Does a Centralized Scheduling Process Improve Referral Timeliness?

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ABSTRACT

Background: Timely, necessary specialist care is associated with better patient health outcomes and lower costs. This assessment looks at the effects of centralized scheduling, as well as patient and referral-level factors on referral completion rates. We hypothesized that centralized scheduling would increase access to specialty care, as evidenced by higher referral completion rates.

Methods: We analyzed data for specialty referrals to cardiology, nephrology, gastroenterology, and neurology from 6 months before to 6 months after implementation of a centralized scheduling system within a midwestern academic health system. We considered a referral complete if an appointment occurred within 3 months following an order for service.

Results: Overall, referral completion rates modestly increased (63.7% to 69.9%, $P < 0.01$), but this was driven by improvement within a single specialty (gastroenterology, 54.2% to 67.3%, $P < 0.05$). Other specialties saw either no significant change (neurology, nephrology) or a decrease (cardiology, 87.3% to 78.6%, $P < 0.05$). The time to schedule, or cycle time, improved overall from 21 days (SD 8-38) to 15 days (SD 8-30), $P < 0.05$.

Conclusions: Centralized scheduling had inconsistent effects on referral completion across specialties, though the process (cycle time) improved. Variable implementation fidelity and microenvironments likely contributed to uneven findings across specialties. Centralized scheduling may improve timely access but likely depends on implementation and buy-in.

INTRODUCTION

Referrals from primary care physicians to specialists represent a major link for patients to have their needs met by the health care system. The referral process touches on all 6 pillars of what the

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National Academy of Medicine considers a well-functioning health care system, namely that care should be safe, effective, patient-centered, timely, efficient, and equitable.[1] The referral process also plays an important role in ensuring that patients receive the specialty care they need, when they need it, and how they need it. Inefficiencies or inequities in the referral process can pose threats to safe and effective care.

Primary care serves as the first point of contact for most Americans with the health care system. When conditions are sufficiently complex, primary care physicians refer to, and coordinate care with, specialists. Around 1 in 10 office visits results in a referral to a specialist, yielding an estimated 50 million new referrals and 430 million specialty visits every year.[2,3] When appropriate and effective, this primary care-specialist coordination can lead to better health outcomes for patients. In chronic kidney disease, for example, specialist co-management of patients is associated with reduced incidence of end stage renal disease, and in more advanced cases of kidney disease, leads to a 37% reduction in mortality.[4-6] Heart failure patients who are co-managed by an internist and a cardiologist have decreased costs of care and are less likely to be admitted to the hospital.[7] Conversely, when patients fail to complete referrals and receive necessary, timely specialist care, they are at risk for worse health outcomes and higher costs.[8]

Patient-centered scheduling efforts have centered around trying to improve patient access to care, but approaches to achieve this goal have varied. In several studies, implemented changes

included same-day appointments, after-hours care, and increased opportunities for walk-in care.[9] Studies have shown open-access scheduling, which emphasizes patient-driven scheduling, to be beneficial for reducing no-show rates and wait times, although effects on patient satisfaction have been mixed.[10] Concerns remain over continuity of care with open-access scheduling and the risks for patients with chronic conditions to fall through the cracks.[10,11] Further, local schedulers are likely more familiar with the subset of clinical conditions seen by their clinicians, and they may also "bump" appointment requests to clinicians for triage. While patient-centered scheduling efforts have been well-defined in primary care, the effects of these efforts on access to specialty care have been less well-characterized and have been limited mainly to single specialty studies.[12-14]

Another component related to the referrals process and access to specialty care is ensuring that access to specialty care is consistent across different groups and demographics. This plays into the National Academy of Medicine's aim of making health care more equitable. One area of identified inequity in health care is racial disparities in use of, and access to, health care. Prior to 2014, access and insurance coverage were identified as primary factors contributing to racial disparities in health care utilization.[15] While the full implementation of the Affordable Care Act has been shown to have reduced racial disparities through increased insurance coverage and access to health care, work remains to be done in making access to health care more equitable.[15]

