Supplemental materials

Practice Transformation in the Transforming Clinical Practice Initiative and Emergency Department Use

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Supplemental Appendix

Practice transformation in Transforming Clinical Practice Initiative was associated with reduced Emergency Department visits

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Supplemental Appendix 2: TCPI background and Change Package

This Supplemental Appendix provides background on the Transforming Clinical Practice Initiative (TCPI), details the data sources we used in this analysis, and describes how we identified TCPI practices and attributed beneficiaries to practices.

1. TCPI background

TCPI was a national, collaborative, peer-based learning initiative for ambulatory care practices of all specialties. The Centers for Medicare & Medicaid Services (CMS) established TCPI under the authority of Section 3021 of the Affordable Care Act. The four-year program operated from September 29, 2015 to September 28, 2019. Through TCPI, CMS had the broad goals of improving the quality of patients' care and spending health care dollars more wisely, and the program aimed to help clinicians achieve broad transformation of clinical practices to meet these goals.

To accomplish its aims, CMS invested $639 million in a broad set of organizations to support clinicians and practices. TCPI helped practices transform through two types of organizations:

- **Practice Transformation Networks (PTNs).** Peer-based learning networks designed to coach, mentor, and assist clinicians in developing core competencies specific to practice transformation
- **Support and Alignment Networks (SANs).** Networks that provide a system for workforce development and training, using national and regional professional associations and other organizations currently working in practice transformation efforts

To address patients' needs and to reduce low-value testing and procedures, PTNs and SANs helped practices use: data, quality improvement methods, and patient and family engagement approaches (together referred to as the TCPI Change Package). The PTNs and SANs that were funded and recruited the practices are listed in here: Transforming Clinical Practice Initiative | CMS. The Change Package focused on implementing quality improvement processes, coordinating care, engaging patients, and making other changes expected to improve patients' care.

2. TCPI Change Package and the Practice Assessment Tool (PAT)

To measure practice transformation, we used data from the PAT, which was developed under TCPI to measure practices' progress in implementing milestones in the TCPI Change Package. The PAT used milestones that measured activity across different aspects of practice transformation summarized into domains, such as care coordination, enhanced access, and community partnership (eAppendix Table 1). Further, eAppendix Table 2 shows how each PAT domain's activities could potentially reduce ED visits.

Supplemental Table 1. Description of domains for measuring practice transformation in the PAT

Domain	Description
Patient and family engagement	Practice has a system in place to collaborate with patients and family and to incorporate their feedback into the quality improvement system.
Population management	Practice has processes in place to identify the risk level of each patient and provide appropriate care for that risk level; practice sets clear expectations for each team member's function to optimize efficiency.

Domain	Description
Practice as community partner	Practice links patients with appropriate community resources to facilitate referrals.
Coordinated care	Practice works with providers outside the practice that they frequently communicate with (including specialists, hospitals, and nursing homes as relevant) to develop criteria for referrals, care coordination, and processes of transition.
Enhanced access	Practice has mechanisms in place for patients to access their care team 24/7 and uses technology to offer scheduling and communication options that improve patient access.
Behavioral health integration[a]	Practice ensures that care addresses the whole person, including mental and physical health.
Measuring and documenting value and quality improvement strategy	Practice uses an organized approach for improvement opportunities, builds quality improvement capability in the practice, regularly produces and reviews performance, shares financial data in transparent manner, and considers itself ready for alternative value-based payment arrangements.
Committed and engaged leadership	Practice has developed a plan for transformation, with aims aligned with the national TCPI aims that are shared broadly within the practice.

[a] The behavioral health integration PAT items were only specified in the primary care version of the PAT, so we could not analyze this domain for specialty care practices.

Supplemental Table 2. Each PAT domain's theoretical potential to reduce ED visits

Domain, and emphasis on primary care, specialty care, or both	Theoretical potential to reduce ED visits
I. Patient and family engagement (both)	By using patient feedback and input, practices' patients may have more trust in their practitioners. In turn, patients may be more likely to seek care at the practice before visiting an ED in an urgent, non-emergency situation.
II. Population management (emphasis primary care)	Focuses on identifying and decreasing care gaps for patients, promoting continuity of care, and tightening the relationship between the care team and patient, increasing the likelihood of resolving emerging issues before they become urgent, possibly requiring an ED visit.
III. Practice as a community partner (both)	Patients with health-related social needs as well as physical conditions are often frequent users of the ED, so practices in strong community partnerships may better support those needs, reducing ED use.
IV. Coordinated care (both)	Individual follow-up after hospitalization and ED visits (one milestone in this domain for primary care practices) can directly address any risk factors for future ED visits. Coordination between primary care providers and specialists can help prevent inadvertent prescription drug interactions and help patients get needed specialty care before problems become urgent, prompting an ED visit.
V. Enhanced access (both)	Gaps in access to care are a common reason for unnecessary ED visits, so improving access to meet those needs should reduce ED visits.
VI. Behavioral health integration (primary care only)	Many ED visits are by people with behavioral health as well as physical health issues. Integrating behavioral health into primary care may lessen unmet needs for these individuals.
VII. Measuring and documenting value, and quality improvement strategy (both)	Addressing this domain may make improvements in the other domains more effective as practices refine their improvement strategies based on their data.
VIII. Committed and engaged leadership (both)	Leadership engagement toward the overall goals of transformation should increase the momentum and resources to make the set of strategies taken together more effective.

PTNs asked all practice units within a Taxpayer Identification Number (TIN) to submit a PAT. PTNs administered the PAT to health care provider units that functioned as one entity for quality improvement and that focused on either primary care or specialty care, but not both. The PAT version 2.0 started in January 2016, to improve upon the first version (version 1.0) which had been developed under tight time pressure at the start of TCPI; because the early and subsequent version items differed, we excluded the PAT version 1.0 from this analysis and used the first available PAT version 2.0 data as the first PAT. The aim was to have every practice unit in TCPI complete the PAT within 30 days of joining the program, and to update it at least every six months thereafter. In reality, practice units completed the PAT at varying intervals because of scheduling issues or because practices achieved progress in milestones they wanted reflected in the PAT before the six-month update.

The PAT comprised 27 primary care milestones and 22 specialty care milestones, which differed slightly by primary care or specialty care practice type (eAppendix Tables 3 and 4).[1] Practices self-identified as being primary care or specialty care practices, based on their focus. The PAT assessed how well a practice unit was meeting each milestone as defined for a primary care or specialty care practice on a scale of 0 to 3, where 0 indicated the milestone had not yet been addressed and 3 indicated the milestone

[1] We excluded Milestones 1 through 3 about the achievement of TCPI aims because they are self-reported outcomes rather than transformation attributes.

was fully implemented. The milestones broadly covered patient- and family-centered care design; continuous, data-driven quality improvement; and sustainable business operations.

