Exploring Care Attributes of Nephrologists Ranking Favorably on Measures of Value

Brian M. Brady, Meera V. Ragavan, Melora Simon, Glenn M. Chertow, and Arnold Milstein

Division of Nephrology, Clinical Excellence Research Center, and Department of Medicine, Stanford University School of Medicine, Stanford, California

ABSTRACT
Background Despite growth in value-based payment, attributes of nephrology care associated with payer-defined value remains unexplored.

Methods Using national health insurance claims data from private preferred provider organization plans, we ranked nephrology practices using total cost of care and a composite of common quality metrics. Blinded to practice rankings, we conducted site visits at four highly ranked and three average ranked practices to identify care attributes more frequently present in highly ranked practices. A panel of nephrologists used a modified Delphi method to score each distinguishing attribute on its potential to affect quality and cost of care and ease of transfer to other nephrology practices.

Results Compared with average-value peers, high-value practices were located in areas with a relatively higher proportion of black and Hispanic patients and a lower proportion of patients aged >65 years. Mean risk-adjusted per capita monthly total spending was 24% lower for high-value practices. Twelve attributes comprising five general themes were observed more frequently in high-value nephrology practices: preventing near-term costly health crises, supporting patient self-care, maximizing effectiveness of office visits, selecting cost-effective diagnostic and treatment options, and developing infrastructure to support high-value care. The Delphi panel rated four attributes highly on effect and transferability: rapidly adjustable office visit frequency for unstable patients, close monitoring and management to preserve kidney function, early planning for vascular access, and education to support self-management at every contact.

Conclusions Findings from this small-scale exploratory study may serve as a starting point for nephrologists seeking to improve on payer-specified value measures.

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Correspondence: Dr. Brian M. Brady, Clinical Excellence Research Center, Stanford University School of Medicine, 365 Lassuen Street, Stanford, CA 94305. Email: bbrady2@stanford.edu

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Nephrology care is complex, costly, and variably delivered. In response to pressure from policymakers working to slow rising United States health care costs without sacrificing quality of care, federal and private payers are increasing use of value-based payment and physician network inclusion. Because ESRD is the only disease-based entitlement to Medicare coverage, nephrologists are no strangers to a practice environment shaped by payers. The ESRD Quality Incentive Program provides incentives to nephrologists and dialysis providers to deliver high-quality care by imposing financial penalties on those who do not meet federal quality standards. Because quality is only part of the value equation, most nephrologists will soon have some accountability for the total cost of the care incurred by their Medicare patients.
The Medicare Access and CHIP Reauthorization Act (MACRA) of 2015 established a value-based payment system that includes positive and negative payment adjustments of as much as 9%, on the basis of measures of quality and efficient resource use.13 Although large health systems such as Kaiser Permanente, the Veterans Administration, and the Cleveland Clinic Foundation use scale-dependent strategies to improve the value of care,14 little is known about how smaller- and medium-sized physician practices deliver high-quality care with less combined spending by patients and payers (“total cost of care”). Recent small-scale exploratory studies of primary care and oncology practices using study designs similar to this study identified care delivery attributes that distinguish practices ranking more favorably on payer-defined measures of value than their peers.15,16 We used a similar mixed-methods positive deviance study design to identify attributes that may be transferable to improve care.17,18

**Significance Statement**

As federal and private payers move toward value-based payment, the authors sought to identify attributes of nephrology care associated with payer-defined value. The authors conducted site visits at United States nephrology practices ranking near the top or ranking near the 50th percentile on measures of quality and total cost of care commonly used by payers. They identified 12 care attributes common in highly ranked nephrology practices that fell into five themes: preventing near-term costly health crises, supporting patient self-care, maximizing effectiveness of office visits, selecting cost-effective diagnostic and treatment options, and developing infrastructure to support high-value care. A panel of nephrologists predicted that four value-based practices may be easiest to transfer to less-favorably ranked peers: rapidly adjustable office visit frequency for unstable patients, close monitoring and management to preserve kidney function, early planning for vascular access, and education to support self-management at every contact. Findings from this exploratory study may serve as a starting point for United States nephrologists who face increasingly value-sensitive payers and patients.

**METHODS**

**Study Design**

Our small-scale exploratory research design combined quantitative and qualitative assessment to identify care attributes more frequently present in nephrology practices ranking favorably on payer-defined measures of value. Similar mixed-methods positive deviance studies have been applied to infection control, in-hospital mortality, and adoption of evidence-based care processes.18–20 This quality improvement study of organizations was granted exempt status by the Stanford Institutional Review Board.

**Data Sources**

We used health insurance claims data to rank practices on risk-adjusted total annual per capita spending for attributed patients and on a composite quality score comprising measures selected by a group of expert nephrologists from those commonly used by payers. The ranking was on the basis of an analysis from Intercontinental Medical Statistics (IMS) Health’s PharmetricsPlus data set that contains medical and pharmaceutical claims records for >60 million Americans with preferred provider organization health insurance. The data set includes patients aged 0–64 years with continuous enrollment in the same insurance plan for at least 12 months between July 2010 and June 2013. An additional linked data set, IMS Health’s OneKey containing descriptive provider data such as the specialties of physicians sharing a practice, was analyzed to identify individual nephrology practices. The unit of analysis for this study was a medical practice with at least one nephrologist. The data set was sufficient to rank 307 nephrology practices, representing a 4% sample of all United States nephrology practices (Supplemental Table 1).

**Identifying and Ranking Practices on Value**

To assess care quality, a senior nephrologist selected nine quality-of-care measures relevant to nephrology that were calculable with the IMS data set and either used by the Centers for Medicare and Medicaid Services or endorsed by the National Quality Forum, assigned a subjective weight to each measure on the basis of its importance in nephrology care, and categorized them into three domains (Supplemental Table 2). To assess health care spending, we aggregated all claims incurred by each patient receiving nephrology care within each 12-month period to calculate the total cost of care per patient-year. Patient-years were attributed to the nephrology provider whose payer-allowable charges accounted for the highest percentage of payer-allowable charges within a given year. Nephrology providers practicing at the same address were grouped, and nephrology groups were included in the analysis if they had at least 30 patient-years attributed to them (Supplemental Tables 3 and 4). Because the lack of a national all-payer claims database requires analysis of small patient sample sizes per practice site, we used an independent scientific panel to make analytic decisions such as the 30 patient minimum sample size, outlier trimming, and patient attribution to a practice. The scientific panel comprised individuals who had published assessments in peer-reviewed journals with high-effect ratings of the validity of measures of clinician cost and/or quality of care.

We adjusted average payer-allowable annual health care cost for severity of illness by assigning each patient-year to a clinical risk group (CRG)21 using 3M Clinical Risk Group Software (Supplemental Table 5). Cost adjustment using CRGs is similar, although not identical, to using case-mix index in that it accounts for important comorbid conditions, such as coincident diabetes and transplant status, when adjusting health care costs. We accounted for geographic cost variation by using the multiplier used by Medicare for regional cost adjustment. We compared per-patient-per-month costs (observed costs) to an average per-patient-per-month cost for each CRG in our data set (expected costs). These data were then used to construct an observed to expected ratio of costs by CRG for each
nephrology practice. We weighted this ratio for each practice on the basis of the number of individuals in each CRG attributed to the practice. We ranked the practices by this weighted observed to expected ratio of health care spending, with a lower ratio equating to a higher ranking (Supplemental Material).

We arbitrarily classified a nephrology practice as a high-value practice if it ranked in the top quartile on both quality and cost. If a practice’s quality and cost scores fell ten percentage points or less from the 50th percentile ranking, we classified it as an average-value practice. We used purposeful sampling to select and sequence a list of practices from across the country and with a case-mix index near the national median to recruit for site visits. We also excluded practices providing only pediatric care as well as those without a board-certified nephrologist. Within each of the two groups, the sequence for recruitment favored higher performance on quality and cost measures. We used the resulting sequence to recruit four high-value and three average-value practices for site visits.