With a drive to improve access, timeliness, and the patient experience, our health system implemented a new process with the centralized management of patient referrals. The process uses a centralized call center with workflows to improve the matching of patients and clinicians at locations most convenient for patients. In this analysis, we aimed to identify the effects of centralized scheduling on access to specialty care, represented by referral completion rates, by reviewing referral data from a large regional academic health system. We also sought to identify other patient and referral-level factors (age, ethnicity, sex, marital status, insurance financial class, and referral priority) that might be associated with higher or lower referral completion rates. By assessing processes, including time to appointment and referral completion, we sought to assess if the process was measurably more efficient. In assessing patient factors, we sought to proactively look at equity and assess for any differences across patient groups—including race, income, and language—such that those could be actively addressed. We hypothesized that centralized scheduling changes would increase access to specialty care, as evidenced by higher referral completion rates. To focus our assessment, we looked at 4 specialties: cardiology, nephrology, neurology, and gastroenterology.

METHODS
Setting
Froedtert and the Medical College of Wisconsin (MCW) is a regional health network serving 9 counties in southeastern Wisconsin. The health network has 3 hospitals, including a 604-bed academic campus, and 38 satellite health centers that provide ambulatory, laboratory, and radiology services. The network has over 900,000 annual outpatient visits, and network physicians have close to 800,000 annual patient visits at its health centers and clinics. Froedtert and MCW implemented these patient-centered, centralized referral management changes, by specialty, over the course of 2015-2017, to help increase patient access to, and satisfaction with, care.

Description of Centralized Scheduling Process
During the centralized scheduling changes implemented during this project, clinicians used provider order entry within an electronic health record (EHR) (Epic Systems, Verona, Wisconsin) to place referrals. Prior to centralized scheduling, clinicians ordered referrals by location, specifying the clinic location where the patient was to be referred. Each referral location was a unique order. Staff within those clinics would then use a work queue to reach out and call patients, or patients would telephone the clinic directly, to schedule those appointments. Through the centralized scheduling process, orders were altered such that clinicians could refer to a specialty using a single order for all locations. Clinicians had the option within the order to specify a patient-preferred location or preference for the first available appointment within the region. Staff at a centralized call center operated these work queues rather than the individual clinics. Scheduling grids were created that outlined the scope of services available at each clinic and scope of practice for individual doctors, such that specialized knowledge that was held within the clinic staff could be scaled to the centralized schedulers. Providers received information about the new process and information about how the order process was modified for centralized scheduling. Schedulers received information and educational inservices about how to access scheduling grids.

Data Sources
We used data from the EHR detailing referrals and appointments for 4 specialties that were high priorities for improving access: cardiology, nephrology, gastroenterology, and neurology. We used referrals as ordered in the EHR by affiliated primary care physicians (PCP) who used the health system's EHR, inclusive of general internal medicine, family medicine, or medicine-pediatrics practices. We excluded referrals that were later cancelled by any clinician. We included patients who had a PCP within the health system and who were 18 years or older when the referral was placed to limit the analysis to electronic orders. Only office visits were included, not referrals for procedures such as endoscopy or cardiovascular or neurological testing because these procedures continued to be scheduled by departments. To assess whether a referral was completed, we used the scheduling system to determine if the patient had a completed appointment within 90 days

of the referral being placed. Referral cycle time, measured in days, was defined as time from referral placement to appointment completion. We assessed implementation fidelity with key informant meetings with ambulatory services leaders. We assessed the number of clinicians seeing patients by a unique count of clinicians within ambulatory clinics during the 6 months before and after the implementation. Differences were compared by paired *t* tests. Data on clinical effort (ie, percent of time seeing ambulatory patients) was not available for this analysis.