Supplemental Table 3. Description of PAT milestones for primary care practices associated with each domain

Domain/ Milestone	Description of milestone
I. Patient and family engagement	
4	Practice can demonstrate that it encourages patients and families to collaborate in goal setting, decision making, and self-management.
5	Practice has a formal approach to obtaining patient and family feedback and incorporating this into the quality improvement system as well as the strategic and operational decisions made by the practice.
II. Population management	
6	Practice sets clear expectations for each team member's functions and responsibilities to optimize efficiency, outcomes, and accountability.
7	Practice has a process in place to measure and promote continuity so that patients and care teams recognize each other as partners in care.
8	Practice uses a data-driven approach to assign patients to a provider panel and confirms assignments with providers and patients. Practice reviews and updates panel assignments on a regular basis.
9	Practice has a reliable process in place for identifying risk level of each patient and providing care appropriate to the level of risk.
10	The practice provides care management for patients at highest risk of hospitalizations and/or complications and has a standard approach to documentation.
16	Practice uses population reports or registries to identify care gaps and acts to reduce them.
III. Practice as a community partner	
11	Practice links patients with appropriate community resources to facilitate referrals.
IV. Coordinated care	
12	Practice has defined its medical neighborhood and has formal agreements in place with these partners to define roles and expectations.
13	Practice follows up via phone, visit, or electronic means with patients within a designated time interval (24 hours, 48 hours, 72 hours, or 7 days) after an emergency room visit or hospital discharge.
14	Practice clearly defines care coordination roles and responsibilities, and these have been fully implemented within the practice.
V. Enhanced access	
17	Practice has mechanisms in place for patient to speak with their care team 24/7.
22	Practice uses technology to offer scheduling and communication options that improve patient access by including alternative visit types and electronic communication approaches.
VI. Behavioral health integration	
15	Practice ensures that care addresses the whole person, including mental and physical health.
VII. Measuring and documenting value, and quality improvement strategy	
19	Practice uses an organized approach (for example, use of plan, do, study, act; Model for Improvement; Lean; Six Sigma) to identify and act on improvement opportunities.

Domain/ Milestone	Description of milestone
20	Practice builds quality improvement capability in the practice and empowers staff to innovate and improve.
21	Practice regularly produces and shares reports on performance at the organization level and provider or care team levels, including progress over time and how performance compares with goals. Practice has a system in place to ensure follow-up action when appropriate.
25	Practice shares financial data in a transparent manner within the practice and has developed the business capabilities to use business practices and tools to analyze and document the value the organization brings to various types of alternative payment models.
26	Practice considers itself ready for migrating into an alternative based payment arrangement.
VIII. Committed and engaged leadership	
18	Practice has developed a vision and plan for transformation that includes specific clinical outcomes and utilization aims that are aligned with national TCPI aims and that are shared broadly within the practice.
Milestones not classified into a domain but included in the overall PAT	
23	Practice uses sound business practices, including budget management and return on investment calculations.
24	Practice has effective strategies in place to cultivate joy in work and can document results.
27	Practice uses a formal approach to understanding its work processes and increasing the value of all processing steps.

Source: PAT milestones (version 2.0/Online PAT).

Note: We excluded Milestones 1 through 3 about the achievement of TCPI aims because they are self-reported outcomes rather than transformation attributes.

PAT = Practice Assessment Tool; TCPI = Transforming Clinical Practice Initiative.

Supplemental Table 4. Description of PAT milestones for specialty care practices associated with each domain

Domain/ Milestone	Description of milestone
I. Patient and family engagement	
4	Practice can demonstrate that it encourages patients and families to collaborate in goal setting, decision making, and self-management.
5	Practice has a formal approach to obtaining patient and family feedback and incorporating this into the quality improvement system as well as the strategic and operational decisions made by the practice.
II. Population management	
6	Practice sets clear expectations for each team member's functions and responsibilities to optimize efficiency, outcomes, and accountability.
7	Practice has a reliable process in place for identifying risk level of each patient and providing care appropriate to the level of risk.
III. Practice as a community partner	
8	Practice links patients with appropriate community resources to facilitate referrals.
IV. Coordinated care	
9	Practice works with primary care practices in its medical neighborhood to develop criteria for referrals for episodic care, co-management, transfer of care or return to primary care, and processes for care transition, including communications with patients and family.
10	Practice identifies the primary care provider or care team of each patient seen and (when there is a primary care provider) communicates to the team about each visit or encounter.

Domain/ Milestone	Description of milestone
V. Enhanced access	
12	Practice has mechanisms in place for patient to access their care team 24/7.
17	Practice uses technology to offer scheduling and communication options that improve patient access by including alternative visit types and electronic communication approaches.
VII. Measuring and documenting value, and quality improvement strategy	
14	Practice uses an organized approach (for example, use of plan, do, study, act; Model for Improvement; Lean; Six Sigma) to identify and act on improvement opportunities.
15	Practice builds quality improvement capability in the practice and empowers staff to innovate and improve.
16	Practice regularly produces and shares reports on performance at the organization and provider or care team levels, including progress over time and how performance compares with goals. Practice has a system in place to ensure follow-up action when appropriate.
20	Practice shares financial data in a transparent manner within the practice and has developed the business capabilities to use business practices and tools to analyze and document the value the organization brings to various types of alternative payment models.
21	Practice considers itself ready for migrating into an alternative based payment arrangement.
VIII. Committed and engaged leadership	
13	Practice has developed a vision and plan for transformation that includes specific clinical outcomes and utilization aims that are aligned with national TCPI aims and that are shared broadly within the practice.
Milestones not classified into a domain but included in the overall PAT	
11	Uses evidence-based protocols/care maps.
18	Practice uses sound business practices, including budget management and return on investment calculations.
19	Practice has effective strategies in place to cultivate joy in work and can document results.
22	Practice uses a formal approach to understanding its work processes and increasing the value of all processing steps.

Source: PAT milestones (version 2.0/Online PAT).

Notes: We excluded Milestones 1 through 3 about the achievement of TCPI aims because they are self-reported outcomes rather than transformation attributes. There was no domain for behavioral health integration for specialty care practices because only primary care practices were asked about the behavioral health milestone.

PAT = Practice Assessment Tool; TCPI = Transforming Clinical Practice Initiative.

Supplemental Appendix 3: Key measures and measurement periods

This Supplemental Appendix describes how we constructed the measures of practices' progress in transformation between the first and the last PAT. It also details the outcome measures and measurement periods used in our analyses.

1. Practice transformation measures

We examined multiple measures of practice transformation: the overall PAT score and individual domain scores.