Identifying Care Attributes Distinguishing High-Value Practices via Site Visits
We conducted site visits to seven nephrology practices (four high-value and three average-value sites) between August 2014 and February 2015. A team consisting of a practicing nephrologist and a qualitative researcher conducted an 8-hour visit to each of the practices. Blinded to the ranking of the practices, the team interviewed practice team members, including physicians, nurses, medical assistants, and other staff, using a standardized interview guide. The guide consisted of (1) open-ended questions to elicit participants’ perspectives on attributes of their care likely to contribute to favorable ranking on value; (2) several nephrology patient vignettes designed to elicit approaches to diagnosis and treatment; and (3) questions about nonclinical attributes such as practice size, staffing composition, and electronic medical record use.

After each site visit, a qualitative researcher debriefed the field team in a structured, recorded telephone interview. The site visit team also prepared a report describing attributes of care delivery they believed contributed to superior value. Our centrally located team trained in qualitative analysis then reviewed debriefing notes and field reports, and used grounded theory to categorize and compile commonly observed practice attributes. Finally, we developed a scoring grid to rate the degree to which each attribute was present at each site (Supplemental Table 6).

Assessing the Face Validity and Transferability of Care Attributes Distinguishing High-Value Practices
To assess the face validity and transferability of care attributes associated with high-value practices, we used a modified Delphi method. Three experienced nephrologists scored each attribute on a one to five scale (five representing the highest score) for its potential effect on quality, cost, and on its transferability to less favorably ranked practices. We defined transferability as the degree to which a nephrology practice was likely to adopt each practice attribute under two reimbursement scenarios: (1) in today’s predominantly fee-for-service reimbursement system, and (2) in a predominantly value-based reimbursement system.

RESULTS
Baseline Characteristics
The seven practices subject to site visits ranged between 1 and 20 nephrologists. High-value practices had fewer attributed patients than average-value practices. The case mix of these attributed patients differed, with average-value practices having a higher acuity patient case-mix than the high-value practices.

Patient demographics within each practice were not obtained, but primary care service area demographics on the basis of census data are reported in Table 1. High-value practices served areas with a relatively higher proportion of black and Hispanic patients and with a lower proportion of patients aged 65 years. Income levels and education were similar among the areas with high- and average-value practices.

The mean risk-adjusted per capita per month spending was 24% lower in the visited high-value practices than the average-value practices (Table 2). The high-value practices scored 8%–9% higher on a composite quality score compared with average-value peers.

Care Attributes associated with High-Value Practices
We identified 12 care attributes observed more frequently in high-value practices than in average-value practices. These practice attributes are categorized into five themes, as presented in Table 3: (1) prevention of costly health deterioration and acute crisis, (2) supporting patient self-care, (3) maximizing effectiveness of office visits, (4) selecting cost-effective diagnostic and treatment options, and (5) developing infrastructure to support high-value care.

Preventing Near-Term Costly Health Deterioration and Acute Crisis
High-value practices prioritized responsiveness to patients’ needs. These practices emphasized treating patients in outpatient settings rather than reflexively referring to high-cost emergency room and inpatient settings. They leveraged multidisciplinary teams of nurses and vascular access coordinators to provide a “high touch” approach to keep their sickest patients from unexpected clinical crises. These high-value teams educated patients in medication adherence, lifestyle and dietary modifications, and helped patients overcome common socioeconomic barriers such as transportation to clinic visits. Nurse practitioners (NPs) had autonomy to schedule same-day visits for urgent patients and to treat lower-acuity patients, approaches that reserved nephrologists’ time for higher-acuity patients. One high-value practice used two vascular access...
coordinators to oversee their practice panel of 600 patients receiving hemodialysis to facilitate rapid scheduling with vascular specialists for same-day angioplasty or thrombolysis/thrombectomy procedures. These specialized coordinators also educated patients and dialysis facility staff about signs and symptoms of infection or impending access failure.

Supporting Patient Self-Care
Physicians and other team members in high-value practices more often empowered their patients to take responsibility for their own health. Providers and staff used structured educational approaches to teach patients the importance of medication adherence and self-care for both symptom recognition and management as well as self-care for home dialysis. Education about self-care happened at every touch point during office visits, beginning with previsit, nurse-led medication reconciliation, reinforced by the providers’ discussions, and further reiterated with customized after-visit summaries that highlighted the teaching points in writing. Some practices leveraged the support of social workers, pharmacists, and even pharmacy students to help patients learn better medication management. Three of the four high-value practices used this same approach to self-care when counseling patients on starting peritoneal dialysis. Peritoneal dialysis nurses supported by lay patient coordinators championed these practices, which allowed

<table>
<thead>
<tr>
<th>Nephrology Group Name</th>
<th>State</th>
<th>Population Density</th>
<th>Median Household Income ($)</th>
<th>Age &gt;65 yr (%)</th>
<th>College Graduates (%)</th>
<th>White (%)</th>
<th>Black (%)</th>
<th>Hispanic (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-value sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Houston nephrology</td>
<td>TX</td>
<td>2600</td>
<td>62,040</td>
<td>7</td>
<td>11</td>
<td>56.4</td>
<td>20.3</td>
<td>36.9</td>
</tr>
<tr>
<td>UAB Kirklin Clinic</td>
<td>AL</td>
<td>865</td>
<td>37,735</td>
<td>13</td>
<td>9</td>
<td>26.6</td>
<td>68.7</td>
<td>3.3</td>
</tr>
<tr>
<td>Southwest Kidney Institute</td>
<td>AZ</td>
<td>4832</td>
<td>50,424</td>
<td>8</td>
<td>12</td>
<td>68.5</td>
<td>6.1</td>
<td>29.1</td>
</tr>
<tr>
<td>Naples nephrology</td>
<td>FL</td>
<td>152</td>
<td>64,240</td>
<td>17</td>
<td>14</td>
<td>86.7</td>
<td>5.8</td>
<td>22.4</td>
</tr>
<tr>
<td>High-value mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>59.55</td>
<td>25.23</td>
<td>22.93</td>
</tr>
<tr>
<td>Average-value sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice 1 FL</td>
<td>1219</td>
<td>52,181</td>
<td></td>
<td>41</td>
<td>15</td>
<td>91.5</td>
<td>2.5</td>
<td>9</td>
</tr>
<tr>
<td>Practice 2 SC</td>
<td>172</td>
<td>40,147</td>
<td></td>
<td>13</td>
<td>7</td>
<td>49.4</td>
<td>45.6</td>
<td>3.3</td>
</tr>
<tr>
<td>Practice 3 PA</td>
<td>1049</td>
<td>63,263</td>
<td></td>
<td>15</td>
<td>12</td>
<td>80.5</td>
<td>5.6</td>
<td>15.6</td>
</tr>
<tr>
<td>Average-value mean</td>
<td>813.33</td>
<td>51,863.67</td>
<td></td>
<td>23.00</td>
<td>11.33</td>
<td>73.80</td>
<td>17.90</td>
<td>9.30</td>
</tr>
</tbody>
</table>

*UAB, University of Alabama.*

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Table 2. Practice-specific demographics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>High-Value Practice</th>
<th>Average-Value Practice</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practices, n</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mean (SD) no. of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialists</td>
<td>2.3 (0.6)</td>
<td>10.0 (7.62)</td>
<td>0.07</td>
</tr>
<tr>
<td>Single specialty</td>
<td>3 (75)</td>
<td>2 (67)</td>
<td></td>
</tr>
<tr>
<td>Independently owned</td>
<td>3 (75)</td>
<td>1 (33)</td>
<td></td>
</tr>
<tr>
<td>Mean attributed patient-years per practice per specialist (SD)*</td>
<td>56 (21.1)</td>
<td>263 (127.0)</td>
<td>0.12</td>
</tr>
<tr>
<td>Mean case-mix index (SD)</td>
<td>0.826 (0.010)</td>
<td>1.297 (0.296)</td>
<td>0.04</td>
</tr>
<tr>
<td>Mean risk-adjusted per capita per month spending, $ (SD)</td>
<td>1279.8 (50.2)</td>
<td>1683.1 (16.28)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Quality score (composite [SD])</td>
<td>1.12 (0.09)</td>
<td>1.03 (0.01)</td>
<td>0.001</td>
</tr>
<tr>
<td>No. of measures</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Population density*</td>
<td>2112</td>
<td>813</td>
<td></td>
</tr>
<tr>
<td>Median household income</td>
<td>53,610</td>
<td>51,863</td>
<td></td>
</tr>
<tr>
<td>Age &gt;65 yr, %</td>
<td>13.9</td>
<td>22.9</td>
<td></td>
</tr>
<tr>
<td>College degree, %</td>
<td>11.6</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>59.6</td>
<td>73.8</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>25.2</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>22.9</td>
<td>9.3</td>
<td></td>
</tr>
</tbody>
</table>

*a* This is the average number of patient-years attributed to a practice divided by the average number of specialists. It is calculated for average- and high-value sites in each specialty.

