Referrals and the PCMH: How Well Do We Know Our Neighborhood?

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Patient-centered medical homes (PCMHs) seek to improve care coordination for patients through the use of multidisciplinary teams and learning health systems. Ambulatory referral processes provide an opportunity to utilize these teams and systems to enhance the quality of patient care. Referrals for specialist consultation, ancillary services, and high-cost procedures in the ambulatory care setting are a source of great expense, miscommunication, and general frustration.[1]

Issues, including stresses on clinical volume, increased cost, fragmentation of care, and lack of process transparency associated with referral processes are well documented in the literature,[1-3] even from as long ago as the 1960s when Kunkle and colleagues described the process as "needlessly inefficient."[4] Although this "inefficient" label may have been intended for the specific process of information transfer and implementation, it may apply to our current referral practices, as well. As we seek to optimize value in healthcare, we need to know how ambulatory referrals impact our goal of improving quality while lowering cost and improving the patient care experience. Referral volume is immense: studies in the 1990s and 2000s observed Medicare beneficiaries receiving 2 referrals per patient per year and seeing an average of 5 specialists in a 365-day period.[5,6] Bodenheimer and colleagues showed that more than one-third of primary care patients receive a specialty referral in a given year.[5]

In this study, we wanted to characterize current patterns of referral (eg, specialist visit, testing, ancillary services) initiated from our academic PCMH using the model originally described by Mehrotra and colleagues in their narrative review of the literature.[1] We focused on the patterns of referral through the lenses of provider experience and the patient's risk of healthcare utilization.[1,7-9] In our academic National Committee for Quality Assurance–certified level 3 PCMH, we compared referral patterns of internal medicine residents and faculty to assess the association of referrals with provider years of practice. We also incorporated a risk stratification tool for the PCMH patients so clinicians and researchers can observe the association of the patients' risk of healthcare utilization on referral patterns.

ABSTRACT

OBJECTIVES: Characterize patterns of referral from a patient-centered medical home (PCMH) and observe the association of provider experience, patient chronic disease burden, and risk of utilization on referral placement.

STUDY DESIGN: Descriptive analysis of referral patterns in an academic, internal medicine PCMH.

METHODS: We examined referrals (eg, specialist visit, testing, ancillary services) placed between July and December of 2014 in an academic PCMH caring for a total of 12,000 patients. All referrals originated from the outpatient PCMH clinic and were divided into resident or faculty clinic based on the assigned primary care provider. Patients with a referral during the 6-month study period served as the unit of analysis, and we developed a generalized linear model to identify variables associated with referral placement. We estimated the association of the patients' risk of healthcare utilization using a risk stratification tool.

RESULTS: The faculty placed 1709 referrals for 3055 unique patients seen compared with 2388 referrals for 2434 unique patients seen by residents. For those patients receiving referral, a mean of 1.72 referrals were placed, with residents having significantly more referrals per patient (1.9 ± 1.3 vs 1.5 ± 0.9; P <.0001). For patients at highest risk of utilization, residents were referred at a rate of 0.327 compared with 0.226 (P = .0035) in the faculty clinic.

CONCLUSIONS: In an academic setting, provider and patient factors play a role in referral patterns. Residents refer highest-risk patients more often than their faculty counterparts, while there is no difference for lower-risk patients.

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TAKE-AWAY POINTS

- Provider experience may matter; resident physicians placed more referrals per patient than their faculty counterparts.
- Chronic disease may also impact referral patterns: diagnoses of chronic obstructive pulmonary disease, peripheral vascular disease, depression, obesity, peptic ulcer disease, and drug abuse increase the likelihood of referral. Iron deficiency anemia decreased the likelihood of referral.
- The intersection of the patient's risk of utilization and provider experience reveals residents refer high-risk patients more often than faculty, and that this difference in rate of referral narrows as we move down the spectrum of risk.