The overall PAT score. The overall PAT score is the sum of scores across all milestones that addressed operational changes. As we noted previously, the PAT measured progress on each milestone on a scale of 0 to 3, in which 0 is not started and 3 is achieved. We expressed the overall PAT score as a percentage of the maximum possible score, which was 72 for primary care practices and 57 for specialty care practices (we excluded Milestones 1 through 3 about the achievement of TCPI aims because they are self-reported outcomes rather than transformation attributes). To study transformation using the overall PAT score, we analyzed the difference in the TIN-level PAT score between the first and last PAT submission, measured as a percentage point change

Mapping of PAT milestones to domains. For our analysis of practice transformation, we mapped PAT milestones into eight domains to analyze the association of different dimensions of practice transformation on outcomes. We developed the domain groupings based on the themes of each milestone. Because the milestones differed for primary care and specialty care practices, the mapping varied across the two types of practices. Further, there was no behavioral health integration domain for specialty care practices because only primary care practices were asked about the behavioral health milestone. (See the mapping for primary care practices in eAppendix Table 3 and the mapping for specialty care practices in eAppendix Table 4).

Individual domain scores. The score for each domain is the sum of the practice unit's scores across all milestones within that domain, meaning that each milestone contributes equally to the domain score. We expressed the domain score as a percentage of the maximum possible score for that domain. For example, the maximum score for primary care practices for the population management domain is 18 because it comprises six milestones, each with a maximum score of 3. A primary practice unit that reported 3s for all milestones in the population management domain would then receive a score of 100 percent for that domain, whereas a primary care practice that reported a 1 on all milestones would receive a score of 6 out of 18, or 33 percent, for that domain.

Aggregation of the PAT data to the TIN-level. For the first and last PAT submission separately, we averaged overall PAT scores and domain scores across practice units to obtain a TIN-level measure, giving more weight to units with more clinicians. Note that because a practice could have primary care and specialty care units, they could have PAT information for each type of unit. We analyzed data separately for primary care and specialty care practices, so the data for a TIN with both types of units was weighted by the proportion of clinicians billing as primary care or specialty care, respectively.

2. Outcome measures

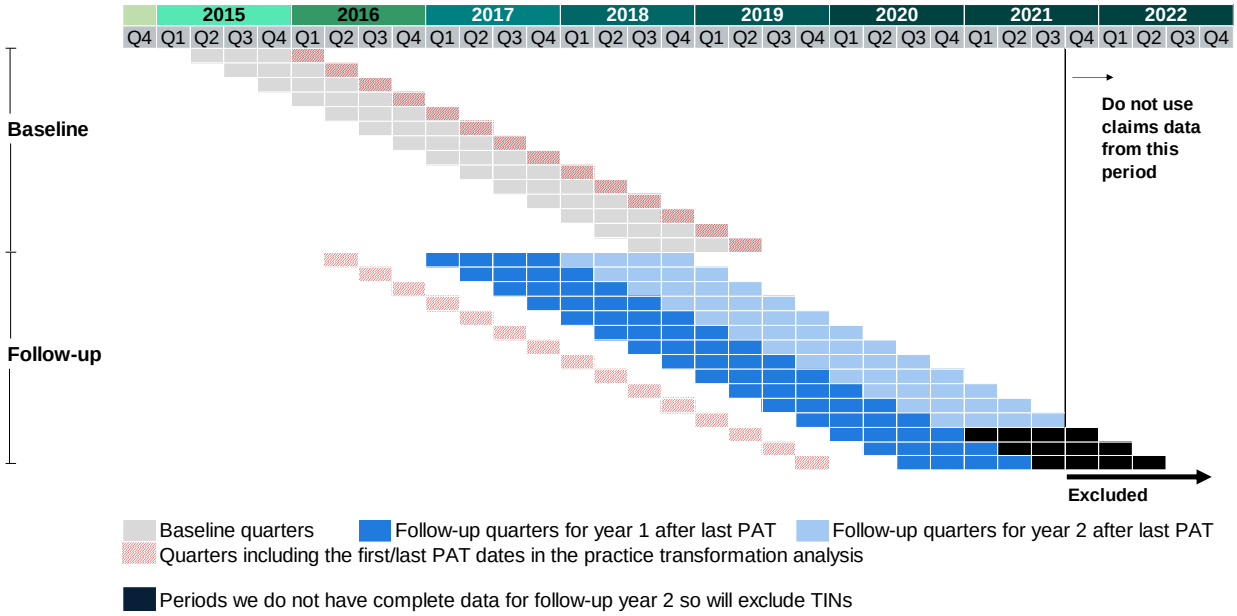
We used claims data for Medicare FFS beneficiaries attributed to TCPI practices to calculate the practice-level average number of ED visits that did not result in an inpatient admission. We excluded ED visits with the coronavirus disease 2019 (COVID-19) diagnoses to account for potential effects of COVID-19 on outcomes. Specifically, we identified claims as COVID-19-related if there was an ICD-10 diagnosis code of either B97.29 (other coronavirus as the cause of diseases classified elsewhere) or U07.1 (COVID-19, virus identified) in any position on the claim, with the claim occurring in January 2020 or later. We report rates per 1,000 beneficiaries per 12-month (four-quarter) period.

3. Measurement periods

To examine the association between practice transformation and patient outcomes, we measured ED visits for Medicare FFS beneficiaries attributed to TCPI practices in the period relative to the practices' first and last PAT submissions. Specifically, we looked at the change in ED visits between: (1) the four-quarter period before the date of first PAT (baseline), and (2) the two four-quarter periods beginning two quarters after the last PAT (follow-up year 1 and year 2, respectively). We began our follow-up two quarters after the last PAT to allow time for operational changes to be sufficiently reflected in outcome data. For analyses involving follow-up year 2 outcomes, we were not able to include TINs with last PATs on or after April 1, 2019 because we did not have claims data for the full follow-up period. However, we still included these TINs in follow-up year 1 analyses. As such, the follow-up year 2 sample is a subset of the follow-up year 1 sample.

Supplemental Figure 1 shows the baseline and follow-up periods used in our analyses. Among all TINs in our analyses, the average time between the first and last PAT was 19 months for primary care and 23 months for specialty care; the median time was 13 months and 25 months, respectively. Among TINs included in follow-up year 2 analyses, the average time between the first and last PAT was 12 months for primary care and 14 months for specialty care; the median time was 7 months and 11 months, respectively.

Supplemental Figure 1. Baseline and follow-up periods for the practice transformation analysis



PAT = Practice Assessment Tool; TIN = Tax Identification Number.

Supplemental Appendix 4: Description of statistical analyses

This Supplemental Appendix describes our technical approach to examine the association between practice transformation and changes in the practice-level average number of ED visits among Medicare FFS beneficiaries.

1. Regression models

We compared changes in Medicare outcomes at TCPI practices that achieved more transformation with those at TCPI practices that achieved less transformation. We used regression models to adjust for measurable differences in beneficiary and practice characteristics and for regional differences across TCPI practices, including the intensity of COVID-19. We estimated the regression models separately for primary care and specialty care practices because the PAT differed across practice type. Additionally, transformation may have different implications for patient outcomes in each type of practice. Because a TIN could have primary care and specialty care practice units, it could be included in both regressions. Further, to focus on transformation, we excluded from the analysis practices that had scored 100 percent on the first PAT (see section 2 in eAppendix C). Finally, to test whether the estimates of interest are statistically significant, we used the level of significance of 0.10 commonly used in nation-wide care transformation models.