*b* Measured in number of people per square mile by census tract.
nephrologists to make peritoneal dialysis the preferred initial dialysis modality.

**Maximizing Effectiveness of Office Visits**

All high-value practices ensured that patients maximized their office visit by establishing procedures for previsit preparation. This preparation often began a week before the patients’ visits to ensure all necessary laboratory studies and other required tests had been performed, and to give the patient time to complete any outstanding items. At one high-value practice, medical assistants initiated the previsit review 1 week in advance, identified missing relevant information such as discharge summaries, laboratory tests, or consultant notes, and subsequently coordinated the completion of this information.

**Selecting Cost-Effective Diagnostic and Treatment Options**

Providers at the high-value practices exercised cost-consciousness when ordering tests or prescribing treatments. Clinical decision support tools helped guide provider choices, particularly on high-cost imaging and invasive procedures. Early planning for outpatient placement of vascular access and in-office anemia management with intravenous iron (in advance of, or in addition to, more-costly erythropoiesis-stimulating agents) were two cost-sensitive areas where high-value practices focused their efforts. Patients received early education about the need for vascular access, and fistula placement was planned in conjunction with a vascular access surgeon well in advance of patients starting dialysis. At the University of Alabama’s (UAB) Kirklin Clinic, NPs and vascular access coordinators kept track of patient referrals and ensured follow-up with scheduled vascular appointments. At the UAB practice, NPs managed anemia with standardized, physician-developed protocols, using in-office intravenous iron infusions as a cost-effective approach to treating iron-deficiency anemia in patients with CKD.

**Developing Infrastructure to Support High-Value Care**

High-value practices invested in a practice infrastructure to support the delivery of high-quality, low-cost care. Salaried advanced practice providers (APPs; NPs and physician assistants) saw patients independently in addition to supporting nephrologists in care coordination tasks. The additional clinical capacity provided by APPs allowed for more flexible scheduling and nimbler accommodation of urgent patient needs. At one high-value practice, NPs conduct three out of four monthly visits for patients on hemodialysis which releases time commitments from the nephrologists, allowing for more time to handle complex, higher-acuity patients in the office, or facilitating care transitions from hospital to home or skilled nursing facility. At UAB Kirklin, the advanced (“predialysis”) CKD program is run entirely by NPs, who see patients for follow-up care after hospitalization, provide education, and manage anemia and mineral bone disease using standardized protocols. This practice uses NP-generated dialysis clinical revenue to support the NP-run predialysis CKD program.

**Effect and Transferability**

Results from the Delphi panel’s rating of the likely effect and transferability for each of the 12 practice attributes noted are described in Table 4.

### Table 3. High-value practice features

<table>
<thead>
<tr>
<th>Category</th>
<th>Feature</th>
<th>High-Value Practices (%)</th>
<th>Average-Value Practices (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention of costly health deterioration and acute crisis</td>
<td>Rapidly adjustable office visit frequency for unstable patients</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Close monitoring and management to preserve renal function</td>
<td>100</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Rapid access to surgeon for vascular access problems</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Supporting patient self-care</td>
<td>Multidimensional medication management at every visit</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Education to support self-management at every contact</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Optimizing peritoneal dialysis selection and management</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Maximizing effectiveness of office visits</td>
<td>Previsit preparation</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Selecting cost-effective diagnostic and therapeutic options</td>
<td>Early planning for and execution of vascular access</td>
<td>75</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>In-office infusion for anemia management</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Developing infrastructure to support high-value care</td>
<td>Encouragement of autonomous practice for midlevel providers for low-complexity patients</td>
<td>75</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Upshifted staff roles for medical assistants</td>
<td>50</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Investment of dialysis revenue into predialysis patient care</td>
<td>50</td>
<td>0</td>
</tr>
</tbody>
</table>

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This small exploratory analysis of nephrology practice sites found 12 practice attributes, categorized into five broad themes, to be more frequently present in high-value practices than average-value practices. A Delphi panel rated four attributes highly for their transferability.

### Theme 1: Preventing Near-Term Costly Health Deterioration and Acute Crisis
High-value nephrology practices emphasized a high-touch, open-access approach to their patients with advanced CKD to detect impending clinical deterioration early, prevent crises, and utilize effective outpatient interventions. High-value practices were comprised of multidisciplinary teams to accommodate more frequent laboratory checks and office visits, allowing for more effective triage, timely referrals, and improved utilization of cost-effective outpatient visits. This proactive approach to chronic disease management (CDM) and maximal utilization of lower-cost outpatient visits over the too-often used expensive emergency room evaluations has demonstrated similar cost-effective results effects in other chronic disease settings.29–31

### Theme 2: Supporting Patient Self-Care
Nephrology has been less apt than other medical subspecialties to adopt patient self-care strategies.32,33 Our analysis found that practices delivering high-value nephrology care used structured educational programs to improve patient engagement, and an evidence-supported approach to improving care quality and lowering health care costs.34,35 The high-value practices used multidisciplinary teams of nurses, pharmacists, nutritionists, and social workers to empower patients to better manage their medications and prioritize peritoneal dialysis as the preferred renal replacement modality. These findings are in line with the broader value-based reimbursement literature that has identified care coordination as a strategy to improve care quality and lower population-wide health care spending.36–38

### Theme 3: Maximizing Effectiveness of Office Visits
High-value practices made concerted efforts to ensure that patients maximized their time during clinic visits through structured previst preparation. Office staff, usually medical assistants, took on previst chart reviews to minimize treatment disruptions caused by poor care transitions, inadequate medication reconciliation, and patient-centered issues such as transportation. This proactive approach to maximizing visit effectiveness allowed more extensively trained clinical staff (Medical Doctors and APPs) to devote the visit time to listening, analyzing, diagnosing, and developing a treatment plan for the patient, rather than engaging in extensive administrative data collection.

### Theme 4: Selecting Cost-Effective Diagnostic and Therapeutic Options
Practices focused on delivering high-value care made a concerted effort to consider cost and management implications of diagnostic tests ordered or therapies prescribed, often with the support of decision aides such as “appropriate use” criteria. High-value practices focused their efforts on early vascular access placement, a cost-effective alternative to central venous catheters.39 Office nurse and vascular access coordinators engaged patients early in discussions of vascular access and ensured early referrals to vascular surgeons aiming to minimize the number of emergent dialysis starts requiring a central venous catheter and inpatient admission.

### Theme 5: Developing Infrastructure to Support High-Value Care
High-value nephrology practices invested in personnel to both coordinate and deliver care. These practices used APPs to assist in routine CKD and dialysis care, typically using physician-approved treatment protocols. One innovative practice funded
the NP-lead CKD education program through revenue generated from NP dialysis visits. Although a causal relation between care coordination and health care cost reduction has not been established, accountable care organizations, other financial risk-bearing practices, and even the Centers for Medicare and Medicaid Innovation have acted on evidence suggesting that care coordination is associated with quality improvement and cost containment.

