

Provision of Primary Care Under Reduced Visit Time Pressures

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[+ Supplemental content](#)

IMPORTANCE Primary care physicians face increasing pressure to deliver complex care within fixed, short visit durations. Prior evidence links higher time pressure to lower-quality care, but the effects of reduced time pressure on care delivery are not well understood.

OBJECTIVE To evaluate whether reduced visit-level time pressure is associated with measures related to greater comprehensiveness and preventive care delivery in primary care visits, overall and by patient chronic condition burden and continuity with one's usual physician.

DESIGN, SETTING, AND PARTICIPANTS This quasi-experimental cross-sectional study used electronic health record data from 2021 to 2024. The study included visits to primary care physicians at primary care practices within a large integrated health system in the Northeastern US who routinely offered same-day visit slots for adult patients in their schedules. Visits preceding an unfilled same-day visit (reduced time pressure) were compared with visits preceding a filled same-day visit (regular time pressure) using linear regression models that included physician and temporal fixed effects.

EXPOSURE Reduced time pressure, defined as an unfilled same-day visit slot immediately following the index visit.

MAIN OUTCOMES AND MEASURES Indicators for comprehensiveness of care (total and new diagnoses addressed, total and new prescriptions, diagnostic testing, and referrals) and ordering of preventive care (immunizations and health maintenance items).

RESULTS Among 191 269 visits across 311 physicians (170 526 regular time pressure; 20 743, reduced time pressure), mean (SD) patient age was 57.7 (18.1) years, and 59.7% of visits were with female patients. Under reduced time pressure, physicians recorded 0.11 (95% CI, 0.08-0.15) more total diagnoses, 0.09 (95% CI, 0.07-0.11) more new diagnoses, and 0.02 (95% CI, 0.01-0.03) more new prescriptions, and ordered 0.08 (95% CI, 0.03-0.13) more diagnostic tests, with no differences in referrals or preventive care. The estimated effects of reduced time pressure on total and new diagnoses were largest among patients with 3 or more chronic conditions (total diagnoses: 0.16 [95% CI, 0.10-0.21]; new diagnoses: 0.10 [95% CI, 0.07-0.14]). Visits with a patient's usual physician included more orders for diagnostic testing and preventive care, although time pressure effects were similar when seeing one's usual physician vs another physician.

CONCLUSIONS AND RELEVANCE In this study, reduced time pressure visits had care patterns aligned with more comprehensive care, particularly for patients with multimorbidity. These modest results highlight the potential trade-offs between visit length and the scope of care delivered, underscoring the importance of addressing time constraints in primary care.

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JAMA Intern Med. doi:10.1001/jamainternmed.2026.1378
Published online May 11, 2026.

Primary care in the US is under strain due to a growing shortage of primary care clinicians relative to rising demands for increasingly complex care for an aging population.¹⁻³ Within this context, and the still-predominant fee-for-service payment system which enhances incentives to maximize visit volume, there is too little time for clinicians to deliver high-quality primary care.^{4,5} One study estimates that a physician with a typical panel of 2500 patients would need to work 26.7 hours per day to deliver all recommended preventive, chronic disease, and acute care.⁶

Prior studies suggest that time pressures in primary care visits may impact the composition and quality of care, for example by limiting clinicians' ability to comprehensively address patients' concerns or provide recommended services. Quasi-experimental studies making use of unexpected scheduling disruptions have found that visits conducted under greater time pressure involve fewer diagnoses, fewer procedures, higher rates of antibiotic and opioid prescribing, increased follow-up care, and reduced delivery of preventive services.^{7,8} Other work using physician absences as a source of increased time pressure has found no impact on emergency department visits or opioid prescriptions but a significant increase in referrals to specialists and a decrease in referrals for laboratory tests.^{9,10} In cross-sectional studies, shorter visits have been correlated with lower patient satisfaction and reduced communication.^{11,12} However, most studies have focused on increased time pressure; none to our knowledge has used a quasi-experimental study design to investigate whether reducing time pressure produces opposite or distinct effects or how these vary across patient populations.

The relationship between visit time pressure and care composition is particularly salient for patients with multiple chronic conditions, who are likely to present with multiple biomedical and psychosocial concerns that may be difficult to fit into a given visit.^{13,14} Under time constraints, physicians may need to prioritize competing demands, potentially altering the composition of care delivered during the visit. Primary care physician (PCP) continuity may serve as a mitigating factor in care composition, given strong evidence linking interpersonal continuity of care (ie, longitudinal, trusting relationships) with better care quality, fewer emergency department visits and hospitalizations, and better patient satisfaction.¹⁵⁻¹⁷ Yet little is known about whether the effects of time pressure on visit composition differ by a patient's number of chronic conditions or by whether the visit is with one's usual PCP.