We outline the regression models we used in this analysis below.

Relationship between overall PAT score and patient outcomes. We regressed the change in practice-level average number of ED visits on the practice's percentage point change in overall PAT score, where changes are measured between the last and first PAT. In these models, we controlled for the baseline (first) PAT score and the baseline practice-level average utilization (number of ED visits at the time of the first PAT, per 1,000 beneficiaries per year). As described below, in these models, we also controlled for potential confounders that might be associated with the overall PAT scores and with changes in utilization (see section 4 in eAppendix C).

We estimated the following model:

(Equation 1)
$$\Delta Outcome_j = \alpha + \beta^{PAT}\Delta PAT_j + \gamma^i\, firstPAT_{i,j} + \beta^{Out} base\_outcome_j + \beta^B X_j^B + \beta^P X_j^P + \beta^C X_j^C + \partial_j^{PAN} + lastPATyear_j + \varepsilon_j$$

In this model, *j* indexes the practice as identified by a TIN, and *i* indexes the category {*i*=1,2,3} representing implementation of less than 10 percent, 10 to 49 percent, or 50 percent or more in the overall PAT measured in the first PAT.

- $\Delta Outcome_j$ is the change in the number of ED visits per 1,000 beneficiaries per year between the 12 months prior to the first PAT date and either: i) the 12-month period beginning 6 months after the last PAT date (follow-up year 1), or ii) the 12-month period beginning 18 months after the last PAT (follow-up year 2).
- ΔPAT_j is the change in the overall PAT score between the first and last PAT date for practice *j*.

- $firstPAT_{i,j}$ is the value of the overall PAT score for practice *j* at the time of its first PAT (transformed into a categorical variable {*i*=1,2,3} based on whether the practice had less than 10 percent, 10 to 49 percent, or 50 percent or more of the overall PAT implemented at the time of the first PAT).
- $base\_outcome_j$ is the baseline value of the utilization measure of interest (number of ED visits per 1,000 beneficiaries) in the 12 months prior to the first PAT date.
- X_j^B is a vector of aggregated beneficiary characteristics for practice *j* (eAppendix Table 5), X_j^P is a vector of practice and market-related characteristics of practice *j* (eAppendix Tables 6 and 7), and X_j^C is a vector of COVID-19 controls for practice *j* (eAppendix Tables 5 and 7).
- ∂_j^{PAN} is an indicator variable for whether *any* of the follow-up period for practice *j* is during COVID-19 (March 2020 or afterward).
- $lastPATyear_j$ is an indicator for the calendar year of the last PAT for practice j (that is, 2016, 2017, 2018, 2019). Specifically, $lastPATyear_j = \sum_{s=2017}^{2019} \beta_s I(lastPATyear_j = s)$ where $I(lastPATyear_j = s)$ equals 1 if $lastPATyear_j = s$ and 0 otherwise. *s* ranges from 2017 to 2019; and *s* = 2016 is the reference category and is omitted from the equation.
- ε_j is the idiosyncratic error term. It represents unexplained variability in the change in the outcome for practice *j*.

The Greek letters are the parameters to be estimated. The key parameter of interest is β^{PAT}, which is the change in the ED visits per 1,000 beneficiaries per year associated with changes in the overall PAT score between the first and last PAT. We express this coefficient in terms of a 40-percentage point improvement in practice transformation to facilitate interpretation of the estimates and because it is an ambitious but attainable amount of change.

In addition to estimating the overall relationship between changes in the utilization and changes in the PAT score for all practices grouped together, we also estimated associations for practices that started off with different levels of PAT scores: (1) less than 10 percent of the PAT implemented at the time of the first PAT, (2) 10 to 49 percent of the PAT implemented at first PAT, and (3) 50 percent or more of the PAT implemented at first PAT.

Specifically, we estimated the following model:

(Equation 2)

$$\Delta Outcome_j = \alpha + \beta^{PAT}\Delta PAT_j + \gamma^i firstPAT_{i,j} + \delta^i \Delta PAT_j * firstPAT_{i,j} + \beta^{Out} base\_outcome_j + \beta^B X_j^B + \beta^P X_j^P + \beta^C X_j^C + \partial_j^{PAN} + lastPATyear_j + \varepsilon_j$$

All notation is as defined previously.

For the model in Equation 2, we are interested in the δ^i's which represent the differential estimated change in ED visits (per 1,000 beneficiaries per year) associated with a 40-percentage point increase in the overall PAT score for each of the baseline categories of the first PAT score. Note that in our tables, we report the full estimated association (that is, $\beta^{PAT} + \delta^i$) for each baseline category.

Finally, we estimated the model in Equation 1 separately for each outcome and practice type, grouping practices by their baseline tercile (bottom, middle, top) of their baseline outcome. These subgroup results from these models provide information on how the association of change in overall PAT score with change in outcomes, β^{PAT} changes based on where a practice started.

Relationship between domain scores and patient outcomes. We regressed the change in ED visits on the practice's change in the domain score. Similar to the overall PAT analysis, we controlled for the baseline rate of utilization and baseline domain score and also controlled for potential confounders. We estimated eight separate sets of models for each of the domains (per outcome and practice type). We excluded practices that had achieved the domain at the first PAT.

As in the overall PAT score analysis, we also examined whether the estimated association varied based on the extent the domain was implemented at the time of the first PAT using the same groupings (less than 10 percent of the domain implemented at the first PAT, 10 to 49 percent of the domain implemented at the first PAT, and 50 percent or more of the domain implemented at first PAT).

Specifically, we estimated the following two models for each of the eight domains:

(Equation 3)
$$\Delta Outcome_j = \alpha + \beta^d \Delta PAT\_domain_{d,j} + \gamma^{d,i} firstPAT\_domain_{d,i,j} + B^{Out} base\_outcome_j + \beta^B X_j^B + \beta^P X_j^P + \beta^C X_j^C + \partial_j^{PAN} + lastPATyear_j + \varepsilon_j$$

(Equation 4)
$$\Delta Outcome_j = \alpha + \beta^d \Delta PAT\_domain_{d,j} + \gamma^{d,i} firstPAT\_domain_{d,i,j} + \delta \Delta PAT\_domain_{d,j} * firstPAT\_domain_{d,i,j} + B^{Out} base\_outcome_j + \beta^B X_j^B + \beta^P X_j^P + \beta^C X_j^C + \partial_j^{PAN} + lastPATyear_j + \varepsilon_j$$

In this model, *d* indexes the domain {d=1, 2, … , 8 domains}, *j* indexes the practice (TIN), and *i* indexes the category {*i*=1,2,3} representing implementation of less than 10 percent, 10 to 49 percent, or 50 percent or more in each domain measured in the first PAT in the baseline.

