.0)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>5229 (39.5)</td>
</tr>
<tr>
<td>Black</td>
<td>7128 (52.8)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>826 (6.1)</td>
</tr>
<tr>
<td>Other/unknown</td>
<td>211 (1.6)</td>
</tr>
<tr>
<td>County</td>
<td></td>
</tr>
<tr>
<td>Kent</td>
<td>2891 (21.4)</td>
</tr>
<tr>
<td>New Castle</td>
<td>7427 (55.0)</td>
</tr>
<tr>
<td>Sussex</td>
<td>3177 (23.5)</td>
</tr>
<tr>
<td>Medicaid eligibility*</td>
<td></td>
</tr>
<tr>
<td>AFDC or extended eligibility</td>
<td>10 155 (75.3)</td>
</tr>
<tr>
<td>SSI</td>
<td>3340 (24.7)</td>
</tr>
<tr>
<td>No. of ambulatory visits in year 1</td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td>4480 (33.2)</td>
</tr>
<tr>
<td>5-6</td>
<td>2987 (22.1)</td>
</tr>
<tr>
<td>7-9</td>
<td>2579 (19.1)</td>
</tr>
<tr>
<td>≥10</td>
<td>3449 (25.6)</td>
</tr>
<tr>
<td>Total</td>
<td>13 495 (100)</td>
</tr>
</tbody>
</table>

*AFDC indicates Aid to Families With Dependent Children; SSI, Supplemental Security Income.

Table 2. Mean Continuity Scores for 13 495 Patients With and Without an Inpatient Hospitalization*

<table>
<thead>
<tr>
<th>No. of Ambulatory Visits in Year 1</th>
<th>3-4</th>
<th>5-6</th>
<th>7-9</th>
<th>≥10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalized in year 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.35†</td>
<td>0.40†</td>
<td>0.47†</td>
<td>0.58†</td>
<td>0.48‡</td>
</tr>
<tr>
<td>No</td>
<td>0.41</td>
<td>0.48</td>
<td>0.55</td>
<td>0.63</td>
<td>0.51</td>
</tr>
<tr>
<td>Hospitalized for a chronic ACSC in year 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.32</td>
<td>0.41</td>
<td>0.56</td>
<td>0.62</td>
<td>0.53</td>
</tr>
<tr>
<td>No</td>
<td>0.41</td>
<td>0.48</td>
<td>0.54</td>
<td>0.62</td>
<td>0.50</td>
</tr>
<tr>
<td>Hospitalized for an acute ACSC in year 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.37</td>
<td>0.47</td>
<td>0.55</td>
<td>0.60</td>
<td>0.53</td>
</tr>
<tr>
<td>No</td>
<td>0.41</td>
<td>0.47</td>
<td>0.54</td>
<td>0.62</td>
<td>0.50</td>
</tr>
</tbody>
</table>

*ACSC indicates ambulatory care-sensitive condition. †P < .001 for differences between clients with and without a hospitalization by Student t test.‡P < .01 for differences between clients with and without a hospitalization by Student t test.

Figure 1. Effect of provider continuity on hospitalization. Asterisk indicates P < .001; dagger, P < .01 (Mantel-Haenszel test for linear association).
others to these components. Such a detailed analysis of ACSCs is beyond the scope of this article.

There are several limitations that must be considered when interpreting the results of our study. First, our outcome variable was the probability of a single hospitalization rather than hospitalization rates or hospital days. While our study did not examine multiple admissions, previous studies have suggested that providing a continuity physician does not reduce the likelihood of readmission. However, other studies have suggested that continuity may reduce length of stay even when it does not reduce hospital rates. Also, because we measured hospitalizations in the second year of a 2-year period, we did not include any hospitalizations in the first year of life, which represent a significant proportion of hospitalizations for young children.

There are also inherent limitations in using claims data to estimate utilization. There is a possibility of data undercounting and miscoding may have affected our measures of ACSCs or case-mix. Although we have no reason to suspect a systematic difference in diagnostic errors for persons with different continuity scores, we were not able to assess this as we did not directly measure the accuracy of our claims data.

Finally, there are limitations to the generalizability of the study. We only included patients who were non-elderly and continuously enrolled. This has been done in many other studies using Medicaid claims data to optimize the validity of the claims data. However, the results cannot be generalized to Medicaid patients who are elderly or who are intermittently enrolled, which are populations that may utilize health care differently from our study population. Also, our study involved Medicaid patients in 1 small state, and we excluded persons with fewer than 3 visits because continuity scores may not be valid for low utilizers (for example, all persons with 1 visit would have a score of 1). Results may differ for patients who are non-Medicaid, who reside in other states, or who are non-elderly or who are intermittently enrolled, which are populations that may utilize health care differently from our study population. Also, our study involved Medicaid patients in 1 small state, and we excluded persons with fewer than 3 visits because continuity scores may not be valid for low utilizers (for example, all persons with 1 visit would have a score of 1). Results may differ for patients who are non-Medicaid, who reside in other states, or who are non-elderly or who are intermittently enrolled, which are populations that may utilize health care differently from our study population.

Despite these limitations, our findings have significant implications for health care policy, especially as cost containment becomes increasingly important. Our study suggests that encouraging patients to focus their care with 1 primary care physician may lead to fewer hospitalizations and lower costs. This hypothesis is supported by previous studies that have found lower cost among pa-

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tients who have a long-term relationship with their physician, as well as studies that show primary care physicians to provide care that is less costly and at least as effective as that provided by specialists.

These findings could also be used to argue that managed care can reduce costs. One of the goals of managed care is to provide all patients with a primary care physician who can provide comprehensive and continuous care. The findings of our study may partly explain why some managed care programs have resulted in decreased hospitalization rates. However, not all managed care programs have seen these decreases, especially those targeted to Medicaid populations. One reason could be that managed care does not necessarily improve provider continuity and may even decrease continuity, especially if patients are required to change primary care physicians when they change insurance plans. If it is found that the benefits of managed care are largely due to provider continuity then it will become important to encourage managed care policies that facilitate provider continuity even when patients change insurance plans.

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