

EDITORIALS

Disruption in Health Care (and Sleep Medicine): “It’s the End of the World as We Know it...and I Feel Fine.”

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INTRODUCTION

“That’s great, it starts with an earthquake”—the first line of the R.E.M. song referenced in the title starts with disruption. Although voices loudly shout from the rooftops about disrupting health care, and millions of written words proclaim major changes are coming, rarely in medicine do things happen fast. However, some of us who practice sleep medicine have learned from personal experience that change can arrive seemingly overnight, dramatically disrupting a clinical practice. Although such an ordeal can be considered a cautionary tale, it also can be an instructive lesson that prepares us for greater changes that are to come.

During my term as the 2018–2019 president of the American Academy of Sleep Medicine (AASM), I traveled the country speaking to sleep clinicians in practice, and executives in private companies with products devoted to sleep, and I’ve worked with my own patients and local clinicians in a large health system. I’ve concluded that sleep medicine is primed for even more disruption in the years ahead. However, I am hopeful that if we anticipate and embrace these changes, sleep medicine providers will have unprecedented opportunities to deliver better care for more people who have sleep disorders. This care will be much more patient centered than it is currently: more accessible, affordable, and personalized. Although the current method of practicing sleep medicine may evolve, the field is primed to survive and prosper.

BACKGROUND

This year marks the 10th anniversary of the text *The Innovator’s Prescription: A Disruptive Solution for Health Care*, in which Harvard Business School professor Clayton M. Christensen and his coauthors heralded the arrival of technological disruption in medicine.¹ They explained that, “The technologies that enable precise diagnosis and, subsequently, predictably effective therapy are those that have the potential to transform health care through disruption.” The book’s publication preceded the events of March 23, 2010, when President Barack Obama signed into law the Patient Protection and Affordable Care Act

(ACA).² The lofty expectations of the law’s supporters were reflected in the remarks of Vice President Joe Biden, who declared at the signing ceremony that the ACA would ensure “access to good health – and that every American from this day forward will be treated with simple fairness and basic justice.”³ This juncture of technological and legislative disruption was expected to have a seismic effect on the US health care system. Approximately 8 years following the publication of his book, however, Christensen and colleagues admitted, “Healthcare has been largely immune to the forces of disruptive innovation.”⁴

Although large-scale “macrodisruption” in health care still may be mostly theoretical, small-scale “microdisruption” is currently occurring in fields such as radiology and electrophysiology, and it already has made a lasting effect on the field of sleep medicine. I experienced firsthand the swift closure of a once-thriving sleep medicine practice after insurers implemented a preauthorization process that began requiring a cheaper diagnostic test—a home sleep apnea test (HSAT)—for many of our patients with suspected obstructive sleep apnea (OSA).⁵ Disruption is guided by simplicity, affordability, and accessibility. In our field, where polysomnography was the established, leading product, HSAT was a major disruptor, and it has caused similar disruptions in other regions across the country. The teachable lesson from that experience is that preparation and flexibility are essential to future success.

Despite my prior “personal disruption,” I remain optimistic about the positive effect that technological disruption can have on the future practice of sleep medicine. I recognize that this might be a minority opinion. Dr. Eric Topol, one of the most prominent advocates for technological innovation in clinical medicine, has written that, “Medicine is remarkably conservative to the point of being properly characterized as sclerotic, even ossified.”⁶ Why? In part, it is because of “the reluctance and resistance of physicians to change.” Sometimes we can cling so stubbornly to our way of practicing medicine that a disruptive force is required to precipitate positive changes in clinical care. Although HSATs created chaos in my previous practice, they have also increased sorely needed patient access to OSA diagnosis at a price point that is more manageable for patients who bear a higher percentage of their medical expenses. As we feel the early rumblings of the earthquake

coming to the field of sleep medicine, we need a building with a good foundation that is also able to bend with the moving earth beneath us.

STRUCTURAL CHANGE

Before I outline the areas of sleep medicine that are ripe for disruption, it is important to recognize some of the current drivers that are promoting—at times forcing—structural change in health care.

Payers

It should come as no surprise that a \$3.5 trillion industry is inherently resistant to change. The much-anticipated transition from fee-for-service payment models to “value-based care” has been extremely slow. A recent survey of the NEJM Catalyst Insights Council found that only about 25% of health care revenues come from value-based reimbursement.⁷ These revenues are derived from a mix of almost 10 different value-based models, including accountable care organizations, bundled payments, and shared savings. However, with their gaze fixed intently on cost-containment, payers will attempt to accelerate the adoption of value-based arrangements in the years ahead. Medical providers increasingly will be expected to share risk and improve efficiency while achieving better outcomes.