- $\Delta Outcome_j$, $base\_outcome_j$, X_j^B, X_j^P, X_j^C, ∂_j^{PAN}, $lastPATyear_j$ are as defined in Equation 1.
- $\Delta PAT\_domain_{d,j}$ is the change in the PAT score of domain d between the first and last PAT date for practice *j*.
- $firstPAT\_domain_{d,i,j}$ is the value of the domain score d for practice *j* at the time of its first PAT (transformed into a categorical variable {*i*=1,2,3} based on whether the practice had less than 10 percent, 10 to 49 percent, or 50 percent or more of the domain implemented at the time of the first PAT).
- ε_j is the idiosyncratic error term. It represents unexplained variability in the change in the outcome variable for practice *j*.

The key parameter of interest in the model in Equation 3 is β^d, which is the estimated change in the ED visits per 1,000 beneficiaries per year associated with a 40-percentage point improvement in the score of domain *d*, between the first and last PAT.

The key parameters of interest in the model in Equation 4 are the set of $\gamma^{d,i}$'s which represent the differential estimated change in ED visits (per 1,000 beneficiaries per year) associated with a 40-percentage point increase in the domain score between first and last PAT, for each of the baseline domain categories. Note that in our tables, we report the full estimated association (that is, $\beta^d + \delta^{d,i}$) for each baseline category.

Similar to the overall PAT score models, we estimated the models in Equation 3 separately three times for each outcome and practice type, grouping practices by their baseline tercile (bottom, middle, top) of their baseline outcome. The subgroup results from these models provide information on how the association of change in each domain score with change in outcomes, β^d varies by where a practice began.

2. Control variables

In estimating the relationship between practice progress in transformation and patient outcomes, we controlled for a broad range of patient and market characteristics that might affect changes in utilization other than the practice's approach to delivering care and how the practice transformed over time. Specifically, we used:

- **Practice-level patient characteristics,** such as average age of attributed beneficiaries, percentage female, race and ethnicity, average number of chronic conditions, HCC score, and percentage dually eligible for Medicare and Medicaid (each averaged over the eight quarters before each practice's first PAT)
- **Practice characteristics**, such as the number of clinicians, whether multi-specialty or hospital-owned; and
- **Practice market or region characteristics**, such as percentage rural, Medicare Advantage penetration rate, and whether in a Health Professional Shortage Area.
- **Controls to account for the effects of COVID-19** on outcomes in 2020 and 2021:
  - COVID-19 and related diagnosis rates among practices' attributed beneficiaries[2]
  - COVID-19 incidence and deaths in practices' local areas each measured for the two relevant 12-month periods for the last PAT (one 12-month follow-up for year 1 and one 12-month follow-up for year 2), and

Indicators for whether the follow-up period of the practice occurs during COVID-19 (March 2020 or afterwards), and indicators for the calendar year of the last PAT. The full list of controls and descriptive statistics on these controls are available in eAppendix Tables 5 through 7.

[2] We defined these measures to identify cases where COVID-19 led (or did not lead) to more severe disease, following guidance in Bohl and Roozeboom-Baker (2020). These measures include all primary and secondary diagnoses for COVID-19 (B9729 and U071) and identify whether the following respiratory and other related illnesses were also diagnosed: viral pneumonia (J1289), bronchitis (J208 [acute] or J40 [unspecified]), lower respiratory infection (J988 [specified] or J22 [unspecified]), acute respiratory distress syndrome (J80), multisystem inflammatory syndrome (M3581), and other specified systemic involvement of connective tissue (M3589).

Supplemental Table 5. Practice-level average beneficiary characteristics used as control variables in regression analyses

Beneficiary characteristics	Categories	Sample for follow-up year 1		Sample for follow-up year 2	
		Primary care practices (N = 1,569)	Specialty care practices (N = 2,398)	Primary care practices (N = 1,068)	Specialty care practices (N = 1,017)
		(% of beneficiaries, unless noted)			
Age	<65 years	15	20	15	17
	65–74 years	43	43	43	45
	75–79 years	16	15	16	16
	80–84 years	12	11	12	11
	85+ years	14	12	14	12
Female		58	54	59	52
Race/ethnicity	White	85	86	84	87
	Black	11	10	11	9
	Asian	1	1	1	1
	North American Native or other	2	2	2	2
	Hispanic ethnicity	2	2	2	2
Dual eligibility status	Fully eligible	14	14	13	11
	Partially eligible	5	5	5	5
	Not dually eligible	81	81	82	83
HCC score (average)[a]		1.2	1.2	1.2	1.1
Disabled and/or ESRD		1	2	1	1
Number of chronic conditions[b]		5	4	5	4
Select chronic conditions	Hypertension	66	56	67	56
	Hyperlipidemia	54	46	55	46
	Rheumatoid arthritis or osteoarthritis	38	34	38	36
	Diabetes	34	28	35	28
	Ischemic heart disease	31	30	31	31
	Anemia	23	21	23	21
	Chronic kidney disease	23	22	24	21
	Cataract	20	21	20	21
	Depression	19	19	19	16

Beneficiary characteristics	Categories	Sample for follow-up year 1		Sample for follow-up year 2	
		Primary care practices (N = 1,569)	Specialty care practices (N = 2,398)	Primary care practices (N = 1,068)	Specialty care practices (N = 1,017)
		(% of beneficiaries, unless noted)			
	Anxiety disorders	18	19	18	15
	Acquired hypothyroidism	18	15	18	15
	Congestive heart failure	16	14	16	14
	Obesity	17	16	17	15
	COPD	13	11	13	11
	Alzheimer's disease and related disorders or senile dementia	13	9	13	9
	Glaucoma	8	12	8	11
	Tobacco use disorder	10	10	10	10
	Cancer[c]	9	11	8	11
	Atrial fibrillation	0	9	9	9
COVID-19 diagnosis and either respiratory or other related illness		0.3	0.3	0.2	0.3
COVID-19 diagnosis but neither respiratory nor other related illness		1.0	1.2	0.8	1.1

Source: Mathematica's analysis of TCPI enrollment data, Medicare administrative data, and other data.

Note: Analysis sample for follow-up year 1 contains all TINs that satisfy the inclusion criteria. Analysis sample for follow-up year 2 contains TINs with last PAT dates before April 1, 2019 (early cohort), which is a subset of the TINs included in follow-up year 1 analyses. Means were weighted to reflect the number of observable beneficiary-quarters, proportion of beneficiaries seen by TCPI-enrolled clinicians two years before the first PAT, and the fraction of the TIN clinicians that are primary care or specialists.

[a] The HCC score incorporates diagnosis history and demographics to estimate a score that represents expected costs for a Medicare beneficiary in the upcoming year. A score of one represents average expected expenditures. HCC scores were calculated with the most recently available HCC algorithms.

[b] In addition to the select chronic conditions listed in the table, we also counted the following conditions: benign prostatic hyperplasia, osteoporosis, asthma, attention deficit hyperactivity disorder and other conduct disorders, acute myocardial infarction, bipolar disorder, hip or pelvic fracture, personality disorders, post-traumatic stress disorder, schizophrenia and other psychotic disorders, stroke or transient ischemic attack, and ESRD. We also counted each type of cancer (among breast, colorectal, endometrial, lung, and prostate cancers) separately.

