

operates a wide range of outpatient facilities. Among these, 17 include full-service primary care facilities housing more than 40 family medicine, internal medicine, and pediatrics clinics located across the system. The payer mix for the organization's patient population is approximately 70% commercial fee-for-service, 12% commercial HMO, 13% Medicare/Medicaid, and 5% self-pay or other form of payment, similar to many health care delivery systems located across the United States.^{35,36}

To initiate improvements in quality and affordability, Lean was deployed as a systemwide transformation beginning in primary care. This represented a proactive effort by the organization to address prevailing challenges, including growing patient demand and increasing pressure to contain costs. Such changes motivated system leaders to find ways of "doing more with less," a fundamental aim of Lean thinking. Lean redesigns were also pursued as a way to address challenges facing primary care, such as provider fatigue and burnout, by streamlining care and reallocating work responsibilities among care team members. Through this effort, Lean redesigns offered a different way of delivering services, particularly with its focus on better coordinating and managing patient care.

Lean redesigns were introduced in all primary care clinics with the support of Lean consultants and internal trainers. These internal resources consisted of local operational leaders and physician champions who worked with frontline physicians and staff to redesign patient examination rooms, care team work spaces, and daily workflows for patient care. The intervention was implemented in all primary care clinics using the same sequence of activities: (1) "5S" standardization of medical equipment, supplies, and health education materials in patient examination rooms; (2) call management and redesign of call center functions; (3) collocation of care teams composed of a physician and a medical assistant (MA); and (4) redesign of care team roles and workflows, including daily huddles between the MD-MA dyad, agenda setting by MAs at the start of patient visits, and designation of all MAs as care team "flow managers" responsible for managing or triaging all incoming items (eg, test results, referrals, patient messages). These redesigns sought to increase work efficiency and productivity among primary care teams, while also improving service quality experienced by patients.

Study sample and performance measures

All study activities involving data extraction and analysis were approved by the organization's institutional review board. Performance measures reflecting the objectives of the Lean initiative were sourced from the organization's electronic health record system, billing and financial data, and patient satisfaction surveys gathered from a third-party administrator. Hence, our analytic sample included a total of 43 primary care clinics and 277 primary care physicians (PCPs) with linked data from all sources. To examine changes in performance measures, we focused on PCPs who had continuous

employment (>5% full-time equivalent for at least two-thirds of months both "pre-Lean" and "post-Lean" at a given clinic location) and who had information on all metrics studied (workflow, physician productivity, and patient experience) during the entire study period. Of the 277 PCPs, 69% were females, 42% practiced family medicine, 36% were internists, and 22% were pediatricians. Our PCP sample had a range of years of practice, with an average of 20 years and standard deviation of 8.43. The average clinical full-time equivalent was 0.74 (standard deviation = 0.18).

Workflow efficiency was measured using electronic health record data and reflected physicians' timely completion of tasks: closure of patient charts within 2 hours of the office visit; electronic reply to patient messages (<4 business hours); renewal of prescription medications (<4 business hours); and resolution of telephoned patient care items (<4 business hours). *Physician productivity* was measured by monthly work relative value units per clinical full-time equivalent. *Patient satisfaction* was measured using a composite score averaged across several domains. These domains assessed patient-reported satisfaction with access to care, moving through visits, interactions with care provider, interactions with nurse/MA, and handling of personal issues (eg, cleanliness of the practice, protection of patient safety and privacy, sensitivity to patient needs).

Contextual measures

Prior to implementation of the redesigns, we surveyed 1333 physicians and nonphysician staff (eg, nurses, MAs, patient service representatives) to gather baseline information about their workplace environments. The average clinic response rate was 73%, with a range of 63% to 86%. These measures, described in detail below, were selected on the basis of previous studies demonstrating the importance of organizational attributes of primary care practices,^{26,37,38} workforce engagement and readiness for change,^{39,40} and the increasing prevalence of burnout among primary care providers.^{34,41,42}

Workplace attributes

To assess work environments prior to Lean redesign, we used a well-validated survey measuring organizational attributes in primary care.²⁶ This instrument contains 4 subscales with 3 to 5 items each, and Cronbach α coefficients ranging from 0.65 to 0.76. In each clinic, we assessed: (1) *teamwork* (eg, "physicians and staff in this clinic operate as a real team"); (2) *participation in decision making* (eg, "all physicians and staff member participate in important decisions about clinical operations"); (3) *stress/chaos* (eg, "this clinic is experienced as "stressful," "this clinic is almost always in chaos"); and (4) *history of change* (eg, "our clinic has changed in how it takes initiative to improve patient care"). Items were rated on 5-point Likert scales ranging from 1 = "strongly disagree" to 5 = "strongly agree," and scores for each domain were averaged for each respondent.

