What is the Optimal Panel Size in Primary Care? A Systematic Review

August 2019

Prepared for:
Department of Veterans Affairs
Veterans Health Administration
Health Services Research & Development Service
Washington, DC 20420

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PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted healthcare topics of importance to clinicians, managers, and policymakers as they work to improve the health and healthcare of Veterans. These reports help:

- Develop clinical policies informed by evidence;
- Implement effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- Set the direction for future research to address gaps in clinical knowledge.

The program is comprised of 4 ESP Centers across the US and a Coordinating Center located in Portland, Oregon. Center Directors are VA clinicians and recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Center Program and Cochrane Collaboration. The Coordinating Center was created to manage program operations, ensure methodological consistency and quality of products, and interface with stakeholders. To ensure responsiveness to the needs of decision-makers, the program is governed by a Steering Committee comprised of health system leadership and researchers. The program solicits nominations for review topics several times a year via the program website.

Comments on this evidence report are welcome and can be sent to Nicole Floyd, Deputy Director, ESP Coordinating Center at Nicole.Floyd@va.gov.

Recommended citation: Shekelle PG, Paige NM, Apaydin EA, Goldhaber-Fiebert JD, Mak SS, Miake-Lye IM, Begashaw MM, Beroes-Severin JM, What is the Optimal Panel Size in Primary Care?: A Systematic Review. Washington, DC: Evidence Synthesis Program, Health Services Research and Development Service, Office of Research and Development, Department of Veterans Affairs. VA ESP Project: #05-226; 2019. Available at: https://www.hsrd.research.va.gov/publications/esp/reports.cfm.

This report is based on research conducted by the Evidence Synthesis Program (ESP) Center located at the **Los Angeles VA Medical Center, Los Angeles, CA**, funded by the Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development. The findings and conclusions in this document are those of the author(s) who are responsible for its contents; the findings and conclusions do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. No investigators have any affiliations or financial involvement (*eg*, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

ACKNOWLEDGMENTS

This topic was developed in response to a nomination by Karin Nelson, Director of the Office of Primary Care's Analytics Team (PCAT) and Primary Care Physician, for the purpose of supporting policy decisions in the Office of Primary Care regarding panel sizes for primary care providers. The scope was further developed with input from the topic nominators (*ie*, Operational Partners), the ESP Coordinating Center, the review team, and the technical expert panel (TEP).

In designing the study questions and methodology at the outset of this report, the ESP consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

The authors gratefully acknowledge Roberta Shanman, MLS and the following individuals for their contributions to this project:

Operational Partners

Operational partners are system-level stakeholders who have requested the report to inform decision-making. They recommend Technical Expert Panel (TEP) participants; assure VA relevance; help develop and approve final project scope and timeframe for completion; provide feedback on draft report; and provide consultation on strategies for dissemination of the report to field and relevant groups.

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Technical Expert Panel (TEP)

To ensure robust, scientifically relevant work, the TEP guides topic refinement; provides input on key questions and eligibility criteria, advising on substantive issues or possibly overlooked areas of research; assures VA relevance; and provides feedback on work in progress. TEP members are listed below:

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Peer Reviewers

The Coordinating Center sought input from external peer reviewers to review the draft report and provide feedback on the objectives, scope, methods used, perception of bias, and omitted evidence. Peer reviewers must disclose any relevant financial or non-financial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center and the ESP Center work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

EXECUTIVE SUMMARY

INTRODUCTION

In 2009, the Veterans Health Administration Handbook 1101.02 established a baseline panel size of 1,200 patients for a full-time physician in a Patient Aligned Care Team (PACT). This number could be adjusted up or down based on availability of support staff, the number of examination rooms, and patient complexity. After adjustment for these factors, panels ranged from 1,000 to 1,400. Veterans Health Administration (VHA) Directive 1406 reaffirmed both the baseline panel numbers and adjustment parameters.