Employers

Many large employers such as Walmart, the largest private employer in the world with a #1 ranking on the Fortune 500 list, have become frustrated by the inefficiencies of the health care system. They are taking matters into their own hands by independently implementing strategies to improve quality while reducing costs. By taking insurers out of the equation, Walmart contracts directly with leading health systems to create “Centers of Excellence,” crafting bundled payment arrangements that cover the cost of employees’ care for certain episodes.⁸ Other companies have chosen to create their own health system altogether. Apple, ranked #4 on the Fortune 500 list, started its own health care company, AC Wellness, in 2018. Not to be outdone, three other Fortune 500 companies—Berkshire Hathaway (#3), Amazon (#8), and J.P. Morgan Chase (#20)—joined forces in 2018 to launch the health care company Haven, hiring renowned surgeon and author Dr. Atul Gawande as CEO. Look for more employers to take proactive approaches to address health care spending in the years ahead.

Pharmacies

The largest pharmacy chains are striving to transform from retailers into health care services companies. Last November, CVS Health, ranked #7 on the Fortune 500 list, completed a \$70 billion acquisition of the health insurer Aetna, vowing to provide “unrivaled community-based access to high-quality care while delivering a simpler, more responsive and more affordable experience.”⁹ CVS is testing a concept called “HealthHub,” which will expand the services of its MinuteClinics to include assessments and treatments for sleep apnea and management of chronic diseases such as high blood

pressure, high cholesterol, and type 2 diabetes.^{10, 11} Meanwhile, Walgreens, #19 on the Fortune 500 list and part of the global enterprise Walgreens Boots Alliance, is bringing laboratory business into its stores through a partnership with LabCorp. It also has a joint venture with Humana to develop senior health clinics, and it is piloting a primary care partnership as an initial step toward a potential national rollout.¹² Pharmacies will continue these efforts to diversify and expand their services.

Consumers

Consumers are taking more control of their own health care than ever before, at least partially incentivized by increasingly high-deductible health care plans. Equipped with tools such as wearable devices, genetic tests, and virtual visits, they are challenging the traditional, top-down medical hierarchy. “With a medical profession that is particularly incapable of making a transition to practicing individualized medicine, despite a new array of powerful tools, isn’t it time for consumers to drive this capability?” asks Dr. Topol in the text *The Creative Destruction of Medicine*. Sleep is one of the clinical fields in which consumers are exerting the most influence.

TECHNOLOGICAL CHANGE

Against this backdrop of structural innovation and change, technological innovation is poised to have a dramatic effect on the field of sleep medicine. In March, the AASM livestreamed a Sleep Medicine Disruptors course to facilitate among our membership a discussion about disruption. Without a doubt, these conversations may make some of our members uncomfortable, in part because medical providers are trained to view disruption negatively. However, the history of medicine is filled with examples of technological disruptions that have had a positive effect on patient care, making it simpler and more affordable. Consider, for example, the innovations that allowed self-monitoring of blood glucose to become a standard of care for people with diabetes. The AASM has worked to educate our members and prepare for future innovation in sleep medicine,¹³ and we have appointed several task forces and committees focused on telemedicine, consumer sleep technology, and artificial intelligence.^{14, 15} In addition, members of the AASM board of directors have met with executives at Fitbit and Verily to discuss and understand their interest in sleep technology on both a consumer and medical technology level. More than just being aware of potential disruptors, it is important for our members to be able to leverage new technology to improve patient care.¹⁶ I anticipate that the sleep field soon will experience disruption in several areas.

Sleep Apnea Testing

Although the HSAT already has disrupted sleep medicine, more diagnostic innovations are on the horizon. Technology companies are attracted by the size of the market, as there are an estimated 23.5 million US adults with undiagnosed OSA.¹⁷ At the AASM Sleep Medicine Disruptors course, the lead sleep scientist at Fitbit reported that the company is conducting a blinded validation trial of an apnea assessment feature for its

popular consumer wearable device. The company intends to apply to the US Food and Drug Administration for approval of Fitbit as a medical screening device. Withings recently announced that its Withings Sleep Mat now detects sleep-disordered breathing.¹⁸ It seems as if it is only a matter of time before Apple, a competitor of both Fitbit and Withings, configures its Apple Watch or its Beddit Sleep Monitor to detect breathing during sleep. Other exploratory technologies being studied include a disposable patch that detects OSA and sensor-embedded clothing that monitors respiration.^{19,20} Whether these devices “screen” for OSA risk and markedly increase patient visits with the limited number of sleep practitioners in this country, or diagnose OSA and remove the need for OSA testing by sleep physicians, the effect of the technological changes will be massive. However, the clinical validity and appropriate use of these devices will first need to be clarified to ensure the best care for sleep patients.

