

# The Business Case for Investing in Physician Well-being

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**IMPORTANCE** Widespread burnout among physicians has been recognized for more than 2 decades. Extensive evidence indicates that physician burnout has important personal and professional consequences.

**OBSERVATIONS** A lack of awareness regarding the economic costs of physician burnout and uncertainty regarding what organizations can do to address the problem have been barriers to many organizations taking action. Although there is a strong moral and ethical case for organizations to address physician burnout, financial principles (eg, return on investment) can also be applied to determine the economic cost of burnout and guide appropriate investment to address the problem. The business case to address physician burnout is multifaceted and includes costs associated with turnover, lost revenue associated with decreased productivity, as well as financial risk and threats to the organization's long-term viability due to the relationship between burnout and lower quality of care, decreased patient satisfaction, and problems with patient safety. Nearly all US health care organizations have used similar evidence to justify their investments in safety and quality. Herein, we provide conservative formulas based on readily available organizational characteristics to determine the financial return on organizational investments to reduce physician burnout. A model outlining the steps of the typical organization's journey to address this issue is presented. Critical ingredients to making progress include prioritization by leadership, physician involvement, organizational science/learning, metrics, structured interventions, open communication, and promoting culture change at the work unit, leader, and organization level.

**CONCLUSIONS AND RELEVANCE** Understanding the business case to reduce burnout and promote engagement as well as overcoming the misperception that nothing meaningful can be done are key steps for organizations to begin to take action. Evidence suggests that improvement is possible, investment is justified, and return on investment measurable. Addressing this issue is not only the organization's ethical responsibility, it is also the fiscally responsible one.

*JAMA Intern Med.* doi:10.1001/jamainternmed.2017.4340  
Published online September 25, 2017.

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Widespread burnout among physicians has been recognized for more than 2 decades.<sup>1-6</sup> Burnout is a syndrome of emotional exhaustion, cynicism, and decreased efficacy at work. Over the past 10 years, studies have demonstrated that the burnout syndrome adversely affects physicians' professionalism, altruism, and sense of calling.<sup>7,8</sup> In addition to its effect on professional commitment, burnout also has potentially profound personal consequences. Population-based studies have linked burnout to cardiovascular disease and also suggest that burnout is associated with significantly shorter life expectancy.<sup>9</sup> Strong evidence has linked burnout in physicians to problematic alcohol use, broken relationships, depression, and suicide.<sup>10-14</sup>

The prevalence of burnout in US physicians is staggering. In 2008, large studies of US surgeons demonstrated that approximately 45% of surgeons had at least 1 symptom of burnout.<sup>15</sup> Although a similar prevalence of burnout was observed in a national study of physicians across all disciplines in 2011, wide variation was

observed by specialty.<sup>4</sup> Notably, physicians in specialties at the front line of access to care (eg, general internal medicine, family medicine, emergency medicine, neurology) appeared to be at highest risk. Burnout was nearly twice as common among physicians compared with US workers in other fields even after adjusting for age, sex, relationship status, level of education, and hours worked per week. Subsequent specialty-specific studies by national societies and professional organizations confirmed high rates of burnout in medical oncologists, neurologists, gynecologic oncologists, and others.<sup>16-18</sup> In 2014, the first follow-up of the 2011 national study found that the rate of burnout among physicians had increased by 9% among US physicians while remaining stable among US workers in other fields over the same interval.<sup>5</sup>

Although it is now widely recognized that 50% of US physicians are afflicted by an occupationally induced syndrome associated with profound personal and professional consequences, little has been done to address this problem.<sup>19</sup> Why has the response to

this situation been so anemic? While there are many potential explanations, we have found that 2 areas of uncertainty among organizational decision makers are the dominant factors. The first is a lack of awareness regarding the economic costs of physician burnout. This uncertainty is typically expressed by the question, "In a time of limited resources and competing priorities, what's the business case to address this issue?" The second barrier is uncertainty about whether anything can be done. This view is often expressed by the fatalistic question, "This is a national epidemic, what can we do about it?" These dimensions are related and often lead to interacting arguments ("Even if we decide something can be done, how much [financially] should we do?"; "We can only allocate x dollars, there's nothing [meaningful] we can do for that amount."). Thus, a lack of awareness by decision makers regarding the evidence that informs the response to these questions has prevented action by many medical centers. Herein, we examine the evidence that provides the platform to answer these questions and develop a rational response.

## What Is the Business Case to Address This Issue?

Although there is a strong moral and ethical case for organizations to address physician burnout, financial principles (eg, return on investment [ROI]) can also be applied to determine the economic cost of burnout and guide the appropriate initial and ongoing investment to address the problem. The business case to address physician burnout is multifaceted and includes costs associated with turnover and lost revenue associated with decreased productivity, as well as financial risk and threats to the organization's long-term viability due to the relationship between burnout and lower quality of care, decreased patient satisfaction, and problems with patient safety.

### Costs Associated With Turnover

Extensive evidence indicates that burnout is a major driver of physician turnover.<sup>20-24</sup> Multiple large, national studies of US physicians have indicated that burnout is one of the largest factors determining whether or not physicians intend to leave their current position over the next 24 months.<sup>23-25</sup> Other studies demonstrate that physicians' intent to leave correlates with actual departures.<sup>20,26,27</sup> Further buttressing this relationship, a recent prospective, longitudinal study of faculty physicians at Stanford University found that the actual 2-year rate of turnover among physician faculty who were burned out was double that of non-burned out faculty (M. Trockel, MD, PhD, written communication, May 2017).