Understanding how the provision of primary care differs under reduced time pressure is important given ongoing primary care payment reform efforts, including alternatives to fee-for-service payment models that aim to alleviate time pressures and support more flexible care delivery.¹⁸ To assess this, we used electronic health record (EHR) data from a large integrated health system and leveraged whether subsequent same-day visit slots were filled as a source of quasi-experimental variation in visit time pressure. We examined outcomes that aligned with comprehensive care (ie, diagnoses addressed, prescriptions, diagnostic testing, and referrals) as well as receipt of recommended preventive care services and

Key Points

Question Is reduced time pressure in primary care visits associated with care pattern changes in care comprehensiveness and quality?

Findings In this cross-sectional study of 191 269 primary care visits across 311 physicians in an integrated health system, reduced time pressure visits included more diagnoses documented, more new prescriptions prescribed, and more diagnostic testing and similar preventive care (eg, immunizations) compared with regular time pressure visits. Estimated effects on diagnosis counts and testing were larger for patients with multiple chronic conditions.

Meaning Results of this study suggest that reducing time pressure in primary care may modestly increase in the scope of issues addressed, particularly for patients with medical complexity.

assessed how these outcomes varied by patients' chronic conditions and by whether they saw their usual physician.

Methods

This study was reviewed by the Mass General Brigham Institutional Review Board. Informed consent was waived due to the use of deidentified data. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline was followed.

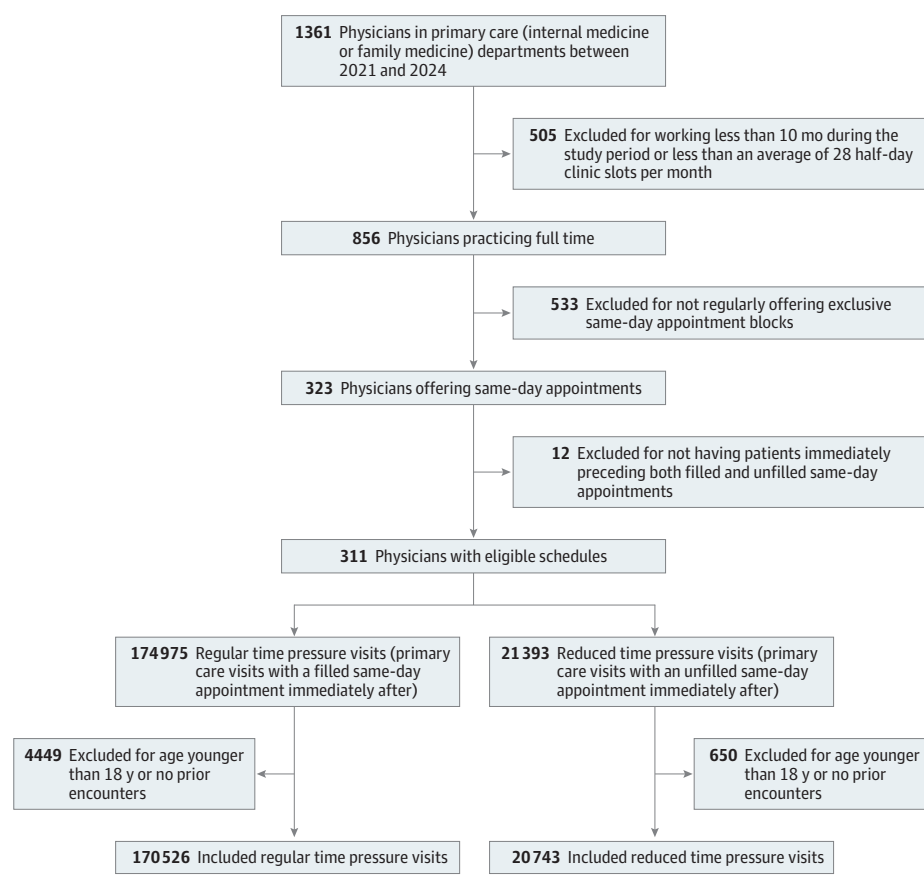
Study Design

We conducted a quasi-experimental serial cross-sectional study of adult primary care visits among physicians who routinely offered same-day visit slots. To assess the effects of reduced time pressure on primary care delivery, we used same-day visits as a source of plausibly exogenous variation in visit-level time pressure within a physician's schedule. We identified visits that immediately preceded a same-day visit slot, comparing those for which the subsequent visit was unfilled (representing reduced time pressure) vs filled (representing regular time pressure). We used EHR data from the Mass General Brigham (MGB) Enterprise Data Warehouse, which consolidates clinical, demographic, and billing information from all hospitals and outpatient practices within the MGB health system. MGB is a large integrated health system based in Massachusetts.