METHODS

We compared referral patterns between the faculty and resident practices in the Medical University of South Carolina's (MUSC) academic internal medicine PCMH. Utilizing the electronic health record (EHR), we searched for all referrals placed for these patients during the 6-month period between July and December of 2014. Qualifying referrals included orders for specialty consultation, ancillary services (eg, physical, speech, and occupational therapies), home- and community-based services (eg, home health, durable medical equipment, and rehabilitation), and high-cost imaging (eg, computerized tomography and magnetic resonance imaging scans) during the study period (**Table 1**). All referrals were generated from the PCMH. All consultation orders placed by providers in the inpatient setting were excluded. Data was divided into resident or faculty clinic based on the assigned primary care physician. The PCMH structure attributes all patients to an individual primary care physician; the clinic recognizes resident physicians as the primary providers in the EHR, but they practice under faculty supervision.

In addition to classifying referral patterns based on provider experience, we looked at referral patterns stratified by patient risk of hospital utilization, a composite of hospitalization and emergency department (ED) visits. We utilized a risk stratification tool that was devised, developed, and validated at the MUSC, and detailed further in the literature.[10] Using this tool, the patients in the PCMH were stratified into 5 quintiles of risk. The fifth quintile represents the highest likelihood of utilization, and the first quintile, the lowest. Risk stratification was performed prior to identifying faculty or resident clinic association. Additionally, the risk tool was applied to the PCMH as a whole, not only to those patients receiving a qualifying referral.

Patients with a referral during the 6-month study period served as the unit of analysis. Referral statistics were calculated and distribution was analyzed. A generalized linear model was applied to identify variables associated with referral placement; a Poisson distribution with log link was assumed as our dependent variable (number of referrals) and assessed for multicollinearity. Multicollinearity exists when 2 or more of the predictor variables are moderately or highly correlated, limiting conclusions from the model. Backward selection determined the variables selected for the model (based on $P \leq .20$). A z test for comparing 2 population proportions was also used. SAS version 9.3 (SAS Institute Inc, Cary, North Carolina) was used for statistical analyses. This project was approved by the MUSC Institutional Review Board.

RESULTS

During our 6-month study period, a total of 4097 referrals were placed for 2387 patients. Table 1 classifies the types of referrals ordered. **Table 2** describes the patients receiving a referral between the 2 study clinics. With regards to referral volume, 1709 referrals were placed for 1111 patients in the faculty clinic during the study period (Table 2). Patients receiving a referral from a faculty member were older and more often male, white, and married compared with resident patients referred. Patients who were referred by a resident were more often poor or reliant on Medicare and/or Medicaid compared with faculty patients referred. These demographic discrepancies persist in the resident and faculty clinics as a whole, irrespective of referral status. During the 6-month study, 3055 unique patients were seen and 6298 individual visits were generated by the faculty. In this context, the faculty placed 0.364 referrals per patient and 0.271 referrals per visit. In contrast, the residents placed 2388 referrals for 1276 patients while seeing 2434 unique patients and conducting 5640 visits during the study period. The residents placed more referrals

TABLE 1. Referral Destinations

Type of Referral	RES Referrals (n = 2388)	ATT Referrals (n = 1709)	*P*
Audiology exam	9 (0.4%)	19 (1.1%)	
Consult and treat	7 (0.3%)	5 (0.3%)	
Consultation	1526 (63.9%)	1049 (61.4%)	.0995
Conversion	10 (0.4%)	13 (0.8%)	
Established	2 (0.08%)	1 (0.06%)	
Home healthcare	75 (3.1%)	16 (0.9%)	<.0001
MRI/CT scan	217 (9.1%)	251(14.7%)	<.0001
Occupational therapy	9 (0.4%)	10 (0.6%)	
Physical medicine	266 (11.1%)	165 (9.7%)	.1268
Psychiatric	76 (3.2%)	28 (1.6%)	.0019
Rehabilitation	3 (0.1%)	1 (0.06%)	
Routine exam	1 (0.04%)	0 (0.0%)	
Speech therapy	3 (0.1%)	0 (0.0%)	
Surgical	110 (4.6%)	111 (6.5%)	.0083
Used durable medical equipment	74 (3.1%)	40 (2.3%)	.1456

ATT indicates attending physician; CT, computerized tomography; MRI, magnetic resonance imaging; RES, resident.

per patient seen (0.524 vs 0.364; P <.0001) and more referrals per visit (0.423 vs 0.220; P <.0001) compared with the faculty. Of the patients referred, an average of 1.72 referrals were placed. With the risk stratification model already applied, this was analyzed in the context of those patients having been referred (Table 2). Of those referred, the resident clinic had significantly more referrals per patient (1.9 ± 1.3 vs 1.5 ± 0.9; P <.0001).