Determining the right or optimal panel size for a full-time physician and team is a complex undertaking, balancing the demands of the system (patient access to care, clinical effectiveness or quality, patient experience, and cost) with the needs of the provider team (physician/team satisfaction, adequate time for care, and avoidance of physician/team burnout).

The standard method for determining panel size has been a function of multiplying a provider's available slots each day by the number of days in clinic divided by the average number of visits each patient will make each year. But this method does not account for the tasks that occur outside of traditional face-to-face clinical visit, including patient communication (letter writing, telephone calls, emails, and form completion), test follow-up, panel management activities, and care coordination.

To help inform an expert panel that will consider issues about determining VA primary care panel size, we were asked to conduct a systematic review of the literature.

METHODS

This topic was developed in response to a nomination by Karin Nelson, Director of the Office of Primary Care's Analytics Team (PCAT) and Primary Care Physician. Key questions were then developed with input from the topic nominator, the ESP Coordinating Center, the review team, and the technical expert panel (TEP).

The Key Questions were:

KQ1A. How should panel size be determined for a primary care provider?

KQ1B. What is the optimal size of a patient panel in primary care?

KQ1C. Is there evidence to suggest that MDs, NPs, and PAs should have different panel sizes?

KQ1D. Is there evidence from large health systems in terms of setting and maintaining panel sizes?

KQ2. Should primary care panel sizes be risk-adjusted for patient complexity? If yes, how should risk adjustment be accomplished?

Data Sources and Searches

We conducted searches in PubMed from inception to 03/08/2019, Web of Science from inception to 03/10/2019, and Scopus and Embase from inception to 03/08/2019. We also searched the gray literature using Google.

Study Selection

There was no restriction on study design, but publications must have presented research with original data that tested a hypothesis (*eg*, the association between panel size and an outcome of interest) or with the description of a model to calculate panel size, or be a toolkit to help determine panel size.

Data Abstraction and Quality Assessment

We abstracted data on the following: practitioner type, study design, sample size (number of practices), panel size range, other factors, and outcomes of interest. We considered outcomes of interest to be the 6 Institute of Medicine (IOM) aims for health care improvement (safe, effective, patient-centered, timely, efficient, equitable) and added to this the aim of reducing provider burnout.

Data Synthesis and Analysis

We did not use quality assessment per se, because all but 1 of the included hypothesis-testing studies were observational and cross-sectional in design, which have limited ability to support causal inferences and are therefore considered to be low-quality evidence. The remaining studies are modeling studies, for which there is no generally accepted tool for assessing quality. However, we narratively discuss the strengths and limitations of the models in addition to their findings. The observational studies were too clinically heterogeneous to support meta-analysis; hence our synthesis is narrative. We used criteria similar to those proposed by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) working group to assess the certainty of evidence.

RESULTS

Results of Literature Search

We identified 448 potentially relevant citations, and 14 additional articles from reference-mining the included studies, for a total of 462 articles whose titles were screened. A total of 30 publications were identified at full-text review as meeting initial inclusion criteria. This included 16 hypothesis-testing studies that assessed the association of panel size with an outcome of interest, 11 studies of models, and 3 toolkits.

Summary of Results for Key Questions

Key Question 1A: How should panel size be determined for a primary care provider?

“How should…” is a question for policymakers that requires value judgments that balance multiple factors, and as such is not something that can be answered by an evidence review. In the remaining sections we describe the evidence policymakers can use when making judgments about how should panel size be determined.

Key Question 1B: What is the optimal size of a patient panel in primary care?

Questions about optimization require that an outcome be chosen to be optimized. Since the important outcome may differ among stakeholders, we included in this section the evidence of the association of panel size with the 6 IOM aims of health care, plus the aim of reducing provider burnout.