Study Sample

For the study period January 1, 2021, through December 31, 2024, we identified 856 physicians who were regularly practicing (≥ 28 half-day clinical sessions scheduled per month on average) for 10 or more months (measured from their first to last observed month) and were affiliated with primary care (including internal medicine and family medicine) practices at MGB. The analysis focused on physicians to ensure comparability in scheduling structures and scope of practice within the health system. We further restricted the sample to 311 physicians whose schedule consistently included same-day visits

Figure 1. Flowchart of Included Primary Care Physicians and Visits



(≥ 4 same-day visits offered on the same weekday and time slot exclusively for same-day visits). We then examined all visits immediately preceding visits that were exclusively scheduled for same-day visits. Physicians would likely have known at the time of those index visits whether the subsequent same-day slot had been filled (in our data, 97.5% of same-day visits were scheduled more than 1 hour before their start time). We further restricted visits to those with adult patients (aged 18 years or older) who had at least 1 prior encounter recorded in the Enterprise Data Warehouse within 5 years of their index visit (Figure 1).

Measures

Primary Outcomes

We examined a series of visit-level outcomes to characterize the composition of care delivered (specifically, in the domains of care comprehensiveness and preventive care) that may be sensitive to time constraints.^{19,20} These outcomes capture documented clinical activities reflecting core components of high-quality primary care, rather than serve as direct measures of care quality or appropriateness.

To understand care patterns aligned with comprehensiveness of care, we assessed the number of patient concerns addressed during the visit (number of new and total diagnostic code categories recorded); prescribing (number of new prescriptions [ie, not prescribed in the prior year] and total num-

ber of prescriptions [including new prescriptions and refills of existing prescriptions]); diagnostic testing (number ordered); and specialist referrals (number ordered, excluding e-consultations).^{7,9,19,21,22} Additional details on the definition of each outcome are provided in eTable 1 in Supplement 1. Outcomes were identified from encounter-linked EHR data and may have been entered during or after the visit. Given this, these measures reflect documented clinical activities rather than direct observation of in-visit clinical content.

To evaluate the provision of preventive care, we measured the number of immunizations administered on the day of the visit and the number of health maintenance items addressed (ie, the screenings, immunizations, and counseling activities that are key components of guideline-based preventive care) (eTable 2 in Supplement 1).

Patient Characteristics

We characterized patients using self-reported demographic information, including age (based on date of birth), sex, marital status, race, and ethnicity. Race and ethnicity data were collected to characterize the patient cohort and not analyzed further. We also captured chronic condition count prior to the study visit, which was defined using a subset of the Chronic Conditions Warehouse (CCW) classification system (eTable 3 in Supplement 1). Patients were classified as having a chronic condition if they had either at least 2 prior inpatient or outpa-

Table. Patient and Visit Characteristics in Regular vs Reduced Time Pressure Visits

	No. (%)		
Characteristic ^a	Regular time pressure (n = 170 526)	Reduced time pressure (n = 20 743)	SMD
Patient characteristic			
Age, y, mean (SD)	57.8 (18.1)	56.7 (18.2)	0.059
Female	102 086 (59.9)	12 147 (58.6)	0.027
Male	68 426 (40.1)	8595 (41.4)	
Marital status			
Married	93 010 (54.5)	10 981 (52.9)	0.033
Single	45 939 (26.9)	5825 (28.1)	
Other ^b	31 577 (18.5)	3937 (19.0)	
Race ^c			
Asian or Other Pacific Islander	6610 (3.9)	800 (3.9)	0.021
Black	10 253 (6.0)	1266 (6.1)	
White	138 573 (81.3)	16 944 (81.7)	
Other ^d	13 170 (7.7)	1534 (7.4)	
Unavailable	1920 (1.1)	199 (1.0)	
Ethnicity ^c			
Hispanic	16 894 (9.9)	2062 (9.9)	0.039
Not Hispanic	145 854 (85.5)	17 895 (86.3)	
Unavailable	7778 (4.6)	786 (3.8)	
Chronic conditions, mean (SD)	2.7 (2.2)	2.7 (2.2)	0.015
Visit characteristic			
Visit type ^e			
Annual/physical	59 203 (34.7)	6027 (29.1)	0.214
Follow-up/return patient	43 499 (25.5)	4335 (20.9)	
New patient	7382 (4.3)	1187 (5.7)	
Office visit	23 068 (13.5)	3264 (15.7)	
Same day	17 508 (10.3)	2888 (13.9)	
Virtual or telemedicine	8637 (5.1)	1457 (7.0)	
Other ^f	11 275 (6.6)	1589 (7.7)	
Scheduled visit length, min ^g			
15-25	56 187 (33.0)	8528 (41.1)	0.180
30	101 975 (59.8)	10 598 (51.1)	
40-60	12 359 (7.2)	1617 (7.8)	
Usual PCP ^h	148 047 (86.8)	17 395 (83.9)	0.084

Abbreviations: PCP, primary care physician; SMD, standardized mean difference.