We abstracted referrals 6 months before and 6 months after the implementation of the centralized scheduling process at each department, looking for appointments within 90 days of the referral (Table 1).We abstracted demographic information from the EHR to capture patient details at the time of the referral, including age, sex, insurance status, marital status, ethnicity, race, ZIP code, and language. We also abstracted details about the referral, such as its priority in the system (urgent vs routine).

Statistical Analysis

We explored descriptive statistics by specialty, comparing referral completion by implementation of the new centralized scheduling process. The unit of analysis was the referral. If patients had multiple referrals to a single specialty within the time frame, we used the first referral. We used multilevel logistic regression on referral completion using SAS version 9.4 with generalized estimating equations using PROC GLIMMIX, clustering by patient given that patients may have had more than 1 referral. Coefficients, *P* values, odds ratios, and confidence intervals were calculated and reported for all variables of interest. A *P* value of <0.05 was required for a variable effect to be considered significant.

RESULTS

During the 6 months prior to and after their respective adoptions of centralized scheduling, 10,974 patients had 11,761 referrals placed to cardiology, nephrology, gastroenterology, and neurology (Table 2). Of these patients, 3719 (33.9%) had at least 1 incomplete referral by our 90-day criteria. Through 4 key informant interviews (vice president of ambulatory services, senior medical director for ambulatory care, director of enterprise scheduling, and chief transformation officer), we assessed implementation fidelity, defined as following through with centralized scheduling rather than local scheduling. Participants identified that cardiology continued to send referrals to local clinics to facilitate scheduling, while the other specialties had a strong fidelity to the intervention. The number of clinicians providing care to patients in the pre- and post-implementation periods increased modestly, driven by a 13% increase in gastroenterology, though the difference was not statistically different (Table 1).

The overall referral completion rate for all 4 specialties of interest was 66.7%, with the completion rate climbing significantly from 63.7% during the time before centralized schedul-

Table 1. Centralized Scheduling Dates and Clinician Counts 6 Months Before and After Implementation

Specialty	CS Implementation Date	Clinicians Before CS	Clinicians After CS
Neurology	8/12/2015	55	53
Cardiology	6/22/2016	45	46
Gastroenterology	4/12/2017	63	71
Nephrology	4/12/2017	21	20

Abbreviation: CS, centralized scheduling.
Counts were statistically similar (*P* = 0.55).

ing implementation to 69.9% after implementation (Table 3). Of the specialties, cardiology had the highest overall completion rate (80.9%); however, it saw its completion rate fall slightly but significantly from pre-centralized scheduling to post-centralized scheduling (83.7% to 78.7%). Conversely, gastroenterology had the lowest overall completion rate (60.2%) but saw its completion rate rise significantly from 54.2% to 67.3%. Neither nephrology nor neurology saw significant changes in the referral completion rates pre- and post-centralized scheduling.

The median time from referral order to specialist appointment (the cycle time) was 18 days, with that number falling significantly from 21 days before implementation of centralized scheduling to 15 days after implementation. Cardiology, gastroenterology, and neurology all saw their median cycle times improve from pre-implementation to post-implementation, although only the changes for neurology (27 to 20) and gastroenterology (21 to 15) were statistically significant. Conversely, nephrology saw its median cycle time rise, from 11 days pre-implementation to 14 days post-implementation, although not significantly.

DISCUSSION

In this assessment of primary care to specialty referrals within a single academic health system implementing a centralized scheduling and referral process, we identified that the centralized scheduling process modestly improved referral completion for patients, though we identified that this was driven almost entirely by throughput in a single specialty of gastroenterology. This may be due, in part, to variable implementation fidelity. We did see that cycle time overall was reduced by about 6 days (or nearly 30%), also driven by both gastroenterology and neurology improvements, which had the highest cycle times at baseline. While the changes in completion were small, any change is important given that the intervention was focused only on scheduling processes. With cycle time more notably improved, it adds credence to how scheduling and administrative processes impact care delivery.