[c] Cancer was defined as having at least one of breast, colorectal, endometrial, lung, or prostate cancer.

COPD = chronic obstructive pulmonary disease; COVID-19 = coronavirus disease 2019; ESRD = end-stage renal disease; HCC = Hierarchical Condition Category; MBSF = Master Beneficiary Summary File; PAT = Practice Assessment Tool; TIN = Tax Identification Number.

Supplemental Table 6. Practice characteristics used as controls in regression analyses

Practice characteristics	Sample for follow-up year 1		Sample for follow-up year 2	
	Primary care practices (N = 1,569)	Specialty care practices (N = 2,398)	Primary care practices (N = 1,068)	Specialty care practices (N = 1,017)
	(% of practices, unless noted)			
Practice type				
Mixed primary and specialty care	60	49	59	37
Practice size, beneficiary complexity, and ownership				
Fewer than 40 attributed beneficiaries per quarter during two-year baseline	1	4	2	5
Number of attributed beneficiaries per quarter during two-year baseline	6,136	5,264	5,731	3,254
Solo practice	11	6	13	8
Clinicians billing Medicare[a]				
1 to 4 clinicians	25	17	27	18
5 to 24 clinicians	23	23	24	31
25 to 49 clinicians	8	11	8	14
50 or more clinicians	44	49	41	37
Attributed beneficiaries had more than five chronic conditions on average	46	42	47	41
Hospital owned	47	41	45	31
Participation in other programs and Medicaid acceptance				
Proportion of clinicians in medical homes in year before TCPI enrollment[c]				
All	2	0	2	0
Some but not all	51	42	51	32
None	47	58	47	68
At least one clinician received meaningful use payment for EHRs before TCPI enrollment	90	87	89	88
At least one clinician participated in PQRS before TCPI enrollment	99.8	99.9	99.7	99.8
At least one clinician met PQRS reporting criteria for at least one measure before TCPI enrollment	53	42	54	32
Accepts Medicaid	69	50	67	39
Clinician specialty and type (% of clinicians)				

Practice characteristics	Sample for follow-up year 1		Sample for follow-up year 2	
	Primary care practices (N = 1,569)	Specialty care practices (N = 2,398)	Primary care practices (N = 1,068)	Specialty care practices (N = 1,017)
	(% of practices, unless noted)			
Clinicians' broad disciplinary categories[b]				
Non-physician	5	22	5	18
Medical specialty	10	22	10	26
Surgical specialty	8	22	8	31
Hospital-based specialty	5	8	4	6
Clinicians who were advanced practice nurses or physician assistants	23	17	24	17
Clinicians' specialties (For specialty care regressions only, not for primary care regressions) (% of clinicians)				
Primary care	n.a.[d]	17	n.a.	14
Optometry	n.a.	10	n.a.	7
Obstetrics and gynecology	n.a.	3	n.a.	2
Licensed clinical social work or clinical psychology	n.a.	6	n.a.	3
Ophthalmology	n.a.	7	n.a.	10
General surgery	n.a.	2	n.a.	2
Podiatry	n.a.	1	n.a.	1
Orthopedic surgery	n.a.	4	n.a.	6
Cardiology	n.a.	6	n.a.	7
Gastroenterology	n.a.	2	n.a.	1
Psychiatry	n.a.	4	n.a.	2
Neurology	n.a.	1	n.a.	1
Dermatology	n.a.	2	n.a.	4
Pulmonary disease	n.a.	2	n.a.	2
Urology	n.a.	5	n.a.	8
Nephrology	n.a.	1	n.a.	1

Sources: Mathematica's analysis of TCPI enrollment data, Medicare administrative data, and other data.

Notes: Analysis sample for follow-up year 1 contains all TINs that satisfy the inclusion criteria. Analysis sample for follow-up year 2 contains TINs with last PAT dates before April 1, 2019 (early cohort), which is a subset of the TINs included in follow-up year 1 analyses. Means were weighted to reflect the number

of observable beneficiary-quarters, proportion of beneficiaries seen by TCPI-enrolled clinicians two years before the first PAT, and the fraction of the TIN clinicians that are primary care or specialists.

[a] Clinicians in each TIN were those who billed the plurality of their Medicare Part B charges to that TIN in the year before the practice's enrollment.

[b] These broad disciplinary categories were defined by MD-PPAS based on combinations of CMS specialty codes.

[c] Most practices recognized as medical homes gained this status through NCQA's PCMH Recognition Program. Because NCQA PCMH data was only available through March 2018, we could not assess PCMH enrollment for practices enrolled in TCPI after that.

[d] We did not report results on clinician specialties for primary care practices because we only used clinician specialties as controls for regressions with specialty care practices (primary care practices were predominantly comprised of primary care clinicians).

CMS = Centers for Medicare & Medicaid Services; EHR = electronic health record; MD-PPAS = Medicare Data on Provider Practice and Specialty; n.a. = not applicable; NCQA = National Committee for Quality Assurance; NPPES = National Plan and Provider Enumeration System; PAT = Practice Assessment Tool; PCMH = patient-centered medical home; PQRS = Physician Quality Reporting System; TCPI = Transforming Clinical Practice Initiative; TIN = Tax Identification Number.

Supplemental Table 7. County- and state-level characteristics used as controls in regression analyses

Practice county or state characteristics	Sample for follow-up year 1		Sample for follow-up year 2	
	Primary care practices (N = 1,569)	Specialty care practices (N = 2,398)	Primary care practices (N = 1,068)	Specialty care practices (N = 1,017)
	(% of practices, unless noted)			
Located in a rural county as of 2013	14	10	12	10
Proportion of population in county below poverty line	15	15	15	15
Medicare Advantage penetration rate in county	25	27	24	27
Health Professional Shortage Area				
Primary care, whole county	5	5	4	6
Primary care, partial county	82	85	84	81
Mental health, whole county	32	28	30	30
Mental health, partial county	57	64	59	62
Number of hospital beds per 10,000 residents in county	34	35	34	40
Number of primary care physicians per 10,000 residents in county	8	8	8	8
Number of specialists per 10,000 residents in county	17	18	15	17
COVID-19 controls				
Rate of COVID-19 cases per 100,000 people in county	3,290	4,848	2,905	4,557
Rate of COVID-19 deaths per 100,000 people in county	60	91	56	81
Rate of all-cause excess deaths per 100,000 people in state	69	108	60	90

Source: Mathematica's analysis of TCPI enrollment data and other data.

Notes: Analysis sample for follow-up year 1 contains all TINs that satisfy the inclusion criteria. Analysis sample for follow-up year 2 contains TINs with last PAT dates before April 1, 2019 (early cohort), which is a subset of the TINs included in follow-up year 1 analyses. Characteristics were measured as of the year before a practice enrolled in TCPI, unless otherwise noted. Means were weighted to reflect the number of observable beneficiary-quarters, proportion of beneficiaries seen by TCPI-enrolled clinicians two years before the first PAT, and the fraction of the TIN clinicians that are primary care or specialists.