^a Each row represents visit-level data; patients may contribute multiple visits in the sample.

^b Other included declined, divorced, legally separated, life partner, unavailable, widowed, and not applicable.

^c Race and ethnicity categories were self-selected from the electronic health records from the Mass General Brigham Enterprise Data Warehouse.

^d Other race included declined, American Indian or Alaska Native, multiple selected, patient does not know, race not listed, and unavailable.

^e Visit type categories are based on appointment scheduling codes.

^f Other included visit types that did not fit into the main categories.

^g Scheduled visit length refers to the appointment slot duration assigned in the scheduling system, not observed visit duration.

^h Usual PCP indicates whether the visit was with a physician listed as the patient's assigned PCP in the electronic health record at the time of the visit.

tient encounters with an associated International Classification of Diseases code in the past 2 years or a record in the corresponding disease registry in the EHR.

Visit Characteristics

Visit measures included the visit type (eg, annual, follow-up, sick visit), scheduled slot length in minutes, and whether the visit was with the patient's usual physician (defined as the physician attributed to the patient in the EHR).

Statistical Analysis

We descriptively analyzed patient sociodemographic and visit characteristics by time pressure status and calculated standardized mean differences (SMDs). We conducted visit-level

analyses using linear regression models to examine the effect reduced visit time pressure on our outcomes and estimate mean differences. Models included physician, temporal (year, month, day of week, visit time), visit length, and visit type fixed effects to enable within-physician comparisons and control for variations in patient mix across time and visit types. To increase the precision of estimates, we also included controls for patient age and sex. We computed cluster-robust SEs at the patient level to account for nonindependence of observations among visits contributed by the same patient. All analyses were conducted using R version 4.4.1 (The R Project for Statistical Computing), with a 2-sided threshold of $P < .05$ used to denote statistical significance. For primary outcomes, we applied Holm-Bonferroni adjustments to control the

family-wise error rate at 0.05. We conducted sensitivity analyses using alternative sets of patient-level controls and different specifications of temporal fixed effects (eAppendix 1 in Supplement 1).

Stratified Analyses

We examined heterogeneity in the estimated effects of time pressure along 2 key dimensions. First, we stratified analyses by the number of chronic conditions a patient had prior to the visit (0, 1-2, or ≥ 3). Second, we stratified visits by the providing physician (the patient's usual physician compared with another physician), given the potential influence of a continuous relationship on comprehensiveness of care and preventive care delivery.

Additional Analyses to Assess Validity

Our study design relies on the assumptions that unfilled same-day visits reduce time pressure during the visit immediately preceding the same-day slot, and that any observed changes in clinical practice are attributable to changes in time pressure. To assess the validity of the first assumption, we examined whether visit duration differed depending on whether the subsequent same-day slot was filled (eAppendix 2 in Supplement 1). While we cannot directly test the second assumption, we assessed the characteristics of patients in visits preceding both filled and unfilled same-day visits to assess balance. Similar patient characteristics (defined as SMDs <0.10) would suggest that differences in clinical practice were unlikely to be driven by differences in observed patient mix.