Readiness for Lean changes

We used a multidimensional Organizational Change Receptants' Beliefs Scale with high-content validity, convergent validity, and reliability.⁴³ This instrument assessed beliefs about impending changes in 5 domains, each with 3 to 4 items and Cronbach α values ranging from 0.68 to 0.86: (1) *discrepancy*, belief in a legitimate need for change as indicated by perceived gaps between the current state and a desired state (eg "We need to improve the way we operate in this organization"); (2) *appropriateness*, extent to which change efforts are justified (eg "Lean is the correct change for our situation"); (3) *valence* or attractiveness of expected outcomes (eg "this change will benefit me"); (4) *principal support* for the change among management and opinion leaders (eg, "my immediate manager is in favor of Lean redesigns"); and (5) *efficacy*, perceived capability of an individual or organizational unit to implement the change (eg, "I believe this clinic can successfully implement the redesigns"). Items were rated on 5-point Likert scales ranging from 1 = "strongly disagree" to 5 = "strongly agree." Scores for each domain were averaged for each respondent.

Physician and staff engagement

We assessed physician and nonphysician engagement using an adapted version of a work experience survey.⁴⁴ As this instrument does not specify a priori domains, we conducted exploratory factor analysis with varimax rotation yielding 3 separate factors (3 items per domain, with acceptable eigenvalues >1 and Cronbach α coefficients of 0.89, 0.84, and 0.81, respectively). We labeled these factors as: (1) *personal recognition*, perceptions among staff that work contributions are valued by others (eg, "my ideas and suggestions for improvement are valued by my clinic"); (2) *work satisfaction*, degree to which individuals are satisfied in the workplace (eg, "overall, I think this is a great place to work"); and (3) *ownership*, degree to which individuals contribute to and understand how their efforts affect organizational goals (eg, "I am willing to put in a great deal of effort to help my clinic succeed"). Items were rated on 5-point Likert scales ranging from 1 to 5 ("strongly disagree/agree"), followed by averaging domain scores for each respondent.

Job-related burnout

Maslach's Burnout Inventory (Human Services Version)⁴⁵ was used to measure 3 domains with 5 to 7 items each and Cronbach α coefficients ranging from 0.76 to 0.91: (1) *emotional exhaustion* or fatigue from delivering patient care (eg, "I feel emotionally drained from my work"); (2) *depersonalization*, a hardening of attitudes of care providers toward patients (eg, "I feel I treat some patients as if they were impersonal objects"); and (3) *personal accomplishment*, a positive self-assessment of care provision (eg, "I feel I'm positively influencing other people's lives through my work"). All statements were assessed on 7-point scales ranging from 1 = "never" to 7 = "every day" and averaged for each respondent.

Statistical analysis

Identification of high improvement (HI) clinics

We used segmented regression with interrupted time series analysis to identify statistically significant changes in performance following Lean intervention. The clinic month (ie, provider data aggregated to the clinic level) was the unit of observation. For each clinic, regression models estimated (1) *immediate change* in performance outcomes and (2) *gradual change over time* following implementation of Lean redesigns. The clinics were defined as "high improvement (HI) clinics" if either the immediate or gradual change was positive and statistically significant. For performance outcomes consisting of multiple metrics (eg, workflow efficiency), the clinics were classified as high improvers when at least half of the metrics increased significantly, with no decreases in any other metric. All models were adjusted for potential confounders, including clinic size, patient factors (eg, average age on panels, percentage of new patients), and provider composition (eg, percentage of female physicians). A first-order autoregressive covariance structure was used to account for the autocorrelation of repeated measures over time.