Physician turnover results in substantial expense to health care organizations. Turnover results in both direct costs associated with recruitment, as well as lost revenue during recruitment, onboarding, and the time it takes for a new physician to reach optimal efficiency in a new system. Historical studies suggest that the cost to replace a physician is 2 to 3 times the physician's annual salary.<sup>28-31</sup> A 2012 report from the Association of Staff Physician Recruiters indicated that the average "hard costs" associated with recruiting a physician (eg, recruiting agency fees, advertisements, interview costs) are \$88 000 before factoring in lost revenue during the recruitment and onboarding process.<sup>32</sup> The actual lost revenue for 1 Association of Staff Physician Recruiters client was \$990 000 per full-time-equivalent physician,<sup>32</sup> similar to Atrius Health's recent report that their organizational cost to replace a physician was \$500 000

to \$1 000 000.<sup>33</sup> The lost revenue associated with replacing procedurally based subspecialty physicians is likely to be substantially higher. Such costs are anticipated to increase as the physician shortage in many specialties intensifies and replacing a physician becomes more difficult. These direct costs of turnover also do not take into account the disruptive impact of turnover on patients, other members of the care team, and the organization's culture and reputation.<sup>34</sup> Indeed, prospective studies demonstrate that the turnover of any member of the care team increases the risk of burnout among all other members of the care team over the next 12 months even if someone is hired to replace that individual.<sup>34</sup> Thus, turnover by physicians can increase burnout rates for both their colleagues, as well as other members of the care team. Turnover can also affect cost and quality of care for accountable care organizations. A patient who is cared for by her physician of 10 years is likely to get better care at lower cost than a patient who is seen by a different physician every few years.<sup>35-37</sup>

### Additional Considerations for Academic Medical Centers

Whereas large practice organizations are typically well aware of the cost of physician turnover,<sup>32,33</sup> we have found that this dimension is a blind spot for most academic medical centers.<sup>38</sup> Academic medical centers frequently mistakenly believe that they are immune to the costs of turnover because they have a ready pool of residents and fellows completing training from which they can recruit. They may even be seduced by the belief that they will save money because the salary of a new junior faculty member will be lower than that of the senior or mid-career physician being replaced. Or they may assume that higher rates of turnover in academic medical centers are inevitable as physicians move to advance their careers. These misperceptions fail to recognize that the largest cost associated with replacing a physician is the opportunity cost of lost patient care revenue.<sup>28-32</sup> Only rarely will the previous faculty member's departure optimally coincide with the completion of residency or fellowship training (typically June), which frequently results in a protracted vacancy before the position is filled. The assumption that a physician completing training can simply be slotted into a position vacated by a mid-career faculty member also fails to account for the greater efficiency and expertise of the more senior physician.

Perhaps the even larger oversight is failing to recognize how different the skill sets of a junior faculty member and mid-career faculty member can be. The academic productivity of the mid-career physician with respect to publications, grants, influence, and ability to design and lead clinical trials is typically substantially different than that of a new faculty member. Indeed, the mean age at first RO1 grant (typically seen as a key measure of being an independent investigator) is approximately 44 years, indicating that faculty members typically do not reach this key milestone in the early phases of their academic careers.<sup>39</sup> Mid- and late-career faculty also have the capacity to mentor junior faculty, who are on the receiving end of such mentorship. The failure of most academic medical centers to recognize these dimensions often causes them to miscalculate the cost and repercussions of physician turnover to their organization.

### Costs Associated With Decreased Productivity

The largest financial impact of physician burnout for a health care organization is likely due not its effect on turnover but its effect on physician productivity. This dimension is difficult to fully quantify.

In a longitudinal study of 2500 physicians at Mayo Clinic, each 1-point increase in burnout (on a 7-point scale) or 1-point decrease in professional satisfaction (on a 5-point scale) was associated with a 30% to 50% increase in likelihood that physicians would reduce their professional work effort over the following 24 months as independently assessed by payroll records.<sup>40</sup> Although subsequent follow-up 1 to 2 years later indicated that reducing work effort is an effective strategy to reduce burnout for individual physicians, it comes at a substantial financial cost to the organization.<sup>41</sup>

Although these observations were derived from a large organization with a salaried physician compensation model, the results seem to apply to other settings.<sup>25</sup> Indeed, they may reflect an underestimate of the effect of burnout on productivity because it is often difficult for physicians in salaried models to receive permission to reduce their professional work effort whereas physicians in productivity-based compensation models can simply reduce the number of patients they see and take home a smaller paycheck. Consistent with this notion, a recent national study found that physicians in pure productivity-based compensation models were more likely to plan to reduce professional work effort over the next 12 months than those in salaried compensation models.<sup>25</sup>

Due to the high fixed costs of many health care organizations, even a small change (eg, 1%-2%) in productivity can have large effects on an organization's bottom line. Even if a health care organization does not directly employ the physician (eg, a hospital with an open staff model), they are nonetheless affected by declines in productivity due to burnout (eg, fewer elective surgical cases, admissions, imaging). For academic medical centers, a decrease in the productivity of faculty in nonclinical tasks (eg, teaching, research, service to the organization on committees) can be even harder to quantify because it is difficult to accurately measure decreased engagement in teaching and mentorship or to identify the manuscripts and grants that a faculty member chose not to write. One estimate suggested that burnout reduces a faculty member's academic productivity (grants, publications) by approximately 15%.<sup>42</sup>