**Effect and Transferability of Practice Attributes**

In the same way that other industry sectors have borrowed best practices from high performers through initiatives such as lean management, we aimed to highlight those attributes of high-value nephrology practices judged by experienced nephrologists to have face-validity for quality effect, cost effect, and ease of transferability to other nephrology practices. Rapidly adjustable office visit frequency for unstable patients, close monitoring and management to preserve kidney function, early planning for vascular access, and education to support self-management at every contact rated favorably on all three measures of face validity. The four attributes resonate with attributes of the patient-centered medical home model, and commensurately, were unsurprisingly rated more highly when coupled with value-based payment. These four readily transferrable practice attributes that scored highly on cost and quality may provide a starting point for nephrology practices preparing for Medicare accountability and reimbursement incentives and disincentives. Finding innovative methods to make these investments will become increasingly important as value-based reimbursement from Medicare ties higher percentages of reimbursement payments to measures of value.

**High-Value Practice Attributes in Broader Context**

The management of patients with kidney disease through the stages of CKD and eventually ESRD fits well into the CDM care model often used to manage chronic illnesses such as congestive heart failure, chronic obstructive pulmonary disease, and diabetes. Many of the nephrology-specific attributes from high-value practices are identified, in more general terminology, as key components of CDM. Education to support patient self-management, rapid access to vascular surgery expertise, and office reorganization to reallocate tasks to nonphysician employees align well to key components of the CDM construct. Additionally, many of the attributes identified at high-value practices also correlate with well validated assessment tools used both by patients and health systems to evaluate the delivery of chronic illness care. The alignment of many of the identified practice attributes with both important components of CDM and several external care delivery assessment tools, may help reinforce their potential for wider adoption.

**Limitations**

Exploratory studies such as an investigation of this scope are subject to several limitations. It is possible that the nephrology practices we studied might not be broadly representative of practices throughout the United States, although they were diverse in terms of size, structure, and geographic location. The small sample size precluded inference testing when comparing attributes across high-value and average-value sites. We ranked practices using data spanning 2010–2013, before MACRA was legislated. If we were to repeat rankings after MACRA’s implementation, practices may have ranked differently. Using a database of commercially insured patients biases our findings toward attributes of care associated with attaining higher value for younger, privately insured patients. This limitation is particularly relevant in the ESRD population, where Medicare pays for most health care costs. Although our study would not have identified practices that care exclusively for patients insured by safety net programs or uninsured patients, identified practices cared for a broad patient population from across the socioeconomic spectrum. The same practice attributes delivered to patients with preferred provider organization insurance were likely delivered similarly to patients with Medicare, Medicaid, and other insurance products. Many of the quality metrics used for ranking practices were designed to evaluate primary care practices rather than nephrology practices; this is a notable limitation of many subspecialty evaluations of quality, which rely on more generalized quality metrics. Under the Center for Medicare and Medicaid Services’ Quality Payment Program and face reimbursement incentives and disincentives. Finding innovative methods to make these investments will become increasingly important as value-based reimbursement from Medicare ties higher percentages of reimbursement payments to measures of value.
Although using CRGs to adjust cost accounts for many medical comorbidities, it does not allow for determination of CKD stage, which would have provided a more granular evaluation. Further, although we ascribe patient care to nephrology practices, we acknowledge that patient care is also strongly affected by the strength of each regional medical community; nephrology practices may be misclassified as high value because of high-quality general medicine or cardiology care, not only because of high-quality nephrology care. Finally, despite our efforts to minimize bias, several steps in the qualitative component of our analysis, such as grouping site visit findings into attributes and broad themes, could be subject to researcher biases. Despite the complexity of this undertaking and the limitations of a small exploratory study, in the absence of a larger-scale, hypothesis-driven study, our findings may be helpful to nephrologists facing increasing pressure from payers to improve value now.

In conclusion, we used measures of value commonly used by payers and national private payer claims data to explore care attributes of nephrology practices that rank favorably. Through site visits and Delphi panel ratings by nephrologists, we identified transferable care attributes that distinguish more favorably ranked practices. As policymakers continue to more strongly reward value, our findings may be a starting point for nephrologists seeking to improve.

ACKNOWLEDGMENTS

Dr. Milstein, Dr. Chertow, and Dr. Brady contributed to conception and design of the work. Dr. Milstein, Dr. Chertow, and Dr. Simon contributed to data acquisition. All authors contributed to data analysis, interpretation, and drafting of the manuscript, and critically revising the intellectual content. All authors gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

This study was granted exempt status by the Stanford Institutional Review Board.

DISCLOSURES

Dr. Chertow serves on the Board of Directors of Satellite Healthcare. Dr. Simon reports grants from Partnership to Fight Chronic Disease, grants from Peterson Center on Healthcare, during the conduct of the study. Dr. Chertow reports personal fees from Akemia, personal fees from AMAG, personal fees from Amgen, personal fees and other from Ardeleyx, personal fees from Astra Zeneca, personal fees from Baxter, personal fees from Bayer, other from Cricket Health, other from Durect, other from DxNow, personal fees from Gilead, other from Outset, personal fees from Reata, personal fees from ReCor, personal fees from Sanifit, personal fees from Vertex, outside the submitted work. All of the remaining authors have nothing to disclose.

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SUPPLEMENTAL MATERIAL

This article contains the following supplemental material online at http://jasn.asnjournals.org/lookup/supp/doi:10.1681/ASN.2019030219/-/DCSupplemental.

Supplemental Table 1. Results of quantitative method of analytically identifying and characterizing performance of medical groups.

Supplemental Table 2. Selected quality metrics and subjective weights.

Supplemental Table 3. Comparison of High-Value Practices: Visited to cohorts.

Supplemental Table 4. Comparison of Average-Value Practices: Visited to cohort.

Supplemental Table 5. Patient Year CRG Breakdown by Value for Visited Sites.

Supplemental Table 6. Scoring grid to rate the presence of each feature at visited site.

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Exploring Attributes of Nephrologists Ranking Favorably on Measures of Value
Supplementary Appendix

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Methods

Identifying practices based on their quality and spending performance

Data Sources:

IMS’ PharMetrics Plus™ Data is a proprietary database of U.S. commercial medical and pharmacy claims data that covers 150 million covered lives from 2006. Commercial insurance data reflects market prices, rather than prices set by Medicare and Medicaid, and allows analysis of the “all-in” cost of care for patients, including payments for drugs, emergency room visits, hospitalizations, lab testing and other services. The PharMetrics Plus™ data is derived from health insurance plans across the US and represents a diverse mix of commercially insured patients. Approximately 71% of the patients in PharMetrics Plus™ are covered by a PPO plan. There is limited inclusion of Medicaid patients. Data for eligible enrollees was extracted from PharMetrics Plus™. Eligible enrollees included only those aged 0-64 with 12 months’ enrollment during the year, with prescription benefit for the duration of enrollment. Additionally, allowed amounts in the study year had to fall in the acceptable range of $10-$1,000,000. Our longitudinal management study made use of PharMetrics Plus™ data from July 2010 – June 2013.

This claims data was combined with IMS’ OneKey™ Data, which provides comprehensive demographic information, address intelligence, affiliations and ownership relationships for over 4.4 million professionals and 500,000 health care facilities. The OneKey™ data allowed for aggregation of providers at the provider group level.

Providers included for analysis in our study were nephrology groups identified by the OneKey™ dataset. OneKey™ Data was used to identify “physician clusters” or “medical groups”. Physician clusters were defined as physicians affiliated and working with a defined outpatient medical practice, including multi-professional practices and sole physician practices. All cost and quality composite calculations described below took place at the medical group level.

Cost measures:

We took a total cost of care perspective, including all medical and prescription claims aggregated for a patient during each 12-month period in which they were eligible. The unit of observation of costs was the patient-year. Because we used three years of aggregated data, a single patient could appear as up to three observations.