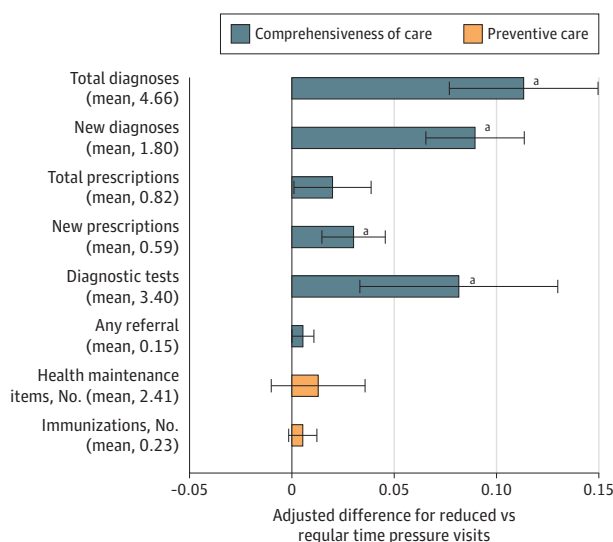
Results

The sample included 191 269 visits across 311 physicians (eTable 4 in Supplement 1), including 170 526 regular time pressure visits and 20 743 reduced time pressure visits (Table). The mean (SD) patient age was 57.7 (18.1) years; 59.7% of visits were with female patients and 40.3% were with male patients. Patients had a mean (SD) of 2.7 (2.2) chronic conditions; the most common were hyperlipidemia (53.6%) and hypertension (47.7%) (eFigure in Supplement 1). For most visits (86.5%), patients saw their usual physicians. The most frequent visit type was an annual or physical examination (34.1%), and the most common scheduled visit length was 30 minutes (58.9%). Patient sociodemographic characteristics and visit characteristics were similar across groups (SMD <0.1), although reduced time pressure visits were more likely to be same-day or shorter time length visits.

Main Estimated Effects of Reduced Time Pressure

During reduced (vs regular) time pressure visits, physicians documented more total diagnoses (mean difference, 0.11; 95% CI, 0.08-0.15) and new diagnoses (mean difference, 0.09; 95% CI, 0.07-0.11) (Figure 2), prescribed more new medications (mean difference, 0.03; 95% CI, 0.01-0.05), and ordered more diagnostic tests (mean difference, 0.08; 95% CI, 0.03-0.13). There was no significant difference in the total number of pre-

Figure 2. Bar Graph of the Effect of Reduced Time Pressure on Care Delivery



Means shown for the outcome in the regular time pressure group. Whiskers indicate 95% CIs.

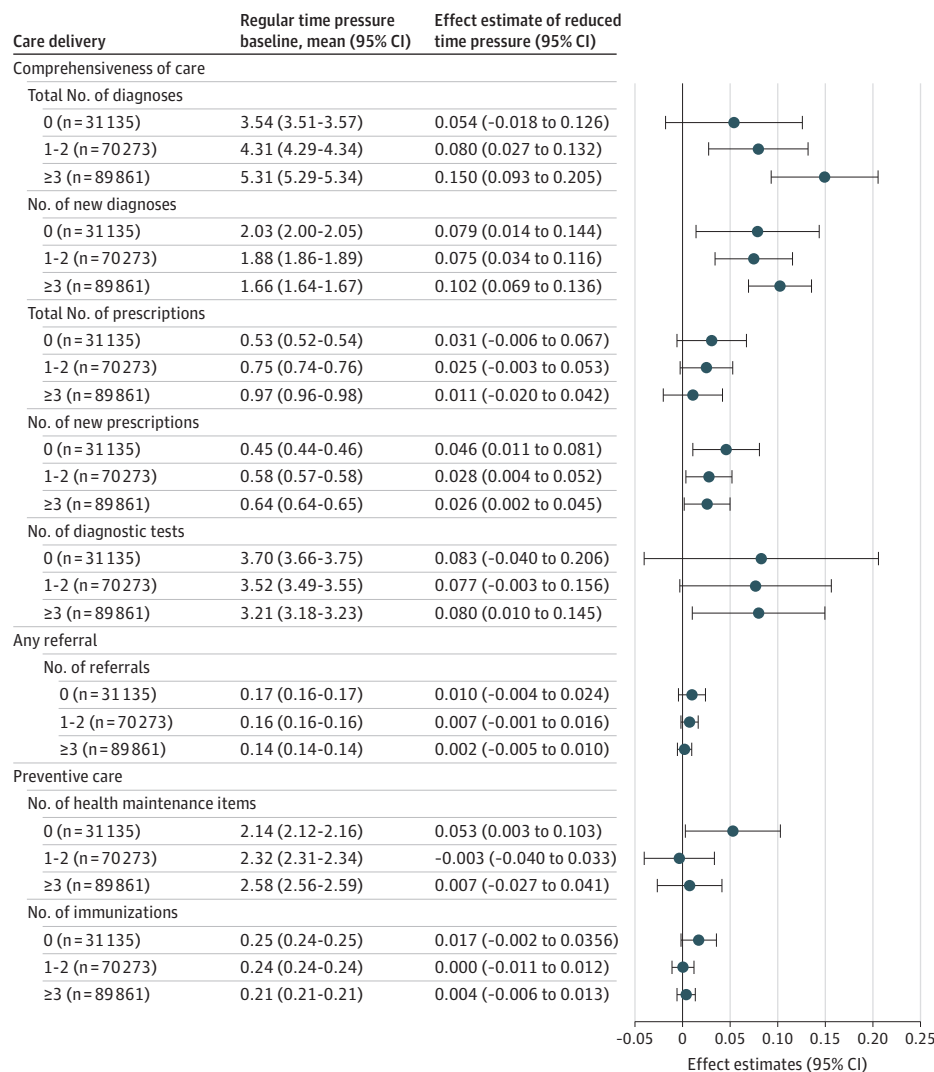
^a $P < .05$ (Holm-Bonferroni adjusted).

scriptions prescribed, referrals ordered, health maintenance items addressed, or immunizations provided.