### Effects on Quality, Safety, and Patient Satisfaction

Extensive evidence has also linked physician burnout to quality of care.<sup>43,44</sup> Studies in both residents and practicing physicians suggest a dose-response relationship between burnout and medical errors, with each 1-point increase in the emotional exhaustion (on a 54-point scale) or depersonalization (on a 30-point scale) domains of burnout correlating with 3% to 10% increase in the likelihood of a physician reporting a major medical error in the past 3 months.<sup>6,45,46</sup> This relationship persists in longitudinal studies (eg, a higher burnout score today increases the risk of errors over the next 3 months) and is independent of fatigue.<sup>45,46</sup> Studies of both residents and practicing physicians also show a relationship between burnout and other suboptimal patient care behaviors such as failing to fully discuss treatment options or answer a patient's questions.<sup>47,48</sup>

Of further concern, a number of studies suggest that burnout can be infectious and that cynicism and loss of engagement can spread from one member of the care team to another.<sup>49-51</sup> Such burnout at the unit or team level seems to adversely influence quality of care. A study of 54 intensive care units in Switzerland found that the aggregate level of burnout among the physicians and nurses working on the unit was correlated with the standardized mortality ra-

tios of the patients cared for on that unit.<sup>49</sup> Longitudinal follow-up of these units demonstrated that burnout led to an erosion of teamwork over the next 9 months and resulted in decreased patient safety both directly as well as indirectly through its impact on team-based care.<sup>50</sup> Studies in nurses have found a correlation between nurse burnout at the hospital level and independently reported hospital-acquired infections,<sup>52</sup> further cementing the relationship between clinician well-being and objectively measured patient outcomes.

A number of studies have linked physician satisfaction to patient satisfaction.<sup>53-56</sup> Physician burnout has also been linked to patient outcomes. For example, 1 prospective longitudinal study among inpatients found that the postdischarge recovery time was longer for patients cared for by physicians who were more burned out.<sup>57</sup> Other studies have found a relationship between physician job satisfaction and suboptimal prescribing habits, testing ordering, and patient adherence to their physicians' recommendations.<sup>58-60</sup>

The principal concern that all of these studies raise is the deleterious effect of physician distress on patients. They also have substantial secondary economic implications for health care organizations with respect to patient satisfaction, quality metrics, contracting, costs to compensate and provide care for injured patients, and litigation-related expenses.

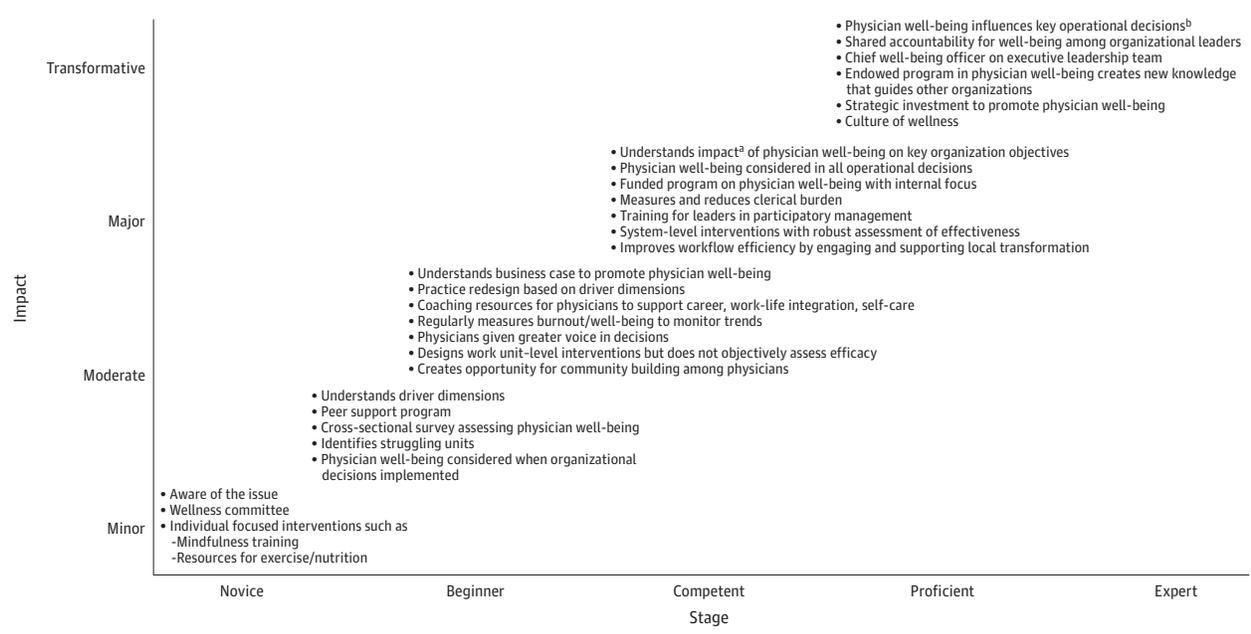
## How Should Organizations Approach the Problem?