Genetic Sleep Tests

In addition to bringing sleep tracking data with them when they see their medical providers, some consumers are bringing the results of their genetic sleep test. For example, 23andMe offers a “Deep Sleep” report as one of the wellness reports provided through its DNA-testing health service. These consumer tests currently may be more of a novelty; however, big data, genome-wide association studies, and machine learning are helping to identify sleep-related biomarkers that may open the door to clinical utility. Examples include biomarkers to estimate circadian time, identify acute sleep loss, and screen for OSA.^{21–24} A pilot study recently provided successful results for a blood test to detect chronic fatigue syndrome.^{25,26} The day may be approaching when a simple blood, urine, or saliva test at home or in the clinic will be able to detect OSA, circadian rhythm sleep-wake disorders, or other sleep disorders.

Sleep Scoring

In the field of sleep medicine, artificial intelligence and machine learning are likely to have their most immediate effect on sleep study scoring, which is both labor-intensive and imprecise. The massive quantity and complexity of data captured by polysomnography is ideally suited for machine learning and deep learning models. Recent studies have found that these methods can perform comparably to human experts.^{27,28} In addition to scoring data more efficiently, innovative tools such as multi-taper spectral analysis and neural networks also may provide sleep clinicians with richer, deeper data to improve clinical decision-making.^{29,30}

OSA Treatments

Nearly four decades after the introduction in 1981 of positive airway pressure therapy for OSA,³¹ the treatment of OSA is still overly reliant on a modality that is quite variable in patient acceptance and adherence. Although other treatments such as oral appliance therapy, positional therapy, oral pressure therapy, and upper airway stimulation have been developed, no other treatment has been able to supplant positive airway pressure therapy as the most effective option for the most patients. The development of an OSA treatment that is simple,

affordable, comfortable, noninvasive, effective at all severity levels, and accepted by most patients is still the Holy Grail of sleep medicine. While we await the technological innovation that may disrupt the treatment of OSA, our best bet may be to apply the principles of precision medicine to become more adept at identifying the best treatment for each patient.³²

CONCLUSIONS

Last October, Dr. Zeev Neuwirth, a physician executive and expert on value-based strategies, gave a presentation to the AASM board of directors describing his concept of “reframing health care.”³³ He described how this goal can be achieved by reorienting our thinking; redefining the problem; and redirecting our strategies, tactics and resources. The rapid approach of disruptive innovation in sleep medicine presents us with the perfect opportunity to “reframe” sleep medicine. As one of the three pillars of health, along with nutrition and exercise, sleep is well positioned to have a central place in a health care marketplace that increasingly values wellness and well-being.

To seize this opportunity, we must reorient our thinking, expanding beyond sleep apnea detection to fully embrace the holistic importance of sleep for disease prevention and management, productivity and satisfaction, and safety and well-being. In a health system that demands greater efficiency, we need to redefine the problem: instead of asking how we can get more patients into the sleep laboratory, we need to determine how to manage the millions of patients with undiagnosed OSA through collaborative care models with primary care providers and other specialists. Finally, we need to redirect our field by leveraging the disruptive technology that will help us improve patient access to sleep care and thereby improve their health. By reframing sleep medicine, we can provide greater value for patients, payers and employers.

I’ll close with a warning from the titular R.E.M. song: “Offer me solutions, offer me alternatives and I decline”; the practitioners of sleep medicine cannot survive future disruption by being closed-minded to potential improvements in patient access, diagnosis and therapies. We need to acknowledge the many positive ways (and perhaps some negative ways, too) in which innovative technology is going to disrupt the field of sleep medicine in the years ahead. Fear of the unknown should not overpower the desire to learn, adapt, and prosper.

CITATION

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DISCLOSURE STATEMENT

Upon completion in June 2019 of his term as the 2018–2019 AASM president, Dr. Kirsch transitioned to the position of 2019–2020 immediate past president.