HI clinics compared with all other clinics

For each performance measure, we conducted independent-samples *t* tests to compare contextual features of HI clinics versus all other clinics that did not demonstrate significant improvement in targeted outcomes. All analyses were conducted in SAS Enterprise Guide 5.1 and STATA 12.

RESULTS

Table 1 describes characteristics of the overall study sample and of clinics that exhibited greatest improvements in each performance area. Overall, most HI clinics tended to be larger as indicated by the average number of full-time equivalent physicians. Controlling for clinic size and other characteristics, Table 2 compares clinics on the basis of their improvements in *workflow efficiency*. High improvement clinics were more likely to report having a *history of change* relative to all other clinics. Also shown in Table 2, HI clinics were those reporting a higher baseline degree of provider burnout in the form of *emotional exhaustion* prior to workflow redesigns. Consistent with this finding, those exhibiting highest improvements in efficiency were characterized by lowest baseline levels of *work satisfaction* and greatest perceived *discrepancy* (ie, *need for change*) prior to Lean intervention.

Table 3 describes clinics exhibiting highest improvements in *physician productivity*, compared with all other clinics. As observed with efficiency, members of clinics with such productivity improvements were more likely to report having a prior *history of change* to improve care. They also reported higher baseline levels of *participation in decision making* with regard to clinical operations. In addition, higher productivity gains were found among clinics whose members perceived

Table 1. Sample Characteristics

Clinic Composition	Clinics With High Performance Improvements							
	Overall Sample (N = 43)		Workflow Efficiency (N = 16)		Physician Productivity (N = 3)		Patient Satisfaction (N = 9)	
	Mean (%)	SD (N)	Mean (%)	SD (N)	Mean (%)	SD (N)	Mean (%)	SD (N)
No. clinical FTE physicians	5.6	4.2	8.3	4.8	5.3	5.6	6.5	5.1
Average percent female physicians	(66.0)	25.0	(69.0)	15.0	(46.0)	44.0	(75.0)	19.0
Physician age, y	41.8	4.9	42.6	4.2	39.6	1.0	41.0	2.1
Average percent new patient visits, monthly	(7.0)	5.0	(7.0)	(4)	(5.0)	3.0	(8.0)	4.0
Patient age on panels, y	34.4	18.6	35.0	19.2	9.05	0.7	32.9	18.3
Family medicine percent	(37.2)	(16)	(43.8)	(7)	(0)	(0)	(44.4)	(4)
Internal medicine percent	(30.2)	(13)	(25.0)	(4)	(0)	(0)	(22.2)	(2)
Pediatrics percent	(32.6)	(14)	(31.2)	(5)	(100)	(3)	(33.4)	(3)

Abbreviation: FTE, full-time equivalent.

stronger *principal support* for Lean redesigns among respected peers and leaders.

Table 4 presents comparisons among clinics based on performance improvements in *patient satisfaction*. High improvement clinics reported higher baseline levels of *teamwork*, workforce engagement in the form of *personal recognition* for ideas to improve care, and *staff*

efficacy to implement changes. Similar to the findings on productivity, HI clinics also reported more *participation in decision making* and *principal support* for Lean redesigns. Unlike previous findings on efficiency, clinics with greatest improvements in patient satisfaction were least *stressful or chaotic* prior to Lean redesigns, compared with all other clinics.

Table 2. Performance Improvements in Workflow Efficiency

Workflow Efficiency	High Improvement Clinics	All Other Clinics	Mean Difference	P
Workplace attributes				
Teamwork	3.59	3.61	− 0.02	.658
Participation in decision making	3.04	3.05	− 0.01	.879
Stress/chaos ^a	3.03	2.84	0.19	.001
Change history ^b	3.66	3.44	0.22	.000
Job-related burnout				
Emotional exhaustion ^a	3.39	3.11	0.27	.008
Depersonalization	1.93	1.85	0.08	.295
Personal accomplishment	1.97	1.95	0.02	.775
Readiness for change				
Discrepancy (need for change) ^c	4.13	4.03	0.10	.021
Appropriateness	3.68	3.67	0.01	.816
Valence	3.53	3.51	0.02	.757
Principal support	3.65	3.64	0.01	.939
Efficacy	3.92	3.92	0.00	.941
Physician and staff engagement				
Personal recognition	3.79	3.74	0.05	.415
Work satisfaction ^c	3.82	3.96	− 0.14	.024
Ownership	4.29	4.36	− 0.07	.092

^aP < .01.