In proactively assessing equity, we identified differences in referral completion by race, a finding that merits closer attention. The results were mixed, with non-White patients having improved referral completion rates compared to White patients in gastroen-

terology but lower in neurology. In general, we saw that patients on Medicare and/or Medicaid were less likely to complete referrals after adjusting for age categories.

Given the inconsistent results for referral priority and the other variables studied across the 4 specialties, we suspect that each specialty represents its own microsystem, and that the variable fidelity of the centralized scheduling process affected the outcomes. As such, due to either differences in patient population characteristics or different, persistent cultural and organizational practices, it is possible that results cannot necessarily be predicted with the implementation of a standardized process, but, like most process improvement activities in health care, must be assessed to ensure that desired results are achieved.

Moving away from local scheduling to scalable, centralized processes has important implications for health systems that are moving forward with enabling several scheduling improvements, such as the ability for patients to self-schedule online, assistants in primary clinics to directly schedule patient appointments, and the ability to create a single customer service center. Ensuring that barriers to scheduling, such as a single scheduling point within clinics or for individual physicians, are minimized are expected to facilitate the above innovations. Our data for gastroenterology likely show the clearest picture of the impact: with centralized scheduling embraced, cycle time dropped and referral completion improved.

We hypothesize that the mechanism of better referral completion is mediated by easier scheduling or giving the patient more flexibility for choosing times or optimal locations. Additionally, as opposed to open-access scheduling, where there have been concerns about decreased continuity of care, scheduling standardization and more consistent scheduling practices achieved through adoption of centralized scheduling might have prevented patients from being lost to follow-up.[10] Other factors, such as appointment reminder telephone calls, went unchanged during this time period, although the effects of staff changes would need to be better analyzed and understood.

Our results appear consistent with prior assessments in patient-centered scheduling improvements in areas where implementation fidelity was judged to be high, such as in gastroenterology. Similar to Rose et al, we identified improvement in access metrics, in the form of reduced wait times and no-show rates.[10] Importantly though, given that patient-centered scheduling effects have been better characterized in a primary care setting, it is possible that there are specialty-level variations that need to be considered and better studied before more coherent results can be synthesized.

Table 2. Patient Demographic Breakdown

	Cardiology		Gastroenterology		Nephrology		Neurology		Total	
No. of referrals	2290	%	5656	%	777	%	3038	%	11732	%
Language										
English	2272	99%	5584	99%	757	97%	3009	99%	11622	99%
Non-English	18	1%	72	1%	20	3%	29	1%	139	1%
Ethnicity										
Non-Hispanic	2235	98%	5447	96%	749	96%	2933	97%	11364	97%
Hispanic	55	2%	209	4%	28	4%	105	3%	397	3%
Race										
White	1896	83%	4756	84%	518	67%	2479	82%	9649	82%
Non-White	387	17%	885	16%	258	33%	552	18%	2082	18%
Marital status										
Married	1252	55%	3077	54%	369	47%	1511	50%	6209	53%
Non-married	1038	45%	2579	46%	408	53%	1527	50%	5552	47%
Insurance										
Medicare/Medicaid	1263	55%	3313	59%	410	53%	1833	60%	6819	58%
Non-government	1027	45%	2343	41%	367	47%	1205	40%	4942	42%
Age group										
18-39	253	11%	1114	20%	92	12%	732	24%	2191	19%
40-64	945	41%	2837	50%	280	36%	1307	43%	5369	46%
65+	1092	48%	1705	30%	405	52%	999	33%	4201	36%
Centralized scheduling										
Before	1029	45%	3081	54%	384	49%	1492	49%	5986	51%
After	1261	55%	2575	46%	393	51%	1546	51%	5775	49%
Sex										
Female	1229	54%	3428	61%	397	51%	1937	64%	6991	59%
Male	1061	46%	2228	39%	380	49%	1101	36%	4770	41%
Priority										
Urgent	270	12%	470	8%	68	9%	157	5%	965	8%
Routine	2017	88%	5169	92%	705	91%	2874	95%	10765	92%