Across alternative specifications that modified covariate adjustment and fixed effects, point estimates were similar in magnitude to those from the primary model, and SEs were comparable, indicating that results were not sensitive to model specification (eTable 5 in Supplement 1). In separate models specifying outcomes as binary indicators, the exposure was associated with a statistically significant increase in the likelihood of any new diagnosis, prescription, new prescription, and screening (eTable 6 in Supplement 1).

Chronic Conditions

When stratifying analyses by patients' medical complexity, we found that across all visits, patients with more chronic conditions had more total diagnoses recorded and total prescriptions ordered, and had fewer new diagnoses recorded (Figure 3). For those with more chronic conditions, physicians recorded 0.06 (95% CI, -0.02 to 0.13), 0.08 (95% CI, 0.03-0.13), and 0.16 (95% CI, 0.10-0.21) more total diagnoses for patients with 0, 1 to 2, and 3 or more chronic conditions respectively during reduced time pressure visits. For new diagnoses, the corresponding differences were 0.08 (95% CI, 0.01-0.14), 0.08 (95% CI, 0.03-0.12), and 0.10 (95% CI, 0.07-0.14). Among patients with 3 or more chronic conditions, physicians ordered 0.08 (95% CI, 0.01-0.15) more diagnostic tests during reduced time pressure visits. We saw no significant effects within subgroups for prescribing or referrals. Among preventive care outcomes, we found more health maintenance items were addressed in reduced time pressure visits (mean difference 0.05; 95% CI, 0.00-0.10) for patients without any chronic conditions.

Figure 3. Baseline Mean Values and Plotted Effect Estimates for Reduced Time Pressure and Care Delivery by Number of Chronic Conditions

Care Continuity

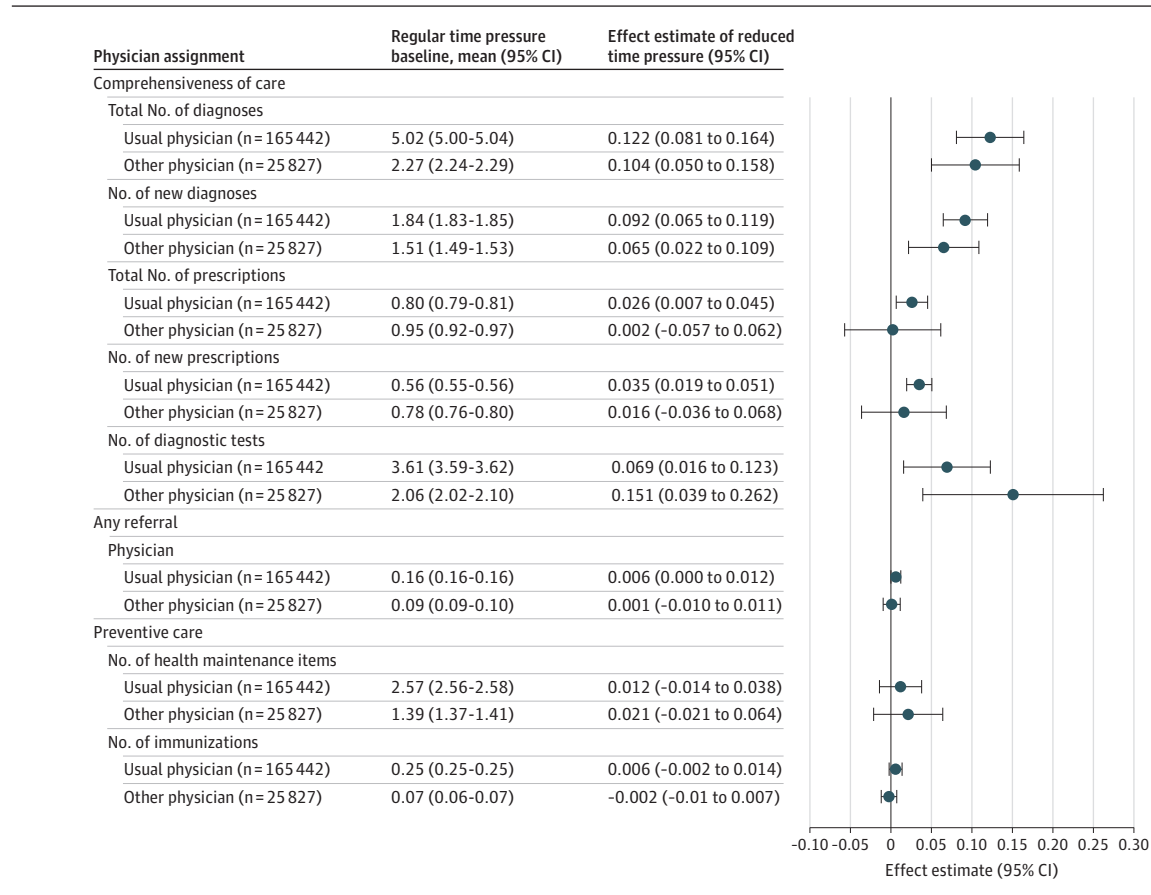
During regular time pressure visits, those in which patients saw their usual physician compared with another physician involved documenting more total diagnoses (5.02 [95% CI, 5.00-5.04] vs 2.27 [95% CI, 2.24-2.29]), ordering more diagnostic tests (3.61 [95% CI, 3.59-3.62] vs 2.06 [95% CI, 2.02-2.10]), placing more referrals (0.16 [95% CI, 0.16-0.16] vs 0.09 [95% CI, 0.09-0.10]), addressing more health maintenance items (2.57 [95% CI, 2.56-2.58] vs 1.39 [95% CI, 1.37-1.41]), and providing more immunizations (0.25 [95% CI, 0.25-0.25] vs 0.07 [95% CI, 0.06-0.07]). In contrast, visits with the usual physician involved fewer total prescriptions (0.80 [95% CI, 0.79-0.81] vs 0.95 [95% CI, 0.92-0.97]) and fewer new prescriptions (0.56 [95% CI, 0.55-0.56] vs 0.78 [95% CI, 0.76-0.80]) (Figure 4). When comparing reduced vs regular time pressure visits, the magnitude of the effect estimate of reduced time pressure on diagnoses was larger for visits with one's usual physician vs another physician but CIs overlapped. A significant increase