^bP < .001.

^cP < .05.

Table 3. Performance Improvements in Physician Productivity

Physician Productivity	High Improvement Clinics	All Other Clinics	Mean Difference	P
Workplace attributes				
Teamwork	3.74	3.58	0.16	.097
Participation in decision making ^a	3.26	3.02	0.24	.045
Stress/chaos	2.86	2.94	−0.08	.452
Change history ^a	3.74	3.54	0.20	.049
Job-related burnout				
Emotional exhaustion	3.34	3.23	0.11	.568
Depersonalization	1.77	1.90	−0.13	.356
Personal accomplishment	2.09	1.94	0.15	.299
Readiness for change				
Discrepancy (need for change)	4.22	4.07	0.15	.064
Appropriateness	3.84	3.66	0.18	.096
Valence	3.65	3.50	0.15	.204
Principal support ^a	3.82	3.62	0.20	.025
Efficacy	4.11	3.91	0.20	.053
Physician and staff engagement				
Personal recognition	3.94	3.75	0.19	.053
Work satisfaction	4.02	3.87	0.15	.245
Ownership	4.38	4.32	0.06	.517

^aP < .05.**Table 4. Performance Improvements in Patient Satisfaction**

Patient Satisfaction	High Improvement Clinics	All Other Clinics	Mean Difference	P
Workplace attributes				
Teamwork ^a	3.69	3.57	0.12	.028
Participation in decision making ^b	3.19	3.01	0.18	.008
Stress/chaos ^b	2.78	2.99	−0.21	.001
Change history	3.58	3.55	0.03	.541
Job-related burnout				
Emotional exhaustion	3.19	3.28	−0.09	.498
Depersonalization	1.85	1.90	−0.05	.568
Personal accomplishment	1.90	1.98	−0.08	.268
Readiness for change				
Discrepancy (need for change)	4.07	4.09	−0.02	.726
Appropriateness	3.74	3.66	0.08	.211
Valence	3.57	3.51	0.06	.367
Principal support ^a	3.75	3.61	0.14	.012
Efficacy ^a	4.01	3.89	0.11	.049
Physician and staff engagement				
Personal recognition ^b	3.91	3.73	0.18	.006
Work satisfaction	3.97	3.86	0.11	.148
Ownership	4.34	4.32	0.02	.635

^aP < .05.^bP < .01.

DISCUSSION

Leveraging data in a large ambulatory care system, we examined baseline contextual features of primary care clinics that demonstrated significant improvements after implementing Lean workflow redesigns. In 2 of the 3 performance areas, conditions associated with highest improvements included having leader support for Lean changes, past experience with quality improvement, and staff participation in decision making. In addition, in 1 of 3 performance areas, HI clinics differed from other clinics in baseline levels of teamwork, recognition by management for ideas to improve care, and staff efficacy to implement changes. Several of these factors reflect the existence of workforce engagement with continuous quality improvement, which are core features of Lean methodology. In previous implementation studies conducted in this organization,^{46,47} we found that initial acceptance of Lean redesigns among frontline physicians and staff depended largely on supportive local leadership and existing cultures within clinics (ie, democratic rather than hierarchical cultures). As revealed by the current study, many contextual conditions previously discovered as facilitating initial implementation efforts were also associated with highest achievement in performance outcomes following Lean redesign.