All cost analytics described below were conducted for two types of cost: payer allowed (i.e., reflecting negotiated prices) and standardized (i.e., assessed against a fee schedule). The fee schedule for standardized cost was developed based on the average payer allowed cost for each service across the entire PharMetrics Plus™ Dataset. Variation in standardized cost reflects differences in utilization and intensity of health care services, while payer allowed cost reflects those differences as well as differences driven by contractual arrangements.
Attribution:

Each eligible patient-year was attributed to the individual provider accounting for the highest percentage of costs associated with Evaluation and Management (E&M) claims in a given year. The percentage had to be at least 10% to reduce the risk of misattribution. In the case of ties, the following were applied as tie-breakers, in order of priority: (1) Count of E&M claims, (2) Earliest E&M claim, (3) Latest E&M claim and (4) Provider ID.

Providers with attributed patients were assigned to medical groups using OneKey™ data as described previously and attributed patient-years were aggregated at the group level.

Adjustment and outlier trimming:

Risk-adjustment was performed using 3M™ Clinical Risk Group (CRG) software, which assigned each patient-year observation to one of more than 1000 CRGs based on the diagnoses and procedures in their claims history. The average cost of all patient-year observations in each CRG constituted the “expected cost” used in cost scoring calculations described below. A given CRG was included in the analysis only if a minimum of 150 enrollees across the full sample fell into the CRG to ensure a stable baseline could be calculated.

Cost outlier trimming was performed within each CRG in order to eliminate abnormally low or high annual costs for patients with similar health statuses. Trim thresholds were determined separately for each CRG using an asymmetric LogMean methodology, whereby a patient’s cost in a given year was excluded from analysis if its log transformation fell 5 standard deviations below or 2.5 standard deviations above the mean log transformation of all patient-year observations in that CRG.

After outlier trimming was performed, adjustments for inflation and geographic variation in input costs were made to the payer allowed cost measure. Claims were adjusted for inflation (by multiplying cost by the ratio of the consumer price index (CPI) for the latest year covered by the data over the CPI for the claim year). Geographic adjustment to correct for variation in input costs was accomplished using the relevant Centers for Medicare and Medicaid Services (CMS) Wage Index or Geographic Adjustment Factor. No adjustments were required in the case of standardized cost because these were calculated using a standardized fee schedule.

Scoring:

Medical groups were only included in cost scoring if they had at least 30 attributed patient-years. Each medical group’s overall observed/expected (O/E) cost ratio was calculated by comparing the average annual health expenditures of attributed patients to the expected cost of their care. The expected cost for a medical group was calculated by multiplying the number of attributed patient-years in each CRG by the appropriate expected cost calculated for the relevant CRGs. Each medical group’s overall O/E cost ratio was then calculated as the sum of observed costs for attributed patient-years divided by the medical group’s expected costs. Put differently, a medical group’s overall O/E ratio was the patient-volume-weighted average of the O/E cost ratio for each
Finally, for each qualifying medical group the percentile rank and confidence interval were estimated around the group’s O/E cost ratio. This analysis was repeated for standardized costs.

**Quality measures:**

We developed a nephrology-specific composite composed of measures drawn from a library of validated measures provided by IMS Health. Considered measures relied on administrative claims data and fell into three broad domains:

- Medication management compliance
- Medication management monitoring
- Treatment process of care (POC)

Measures were selected using a two-step process. First, a practicing internist reviewed the library of measures and created a preliminary list of measures relevant to nephrology. This list was then finalized by a senior nephrologist who also assigned a subjective weight to each measure based on clinical importance. Table 2 below lists the specific quality measures grouped by domain as well as the components of and subjective weights assigned to each measure.

**Attribution and exclusions:**

Attribution was based on rendering providers having encounters over a measure-specific timeframe. An “encounter table” was created containing provider, patient and date of encounter; encounters were identified by CPT codes for outpatient encounters and dates varied by measure. The encounter dates covered the timeframe for eligibility (denominator) and numerator. To be eligible for attribution, a provider needed two or more encounters. A single provider was chosen who had the most frequent number of encounters over the timeframe for that measure. In the case of ties, the provider having the more recent encounter was chosen. Medication management measures unrelated to specific events were calculated similarly, with prescriptions taking the place of encounters and similar logic applied around timeframes and minimum prescriptions (2) for eligibility.

As with cost measures, providers were aggregated by OneKey™ data for comparison at the medical group level.

**Composite formation:**

In addition to determining which measures merited inclusion, senior nephrologists engaged in subjectively weighting measures based on their clinical expertise. Each measure was rated as “Low”, “Medium” or “High” clinical significance. These ratings were then used as the basis for constructing numerical weights used in composite score calculations.
Attribution of Care to Providers:

In order for a measure to be included in the analysis, the sum of observations must be at least 30. All attributed patients, regardless of whether the responsible group qualifies for scoring, are included in the calculation of peer rates.

In order for a medical group’s composite to be calculated, that medical group had to satisfy the following requirements:

- Required number of observations for the medical group in the composite: The sum of the medical group’s denominators across all individual measures that comprise the group’s composite must be at least 30
- Required Number of Measures: A medical group can only get a composite score if they have a valid rate for at least 4 component measures

Medical groups’ overall composite rating was constructed using indirect standardization of individual measures meeting the requirements outlined above. The Indirectly Standardized Composite (ISC) methodology produces a ratio of observed to expected numerators across the individual component measures, which are weighted according to the specified composite weights. In other words, for each measure for which a group had adequate sample size for scoring, an expected numerator was calculated by multiplying the peer group’s rate by the number of quality opportunities (the denominator) the group had for the particular measure. A final number of expected quality opportunities met was calculated by summing the product of expected opportunities met for each measure and its subjective weight, normalized to account for the fact that a given group may be scored on less than the full complement of measures. That is, the subjective weights of the measures for which the provider is scored were adjusted to add up to one with their relative weights remaining as the same. The observed number of quality opportunities met was simply the sum of the products of the actual number of opportunities met for each measure multiplied by this same weight. This O/E ratio represents the clinically weighted indirectly standardized composite ratio. Groups were percentile ranked according to this ratio and a confidence interval was estimated for each group.

Results

The results of our analysis of longitudinal management medical groups are summarized in the following table, which shows:

- The number of medical groups contained in the OneKey™ database
- The number of medical groups with patients eligible for inclusion
- The number of these medical groups eligible for scoring from cost and quality perspectives
- The number of “exemplar” groups (i.e. top quartile on cost and quality, statistically significantly different than the mean)
- The number of “comparator” groups (i.e. 40th-60th percentile) on both payer allowed cost and the clinically weighted quality composite.
Table 1. Results of quantitative method of analytically identifying and characterizing performance of medical groups

|                         | In OneKey™ Database | Eligible | Scorable on Quality | Scorable on Cost | Scorable on both Cost and Quality | Exemplar Pool | Comparator Pool |
|-------------------------|---------------------|----------|---------------------|------------------|-----------------------------------|---------------|----------------|---|
| Nephrology Practices (n)| 7123                | 2663     | 819                 | 519              | 307                               | 9             | 12             |

Study Sample Characteristics

As previously mentioned, we partnered with IMS Health to run a data analysis on nephrology practice sites. They provided us with structural, geographic, patient-related, cost and quality OneKey™ information for the following groups:

1. High-Value Cohort – all sites that qualified as High-Value Practices on cost and quality
2. Average-Value Cohort – all sites that qualified as Average-Value Practices on cost and quality
3. Visited High-Value Practices
4. Visited Average-Value Practices
Table Descriptions

Table 2 displays a table of the CMS and National Quality Forum (NQF) selected quality metrics and subjective weights used to rank those metrics.

Tables 3-5 draw comparisons among the different groups to shed light on our process of selecting sites.