The fact that physician burnout is a national epidemic leads many organizations to believe that there is nothing they can do to address the problem. Those centers that do recognize that they control many of the factors that drive burnout are often unsure how an organizational-level intervention can combat such a complex problem. Even the dauntless institutions who recognize that they must try are frequently unsure where to begin and do not believe that the resources they have to invest are sufficient to do anything meaningful.

The available evidence contradicts all of these notions. Burnout is primarily a system-level problem driven by excess job demands and inadequate resources and support,<sup>61,62</sup> not an individual problem triggered by personal limitations.<sup>3,19,63-65</sup> Two systematic reviews and meta-analyses have demonstrated that organizational interventions can reduce burnout,<sup>66,67</sup> and evidence suggests that even modest investments can make a difference.<sup>65,68-71</sup>

Indeed, nearly all US health care organizations have used similar evidence to that discussed to justify their investments in safety and quality. This investment is based both on the moral and ethical imperative to improve safety and quality, as well as the risk to organizational viability if safety and quality are not improved (lower patient satisfaction, less favorable patient outcomes, effects on contracting, greater litigation risk). System-level interventions by organizations to enhance quality include prioritization by leadership, organizational learning, metrics, staffing considerations, structured interventions (eg, Plan-Do-Study-Act), open communication, and promoting culture change by intervening at the work unit, leader, and organization level.<sup>72,73(pp1-32)</sup> To coordinate these initiatives, nearly all health care organizations have a chief quality officer who is an integral component of the leadership structure. This individual is typically allocated resources, charged to assess the or-

**Figure 1. Typical Steps in an Organization's Journey Toward Expertise in Physician Well-being**



<sup>a</sup> Finances, turnover, safety/quality, patient satisfaction.

<sup>b</sup> Strategy, priorities, resource allocation, new initiatives.

ganization, and empowered to change both processes and culture to help the organization improve.

A similar framework can be used to foster improvement in physician well-being. We have observed that many organizations that have endeavored to address this problem tend to follow a somewhat predictable path (Figure 1). While well intentioned, most organizations are currently stuck at the novice or beginner phase, with relatively few having moved to the competent, proficient, or expert phases in which real progress is made.

It is important for organizations to understand the factors that drive burnout and engagement. These factors can be organized into 7 driver dimensions: workload, efficiency, flexibility and/or control, culture and values, work-life integration, community at work, and meaning in work.<sup>65,74</sup> Each of these drivers is influenced by national, organizational, work unit, and individual factors.<sup>65</sup> Organizations can often make profound and effective changes in several of these dimensions (eg, flexibility and/or control, efficiency, community at work, and meaning in work) with limited investment. The fact that such changes can be low cost does not mean that they are easy. They typically require a strategic plan customized to the local environment along with prioritization, commitment, and follow-through at the highest level of the organization.<sup>65</sup> Organizations should also aspire to realize the potentially even greater benefits of taking on the challenge of improving the efficiency of their work environment, reducing clerical burden, addressing problems with workload, and having the courage to address problems with values alignment and organizational culture. Commitment from executive leadership is the prerequisite, assessment the first step, and front-line leadership a force multiplier.<sup>65,75</sup>

## How Should an Organization Determine an Appropriate Initial Level of Investment?

Based on present knowledge, how much should an organization invest each year to reduce burnout and promote physician engagement? The answer to this question is informed by the size of the organization (eg, number of physicians), other local characteristics (eg, rates of turnover, safety scores, patient satisfaction scores), and standard financial calculations (eg, ROI).

Consider a hypothetical organization that employed 450 physicians, had an annual turnover rate of 7.5%, and which had typical replacement costs of \$500 000 per physician.<sup>32,33</sup> The annual organizational cost of physician turnover would be approximately \$16.9 million/y. Although people leave organizations for many reasons (eg, promotion opportunities, lack of fit, illness, life events, family considerations, conflicts with coworkers or leaders), some of this turnover is directly related to burnout. Given prospective longitudinal studies demonstrating that burned out physicians are twice as likely to turn over and a burnout prevalence of 50%,<sup>5,25</sup> the amount of turnover attributable to burnout for this organization would be approximately 2.5%/y. This number is derived from the fact that the overall rate of turnover (7.5%) is composed of the combination of 5% turnover among those without burnout and 10% turnover among those who are burned out. Accordingly, without burnout, the turnover rate for the organization as a whole would decrease from 7.5% to 5%. If the organization believed that it had identified an organizational intervention that cost \$1 million/y that could reduce the prevalence of burnout from 50% to 40% (a 20% relative risk re-

Figure 2. Worksheet to Project Organizational Cost of Physician Burnout

1. Input data:	Enter values
N = No. of physicians at your center	_____
BO = Rate of burnout of physicians at your center	_____ <sup>a</sup>
TO = Current turnover rate per year	_____ <sup>b</sup>
C = Cost of turnover per physician	_____ <sup>c</sup>

**2. Calculations:**  
**Estimated Cost of Physician Turnover Attributable to Burnout**

A. TO without burnout (solve for TO without burnout):  
**Formula:**<sup>d</sup>  
 $TO = [TO \text{ without burnout} \times (1 - BO)] + [(2 \times TO \text{ without burnout}) \times BO]$   
**Simplified formula:**  
 $TO \text{ without burnout} = TO / (1 + BO)$