There is a modest literature of observational studies, all but 1 being cross-sectional, that assess the relationship between panel size and outcomes of interest. The greatest number of studies assess the IOM aim of timely care, either as access or continuity. In general, these studies found variable access results, some reporting better access, others reporting worse access. Continuity seems to be little affected. There were fewer studies assessing the association between panel size and clinical quality and between panel size and patient experience (3 studies each). In general, these studies showed negative statistically significant relationships of modest size, or no statistically significant relationship, between increasing panel size and various measures of clinical quality and patient experience. One study reported 1 clinical quality measure that had better performance associated with increased panel size. No study assessed the relationship between panel size and cost. One study found a cross-sectional relationship between increased panel size and physician burnout. We did not identify any studies assessing the association of panel size and patient safety or equity.

We identified 4 groups of studies that built and assessed models for determining panel size. The modeling studies have varied in how they used or estimated important variables, such as predictors of patient demand, the source of the estimates for those predictors of demand, whether the demand is stochastic or not, and the optimization technique used. All models are optimizing some measure of access or continuity, and have either explicitly or implicitly assumed that other aims for health care improvement, such as clinical quality or patient experience, are equivalent with changes in panel size. A consistent finding from the modeling studies is that the optimal panel size for measures of access changes when patient factors are considered.

Key Question 1C: Is there evidence to suggest that MDs, NPs, and PAs should have different panel sizes?

We found no empirical evidence to inform this question in the published or gray literature.

Key Question 1D: Is there evidence from large health systems in terms of setting and maintaining panel sizes?

We identified no evidence per se on this topic. We identified only 2 US-based studies and 1 study from the English National Health Service, but none of these discussed how panel sizes are set or maintained.

Key Question 2: Should primary care panel sizes be risk-adjusted for patient complexity? If yes, how should risk adjustment be accomplished?

A consistent finding of the modeling studies is that the optimal panel size for measures of access is sensitive to risk adjustment for patient complexity. Which method of adjustment – which has varied from a simple method that includes age, gender, and insurance status to a complex method that includes many patient health status and prior utilization variables collected from the

electronic health record – is "better" has not been tested in head-to-head comparisons, other than to conclude that even the simple method is an improvement over a method that considers just age and gender.

DISCUSSION

Key Findings and Strength of Evidence

The evidence about the effect of panel size on the Institute of Medicine aims for health care improvement is surprisingly thin, given the importance of primary care panel size to all models of population-based care. The evidence consists of a handful of cross-sectional studies that assess associations of panel size with clinical quality, patient experience, access, and continuity, and show variable, no, or negative associations of increasing panel size on these outcomes of interest. By their design these studies cannot support conclusions about increasing panel size being the cause of any differences in outcomes. These studies at best act as a signal that there might be causal relationships between larger panel size and worse clinical quality and worse patient experience. The remainder of the evidence consists of a handful of studies that try and model what should be an optimal panel size, where "optimal" is defined exclusively by access. The modeling studies make the assumption that every additional patient added to a panel is going to be delivered with equal quality and patient-centeredness regardless of the number added. The cross-sectional studies we identified provide a signal that this assumption may not be correct. What does seem clear from the modeling studies is that simple models developed years ago, which basically take the number of visits made by existing patients and the number of appointment slots available to determine the panel size, can be improved. Not all patients require the same amount of time, and risk-adjusting methods tested vary from simple (age and gender) to complex (number of health care conditions, number of medications, and more). Furthermore, the resources available to the primary care provider influence how many patients can be cared for, as well as resources like the number of rooms available to see patients, the ability to delegate tasks to advanced practice providers, and the availability of clinical staff such as RN managers. Lastly, since the early models were developed there has been a plethora of new developments in health care that will influence how many patients can be cared for, such as the rise of non-face-to-face visits, telehealth, and the use of secure messaging, along with a much greater load of information the primary care provider needs to process, and be accountable for.