Table 3 compares the high-value visited sites to the high-value practice cohort, visited and non-visited, as a whole. In comparing the two, the cohort has a slightly larger percentage of independently owned sites and sees fewer patients with significant chronic disease in a single organ system but more patients with significant chronic disease in multiple organ systems. Both groups had similar quality performance and varied in cost performance.

Table 4 compares the average-value visited sites to the average-value practice cohort, which includes visited and non-visited sites. Overall, the visited sites have more specialists than the rest of the cohort. They are less likely to be single specialty and/or independently owned sites. However, they have better cost performance than the cohort and the same quality performance.

Table 5 displays the distribution of Clinical Risk Groups (CRGs) among the patient years for visited high and average-value sites within each specialty. High-value practices tend to see more patients with significant chronic disease in a single organ system while average-value practices tend to see more patients with significant chronic disease in multiple organ systems. The high-value practices could be doing a better job of preventing further deterioration among their patients or they could be seeing initially healthier patients. There is no evidence to sway the argument one way or another.

Table 6 depicts the scoring grid used by our qualitative research team to assess the degree to which each care attribute was present at visited sites.
Table 2: Selected Quality Metrics and Subjective Weights

<table>
<thead>
<tr>
<th>Quality Domain</th>
<th>Quality Measure</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Assigned Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication Management Compliance</td>
<td>The percentage of patients 18 years and older who met the Proportion of Days Covered (PDC) threshold of 80 percent during the measurement period. Angiotensin-converting enzyme (ACE) inhibitor or Angiotensin-receptor blocker (ARB)</td>
<td>Patients 18 years and older who for at least 80% of the measurement period covered by prescription claims were prescribed an Angiotensin-converting enzyme (ACE) inhibitor or Angiotensin-receptor blocker (ARB)</td>
<td>Patients 18 years and older who meet continuous enrollment criteria for the measurement year</td>
<td>Low (0.0500)</td>
</tr>
<tr>
<td>Medication Management Compliance</td>
<td>The percentage of patients 18 years and older who met the Proportion of Days Covered (PDC) threshold of 80 percent during the measurement period. Beta-blocker (BB)</td>
<td>Patients 18 years and older who for at least 80% of the measurement period covered by prescription claims were prescribed a Beta-blocker (BB)</td>
<td>Patients 18 years and older who meet continuous enrollment criteria for the measurement year</td>
<td>Low (0.0500)</td>
</tr>
<tr>
<td>Medication Management Compliance</td>
<td>The percentage of patients 18 years and older who met the Proportion of Days Covered (PDC) threshold of 80 percent during the measurement period. Renin Angiotensin System Antagonists</td>
<td>Patients 18 years and older who for at least 80% of the measurement period covered by prescription claims were prescribed an Renin Angiotensin System Antagonist</td>
<td>Patients 18 years and older who meet continuous enrollment criteria for the measurement year</td>
<td>Low (0.0500)</td>
</tr>
<tr>
<td>Medication Monitoring</td>
<td>The percentage of patients 18 years of age and older on angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB) who received annual monitoring.</td>
<td>At least one serum potassium and either a serum creatinine or a blood urea nitrogen therapeutic monitoring test in the measurement year</td>
<td>Patients 18 years and older who were on a Renin Angiotensin System Antagonist for at least 80% of the measurement period</td>
<td>Medium (0.1875)</td>
</tr>
<tr>
<td>Medication Monitoring</td>
<td>The percentage of patients 18 years of age and older on diuretics who received annual monitoring.</td>
<td>At least one serum potassium and either a serum creatinine or a blood urea nitrogen therapeutic monitoring test in the measurement year</td>
<td>Patients 18 years and older who were on a diuretic for at least 80% of the measurement period</td>
<td>Medium (0.1875)</td>
</tr>
<tr>
<td>Treatment Process of Care</td>
<td>To ensure that patients with chronic kidney disease (CKD) and ESKD are monitored for PTH levels at least once annually.</td>
<td>Eligible members who received at least one PTH blood test during the measurement year</td>
<td>Patients with a confirmed diagnosis of CKD or on dialysis who meet continuous enrollment criteria during the measurement year</td>
<td>Low (0.0500)</td>
</tr>
<tr>
<td>Treatment Process of Care</td>
<td>Proportion of patients with chronic kidney disease (CKD), but who are not on dialysis, who received at least one blood calcium level and at least one phosphorus level during the measurement year.</td>
<td>Eligible members who received at least one calcium blood test and one phosphorus blood test during the measurement year</td>
<td>Members with a confirmed diagnosis of CKD who meet continuous enrollment criteria during the measurement year</td>
<td>Low (0.0500)</td>
</tr>
<tr>
<td>Treatment Process of Care</td>
<td>To ensure that patients with chronic kidney disease (CKD) who are not on dialysis have an evaluation of hemoglobin levels at least annually.</td>
<td>Eligible members who received at least one CBC or hemoglobin/hematocrit blood test during the measurement year</td>
<td>Patients with a confirmed diagnosis of CKD who meet continuous enrollment criteria during the measurement year</td>
<td>Medium (0.1875)</td>
</tr>
<tr>
<td>Treatment Process of Care</td>
<td>To ensure that all eligible patients identified as having Stage 3 or greater chronic kidney disease (CKD) receive lipid monitoring at least annually.</td>
<td>Eligible members who received at least one lipid panel or LDL level during the measurement year</td>
<td>Patients 18 years and older, with a confirmed diagnosis of CKD or on dialysis who meet continuous enrollment criteria during the measurement year.</td>
<td>Medium (0.1875)</td>
</tr>
</tbody>
</table>

* Confirmed diagnosis of CKD defined as patients with CKD Stages 3-5, determined by diagnostic code
†Metric applies to patients with CKD and ESRD
‡Metric applies to patients with CKD, and excludes patients with ESR
Table 3. Comparison of High-Value Practices: Visited to Cohort
(“cohort” refers to both visited and non-visited high-value sites)