The generalized linear model (**Table 3**) revealed 5 parameters with a significance of $P \leq .05$ with the outcome of referral. At this level, chronic obstructive pulmonary disease (COPD), peripheral vascular disease (PVD), depression, and obesity increased the likelihood of referral, whereas assignment to the faculty clinic decreased the likelihood. Three parameters at the $P \leq .1$ level of significance included peptic ulcer disease and drug abuse, which increased the likelihood of referral; iron deficiency anemia decreased the likelihood. The rate of referral (referrals divided by the patients assigned to the respective clinic) was calculated by tier of utilization in both the faculty and resident clinic groups, as seen in the **Figure**. For those at the highest risk of utilization (fifth tier), residents referred patients at a rate of 0.327 versus 0.226 in the faculty clinic (P = .0035). As we move down the spectrum of risk, the rate gap narrows, with no significant difference in referral rates between faculty and residents. The fourth tier of utilization has a referral rate of 0.160 for the residents and 0.198 for the faculty (P = .0535).

TABLE 2. Baseline Characteristics

	RES Patients (n = 1276)	ATT Patients (n = 1111)	*P*
Age, years: mean ± SD	58.9 ± 14.5	63.0 ± 13.8	<.0001
Male, %	369 (28.9%)	427 (38.4%)	<.0001
White, %	257 (20.1%)	735 (66.2%)	<.0001
Unmarried, %	944 (74.0%)	411 (37.0%)	<.0001
Public insurance, %	969 (75.9%)	541 (48.7%)	<.0001
Poverty, %	615 (48.2%)	263 (23.7%)	<.0001
N of referrals, mean ± SD	1.9 ± 1.3	1.5 ± 0.9	<.0001
Risk quintile 1 (lowest)	1.7 ± 1.4	1.4 ± 0.9	.2329
Risk quintile 2	1.6 ± 0.9	1.5 ± 1.0	.8199
Risk quintile 3	1.8 ± 1.2	1.5 ± 0.8	.0101
Risk quintile 4	1.8 ± 1.1	1.5 ± 0.9	.0053
Risk quintile 5 (highest)	2.0 ± 1.4	1.9 ± 1.3	.8511
Referrals, n	2388	1709	
Patients referred, n	1276	1111	
Patients seen, n	2434	3055	
Patients visits, n	5640	6298	
Patients referred rate	0.524	0.364	<.0001
Referrals rate	0.423	0.271	<.0001

ATT indicates attending physician; RES, resident; SD, standard deviation.

DISCUSSION

In this descriptive analysis, there were more referrals placed in the resident clinic (2388 vs 1709) despite fewer total visits. For those patients referred, the average number of referrals per patient (for those patients referred) was significantly greater in the resident clinic (1.9 vs 1.5; P <.0001). Multiple factors may play a role in this difference.

With regard to healthcare setting, reduced provider continuity in the resident clinic could contribute to this increase in referrals. Multiple providers (both residents and faculty) navigating a crowded EHR might result in the placing of redundant referrals, ordering additional services, or requesting further testing unnecessarily. Haggerty and colleagues described continuity in the referral process in 3 domains: information fidelity, coherent management, and ongoing therapeutic relationships.[11] Failure to deliver continuity in these domains may potentially increase referral volume and may help to explain the results.

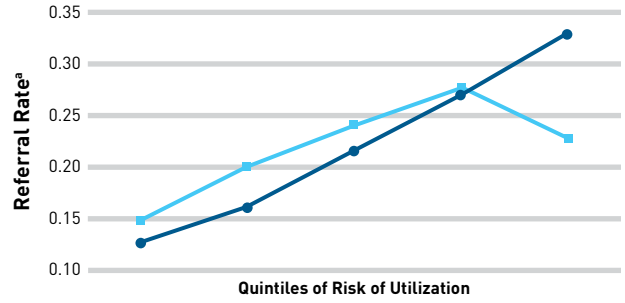
Patient-level factors also play a role, such as the patient's risk of utilization, access to resources, chronic medical conditions, and desire for referral.[3,12,13] In considering patient utilization risk, a substantially greater total of high-risk (quintile 5 utilization) patients are seen in the resident clinic as opposed to the faculty clinic (1878 vs 199, respectively). Higher utilization may necessitate an increased need for assistance in managing these patients. It may also suggest higher complexity, which impacts referral decision