Table 3. Completion Percentages and Referral Counts by Specialty

	Cardiology	Gastroenterology	Nephrology	Neurology	Total
Total Referrals	2287	5656	777	3038	11758
Completed Referrals	1850	3403	575	2016	7847
Overall Completion %	80.9%	60.2%	74.0%	66.4%	66.7%
Pre-CS Completion %	83.7%	54.2%	74.7%	66.6%	63.7%
Post-CS Completion %	78.6%[a]	67.3%[a]	73.3%	66.1%	69.9%[a]
Overall Median Cycle Time	15 (7-29)	18 (8-35)	14 (7-24)	22 (11-41)	18 (8-35)
Pre-CS Median Cycle Time	16 (7-30)	21 (9-41)	11 (7-24)	27 (13-44)	21 (8-38)
Post-CS Median Cycle Time	14 (7-28)	15 (7-29)[b]	14 (8-26)	20 (9-37)[b]	15 (8-30)[b]

Abbreviation: CS, centralized scheduling.
[a]$P < 0.05$ by chi-square.
[b]$P < 0.05$ by Wilcoxon rank-sum.
[c]Cycle time measured in days, defined as time from referral placement to appointment completion. Appointments that weren't completed did not have a cycle time and were thus omitted from these calculations.

Looking at race and equity in health care, being a race other than White was associated with increased odds of a completed referral in gastroenterology but decreased odds of a completed referral in neurology. These mixed results are somewhat unexpected, given the findings from other studies uncovering racial disparities in health care access and utilization.[15] Further assessment looking at more granular details, such as transportation access and geography may be helpful to understand these results in more detail. Proactively monitoring equity for patients across different groups should be explored for any changes that relate to access.

Our analysis has limitations that should be considered. We assessed fidelity of the implementation through key informant interviews but do not have quantifiable data about this aspect of the project available. Nonetheless, the information provides important context for why we may see differences by specialty. We used 90-day cutoffs for when appointments were to be scheduled, but it is possible that some elective referrals may have been completed outside of that window. We only captured referrals that were completed within our health network; it is possible that patients may have had referrals completed at outside systems but did not have claims data available. While this "leakage" may overestimate uncompleted referrals, we do not expect that leakage would have differed before or after implementation of centralized scheduling. We did not look at appointment scheduling time because of limitations with cancellations and reschedules affecting the clarity of the picture. Our models contained a significant number of potentially relevant pieces to the referrals puzzle. However, we were not able to include all the desired variables in our research model, including other patient contextual factors that are likely to be relevant, such as transportation access, childcare availability, or financial information such as copayment requirements. Organizational factors, such as staff turnover and physician leader engagement, were also not included in our model. Limited analysis of provider counts in each of the specialties before and after centralized scheduling implementation showed a mild increase in the number of gastroenterology providers but was otherwise insignificant. However, this analysis did not include any calculation or consideration of full-time equivalents. Future research would add additional variables through focused patient-surveys or incorporation of other contextual data to paint a more complete picture of factors affecting referral completion.

CONCLUSION

As attempts are made to improve access to care, it is important to ensure that these measures are having their intended effects. Where the centralized scheduling changes were most completely adopted, improvements in referral completion rates appear to have been the highest. Variable implementation fidelity and microenvironments within the different specialties, among other things, likely led to uneven findings across specialties, with some specialties failing to improve their completion rates significantly. There were similar uneven findings with racial equity and likelihood of completion of specialty referrals, hinting at currently unmeasured variables that might explain why the relative referral completion rates by race differs significantly across specialty. A more in-depth focus on the granular scheduling details—both past and present—of each specialty, along with characterization of patient socioeconomic factors, would help us better understand why we saw such divergent results for an organization-wide initiative and what needs to be done to ensure more consistent improvements to access to care with future interventions.

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