Certainty of Evidence for the Effect of Panel Size on Aims of Healthcare

Outcome	Number of studies	Study limitations	Consistency	Direction of effect	Overall Certainty of Evidence
Safe	0	N/A	N/A	N/A	Very Low
Effective (Clinical quality)	3	Serious	Mostly consistent	No association or negative association of modest size	Low
Patient centered	3	Serious	Inconsistent	No association or negative associations of modest size	Low
Timely (Access, including Continuity)	8	Serious	Inconsistent	Variable	Low

Efficient (including Cost)	0	N/A	N/A	N/A	Very Low
Equitable	0	N/A	N/A	N/A	Very Low
Provider burnout	1	Serious	N/A	Increased physician burnout with panel sizes higher than 1,200	Very Low

Certainty of Evidence for Risk-adjustment

Outcome	Number of studies	Study limitations	Consistency	Direction of effect	Overall Certainty of Evidence
Access	5	Not serious	Consistent	Better optimization when panel sizes are adjusted for case mix	Moderate
Access	2	Not serious	Consistent	Risk adjustment that includes clinical conditions is better than risk adjustment with just age and sex in optimizing access	Moderate

Applicability

Four of the studies identified were done in VA populations and therefore are directly relevant to VA. However, even these studies use VA data that are 5-10 years old. Primary care delivery in VA has been changing rapidly (for example, PACT), suggesting that the results of these VA studies may already be out of date.

Research Gaps/Future Research

A substantial amount of research is needed before declarations of what constitutes an "optimal" panel size in primary care can claim to be evidence-based. These needs include VA-based studies of associations – longitudinal if possible, cross-sectional if necessary – of differences in panel size and IOM aims other than access, plus provider burnout. Existing VA data in (SAIL) and Patient Centered Management Module (PCMM) could be leveraged for this. Even better, causal evidence could come from experimental changes in panel size on clinical quality, access, patient experience, etcetera, and burnout. This would involve intentional changes in panel size – say an increase or decrease by 20% – being applied to existing primary care physician (PCP) panels, and then a comparison being made of outcomes to practitioners whose panel sizes remained unchanged. A third line of research could focus on risk adjustment. VA patients tend to be more complex than non-VA patients, but the variation in complexity has been less well-studied.

More fundamentally, evidence is needed about the appropriate visit frequency or follow-up time, and format (face-to-face, video or telephone, or secure messaging), for patients with chronic conditions. Most currently used visit frequencies or follow-up times (such as a visit frequency of twice a year for a patient with well-controlled diabetes and hypertension) are based on historical

norms, are variable between physicians, and lack evidence that the particular frequency produces better outcomes than some other frequency. Thus, panel size calculations that take a provider's current patients and uses their prior year's number of visits in order to calculate what size panel the provider can care for simply perpetuate historical provider-specific variability in visit frequency. Having evidence that a particular frequency produces better outcomes will help break through this endogenous reasoning.

Conclusions

The evidence about the effect of panel size on the IOM aims for health care improvement is thin. The few studies available provide a signal that increasing panel size may have an association with modest worsening of clinical quality and patient experience. Several modeling studies exist, but all model only the effect of panel size on access to care, and assume that other IOM aims are constant with increasing panel size. Modeling studies support the policy that risk-adjustment and practice-level variables influence the optimal panel size for access. Current recommendations regarding primary care panel size are based more on historical experience than on evidence.

ABBREVIATIONS TABLE

Computerized Patient Record System	CPRS
Evidence Synthesis Program	ESP
Grading of Recommendations Assessment, Development and Evaluation	GRADE
Hierarchical Conditions Categories	HCC
Institute of Medicine	IOM
Medical Group Management Association	MGMA
Patient Aligned Care Team	PACT
Patient Centered Management Module	PCMM
Primary Care Physician	PCP
Relative Value Unit	RVU
Strategic Analytics for Improvement and Learning	SAIL
12-Item Short Form Health Survey	SF-12
Survey of Healthcare Experiences of Patients	SHEP
Technical Expert Panel	TEP
Third Next Available Appointment	TNAA
Usual Provider Continuity Index	UPC
Veterans Health Administration	VHA