B. Projected No. of physicians turning over per year due to burnout (solve using input variables and TO without burnout value from step A):  
**Formula:**  
 $\text{No. of physicians turning over due to burnout per year} = (TO - TO \text{ without burnout}) \times N$

C. Projected cost of physician turnover per year due to burnout (solve using input variables and No. of physicians turning over due to burnout per year from step B):  
**Formula:**  
 $\text{Estimated cost of turnover due to burnout} = C \times \text{No. of physicians turning over due to burnout per year}$

**Example Using N = 450; BO = 50%; TO = 7.5%; C = \$500 000**

A. TO without burnout:  
 $0.075 = [TO \text{ without burnout} \times (1 - 0.5)] + [(2 \times TO \text{ without burnout}) \times 0.5]$   
or  $0.075 / (1 + 0.5) = 5\%$

B. No. of physicians turning over due to burnout per year:  
 $(0.075 - 0.05) \times 450 = 11.25$

C. Projected cost of physician turnover per year due to burnout:  
 $\$500\,000 \times 11.25 = \$5\,625\,000$

<sup>a</sup> National mean, approximately 54%.

<sup>b</sup> National mean, approximately 7%.

<sup>c</sup> Mean cost of \$500 000 to \$1 000 000 per physician.

<sup>d</sup> Assumes that burned out physicians are approximately 2 times as likely to turn over as non-burned out physicians.

duction), the intervention would be expected to reduce turnover by 0.5% (a 20% reduction in the 2.5% turnover attributable to burnout). The associated organizational cost savings would be \$1.125 million per year (ROI, 12.5%).

This estimated ROI is conservative because it does not account for lost revenue due to decreased productivity among burned out physicians who do not turn over<sup>41</sup> or consider the other benefits of reduced burnout with respect to patient satisfaction, quality and safety, and potential reductions in litigation risk.<sup>76,77</sup> Given the "infectious" nature of burnout, as well as the increased risk of burnout for all members of the care team associated with turnover,<sup>34</sup> the reduction in physician burnout would also likely have a salutary ripple effect, reducing the burnout of the other members of the care team.

Thus, the same \$1 million investment to reduce burnout would also be expected to pay financial dividends with respect to patient satisfaction and quality of care, all of which add to an ROI that already exceeded 12% due to turnover costs alone. It should be noted that the \$1 million/y (\$2222/physician) cost of the hypothetical intervention to reduce burnout by 10% in the aforementioned organization is consistent with or greater than that of

Figure 3. Worksheet to Determine Return on Investment (ROI) in Reduced Turnover Costs Resulting From Intervention to Reduce Physician Burnout (BO)

1. Input data:	Enter values
CB = Estimated cost of turnover due to physician burnout	_____ <sup>a</sup>
CI = Cost of intervention per year	_____
R = Relative reduction in BO	_____

**2. Calculations:**  
**ROI**

A. Savings due to reduced BO:  
**Formula:**  
 $\text{Savings due to reduced BO} = (CB \times R)$

B. ROI:  
**Formula:**  
 $ROI = (\text{Savings due to reduced BO} - CI) / CI$

**Example Using CB = \$5 625 000; CI = \$1 000 000; R = 20%**

A. Savings due to reduced BO:  
 $\$5\,625\,000 \times 0.20 = \$1\,125\,000$

B. ROI:  
 $(\$1\,125\,000 - \$1\,000\,000) / \$1\,000\,000 = 12.5\%$

<sup>a</sup> From Figure 2.

multiple actual interventions that have been shown to reduce burnout.<sup>65,67,68,70,71,78-80</sup> A worksheet to estimate the costs of burnout and potential ROI for a given organization are provided in Figure 2 and Figure 3.

### Need for Occupation-Specific Interventions

These financial considerations also represent one of several reasons organizations should be careful invoking generic "well-being" initiatives that aim to reduce burnout among all employees. Although efforts to improve teamwork and improve the efficiency of the practice environment may benefit all members of the care team, each discipline also has unique challenges, necessitating targeted interventions to address their unique needs. The system interventions that would be most helpful for an intensive care unit nurse, an operating room nurse, a pharmacist, a physical therapist, a laboratory technologist, and a urologist are distinct. Global, one-size-fits-all approaches typically fail to implement the interventions that would be most effective for each group. The magnitude of investment that yields a positive ROI can also vary widely for each occupation because the replacement costs and revenue loss associated with turnover and decreased productivity vary by profession and job type. A well-intentioned global investment that modestly improved well-being for all employees but failed to reduce burnout among physicians could have a large negative ROI because it was not designed in a targeted or strategic manner. Conversely, a relatively expensive intervention that made a meaningful impact might not be feasible for all health care workers but yield a substantial positive ROI in physicians.

### Conclusions

Despite the staggering prevalence of physician burnout and increased organizational awareness of the problem, many organizations have failed to take action commensurate with the

risk to the organization. Understanding the business case to reduce burnout and promote engagement as well as overcoming the misperception that nothing meaningful can be done are key steps for organizations to begin to take action.

Improvement is possible, investment is justified, and return on investment measurable. Addressing this issue is not only the organization's ethical responsibility, it is also the fiscally responsible one.