Other aspects of our findings are consistent with quality improvement research. For example, prior studies suggest that favorable perceptions of change and a constructive history of new initiatives promote change readiness and positive results from improvement projects.^{40,48} Moreover, environments that engage staff as well as leaders foster deeper transformation and more visible improvement at the front lines of care delivery.^{2,38} This is reflective of the fact that mutual support and trust among management, staff, and opinion leaders are prerequisite components for optimizing change.^{46,49,50} Such cohesive “microsystems” in high functioning teams and organizations are widely recognized as facilitators of delivering high-quality care.³⁸

Besides these facilitating features, we discovered a set of contextual conditions that may have also contributed to the ability of clinics to take advantage of, and consequently, benefit from Lean redesigns. Substantial improvements in workflow efficiency were found in clinics with high baseline levels of workplace stress, provider burnout, and work dissatisfaction prior to Lean intervention. Consistent with this, a widespread perception of need for change was associated with improvements in efficiency. These findings reflect the idea that perceived performance gaps often serve to legitimate changes that might otherwise be seen as unnecessary or arbitrary. As other studies have shown, unfavorable work conditions, including work stress and job-related burnout, can positively bias physicians and staff toward improvement projects and enhance the potential for successful change efforts.^{40,51,52} In our study, Lean workflows likely held most promise for clinics whose members could readily identify a need for—and

hence stood to benefit most from—workflow changes designed to alleviate daily work demands.

Limitations of this study include risks of confounding association and causality. We identified certain contextual features that were associated with, but may not have caused, the improvements observed after Lean was implemented. We reduced but did not completely eliminate that risk in two ways. First, we opted to analyze data from surveys fielded at baseline, which assessed contextual features of clinics 3 to 6 months *before* the introduction of redesigns. Thus, these features were present and descriptive of clinics prior to intervention. Second, in other qualitative studies published elsewhere,^{46,47} early interviews with physicians and leaders corroborated many of the current study findings. Specifically, qualitative interviews suggested that features identified by this study were characteristic of clinics with a high acceptance of Lean redesigns. A potential next step for research would be to identify relations *among* contextual conditions that were found to facilitate performance improvements.

CONCLUSION

Our study underscores the importance of the local setting in quality improvement initiatives. We identified a range of contextual conditions that were associated with Lean-based performance improvements. These conditions included high levels of employee engagement, leader support for changes, and staff experience with quality improvement. Of interest were the findings that workplace stress, provider burnout, and dissatisfaction with the current state of affairs may have created a particularly receptive environment for Lean intervention. As suggested by our study, redesigns that offered relief from burdensome tasks by optimizing work arrangements among care team members may have led to substantial increases in performance, particularly with regard to workflow efficiency.

Our findings should encourage system leaders and practitioners who are implementing changes to pay close attention to the expectations and needs of physicians and other clinical staff and to evaluate clinic capacity to effectively implement work redesigns. Leaders may recognize that some clinics need more support in implementing changes than do others that have high existing levels of teamwork, support from leaders, and prior experience with change initiatives. Leaders may also discover that staff burnout and dissatisfaction are associated with change readiness and high potential to benefit from improvement efforts, particularly when redesigns offer relief from daily demands rather than impose additional burden. Consideration of such conditions may help leaders select interventions most appropriate for certain clinics, while identifying others that may need extra support with implementing change.

REFERENCES

1. Kaplan HC, Brady PW, Dritz MC, et al. The influence of context on quality improvement success in health care: a systematic review of the literature. *Milbank Q*. 2010;88(4):500-559.

