

# Variation in Triple Aim Measures: Implications of Clinical Signatures in Family Medicine Residency Programs

Cristen P. Page, MD, MPH

Alfred Reid, MA

Christina Drostin, MD, MPH

Warren P. Newton, MD, MPH

## ABSTRACT

**Background** Evidence from several specialties suggests that practice patterns developed in residency influence the quality and cost of care long after completion of training. Improving the quality, cost, and patient experience of care (the “Triple Aim”) is foundational to future health systems change.

**Objective** We measured variation in Triple Aim measures among family medicine residency programs in a regional quality improvement collaborative (I<sup>3</sup> Population Health Collaborative).

**Methods** We calculated medians and interquartile ranges for each of 11 Triple Aim measures and compared them with median splits of population and practice characteristics, including payer mix, patient race and age, electronic health record used, registry use, and National Committee for Quality Assurance patient-centered medical home recognition.

**Results** All 22 participating family medicine residency programs provided baseline data. The number of practices reporting data on individual measures ranged from 9 to 17 (41%–77%). We found variation averaging 51% across all measures, from a low of 12% for readmission rates to 94% for emergency department visit rates. Variations were stable over time. We found no significant relationships between practice or population characteristics and measures, nor between practice characteristics and outcomes variation.

**Conclusions** The 22 family medicine residency programs in our study showed substantial variation in quality, cost, and patient experience of care. These variations did not appear to result from differences in practice characteristics, payer mix, or patient demographics.

## Introduction

Research has suggested that practice patterns developed in residency persist in graduates long after they enter practice. One study found a correlation between obstetrics and gynecology residency programs’ ranking of 9 objective patient quality of care measures, and rates of surgical complication among graduates 15 years postresidency.<sup>1</sup> Using answers to board questions as a measure of conservative versus aggressive management, research in internal medicine showed graduates who trained in low-intensity medical practices during residency were better at recognizing when conservative management was the best approach.<sup>2</sup> Recent research found a strong relationship between residency training in a lower-cost setting and Medicare expenditures many years later.<sup>3</sup>

Imprinting clinical practice styles has implications for health care quality, health systems change, and health care reform. Foundational to health systems change is the “Triple Aim”—improving population health, enhancing the patient experience, and

reducing cost.<sup>4</sup> Making progress in the Triple Aim depends critically on a primary care workforce capable of achieving its goals. It is thus crucial to assess how family medicine residency programs implement the Triple Aim in their clinical practices.

We used data from the I<sup>3</sup> Population Health Collaborative (I<sup>3</sup> POP Collaborative) to explore variation in implementation of the Triple Aim across family medicine residencies. Since 2005, the I<sup>3</sup> POP Collaborative has focused on practice transformation among primary care residency programs across North Carolina, South Carolina, and Virginia.<sup>5,6</sup> The third phase (2012–2015) focused on implementing the Triple Aim for the populations cared for by participating residency programs.<sup>7,8</sup>

We investigated the variation in Triple Aim measures within the I<sup>3</sup> POP Collaborative and explored relationships between these measures and population and practice characteristics.

## Methods

### Setting and Collaborative Design

The I<sup>3</sup> POP Collaborative tailored the Institute for Healthcare Improvement Breakthrough Series

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Collaborative design<sup>9</sup> to address the Triple Aim in primary care residency programs. Detailed descriptions of methods are published elsewhere.<sup>7,8</sup> As prework in early 2012, 22 family medicine, 3 internal medicine, and 4 pediatrics residency programs in North Carolina, South Carolina, and Virginia responded to an initial survey and reported program and practice characteristics, including size and setting of the residency, number of physicians, other health professionals and staff, electronic health record used, faculty physician involvement in acquisition and reporting of quality data, and program priorities for improvement. An initial planning meeting finalized measures and endorsed the overall design of the collaborative. Participating programs identified inter-professional practice improvement teams, including faculty, residents, and staff, and participated in face-to-face meetings every 6 months as well as monthly webinars on the components of the Triple Aim. In this article, we focus on the 22 family medicine residency programs that provided baseline data on practice characteristics (summarized in TABLE 1) and core measures.