<table>
<thead>
<tr>
<th>Practices, n</th>
<th>Visited</th>
<th>Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Number of Specialists (SD)</td>
<td>2.3 (0.6)</td>
<td>2.4 (1.5)</td>
</tr>
<tr>
<td>Single Specialty</td>
<td>4 (100)</td>
<td>9 (100)</td>
</tr>
<tr>
<td>Independently Owned</td>
<td>3 (75)</td>
<td>7 (78)</td>
</tr>
<tr>
<td>Mean Attributed Patient Years per Practice per Specialist (SD)</td>
<td>56 (42.2)</td>
<td>54 (32.1)</td>
</tr>
<tr>
<td>Mean Case Mix Index (SD)</td>
<td>.826 (0.010)</td>
<td>.822 (0.237)</td>
</tr>
<tr>
<td>Patient Years by CRG, n (%)</td>
<td>224 (100)</td>
<td>487 (100)</td>
</tr>
<tr>
<td>Healthy</td>
<td>7 (3)</td>
<td>19 (4)</td>
</tr>
<tr>
<td>History of Significant Acute Disease</td>
<td>3 (1)</td>
<td>9 (2)</td>
</tr>
<tr>
<td>Single Minor Chronic Disease</td>
<td>3 (1)</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Minor Chronic Disease in Multiple Organ Systems</td>
<td>4 (2)</td>
<td>8 (2)</td>
</tr>
<tr>
<td>Significant Chronic Disease</td>
<td>68 (30)</td>
<td>120 (25)</td>
</tr>
<tr>
<td>Significant Chronic Disease in Multiple Organ Systems</td>
<td>97 (43)</td>
<td>254 (52)</td>
</tr>
<tr>
<td>Dominant Chronic Disease in Three or More Organ Systems</td>
<td>25 (11)</td>
<td>46 (9)</td>
</tr>
<tr>
<td>Dominant Metastatic Malignancy</td>
<td>2 (1)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Catastrophic</td>
<td>15 (7)</td>
<td>22 (5)</td>
</tr>
<tr>
<td>Mean risk-adjusted per capita spending, $ (SD)</td>
<td>1279.8 (50.2)</td>
<td>1252.1 (121.2)</td>
</tr>
<tr>
<td>Weighted O/E Ratio</td>
<td>1.12</td>
<td>1.11</td>
</tr>
<tr>
<td>Number of Measures</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Table 4. Comparison of Average-Value Practices: Visited to Cohort</td>
<td>Visited</td>
<td>Cohort</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>Practices, n</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Mean Number of Specialists (SD)</td>
<td>10.0 (7.6)</td>
<td>5.0 (4.85)</td>
</tr>
<tr>
<td>Single Specialty</td>
<td>2 (67)</td>
<td>9 (75)</td>
</tr>
<tr>
<td>Independently Owned</td>
<td>1 (33)</td>
<td>8 (67)</td>
</tr>
<tr>
<td>Mean Attributed Patient Years per Practice per Specialist (SD)</td>
<td>263 (220.0)</td>
<td>221 (166.0)</td>
</tr>
<tr>
<td>Mean Case Mix Index (SD)</td>
<td>1.297 (0.296)</td>
<td>1.171 (0.284)</td>
</tr>
<tr>
<td>Patient Years by CRG, n (%)</td>
<td>788 (100)</td>
<td>2653 (100)</td>
</tr>
<tr>
<td>Healthy</td>
<td>25 (3)</td>
<td>117 (4)</td>
</tr>
<tr>
<td>History of Significant Acute Disease</td>
<td>10 (1)</td>
<td>52 (2)</td>
</tr>
<tr>
<td>Single Minor Chronic Disease</td>
<td>5 (1)</td>
<td>35 (1)</td>
</tr>
<tr>
<td>Minor Chronic Disease in Multiple Organ Systems</td>
<td>8 (1)</td>
<td>22 (1)</td>
</tr>
<tr>
<td>Significant Chronic Disease</td>
<td>184 (23)</td>
<td>613 (23)</td>
</tr>
<tr>
<td>Significant Chronic Disease in Multiple Organ Systems</td>
<td>428 (54)</td>
<td>1368 (52)</td>
</tr>
<tr>
<td>Dominant Chronic Disease in Three or More Organ Systems</td>
<td>70 (9)</td>
<td>235 (9)</td>
</tr>
<tr>
<td>Dominant Metastatic Malignancy</td>
<td>9 (1)</td>
<td>27 (1)</td>
</tr>
<tr>
<td>Catastrophic</td>
<td>49 (6)</td>
<td>184 (7)</td>
</tr>
<tr>
<td>Mean risk-adjusted per capita spending, $ (SD)</td>
<td>1683.1 (16.5)</td>
<td>1695.8 (54.0)</td>
</tr>
<tr>
<td>Weighted O/E Ratio</td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td>Number of Measures</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
Table 5. Patient Year CRG Breakdown by Value for Visited Sites

<table>
<thead>
<tr>
<th>Practices, n</th>
<th>High-Value Practice</th>
<th>Average-Value Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td>7 (3)</td>
<td>25 (3)</td>
</tr>
<tr>
<td>History of Significant Acute Disease</td>
<td>3 (1)</td>
<td>10 (1)</td>
</tr>
<tr>
<td>Single Minor Chronic Disease</td>
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<td>5 (1)</td>
</tr>
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<td>Dominant Chronic Disease in Three or More Organ Systems</td>
<td>25 (11)</td>
<td>70 (9)</td>
</tr>
<tr>
<td>Dominant Metastatic Malignancy</td>
<td>2 (1)</td>
<td>9 (1)</td>
</tr>
<tr>
<td>Catastrophic</td>
<td>15 (7)</td>
<td>49 (6)</td>
</tr>
</tbody>
</table>

There was no significant difference in CRG distribution between High-Value Practices and Average-Value Practices.
Table 6. Scoring grid to rate the presence of each feature at visited sites

<table>
<thead>
<tr>
<th>Prevention of costly health deterioration and acute crisis</th>
</tr>
</thead>
</table>

**Rapidly adjustable office visit frequency for unstable patients**
For “Rapidly adjustable office visit frequency for unstable patients” to be considered present the site must exhibit the following elements:
1. Patients can call the practice and receive advice and/or be worked into the schedule on that day.
2. Patients identified as requiring close monitoring are scheduled for frequent office visits until their condition is stabilized.

**Close monitoring and management to preserve renal function.**
For “Close monitoring and management to preserve renal function” to be considered present the site must exhibit the following elements:
1. The practice has methods to identify patients whose illness requires close management to prevent disease progression.
2. The practice sees identified patients regularly to manage the underlying disease process.

**Rapid access to surgeon for vascular access problems.**
For “Rapid access to surgeon for vascular access problems” to be considered present the site must exhibit the following element:
1. They track and monitor fistula issues.
2. They have a close relationship with a vascular surgeon who provides rapid access to address fistula issues.

**Supporting patient self-care.**

**Multidimensional medication management at every visit.**
For “Multidimensional medication management at every visit” to be considered present the site must exhibit at least four of the following elements:
1. Tailoring the medication regimen to desired outcomes.
2. At every visit review and adjust as necessary:
   a. Monitoring for desired outcomes/effectiveness.
   b. Review of medications from other prescribers.
   c. Assessment of patient adherence.
   d. Assessment of polypharmacy and reducing number of medications.
3. Patient education on medication and changes including written instructions.

**Education to support self-management at every contact.**
For “Education to support self-management at every contact” to be considered present the site must exhibit the following elements:
1. Education is provided with clear instructions on what symptoms to monitor and when to contact the provider.
2. Written instructions and handouts are provided, often with tailored patient-specific information added.
3. Education is provided and reinforced at every contact with a member of the care team.

**Maximizing effectiveness of office visits.**

**Pre-visit preparation**
For “Pre-visit preparation” to be considered present the site must exhibit the following elements:
1. A member of the care team systematically reviews patient charts several days before the appointment date.
2. The patient is contacted to obtain missing information or to schedule lab work.
## Selecting cost-effective diagnostic and treatment options.

### Early planning for and execution of vascular access.
For “Early planning for and execution of vascular access” to be considered present the site must exhibit the following elements:

1. Patients are educated early about the need for vascular access.
2. The practice has a relationship with a preferred vascular access surgeon.

### In-office infusion for anemia management.
For “In-office infusion for anemia management” to be considered present the site must exhibit the following element:

The practice provides IV iron infusion in the office for pre-dialysis and dialysis patients.

## Developing infrastructure to support collaboration.

### Encouragement of autonomous practice by advanced practice providers (APPs) for less complex patients.
For “Encouragement of autonomous practice by advanced practice providers (APPs) for less complex patients” to be considered present the site must exhibit the following elements:

1. APP’s must practice collaboratively, but with a high-level of autonomy.
2. APP’s must see their own panel of patients.
3. APP’s must provide a high degree of follow-up care and additional care that would not otherwise happen, e.g. urgent care, extended, or more frequent follow-up visits.

### Upshifted staff roles – Medical Assistants.
For “Upshifted staff roles – Medical Assistants” to be considered present the site must exhibit the following elements:

1. Very clearly defined role of the Medical Assistants: standardized (protocol-supported) approach to prepare and process the office visit.
2. Upshifted role, e.g. by supporting pre-visit and in-visit preparation, coordinating care, documenting, educating patients, communicating results.
3. Assigned Medical Assistants vs. flexible use of Medical Assistants.