2. Harrison M, Paez K, Carman KL, et al. Effects of organizational context on Lean implementation in five hospital systems. *Health Care Manage Rev.* 2016;41(2):127-144.
3. Crabtree BF, Nutting PA, Miller WL, et al. Primary care practice transformation is hard work: insights from a 15-year developmental program of research. *Med Care.* 2011;49(suppl):S28-S35.
4. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci.* 2009;4:50.
5. Rojas Smith L, Ashok M, Dy S, Wines R, Teixeira-Poit S. *Contextual Frameworks for Research on the Implementation of Complex System Interventions.* Research Triangle Park, NC: RTI International-University of North Carolina at Chapel Hill Evidence-Based Practice Center; 2014.
6. Gabow P, Conway PH. Lean: a comprehensive approach to the transformation our health care system needs. *Health Aff Blog.* 2015. <http://healthaffairs.org/blog/2015/08/13/lean-a-comprehensive-approach-to-the-transformation-our-health-care-system-needs/>. Accessed January 10, 2018.
7. Meyer H. Life in the "Lean" lane: performance improvement at Denver Health. *Health Aff (Millwood).* 2010;29(11):2054-2060.
8. Toussaint JS, Berry LL. The promise of Lean in health care. *Mayo Clin Proc.* 2013;88(1):74-82.
9. Chassin MR. Improving the quality of health care: what's taking so long? *Health Aff (Millwood).* 2013;32(10):1761-1765.
10. President's Council of Advisors on Science and Technology. *Better Health Care and Lower Costs: Accelerating Improvement Through Systems Engineering.* Washington, DC: Office of Science and Technology Policy; 2014.
11. Kaplan G, Bo-Linn G, Carayon P, et al. *Bringing a Systems Approach to Health.* Washington, DC: Institute of Medicine and National Academy of Engineering; 2013.
12. Wojtys EM, Schley L, Overgaard KA, Agabian J. Applying Lean techniques to improve the patient scheduling process. *J Healthc Qual.* 2009;31(3):10-16.
13. Kim CS, Spahlinger DA, Billi JE. Creating value in health care: the case for Lean thinking. *JCOM.* 2009;16(12):557-562.
14. Mazzocato P, Savage C, Brommels M, Aronsson H, Thor J. Lean thinking in healthcare: a realist review of the literature. *Qual Saf Health Care.* 2010;19(5):376-382.
15. Garcia M. Using Lean management principles to improve patient satisfaction and reduce wait times at UNM GI/endoscopy. *UNM CIR J Qual Improv Healthc.* 2017;2:16-18.
16. Hung DY, Harrison MI, Martinez MC, Luft HS. Scaling Lean in primary care: impacts on system performance. *Am J Manag Care.* 2017;23(3):161-168.
17. D'Andrea Matteo A, Ianni L, Lega F, Sargiacomo M. Lean in health-care: a comprehensive review. *Health Policy.* 2015;119(9):1197-1209.
18. Hung DY, Harrison MI, Truong Q, Du X. Experiences of primary care physicians and staff following lean workflow redesign. *BMC Health Serv Res.* 2018;18(1):274.
19. Andersen H, Rovik KA, Ingebrigtsen T. Lean thinking in hospitals: is there a cure for the absence of evidence? A systematic review of reviews. *BMJ Open.* 2014;4(1):e003873.
20. DelliFraine JL, Langabeer JR II, Nembhard IM. Assessing the evidence of Six Sigma and Lean in the health care industry. *Qual Manag Health Care.* 2010;19(3):211-225.
21. Poksinska B. The current state of Lean implementation in health care: literature review. *Qual Manag Health Care.* 2010;19(4):319-329.
22. Brandao de Souza L. Trends and approaches in Lean healthcare. *Leadersh Health Serv.* 2009;22(2):121-139.
23. Dickson EW, Anguelov Z, Vetterick D, Eller A, Singh S. Use of Lean in the emergency department: a case series of 4 hospitals. *Ann Emerg Med.* 2009;54(4):504-510.
24. Holden RJ. Lean thinking in emergency departments: a critical review. *Ann Emerg Med.* 2011;57(3):265-278.
25. Beck MJ, Gosik K. Redesigning an inpatient pediatric service using Lean to improve throughput efficiency. *J Hosp Med.* 2015;10(4):220-227.
26. Ohman-Strickland PA, John Orzano A, Nutting PA, et al. Measuring organizational attributes of primary care practices: development of a new instrument. *Health Serv Res.* 2007;42(3, pt 1):1257-1273.
27. Ghorob A, Bodenheimer T. Sharing the care to improve access to primary care. *N Engl J Med.* 2012;366(21):1955-1957.
28. Sinsky CA, Willard-Grace R, Schutzbank AM, Sinsky TA, Margolius D, Bodenheimer T. In search of joy in practice: a report of 23 high-functioning primary care practices. *Ann Fam Med.* 2013;11(3):272-278.