### Population and Core Measures

The index population was active patients, defined as patients with more than 1 visit in the 18 months prior to the start of the collaborative, and was recalculated annually. Chronic care and preventive care quality core measures (see TABLE 2) were chosen to maximize consistency with established national standards (eg, National Quality Forum, National Center for Quality Assurance, Physician Consortium for Performance Improvement) and existing or emerging practice requirements such as Meaningful Use of Health Information Technology mandated by the Affordable Care Act. Cost was operationalized by utilization rates (rates of hospitalization, readmission, emergency department visits, high-end radiology use, specialty referral). Patient experience was measured by days to third available appointment, a measure of access, and average practice usual provider continuity rate.<sup>10</sup> Further details on measure specifications are provided in other publications.<sup>7,8</sup> Residency programs participated extensively in the definition of the measures. To maximize alignment with health systems' quality improvement priorities, each program selected measures from each component of the Triple Aim on which to focus local improvement efforts. We collected population and Triple Aim metrics annually and updated practice characteristics after 2 years.

The University of North Carolina Institutional Review Board approved the baseline data and initial

#### What was known and gap

Research suggests practice patterns developed in residency influence care long after training. Improving the quality, cost, and patient experience of care (the "Triple Aim") during residency may be foundational to future health systems change.

#### What is new

A study measured variation in Triple Aim metrics across 22 family medicine residency programs participating in a regional quality improvement collaborative.

#### Limitations

Single specialty study limits generalizability; retrospective data collection may not have assessed all pertinent factors.

#### Bottom line

Variations across programs were stable over time, and were not explained by patient population or residency program characteristics.

assessment protocols, and exempted the core measures from further review.

### Analyses

All statistical analyses were performed using Stata version 10.1 (StataCorp LLC, College Station, TX). For all measures except days to third available appointment, we calculated the percent variation as the difference between maximum and minimum value for the measure. Data were significantly skewed so the Wilcoxon rank sum test was used to compare median splits of each measure against each practice characteristic, including patient age distribution, proportion of non-white patients, and payer mix. Age and race/ethnicity distribution and payer mix were used to estimate the variation across residency programs in vulnerable populations, and confounding due to differences in acuity and socioeconomic status. We used Wilcoxon matched-pairs signed rank test to assess changes in practice characteristics over time. Statistical tests were corrected for multiple comparisons.

### Results

All 22 family medicine programs provided data on practice characteristics (TABLE 1) and core measures (TABLE 2); the number of practices reporting any given measure ranged from 9 to 17. We found no statistically significant relationship between any of the core measures and patient age distribution, proportion of non-white patients, payer mix, or any other practice characteristics enumerated in TABLE 1. We also did not find significant changes in practice characteristics or magnitude of variation in the 2 years after baseline data collection. The FIGURE illustrates variation in core measures. We found an average 51% difference across the ranges of all

TABLE 1

Characteristics of I<sup>3</sup> Collaborative Family Medicine Programs

| Characteristics                     | N       | %  |
|-------------------------------------|---------|----|
| EHR                                 |         |    |
| AHLTA                               | 1       | 5  |
| Allscripts                          | 7       | 32 |
| Centricity                          | 5       | 23 |
| Cerner                              | 1       | 5  |
| Epic                                | 6       | 27 |
| Medinformatix                       | 1       | 5  |
| WebCIS                              | 1       | 5  |
| EHR in transition                   | 6       | 27 |
| University setting                  | 4       | 18 |
| Practice used a registry            | 21      | 95 |
| Faculty involved in data management | 8       | 36 |
| NCQA PCMH recognition               | 18      | 82 |
| Physicians: faculty/fellows         | 256     |    |
| Residents                           | 405     |    |
| Active patients                     | 195 638 |    |
| No. of visits by active patients    | 655 307 |    |
| Non-white                           | 89 993  | 46 |
| Age < 18                            | 395 128 | 20 |
| Age 18–64                           | 133 034 | 68 |
| Age > 64                            | 23 477  | 12 |
| Medicare                            | 44 997  | 23 |
| Medicaid                            | 46 953  | 24 |
| Uninsured                           | 84 124  | 43 |
| Commercial                          | 21 520  | 11 |