in new prescriptions under reduced time pressure was observed only in visits with one's usual physician (mean difference, 0.02; 95% CI, 0.01-0.03). For diagnostic testing, the magnitude of the effect estimate of reduced time pressure was larger for visits with another physician vs one's usual physician but CIs overlapped.

Discussion

In this quasi-experimental cross-sectional study of primary care visits, we observed a clear effect of lower time pressure on care patterns related to comprehensiveness of care but not on preventive care provision. During reduced time pressure visits, physicians recorded a greater number of health concerns (both more total and new diagnoses), prescribed more new medications, and ordered more diagnostic tests. The estimated effects of reduced time pressure on diagnoses and diagnostic

Figure 4. Baseline Mean Values and Plotted Effect Estimates for Reduced Time Pressure and Care Delivery by Care Continuity



tests were more pronounced among patients with multiple chronic conditions. Visits in which patients saw their usual physicians had more comprehensive care patterns and included more preventive care in general, while the estimated effects of reduced time pressure were similar regardless of prior relationship with the physician.

These findings build on prior research linking higher time pressure and shorter visit durations to fewer diagnosis codes⁷⁻⁹ by examining how reductions in time pressure are associated with changes in primary care delivery patterns. The larger difference in diagnoses recorded among patients with greater chronic condition burden suggests that time pressure may be particularly consequential for visits involving clinical complexity. This is notable given that visit lengths in most health systems remain highly standardized, with little adjustment for patient complexity.

Our findings related to prescribing and diagnostic testing align with previous literature which generally report opposite effects with increased time pressure,^{9,10} and further suggest that reduced time pressure may alter the composition of primary care visits. While the total number of prescriptions did not significantly differ by time pressure, physicians were more likely to prescribe new medications during reduced time pressure visits. This suggests that physicians may be using additional time to initiate or adjust medications, perhaps to address a new diagnosis or medication adverse effect discussed

during the visit. In contrast, refills of existing medications may be relatively quick (requiring limited discussion or cognitive work), and therefore occur with or without time pressure.

In contrast, we observe no association between time pressure and referral rates. Referrals could plausibly increase or decrease with reduced time pressure. On one hand, additional time may allow physicians to address concerns directly within the visit, potentially reducing the need for specialty referrals. On the other hand, longer visits may allow patients to raise additional concerns or previously deferred issues that then lead to referral. These competing dynamics may help to explain the null overall association observed.