29. O'Malley AS, Gourevitch R, Draper K, Bond A, Tirodkar MA. Overcoming challenges to teamwork in patient-centered medical homes: a qualitative study. *J Gen Intern Med.* 2015;30(2):183-192.
30. Lowe G. How employee engagement matters for hospital performance. *Healthc Q.* 2012;15(2):29-39.
31. Anagnostopoulos F, Liolios E, Persefonis G, Slater J, Kafetsios K, Niakas D. Physician burnout and patient satisfaction with consultation in primary health care settings: evidence of relationships from a one-with-many design. *J Clin Psychol Med Settings.* 2012;19(4):401-410.
32. Rabatin J, Williams E, Baier Manwell L, Schwartz M, Brown R, Linzer M. Predictors and outcomes of burnout in primary care physicians. *J Prim Care Community Health.* 2016;7(1):41-43.
33. Dyrbye LN, Shanafelt TD. Physician burnout: a potential threat to successful health care reform. *JAMA.* 2011;305(19):2009-2010.
34. Gregory ST, Menser T. Burnout among primary care physicians: a test of the areas of worklife model. *J Healthc Manag.* 2015;60(2):133-148.
35. Centers for Medicare & Medicaid Services. National health expenditures 2015 highlights. <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/highlights.pdf>. Published 2016. Accessed 2017.
36. Cothran J. US health care spending: who pays? <http://www.chcf.org/publications/2015/12/data-viz-hcc-national>. Published 2015. Accessed 2017.
37. Cohen D, McDaniel RR Jr, Crabtree BF, et al. A practice change model for quality improvement in primary care practice. *J Healthc Manag.* 2004;49(3):155-168; discussion 169-170.
38. Ferlie EB, Shortell SM. Improving the quality of health care in the United Kingdom and the United States: a framework for change. *Milbank Q.* 2001;79(2):281-315.
39. Weiner BJ, Amick H, Lee SY. Conceptualization and measurement of organizational readiness for change: a review of the literature in health services research and other fields. *Med Care Res Rev.* 2008;65(4):379-436.
40. Hung D, Chen P. Ready for change? The role of physician and staff engagement, burnout, and workplace attributes. *J Ambul Care Manage.* 2017;40(2):150-157.
41. Scheurer D, McKean S, Miller J, Wetterneck T. U.S. physician satisfaction: a systematic review. *J Hosp Med.* 2009;4(9):560-568.
42. West CP, Dyrbye LN, Shanafelt TD. Physician burnout: contributors, consequences, and solutions. *J Intern Med.* 2018;283(6):516-529.
43. Armenakis A, Bernerth JB, Pitts JP, Walker HJ. Organizational change recipients' beliefs scale: development of an assessment instrument. *J Appl Behav Sci.* 2007;43:481-505.
44. Advisory Board. Helping you build a high-performance culture. Survey Solutions Employee Engagement [Web page]. <http://www.advisory.com/talent-development/employee-engagement-initiative>. Published 2017. Accessed February 20, 2017.
45. Maslach C, Jackson SE, Leiter MP, Schaufeli WB, Schwab RL. *Maslach Burnout Inventory (Human Services) Sampler Set Manual, General Survey, Human Services Survey, Educators Survey, & Scoring Guides.* Menlo Park, CA: Mind Garden Publishers; 1986.
46. Hung D, Gray C, Martinez M, Schmittiel J, Harrison MI. Acceptance of lean redesigns in primary care: a contextual analysis. *Health Care Manage Rev.* 2017;42(3):203-212.
47. Hung D, Martinez M, Yakir M, Gray C. Implementing a Lean management system in primary care: facilitators and barriers from the front lines. *Qual Manag Health Care.* 2015;24(3):103-108.
48. Weiner B. A theory of organizational readiness for change. *Implement Sci.* 2009;4(1):67.

49. Chreim S, Williams BE, Janz L, Dastmalchian A. Change agency in a primary health care context: the case of distributed leadership. *Health Care Manage Rev.* 2010;35(2):187-199.
50. Willis CD, Saul J, Bevan H, et al. Sustaining organizational culture change in health systems. *J Health Organ Manag.* 2014;30(1):2-30.
51. Bartunek JM, Rousseau DM, Rudolph JW, DePalma JA. On the receiving end sensemaking, emotion, and assessments of an organizational change initiated by others. *J Appl Behav Sci.* 2006;42(2):182-206.
52. Rafferty AE, Griffin MA. Perceptions of organizational change: a stress and coping perspective. *J Appl Psychol.* 2006;91(5):1154-1162.