TABLE 3. Regression Estimates

	Estimate	*P*	RR (95% CI)
Intercept	0.5671	<.0001	1.7631 (1.5136-2.0540)
Age	−0.0019	.1330	0.9981 (0.9957-1.0006)
RES[a]	0.1370	.0001	1.1468 (1.0703-1.2288)
Public insured	0.0563	.1378	1.0579 (0.9822-1.1395)
COPD	0.0813	.0214	1.0847 (1.0121-1.1625)
Cancer	0.0698	.1298	1.0723 (0.9797-1.1736)
Deficiency anemia	−0.0792	.0977	0.9239 (0.8412-1.0146)
Drug abuse	0.1032	.0856	1.1087 (0.9857-1.2471)
Liver disease	0.0865	.1275	1.0904 (0.9755-1.2187)
HIV	−0.2174	.1688	0.8046 (0.5904-1.0966)
Paralysis	−0.1226	.1470	0.8846 (0.7495-1.0440)
Peptic ulcer disease (excluding bleeding)	0.1375	.0909	1.1474 (0.9783-1.3455)
Peripheral vascular disorders	0.1153	.0314	1.1222 (1.0104-1.2463)
Depression	0.0757	.0283	1.0786 (1.0081-1.1542)
Obesity	0.0721	.0261	1.0748 (1.0086-1.1452)

CI indicates confidence interval; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency disease; RES, resident; RR, referral rate.
[a]RES was coded to 1 if the primary care physician was a resident.

FIGURE. Rate of Referral by Utilization Risk



	1 lowest	2	3	4	5 highest
RES	0.127	0.160	0.215	0.269	0.327
FAC	0.145	0.198	0.240	0.275	0.226
P value	.3968	.0535	.1979	.7798	.0035

ATT indicates attending physician; RES, resident.
[a]Rate of referral indicates patients referred/assigned to the respective clinic by risk of utilization.

making by increasing the likelihood that there will be difficult conditions to manage outside the scope of the primary provider. Additionally, increased patient complexity may limit the time a primary provider can allot to each condition, leading to an increase in referral placement. However, the involvement of more subspecialists increases the potential for miscommunication, additional testing, and polypharmacy, which may contribute to higher rates of ED visits and hospitalizations.

Resident clinic patients likely also have less access to specialty services. In our study, the resident patients receiving referrals relied on public payers more often and were often more impoverished than faculty patients. These factors decrease a patient's ability to be seen in specialty clinics, receive ancillary services, or obtain high-priced testing, and this lack of access—likely resulting in a lower rate of referral completion—might paradoxically drive an increase in orders placed. Lastly, the patient's chronic medical conditions likely impact referral patterns. Chen and colleagues showed the impact of patient comorbidities, expectations, and the diagnosis attached to referral on referral patterns.[8] The generalized linear model sought to evaluate this issue in the study sample. The presence of obesity, depression, COPD, and PVD all increased the likelihood of referral. Although these conditions' contribution to morbidity can be appreciated, it is interesting that they lead to high referral patterns in that they are almost all managed by primary care physicians, except at the extremes of disease.

Further investigation into the diagnosis for which providers generate referral may be valuable in further characterizing these orders. With regards to provider experience, the results of previous studies suggest providers with less experience refer more often,[14,15] and our findings agree. A more focused investigation into the impact of provider experience on referral patterns may further address this issue.

In discussing referral patterns in the contexts of setting, provider, and patient, the Figure provides an intersection between all 3 elements. In this Figure, a marked gap emerges in the referral rates of patients at the highest risk of utilization. Residents refer quintile 5 patients more often than their faculty counterparts. However, as the risk of utilization falls, the referral rates begin to converge, with no statistical difference in the rate between the 2 clinics. Additionally, the faculty rate of referral decreases from quintile 4 to quintile 5 patients. Multiple explanations may contribute to this change in referral rate across the continuum of utilization risk. First, faculty physicians may exhibit more comfort with patients at high risk of utilization. This comfort may decrease their tendency to order specialty referrals, ancillary services, or high-cost imaging procedures. Next, patients in the faculty clinic—as a result of longer-term continuity and ongoing therapeutic relationships—already receive specialty care for their conditions, which may limit the number of new referrals originated during the study period. This could be better assessed with a longer study period or a longitudinal study of these patients in the faculty clinic.