### Investing dialysis based revenue into supporting pre-dialysis patients
For “Investing dialysis-based revenue into supporting pre-dialysis patients” to be considered present the site must exhibit the following element:

The practice uses APPs to provide routine care in dialysis units and either funds additional practice resources with the revenue savings or uses the same APPs in clinic.
<table>
<thead>
<tr>
<th>Agenda Item</th>
<th>Open-ended questions</th>
<th>Data points to capture</th>
</tr>
</thead>
</table>
| Opening discussion (Questions that can be used to kick-off any meeting) | 1. What 3 things do you think account for your ability to deliver high quality care for your patients?  
2. What 3 things do you think account for your ability to keep total costs of care low? | 1. The features that account exceptional quality  
2. The features that explain success in managing total cost of care |
| Tour and overview of site | Observation of their:  
1. Office space and resources on site  
2. Staffing and team interactions  
3. Patient population and flow | 1. The office space and resources onsite  
2. Who works at the practice site (e.g. nephrologists, other specialists on staff or hosted, physician extenders, MAs, administrative staff)  
3. How the office is structured to support team working and patient flow |
| Meeting with the lead clinician on clinical processes | 1. Tell us about a typical day for you  
2. What is your estimated breakdown of patients with different stages of kidney disease (Stage 1 or 2, Stage 3a and 3b, Stage 4, and Stage 5? What is the percentage of your patients that are on dialysis? Broken down by different dialysis modalities?  
3. How does your care differ by CKD stage? How do you prevent the progression of CKD? Are there incentives in place for you to do so? How do you avoid health complications?  
4. Question around managing costs of drugs? Follow-up question on ESAs  
5. How does the clinical and non-clinical staff on site support you to manage patient care?  
6. How do you decide when it is appropriate to start dialysis and on what modality?  
7. What systems and processes do you have in place to help you manage your patient care? For example how would you know if a patient had attended their specialist visit or fulfilled their care plan outside of the office visit? Attended dialysis? | 1. Approach to care for patients with different stages of disease  
2. Percentage of patients by disease stage and dialysis modality  
3. Formal and/or informal policies and protocols that underpin clinical processes (collect artifacts)  
4. Formal or informal policies for prescribing and medication management  
5. Use of team to help manage patient care  
6. Approach to care for patients when there are different treatment options and trade offs for the patient (e.g. dialysis modality or dialysis versus different end stage treatment options)  
7. Systems to segment, track, monitor and manage patients in and outside of the clinic  
Capture any tools or resources they use. |
| Tour of dialysis clinic and unstructured time for observation | 1. Dialysis clinic set-up and resources on site  
2. Staffing and team interactions  
3. Patient flow | 1. The office space and resources onsite  
2. Who works at the dialysis site (e.g. nephrologists, other specialists on staff or hosted, physician extenders, MAs, administrative staff)  
3. How the office is structured to support patient flow |
| --- | --- | --- |
| Meeting with the administrative lead at the dialysis center | 1. Tell us about a typical day for you  
2. What systems and processes do you have in place to help you do your job?  
3. How does the clinic manage patient follow-up for symptom control or missed appointments?  
4. How do you organize your dialysis unit to be efficient | 1. Roles and responsibilities  
2. Formal and/or informal policies or protocols that underpin non-clinical processes (e.g. access and scheduling)  
3. Systems for tracking and following up with patients  
4. Features that promote efficient care (e.g. volume/scale)  
Collect artifacts. |
| Meeting with the physicians and mid-levels at the dialysis clinic on their approach to dialysis care | 1. Tell us about a typical day for you  
2. What is your approach to patient access?  
3. Talk us through the patient journey for the different patient groups you have on dialysis.  
4. How are decisions made about when to start a patient on dialysis?  
5. How do you work together to manage patient care?  
6. How do you help your patients avoid serious health complications?  
7. What resources do you have in place to support patients at home? | 1. Roles and responsibilities  
2. Their approach to access, including extended hours  
3. Formal and/or informal policies or protocols that underpin clinical processes (collect artifacts)  
4. Support for patients (and their families) to make decisions where there are different treatment options and trade-offs for the patient (e.g. in-center versus home dialysis). Capture any tools or resources the use.  
5. Systems to cooperatively manage care  
6. Systems to monitor and manage dialysis and symptom control including any closed loop systems  
7. Resources available to patients in the clinic and at home |
| Meeting with a primary care provider who often refers to this practice | 1. How do you work with the nephrologists at this practice  
2. How are decisions made about what patients you manage versus patients that would benefit from having a nephrologist?  
3. How do you keep informed about the care your patients are receiving at the nephrology practice and dialysis center? | 1. Processes/protocols to help primary care physician manage care for patients with a relevant chronic disease or condition, but are low risk  
2. Threshold for referral and referral process |
| Meeting with multiple MAs (15-30 minute sessions) | 1. Tell us about a typical day for you  
2. What are you key responsibilities?  
3. How do you interact the clinical and non-clinical staff  
4. How do you interact with the dialysis clinic | 1. Roles and responsibilities of the MAs  
2. Processes/protocols in place that help the MAs fulfill their roles and responsibilities |
| --- | --- | --- |
| Meeting with the clinician to discuss quality management | 1. How do you judge the quality of the care you provide? Do you collect and analyze internal data? Do you work with payers to collect additional data? How do you benchmark and/or set goals?  
2. How frequently do you internally measure and monitor cost? Do you have insight into total cost of care? How do you benchmark yourselves and/or set goals?  
3. What else do you measure/monitor? | 1. The existence/structure of a quality group and staffing/skill mix  
2. Measures collected, process of project selection  
3. Example projects (and impact on cost and quality), and future projects. |
| Meeting with practice manager and clinician with lead responsibility for non-clinical processes | 1. What is your role?  
2. What is your role in the practice’s finances?  
3. How do you know what is and isn’t appropriate utilization?  
4. What types of reimbursements do you receive for patient care?  
5. What are other sources of revenue for your group?  
6. How are clinical and non-clinical staff compensated? Are there any incentives?  
7. How do you measure financial and economic success?  
8. What contracts do you have (if any) with external providers | 1. Duties of the clinic manager  
2. Role in managing the clinic’s finances  
3. Systems and processes for managing utilization  
4. The reimbursement model (breakdown of patients by payor and revenue by payor)  
5. Other revenue sources and how they contribute to controlling costs  
6. Their clinical and non-clinical staff compensation model  
7. Cost controlling mechanisms  
8. External contracts |
| Discussion with the person doing scheduling | 1. What is your approach to patient access?  
2. Describe your approach to patient scheduling  
3. How would you know if a patient had missed their appointment at the clinic or their dialysis appointment at the dialysis clinic? | 1. How access is organized access and any systems and/or processes in place to help them manage this  
2. System for scheduling patients  
3. Systems for monitoring and managing patient appointments |
Care Team Interview Guide

The wrap-up with the site leadership will be an opportunity for the site visit team to share what they’ve learned from the site visit with the leadership and provide feedback on the key impressive takeaways from the visit. It also provides an opportunity to further clarify on any outstanding questions using the opening guide hypotheses as a potential guide to surface any areas that might have been missed.

1. What does a typical day look like for you?

2. How do you interact with the clinical and non-clinical staff?

3. What systems, protocols and procedures are in place that help you do your job?

4. What do you think contributes to your ability to provide high quality care?

5. What do you think contributes to your ability to keep health spending low for your patients?

6. How do you help patients avoid serious health complications/hospitalizations?

7. What is your role in helping patients keep their appointments, either at the clinic or with PCPs and other specialists?
Clinical Scenarios [to be used if the Opening Questions do not generate sufficient detail/specific care features]

1. Renal replacement therapy selection and vascular access:
   - What is your general approach for renal replacement therapy selection?
   - What is your referral threshold and process for dialysis?
   - How do you support your patients on in-home peritoneal dialysis? What resources do you provide them (either in or out of the office?)

2. Renal artery stenosis management:
   - What is your strategy for controlling complex patients’ blood pressure?
   - When do you refer patients for renal artery stenting? What is your threshold?

3. ACE inhibitor/angiotensin receptor blocker use:
   - What are your approaches to antihypertensive selection? How often, and in what contexts do you use angiotensin-converting-enzyme inhibitors and angiotensin—receptor blockers (including combination therapy, if needed)?

4. Renal transplant evaluation:
   - What is your evaluation approach for renal transplants? What criteria do you use? Do you have any disqualifiers, and if so, what are they?
   - How often and in what contexts do you refer for renal transplants?