While we cannot directly assess whether the increase in comprehensive care patterns reflects higher quality care, these findings suggest that reduced time pressure allows physicians greater flexibility in how visit time is allocated and may allow them to address additional concerns during a visit. Prior work has shown that patients of physicians who address multiple concerns during a visit rather than focusing entirely on the patient's primary problem have fewer visits annually, lower annual resource costs, and better disease management scores.²³

Beyond visit-level time pressure, our findings also highlight how organizational features such as continuity of care may affect primary care delivery. Stratified analyses by patient-physician relationship show that physicians provided more po-

tentially comprehensive and preventive care to their usual patients at baseline, but the estimated effects of time pressure were similar across continuity status. Although reduced time pressure was associated with increased documentation of diagnoses in both groups, physicians documented substantially more concerns when seeing their usual patients, suggesting continuity enables more issues to be addressed even under typical constraints.

Finally, the lack of observed effect of reduced time pressure on preventive care provision in our main analyses may reflect the more standardized and reminder-based nature of preventive tasks, which are typically less sensitive to physician discretion or available time. Although the visit-level differences observed in this study are modest, they occur across a very large volume of primary care visits within highly standardized scheduling environments. Even small per-visit changes in how care is delivered may therefore accumulate to meaningful differences at the health system or population level. By identifying which components of primary care appear sensitive to time pressure, this study lays the groundwork for future research evaluating whether these differences translate into changes in care quality.

Strengths and Limitations

A key strength of this study is the use of same-day visits as a plausibly exogenous source of variation in time pressure, providing a quasi-experimental approach to isolate the effect of time pressure. A second strength is the inclusion of physician and temporal fixed effects, which help to mitigate confounding from physician-level practice styles and differences in patient mix across visit times. Several limitations should also be noted. First, our analysis was conducted within a single integrated health system, which may limit the generalizability of our findings to other settings with different organizational structures, scheduling practices, or patient populations. How-

ever, MGB includes both academic and community-based primary care practices that use widely adopted EHR and scheduling platforms, and its physicians face productivity and continuity pressures similar to those in other large integrated systems. Second, our physician sample was restricted to physicians who regularly offered same-day visits, which may represent a subset of physicians who differ in unobserved ways from those who do not incorporate same-day visits into their schedules. Third, with our comprehensiveness of care measures, we were unable to assess the clinical appropriateness of the additional diagnoses, orders, or referrals observed. Accordingly, our findings reflect differences in documented care processes rather than definitive evidence of improved quality. Finally, our study does not examine whether reduced time pressure improves other aspects of visit efficiency and productivity or downstream patient outcomes.

Conclusions

In this quasi-experimental cross-sectional study of primary care visits in a large health system, lower visit time pressure was associated with differences in how care was delivered, including physicians recording more patient concerns, prescribing more new medications, and ordering more diagnostic tests and referrals. These findings suggest that scheduling strategies that reduce time pressure may alter how clinicians allocate attention and effort within visits, particularly for complex patients. Scheduling practices that reduce time pressure may be especially relevant for value-based payment models, in which addressing multiple needs efficiently aligns with systems' incentives to improve quality and reduce downstream costs. Future work should examine whether such changes in visit composition translate into improvements in patient outcomes, care quality, and physician well-being.

ARTICLE INFORMATION

Accepted for Publication: March 16, 2026.

Published Online: May 11, 2026.

doi:10.1001/jamainternmed.2026.1378

Author Contributions: Ms Zhang had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: Zhang, Cohen, Ganguli.

Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: Zhang.

Critical review of the manuscript for important intellectual content: All authors.

Statistical analysis: Zhang.

Administrative, technical, or material support: Zhang, Ganguli.

Supervision: Cohen, McConnell, Ganguli.

Conflict of Interest Disclosures: Dr Morgan reported receiving grants from the Health Resources and Services Administration during the conduct of the study. Dr Ganguli reported receiving grants from the National Institute on Aging during the conduct of the study and receiving personal fees from *JAMA Internal Medicine* as an Associate Editor outside the submitted work. Dr Ganguli is a

member of the National Academy of Sciences, Engineering, and Medicine Standing Committee on Primary Care. No other disclosures were reported.

Funding/Support: This article was supported by grant K23AG068240 from the National Institute on Aging of the National Institutes of Health (Dr Ishani Ganguli).

Role of the Funder/Sponsor: The National Institute on Aging of the National Institutes of Health had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Disclaimer: Dr Ganguli is an Associate Editor of *JAMA Internal Medicine* but was not involved in any of the decisions regarding review of the manuscript or its acceptance.

Data Sharing Statement: See [Supplement 2](#).

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