Value may also play a role in the decision to refer patients at highest risk of utilization. Faculty may make a conscious effort to improve the quality-to-cost quotient by requesting specialty consultation and high-cost testing less often for patients with a higher propensity to utilize healthcare resources. More importantly, patients in long-term therapeutic relationships with their faculty provider may not pursue or desire more testing, consultations, or additional services. A more direct question with feedback from patients and faculty providers may better address this issue. Fluctuation in referral rate along the continuum of utilization risk may provide an opportunity to further explore the intersections of patient, provider, and practice factors that impact referral patterns.

One persisting question revolves around ordering recommended screening procedures. Referrals for recommended screening procedures would appropriately increase referrals for those at lower risk of healthcare utilization compared with those in the highest quintile who may not benefit from these screening measures. Increasing preventive measures in those who might benefit, while limiting such testing in those with potentially more comorbidities, may improve value.[16] This study did not include mammograms or bone density testing on account of lower cost. However, such information is needed to illustrate the full impact of screening measures on referral rates.

Although referrals contribute to clinical volume, healthcare cost, and care fragmentation, they do provide an essential role in the care of patients. At this point, the ideal number of referrals is not clear. If healthcare systems continue efforts to improve care coordination and multi-specialty system integration, the risks

of increased cost and care fragmentation may lessen. Referrals' contribution to quality, safety, and meaningful clinical outcomes requires further assessment. Health services researchers will need to address the utility of referrals in the setting of need for individual patients, providers, and healthcare systems.

Limitations

Our study has several limitations. This project was conducted in a single academic medical center and done so over a relatively brief study period (6 months). There was also no adjustment for social determinants, which likely have an impact on patient-level factors contributing to referral decisions. Social determinants impact access to care, the need for services, the volume of issues facing the primary care physician, and the transfer of information. With regard to access, social determinants may limit the testing or consultations available to patients, impact the adherence to scheduled appointments, or affect the ability to follow up on incomplete referral processes. Social determinants play a role in the volume of issues encountered in the primary care setting, which may lead to differing referral patterns in an effort to fit time constraints while managing multiple problems. Additionally, they play a role in the transfer of information. With current barriers to care coordination including fragmentation and lack of system integration, the patient often serves as the primary vehicle for information exchange between providers. Social determinants impact the ability of patients to participate in this role. Also of note, there is the potential for a first-order interaction when looking at demographic data—in particular, when looking at race and payer system.

Another limitation includes the inherent demographic differences between faculty and resident patients, limiting the ability to fully isolate the impact of clinician experience on referral patterns. Residents see more high-risk patients, and the patients are more often impoverished and reliant on public payer systems for healthcare. Future studies will need to address experience within the context of more similar patient populations to fully understand the impact on referral patterns. A multi-level model may have better assessed the role of clustering; however, this type of modeling was not feasible due to the structure of our data. Despite assignment to individual resident providers and empanelment in the resident physician practice, patients did not always see their assigned resident. On account of resident scheduling and clinic availability, assigned patients would often see other resident providers, which made it difficult to account for patients seen per provider and to appropriately assess clustering. However, this is a scenario that does not play out on the faculty side, where patients saw their assigned faculty provider (advanced practice providers also involved) almost every visit. Finally, the data collected is dependent on the veracity of the EHR.

CONCLUSIONS

Setting, provider, and patient factors all can play a role in referral patterns. In looking at referral rates in the setting of risk of healthcare utilization, residents refer high-risk patients more often than their faculty counterparts. This difference in rate of referral narrows as we move down the spectrum of risk. Understanding the factors that influence these disparities in referral rates may aid patients, clinicians, healthcare systems, and policy makers in identifying opportunities to improve the referral process. Efforts to optimize care coordination and the utilization of specialty physicians, diagnostic testing, and ancillary services could enhance healthcare quality and reduce cost in the future. ■

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