#### ARTICLE INFORMATION

**Accepted for Publication:** July 7, 2017.

**Published Online:** September 25, 2017.  
doi:10.1001/jamainternmed.2017.4340

**Conflict of Interest Disclosures:** Dr Shanafelt is co-inventor of the Physician Well-being Index, Medical Student Well-being Index, and Well-being Index. Mayo Clinic holds the copyright for these instruments and has licensed them for use outside Mayo Clinic. Dr Shanafelt receives a portion of any royalties paid to Mayo Clinic. No other disclosures are reported.

#### REFERENCES

- Ramirez AJ, Graham J, Richards MA, Cull A, Gregory WM. Mental health of hospital consultants: the effects of stress and satisfaction at work. *Lancet*. 1996;347(9003):724-728.
- Ramirez AJ, Graham J, Richards MA, et al. Burnout and psychiatric disorder among cancer clinicians. *Br J Cancer*. 1995;71(6):1263-1269.
- Shanafelt TD, Sloan JA, Habermann TM. The well-being of physicians. *Am J Med*. 2003;114(6):513-519.
- Shanafelt TD, Boone S, Tan L, et al. Burnout and satisfaction with work-life balance among US physicians relative to the general US population. *Arch Intern Med*. 2012;172(18):1377-1385.
- Shanafelt TD, Hasan O, Dyrbye LN, et al. Changes in burnout and satisfaction with work-life balance in physicians and the general US working population between 2011 and 2014. *Mayo Clin Proc*. 2015;90(12):1600-1613.
- Shanafelt TD, Balch CM, Bechamps G, et al. Burnout and medical errors among American surgeons. *Ann Surg*. 2010;251(6):995-1000.
- Dyrbye LN, Massie FS Jr, Eacker A, et al. Relationship between burnout and professional conduct and attitudes among US medical students. *JAMA*. 2010;304(11):1173-1180.
- Jager AJ, Tutty MA, Kao AC. Association between physician burnout and identification with medicine as a calling. *Mayo Clin Proc*. 2017;92(3):415-422.
- Ahola K, Väänänen A, Koskinen A, Kouvonen A, Shirom A. Burnout as a predictor of all-cause mortality among industrial employees: a 10-year prospective register-linkage study. *J Psychosom Res*. 2010;69(1):51-57.
- Oreskovich MR, Shanafelt T, Dyrbye LN, et al. The prevalence of substance use disorders in American physicians. *Am J Addict*. 2015;24(1):30-38.
- Oreskovich MR, Kaups KL, Balch CM, et al. Prevalence of alcohol use disorders among American surgeons. *Arch Surg*. 2012;147(2):168-174.
- Shanafelt TD, Balch CM, Dyrbye L, et al. Special report: suicidal ideation among American surgeons. *Arch Surg*. 2011;146(1):54-62.
- Pompili M, Innamorati M, Narciso V, et al. Burnout, hopelessness and suicide risk in medical doctors. *Clin Ter*. 2010;161(6):511-514.
- Dyrbye LN, Thomas MR, Massie FS, et al. Burnout and suicidal ideation among US medical students. *Ann Intern Med*. 2008;149(5):334-341.
- Shanafelt TD, Balch CM, Bechamps GJ, et al. Burnout and career satisfaction among American surgeons. *Ann Surg*. 2009;250(3):463-471.
- Shanafelt TD, Gradishar WJ, Kosty M, et al. Burnout and career satisfaction among US oncologists. *J Clin Oncol*. 2014;32(7):678-686.
- Busis NA, Shanafelt TD, Keran CM, et al. Burnout, career satisfaction, and well-being among US neurologists in 2016. *Neurology*. 2017;88(8):797-808.
- Cass I, Duska LR, Blank SV, et al. Stress and burnout among gynecologic oncologists: a Society of Gynecologic Oncology evidence-based review and recommendations. *Gynecol Oncol*. 2016;143(2):421-427.
- Shanafelt TD, Dyrbye LN, West CP. Addressing physician burnout: the way forward. *JAMA*. 2017;317(9):901-902.
- Buchbinder SB, Wilson M, Melick CF, Powe NR. Primary care physician job satisfaction and turnover. *Am J Manag Care*. 2001;7(7):701-713.
- Sibbald B, Bojke C, Gravelle H. National survey of job satisfaction and retirement intentions among general practitioners in England. *BMJ*. 2003;326(7379):22.
- Landon BE, Reschovsky JD, Pham HH, Blumenthal D. Leaving medicine: the consequences of physician dissatisfaction. *Med Care*. 2006;44(3):234-242.