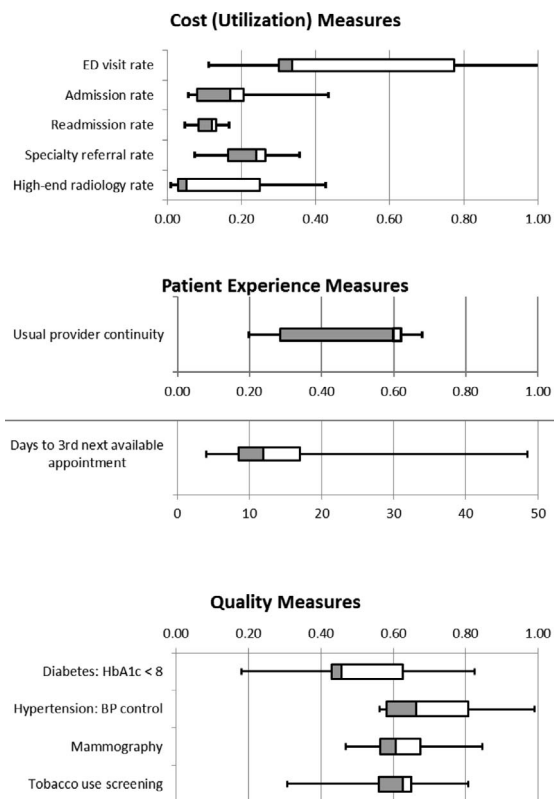
Abbreviations: EHR, electronic health record; NCQA, National Committee for Quality Assurance; PCMH, patient-centered medical home.

measures. The greatest included a 94% difference in reported number of emergency department visits per 100 patients, a 48% difference in average practice usual provider continuity, and a 64% difference in the proportion of diabetics with HbA1c < 8%.

## Discussion

Our results demonstrate substantial variation across family medicine residency programs in each component of the Triple Aim. This variation was stable over time and was not explained by population characteristics—patient age, insurance status, or proportion of minority patients—or by organizational characteristics of the residency programs.

These differences across programs may be both clinically and educationally important. For quality of care, they appear to represent large variations in the quality of diabetes care and preventive care. With respect to patient experience, the difference between a patient having one-fifth of his or her total primary



FIGURE

Variation in I<sup>3</sup> Collaborative Core Measures at Baseline

Note: The second quartile (gray bar) is separated from the third quartile (white bar) by the median. Whiskers indicate minimum and maximum values.

care visits with the same physician contrasted with two-thirds, has educational and patient care implications in family medicine, which has made continuity of care a foundation of residency. Finally, with respect to utilization of care, there were substantial differences across residencies in admission rate, readmission rate, and emergency department visit rate. Future clinical integrated networks and insurers, which hire residency graduates, will expect residents to achieve high quality chronic care with optimum use of emergency departments and hospitalization.

Our findings are consistent with published literature in other specialties. A variety of studies have noted significant variations across residency programs in several specialties in clinical quality and safety and in the cost of care.<sup>1–3</sup> In family medicine, our prior work has noted differences in access and continuity measured across family medicine programs.<sup>5–8,10,11</sup> Our results are consistent with the extensive literature in local variations in care by small area and by hospital service area.<sup>12</sup> What is relatively novel in our data is the finding of significant variation across residency programs in all components of the Triple