COVID-19 = coronavirus disease 2019; PAT = Practice Assessment Tool; TCPI = Transforming Clinical Practice Initiative; TIN = Tax Identification Number.

References

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Supplemental Appendix 5: Additional analyses

In this Supplemental Appendix, we present additional results from our analyses of the association between TCPI practice progress in transformation and changes in patient outcomes.

1. Regression-adjusted associations between practice transformation and changes in ED visits, by tercile of baseline ED visit rate

Supplemental Table 8 shows how the relationship between practice transformation and changes in ED visits vary by baseline ED visit rate.

Supplemental Table 8. Relationship between TCPI practice progress in transformation and changes in ED visits for Medicare FFS beneficiaries in follow-up year 2, by tercile of baseline ED visit rate

PAT score or domain	Percentage change in ED visits by follow-up year 2[a]			
		Practices in the:		
	All practices	Low rate of ED visits at baseline (bottom tercile)	Moderate rate of ED visits at baseline (middle tercile)	High rate of ED visits at baseline (top tercile)
Primary care practices				
Number of TCPI practices[b]	**1,067**	**382**	**361**	**324**
Baseline mean of ED visits (per 1,000 beneficiaries per year)[b]	**549**	**314**	**496**	**736**
Overall PAT score	**-6%*****	**-8%***	-2%	**-10%****
Patient and family engagement	-1%	-3%	<1%	**-6%****
Population management	**-5%*****	-6%	-2%	**-9%****
Practice as a community partner	-<1%	-4%	1%	-4%
Coordinated care	**-3%***	-3%	-4%	**-9%***
Enhanced access	**-3%***	-4%	2%	**-8%****
Behavioral health integration	**-4%***	-<1%	<1%	**-10%***
Measuring and documenting value and QI strategy	**-5%*****	-2%	-2%	**-7%****
Committed and engaged leadership	-<1%	3%	-<1%	3%
Specialty care practices				
Number of TCPI practices[b]	**1,016**	**287**	**366**	**363**
Baseline mean of ED visits (per 1,000 beneficiaries per year)[b]	**506**	**179**	**343**	**726**
Overall PAT score	**-4%***	-1%	**-7%****	-4%
Patient and family engagement	-2%	-5%	-4%	-4%
Population management	**-5%****	6%	**-8%****	**-7%***
Practice as a community partner	-<1%	6%	-4%	-3%
Coordinated care	-2%	-6%	-6%	-4%
Enhanced access	**-3%***	<1%	-4%	-4%

PAT score or domain	Percentage change in ED visits by follow-up year 2[a]			
		Practices in the:		
	All practices	Low rate of ED visits at baseline (bottom tercile)	Moderate rate of ED visits at baseline (middle tercile)	High rate of ED visits at baseline (top tercile)
Measuring and documenting value and QI strategy	-2%	-5%	**-6%****	-1%
Committed and engaged leadership	2%	-10%	<1%	3%

Sources: Authors' analysis of PAT data and Medicare administrative data.

Notes: This table shows the estimated percentage change in ED visits in follow-up year 2 associated with a 40-percentage point increase in the overall PAT score or domain score between the first and last PAT submission. Each row corresponds to separate models. We used a separate regression for each of the last three columns, in which we allowed the association to vary based on practice's tercile of their baseline ED visit rate. Because we excluded practices that had fully implemented processes measured in the overall PAT or domain at the first PAT, each regression could have a different set of practices in the sample.

[a] We calculated the percentage change estimates by dividing the estimated coefficient by the baseline mean outcome from each respective regression.

[b] The sample sizes and the baseline means shown are based on the set of practices included in the analysis for the overall PAT (that is, excluding those that scored 100 percent on the first PAT).

***/**/* The underlying estimate (which is visits per 1,000 beneficiaries per year) was statistically significant at the 0.01/0.05/0.10 level, two-tailed test.

2. Regression-adjusted associations between practice transformation and changes in ED visits

The main tables show the percentage estimates from regression analyses of the association between TCPI practice progress in transformation and changes in ED visits. eAppendix Tables 9 and 10 show the underlying *coefficient* estimates and their *p*-values from the same regressions. The takeaways remain unchanged.

Supplemental Table 9. Relationship between TCPI practice progress in transformation and changes in ED visits for Medicare FFS beneficiaries in the two follow-up years (in number of visits per 1,000 beneficiaries per year)

PAT score or domain	Change in ED visits by follow-up year 1	Change in ED visits by follow-up year 2			
			Practices with:		
	All practices	All practices	< 10 percent implemented at first PAT	10 to 49 percent implemented at first PAT	50+ percent implemented at first PAT
	Coefficient (*p*-value)	Coefficient (*p*-value)			
Primary care practices					
Number of TCPI practices[a]	**1,567**	**1,067**	**168**	**561**	**338**
Baseline mean of ED visits (per 1,000 beneficiaries per year)[a]	**549**	**549**	**509**	**545**	**555**

PAT score or domain	Change in ED visits by follow-up year 1	Change in ED visits by follow-up year 2			
			Practices with:		
	All practices	All practices	< 10 percent implemented at first PAT	10 to 49 percent implemented at first PAT	50+ percent implemented at first PAT
	Coefficient (*p*-value)		Coefficient (*p*-value)		
Overall PAT score	-8.5 (0.22)	**-31.1 (0.00)*** **	10.1 (0.77)	**-32.6 (0.00)*** **	**-38.5 (0.04)** **
Patient and family engagement	2.8 (0.61)	-7.9 (0.36)	-13.3 (0.24)	-9.3 (0.40)	5.2 (0.75)
Population management	-6.7 (0.30)	**-26.9 (0.00)*** **	-21.7 (0.21)	**-27.7 (0.01)*** **	**-29.6 (0.08)** **
Practice as a community partner	-1.4 (0.84)	-4.5 (0.63)	-1.8 (0.89)	-1.0 (0.95)	-11.2 (0.50)
Coordinated care	-4.4 (0.50)	**-14.8 (0.09)** **	-53.3 (0.24)	-13.3 (0.13)	-4.3 (0.80)
Enhanced access	4.1 (0.55)	**-16.0 (0.09)** **	-19.4 (0.33)	-23.7 (0.14)	-11.0 (0.34)
Behavioral health integration	-9.2 (0.24)	**-19.4 (0.06)** **	1.5 (0.93)	**-32.3 (0.04)** **	-13.1 (0.29)
Measuring and documenting value, and QI strategy	**-15.9 (0.01)** **	**-27.1 (0.00)*** **	-22.6 (0.19)	**-27.4 (0.00)*** **	**-35.8 (0.06)** **
Committed and engaged leadership	-2.5 (0.59)	-1.3 (0.86)	-0.1 (0.99)	2.2 (0.88)	-35.8 (0.25)
Specialty care practices					
Number of TCPI practices[a]	**2,397**	**1,016**	**121**	**539**	**356**
Baseline mean of ED visits (per 1,000 beneficiaries per year)[a]	**539**	**506**	**365**	**501**	**516**
Overall PAT score	-2.5 (0.74)	**-19.3 (0.09)** **	-11.4 (0.52)	-7.3 (0.55)	**-46.0 (0.06)** **
Patient and family engagement	1.7 (0.81)	-11.8 (0.14)	-2.8 (0.80)	-14.0 (0.15)	-21.0 (0.21)
Population management	-1.4 (0.85)	**-23.2 (0.01)** **	-1.8 (0.88)	**-24.8 (0.02)** **	**-34.5 (0.05)** **
Practice as a community partner	4.1 (0.59)	-4.3 (0.68)	5.8 (0.58)	-14.9 (0.30)	-16.7 (0.45)
Coordinated care	*18.4 (0.02)***	-10.6 (0.29)	2.2 (0.88)	**-21.4 (0.09)** **	-6.7 (0.62)
Enhanced access	6.6 (0.30)	**-18.0 (0.07)** **	-14.8 (0.30)	4.5 (0.76)	**-29.3 (0.03)** **
Measuring and documenting value, and QI strategy	7.8 (0.23)	-9.8 (0.23)	-15.9 (0.13)	3.1 (0.77)	**-56.0 (0.00)*** **
Committed and engaged leadership	-1.2 (0.89)	9.4 (0.39)	*19.6 (0.10)**	-22.6 (0.24)	13.3 (0.81)