- Shanafelt T, Sloan J, Satele D, Balch C. Why do surgeons consider leaving practice? *J Am Coll Surg*. 2011;212(3):421-422.
- Shanafelt TD, Raymond M, Kosty M, et al. Satisfaction with work-life balance and the career and retirement plans of US oncologists. *J Clin Oncol*. 2014;32(11):1127-1135.
- Sinsky CA, Dyrbye LN, West CP, Satele D, Tutty M, Shanafelt TD. Professional satisfaction and the career plans of US physicians. *Mayo Clin Proc*. In press.
- Hann M, Reeves D, Sibbald B. Relationships between job satisfaction, intentions to leave family practice and actually leaving among family physicians in England. *Eur J Public Health*. 2011;21(4):499-503.
- Rittenhouse DR, Mertz E, Keane D, Grumbach K. No exit: an evaluation of measures of physician attrition. *Health Serv Res*. 2004;39(5):1571-1588.
- Buchbinder SB, Wilson M, Melick CF, Powe NR. Estimates of costs of primary care physician turnover. *Am J Manag Care*. 1999;5(11):1431-1438.
- Misra-Hebert AD, Kay R, Stoller JK. A review of physician turnover: rates, causes, and consequences. *Am J Med Qual*. 2004;19(2):56-66.
- Atkinson W, Misra-Hebert A, Stoller JK. The impact on revenue of physician turnover: an assessment model and experience in a large healthcare center. *J Med Pract Manage*. 2006;21(6):351-355.
- Berger JE, Boyle RL Jr. How to avoid the high costs of physician turnover. *Med Group Manage J*. 1992;39(6):80-86.
- Schutte L. What you don't know can cost you: building a business case for recruitment and retention best practices. 2012. Association of Staff Physician Recruiters website. <http://www.aspr.org/?696>. Accessed April 28, 2017.
- Noseworthy J, Madara J, Cosgrove D, et al. Physician burnout is a public health crisis: a message to our fellow health care CEOs. *Health Affairs Blog*; March 28, 2017. <http://healthaffairs.org/blog/2017/03/28/physician-burnout-is-a-public-health-crisis-a-message-to-our-fellow-health-care-ceos/>. Accessed April 28, 2017.
- Helfrich CD, Simonetti JA, Clinton WL, et al. The association of team-specific workload and staffing with odds of burnout among VA primary care team members. *J Gen Intern Med*. 2017;32(7):760-766.
- Gill JM, Mainous AG III. The role of provider continuity in preventing hospitalizations. *Arch Fam Med*. 1998;7(4):352-357.
- Raddish M, Horn SD, Sharkey PD. Continuity of care: is it cost effective? *Am J Manag Care*. 1999;5(6):727-734.
- Shin DW, Cho J, Yang HK, et al. Impact of continuity of care on mortality and health care costs: a nationwide cohort study in Korea. *Ann Fam Med*. 2014;12(6):534-541.
- Lieff SJ. Perspective: the missing link in academic career planning and development: pursuit of meaningful and aligned work. *Acad Med*. 2009;84(10):1383-1388.
- Turner TB, Dilley SE, Smith HJ, et al. The impact of physician burnout on clinical and academic productivity of gynecologic oncologists: a decision analysis. *Gynecol Oncol*. 2017; S0090-8258(17)30967-8.
- Shanafelt TD, Mungo M, Schmitgen J, et al. Longitudinal study evaluating the association between physician burnout and changes in professional work effort. *Mayo Clin Proc*. 2016;91(4):422-431.
- Shanafelt TD, Dyrbye LN, West CP, Sinsky CA. Potential impact of burnout on the US physician workforce. *Mayo Clin Proc*. 2016;91(11):1667-1668.
- Turner TB, Dilley SE, Smith HJ, et al. The impact of physician burnout on clinical and academic productivity of gynecologic oncologists: a decision analysis [published online June 24, 2017]. *Gynecol Oncol*. doi: 10.1016/j.ygyno.2017.06.026
- Wallace JE, Lemaire JB, Ghali WA. Physician wellness: a missing quality indicator. *Lancet*. 2009;374(9702):1714-1721.
- Hall LH, Johnson J, Watt I, Tsipa A, O'Connor DB. Healthcare staff wellbeing, burnout, and patient safety: a systematic review. *PLoS One*. 2016;11(7):e0159015.
- West CP, Huschka MM, Novotny PJ, et al. Association of perceived medical errors with