TABLE 2

I<sup>3</sup> Collaborative Core Measures

| Measures                                                                                                   | Programs Reporting, n (%) | Patients | Median, % | Range, %  | Variation, % |
|------------------------------------------------------------------------------------------------------------|---------------------------|----------|-----------|-----------|--------------|
| <b>Cost (Utilization) Rates per 100 patients</b>                                                           |                           |          |           |           |              |
| High-end radiology rate                                                                                    | 13 (59)                   | 137 319  | 5         | 1–43      | 42           |
| Specialty referral rate                                                                                    | 14 (64)                   | 138 497  | 24        | 7–36      | 28           |
| Readmission rate                                                                                           | 13 (59)                   | 121 906  | 12        | 5–17      | 12           |
| Admission rate                                                                                             | 15 (68)                   | 164 313  | 17        | 6–43      | 38           |
| ED visit rate                                                                                              | 11 (50)                   | 89 783   | 33        | 10–105    | 94           |
| <b>Patient Experience</b>                                                                                  |                           |          |           |           |              |
| Usual provider continuity<br><i>Practice average proportion of patients' visits with assigned provider</i> | 11 (50)                   | 125 510  | 60        | 20–68     | 48           |
| Days to third next available appointment                                                                   | 17 (77)                   | 157 541  | 12 days   | 4–49 days | 45 days      |
| <b>Quality of Care Rates per 100 patients</b>                                                              |                           |          |           |           |              |
| Diabetes: HbA1c < 8<br><i>Rate per 100 diabetic patients</i>                                               | 17 (77)                   | 13 945   | 46        | 18–83     | 64           |
| Hypertension: BP < 140/90<br><i>Rate per 100 hypertensive patients</i>                                     | 14 (64)                   | 33 180   | 66        | 56–99     | 43           |
| Mammography<br><i>Rate per 100 eligible women</i>                                                          | 9 (41)                    | 22 678   | 61        | 47–85     | 38           |
| Tobacco use screening<br><i>Rate per 100 patients</i>                                                      | 12 (55)                   | 79 451   | 63        | 31–81     | 50           |

Abbreviations; ED, emergency department; BP, blood pressure.

Aim, with these metrics foundational to health systems change.

The link between the training environment and future performance and outcomes in practice is gaining national recognition across specialties and settings. The American College of Surgeons has advocated for the use of a tool that measures the quality of patient outcomes, suggesting it could be used for benchmarking and to stimulate competition to raise education standards.<sup>13</sup> The University of Florida College of Medicine has implemented a tool based on patient outcomes to evaluate its Accreditation Council for Graduate Medical Education (ACGME) accredited training programs.<sup>14</sup> Some medical schools encourage students to look at the hospital quality measures of the residency programs in which they plan to apply as a measure of the kind of physician they will become.<sup>15,16</sup> Finally, in ACGME Clinical Learning Environment Review visits, a great deal of attention focuses on the culture of quality and safety in teaching hospitals.<sup>17</sup>

Our study has limitations. The design did not allow for detailed control of patient acuity, multiple comorbidities, or socioeconomic status. Another limitation is its single specialty status, which limits the generalizability of findings to other primary care residencies. All participating programs were located

in the southeast United States, and there may be regional variation in the scope of practice of family medicine across the country. Data were not collected prospectively, and we were able to obtain only partial data from some programs due to changes in electronic health record system and institutional information technology priorities.<sup>7,8</sup> Finally, variation in response rates across programs may have influenced the variation among metrics.

Future research should address the generalizability of our findings to other regions in the United States, and to other primary care specialties. Prospective studies should collect patient acuity and socioeconomic factors in addition to practice characteristics and physician performance factors to better understand practice differences. If confirmed, our findings support the practice of using clinical outcomes as a criterion for accreditation of family medicine programs.

## Conclusion

Family medicine residency programs in our study showed substantial variation in each component of the Triple Aim. Variations were stable over time and were not explained by patient population or residency program characteristics.

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**Cristen P. Page, MD, MPH**, is William B. Aycock Distinguished Professor and Chair, Department of Family Medicine, University of North Carolina at Chapel Hill; **Alfred Reid, MA**, is Research Associate Professor, Department of Family Medicine, University of North Carolina at Chapel Hill; **Christina Drostin, MD, MPH**, is a Family Physician, Choptank Community Health System; and **Warren P. Newton, MD, MPH**, is Emeritus Professor, Department of Family Medicine, University of North Carolina at Chapel Hill, and President and CEO, American Board of Family Medicine.

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Corresponding author: Cristen P. Page, MD, MPH, University of North Carolina at Chapel Hill, Department of Family Medicine, CB #7595, 590 Manning Drive, Chapel Hill, NC 27599-7595, 919.843.2284, fax 919.966.6125, [cristy\\_page@med.unc.edu](mailto:cristy_page@med.unc.edu)

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