Sources: Mathematica's analysis of PAT data and Medicare administrative data.

Notes: This table shows the estimated change in ED visits in follow-up years 1 and 2 associated with a 40-percentage point increase in the overall PAT score or domain score between the first and last PAT submission. Each row corresponds to separate models. We used one regression for the last three columns, in which we allowed the association to vary based on practice's implementation of the first PAT. Because we excluded practices that had fully implemented processes measured in the overall PAT or domain at the first PAT, each regression could have a different set of practices in the sample.

[a] The sample sizes and the baseline means shown are based on the set of practices included in the analysis for the overall PAT (that is, excluding those that scored 100 percent on the first PAT).

***/**/* The estimate (which is visits per 1,000 beneficiaries per year) was statistically significant at the 0.01/0.05/0.10 level, two-tailed test.

Supplemental Table 10. Relationship between TCPI practice progress in transformation and changes in ED visits for Medicare FFS beneficiaries in follow-up year 2, by tercile of baseline ED visit rate (in number of visits per 1,000 beneficiaries per year)

	Change in ED visits by follow-up year 2			
		Practices in the:		
	All practices	Low rate of ED visits at baseline (bottom tercile)	Moderate rate of ED visits at baseline (middle tercile)	High rate of ED visits at baseline (top tercile)
PAT score or domain	**Coefficient (*p*-value)**	**Coefficient (*p*-value)**		
Primary care practices				
Number of TCPI practices[a]	**1,067**	**382**	**361**	**324**
Baseline mean of ED visits (per 1,000 beneficiaries per year)[b]	**549**	**314**	**496**	**736**
Overall PAT score	**-31.1 (0.00)*** **	**-24.3 (0.06)***	-11.2 (0.43)	**-73.6 (0.04)** **
Patient and family engagement	-7.9 (0.36)	-8.9 (0.37)	3.3 (0.75)	**-47.6 (0.02)** **
Population management	**-26.9 (0.00)*** **	-17.6 (0.17)	-8.8 (0.62)	**-63.1 (0.03)** **
Practice as a community partner	-4.5 (0.63)	-11.3 (0.49)	7.1 (0.63)	-26.0 (0.66)
Coordinated care	**-14.8 (0.09)***	-8.6 (0.43)	-19.5 (0.12)	**-69.7 (0.08)***
Enhanced access	**-16.0 (0.09)***	-12.1 (0.29)	7.9 (0.66)	**-60.1 (0.02)** **
Behavioral health integration	**-19.4 (0.06)***	-0.2 (0.99)	3.9 (0.77)	**-74.9 (0.10)***
Measuring and documenting value and QI strategy	**-27.1 (0.00)*** **	-6.2 (0.57)	-11.6 (0.33)	**-50.7 (0.04)** **
Committed and engaged leadership	-1.3 (0.86)	8.1 (0.24)	-3.6 (0.75)	23.5 (0.52)
Specialty care practices				
Number of TCPI practices[a]	**1,016**	**287**	**366**	**363**
Baseline mean of ED visits (per 1,000 beneficiaries per year)[b]	**506**	**179**	**343**	**726**
Overall PAT score	**-19.3 (0.09)***	-2.6 (0.84)	**-23.2 (0.04)** **	-32.2 (0.30)
Patient and family engagement	-11.8 (0.14)	-8.5 (0.44)	-12.3 (0.28)	-25.4 (0.21)
Population management	**-23.2 (0.01)** **	10.1 (0.22)	**-27.8 (0.01)** **	**-48.7 (0.07)***
Practice as a community partner	-4.3 (0.68)	10.3 (0.30)	-15.4 (0.13)	-24.7 (0.35)
Coordinated care	-10.6 (0.29)	-11.1 (0.35)	-20.0 (0.18)	-28.4 (0.29)

PAT score or domain	Change in ED visits by follow-up year 2			
		Practices in the:		
	All practices	Low rate of ED visits at baseline (bottom tercile)	Moderate rate of ED visits at baseline (middle tercile)	High rate of ED visits at baseline (top tercile)
	Coefficient (*p*-value)	Coefficient (*p*-value)		
Enhanced access	**-18.0 (0.07)***	0.2 (0.99)	-13.2 (0.25)	-31.0 (0.23)
Measuring and documenting value and QI strategy	-9.8 (0.23)	-9.0 (0.43)	**-20.8 (0.03)****	-8.1 (0.67)
Committed and engaged leadership	9.4 (0.39)	-17.4 (0.21)	1.4 (0.91)	19.4 (0.26)

Sources: Mathematica's analysis of PAT data and Medicare administrative data.

Notes: This table shows the estimated change in ED visits in follow-up year 2 associated with a 40-percentage point increase in the overall PAT score or domain score between the first and last PAT submission. Each row corresponds to separate models. We used a separate regression for each of the last three columns, in which we allowed the association to vary based on practice's tercile of their baseline ED visit rate. Because we excluded practices that had fully implemented processes measured in the overall PAT or domain at the first PAT, each regression could have a different set of practices in the sample.

[a] The sample sizes and the baseline means shown are based on the set of practices included in the analysis for the overall PAT (that is, excluding those that scored 100 percent on the first PAT).

***/**/* The estimate (which is visits per 1,000 beneficiaries per year) was statistically significant at the 0.01/0.05/0.10 level, two-tailed test.