- resident distress and empathy: a prospective longitudinal study. *JAMA*. 2006;296(9):1071-1078.
46. West CP, Tan AD, Habermann TM, Sloan JA, Shanafelt TD. Association of resident fatigue and distress with perceived medical errors. *JAMA*. 2009;302(12):1294-1300.
47. Shanafelt TD, Bradley KA, Wipf JE, Back AL. Burnout and self-reported patient care in an internal medicine residency program. *Ann Intern Med*. 2002;136(5):358-367.
48. Williams ES, Manwell LB, Konrad TR, Linzer M. The relationship of organizational culture, stress, satisfaction, and burnout with physician-reported error and suboptimal patient care: results from the MEMO study. *Health Care Manage Rev*. 2007;32(3):203-212.
49. Welp A, Meier LL, Manser T. Emotional exhaustion and workload predict clinician-rated and objective patient safety. *Front Psychol*. 2015;5:1573.
50. Welp A, Meier LL, Manser T. The interplay between teamwork, clinicians' emotional exhaustion, and clinician-rated patient safety: a longitudinal study. *Crit Care*. 2016;20(1):110.
51. Bakker AB, Le Blanc PM, Schaufeli WB. Burnout contagion among intensive care nurses. *J Adv Nurs*. 2005;51(3):276-287.
52. Cimiotti JP, Aiken LH, Sloane DM, Wu ES. Nurse staffing, burnout, and health care-associated infection. *Am J Infect Control*. 2012;40(6):486-490.
53. Linn LS, Brook RH, Clark VA, Davies AR, Fink A, Koseoff J. Physician and patient satisfaction as factors related to the organization of internal medicine group practices. *Med Care*. 1985;23(10):1171-1178.
54. Haas JS, Cook EF, Puopolo AL, Burstin HR, Cleary PD, Brennan TA. Is the professional satisfaction of general internists associated with patient satisfaction? *J Gen Intern Med*. 2000;15(2):122-128.
55. Grembowski D, Paschane D, Diehr P, Katon W, Martin D, Patrick DL. Managed care, physician job satisfaction, and the quality of primary care. *J Gen Intern Med*. 2005;20(3):271-277.
56. 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.
57. Halbesleben JR, Rathert C. Linking physician burnout and patient outcomes: exploring the dyadic relationship between physicians and patients. *Health Care Manage Rev*. 2008;33(1):29-39.
58. Melville A. Job satisfaction in general practice: implications for prescribing. *Soc Sci Med Med Psychol Med Sociol*. 1980;14A(6):495-499.
59. Grol R, Mokkink H, Smits A, et al. Work satisfaction of general practitioners and the quality of patient care. *Fam Pract*. 1985;2(3):128-135.
60. DiMatteo MR, Sherbourne CD, Hays RD, et al. Physicians' characteristics influence patients' adherence to medical treatment: results from the Medical Outcomes Study. *Health Psychol*. 1993;12(2):93-102.
61. Bakker AB, Van Emmerik H, Van Riet P. How job demands, resources, and burnout predict objective performance: a constructive replication. *Anxiety Stress Coping*. 2008;21(3):309-324.
62. Maslach C, Leiter MP. Understanding the burnout experience: recent research and its implications for psychiatry. *World Psych*. 2016;15(2):103-111.
63. Linzer M, Manwell LB, Mundt M, et al. Organizational climate, stress, and error in primary care: the MEMO Study. In: Henriksen K, Battles JB, Marks ES, et al, eds. *Advances in Patient Safety: From Research to Implementation*. Vol 1. Rockville, MD: Agency for Healthcare Research and Quality; 2005.
64. Rabatin J, Williams E, Baier Manwell L, Schwartz MD, Brown RL, Linzer M. Predictors and outcomes of burnout in primary care physicians. *J Prim Care Community Health*. 2016;7(1):41-43.
65. Shanafelt TD, Noseworthy JH. Executive leadership and physician well-being: nine organizational strategies to promote engagement and reduce burnout. *Mayo Clin Proc*. 2017;92(1):129-146.
66. West CP, Dyrbye LN, Erwin PJ, Shanafelt TD. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet*. 2016;388(10057):2272-2281.
67. Panagioti M, Panagopoulou E, Bower P, et al. Controlled interventions to reduce burnout in physicians: a systematic review and meta-analysis. *JAMA Intern Med*. 2017;177(2):195-205.
68. West CP, Dyrbye LN, Rabatin JT, et al. Intervention to promote physician well-being, job satisfaction, and professionalism: a randomized clinical trial. *JAMA Intern Med*. 2014;174(4):527-533.
69. Dunn PM, Arnetz BB, Christensen JF, Homer L. Meeting the imperative to improve physician well-being: assessment of an innovative program. *J Gen Intern Med*. 2007;22(11):1544-1552.
70. Swensen S, Kabcenell A, Shanafelt T. Physician-organization collaboration reduces physician burnout and promotes engagement: the Mayo Clinic experience. *J Healthc Manag*. 2016;61(2):105-127.
71. Boissy A, Windover AK, Bokar D, et al. Communication skills training for physicians improves patient satisfaction. *J Gen Intern Med*. 2016;31(7):755-761.
72. Agency for Healthcare Research and Quality. Improving patient safety in hospitals: a resource list for users of the AHRQ Hospital Survey on Patient Safety Culture. 2016. <https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/patientsafetyculture/hospital/resourcelist/hospitalresourcelist.pdf>. Accessed August 8, 2017.
73. The Joint Commission. Patient Safety Initiative: Hospital Executive and Physician Leadership Strategies. 2017. <http://www.jcrinc.com/patient-safety-initiative-hospital-executive-and-physician-leadership-strategies/>. Accessed August 8, 2017.
74. Leiter MP, Maslach C. Areas of worklife: a structured approach to organizational predictors of job burnout. In: *Research in Occupational Stress and Well Being*. Perrewé P, Halbesleben J, Rosen C, eds. Oxford, England: Elsevier; 2004:91-134.
75. Shanafelt TD, Gorringer G, Menaker R, et al. Impact of organizational leadership on physician burnout and satisfaction. *Mayo Clin Proc*. 2015;90(4):432-440.
76. Balch CM, Oreskovich MR, Dyrbye LN, et al. Personal consequences of malpractice lawsuits on American surgeons. *J Am Coll Surg*. 2011;213(5):657-667.
77. Chen KY, Yang CM, Lien CH, et al. Burnout, job satisfaction, and medical malpractice among physicians. *Int J Med Sci*. 2013;10(11):1471-1478.
78. West CP, et al. A randomized controlled trial evaluating the effect of COMPASS (Colleagues Meeting to Promote and Sustain Satisfaction) small group sessions on physician well-being, meaning, and job satisfaction. *J Gen Intern Med*. 2015;30:S89.
79. Jones JW, Barge BN, Steffy BD, Fay LM, Kunz LK, Wuebker LJ. Stress and medical malpractice: organizational risk assessment and intervention. *J Appl Psychol*. 1988;73(4):727-735.
80. West, CP, Dyrbye LN, Erwin PJ, Shanafelt TD. Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis. *Lancet*. 2016;388(10057):2272-2281.