



Inter-generational Effects of Technology: Why Millennial Physicians May Be Less at Risk for Burnout Than Baby Boomers

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Abstract

Purpose of Review Younger generations of physicians are using technology more fluently than previous generations. This has significant implications for healthcare as these digital natives become a majority of the population's patients, clinicians, and healthcare leaders.

Recent Findings Historically, healthcare has been slow to adopt new technology. Many physicians have attributed burnout symptoms to technology-related causes like the EMR. This is partly due to policies and practices led by those who were less familiar and comfortable with using new technologies.

Summary Younger physicians will drive technological advancement and integration faster than previous generations, allowing technology to adapt more quickly to serve the needs of clinicians and patients. These changes will improve efficiency, allow more flexible working arrangements, and increase convenience for patients and physicians. The next generation of physicians will use technology to support their work and lifestyle preferences, making them more resilient to burnout than previous generations.

Keywords Resilience · Burnout · Technology · Millennials · Wellness · Digital well-being

Introduction

Physicians are increasingly using technology in their everyday practices. In 2008, less than 10% of U.S. hospitals had a basic electronic medical record (EMR), and within 10 years, that number had grown to greater than 95% [1]. The use of telemedicine has also increased significantly over the past decade [2, 3], and the coronavirus pandemic (Covid-19) has only accelerated widespread adoption of telemedicine and virtual care [4]. The role of technology in everyday care is likely to continue increasing with policies encouraging more interoperability of data, expanded reimbursement of telemedicine, and consumers expecting more convenience and ease of accessing care.

Technology Changes Exponentially, Humans Think Linearly

Unfortunately, technology and humans evolve at drastically different paces. A hallmark of technology is its exponential growth [5]. Moore's Law [6] is just one example among many that demonstrate that technology advances exponentially. However, despite our awareness and understanding of this fact, human brains tend to be hardwired to extrapolate linearly based on historical observations [5]. Furthermore, human behaviors are quite resistant to change [7], making it difficult for us to adapt quickly. This can make humans struggle with technology's rate of change. In healthcare, this was evident in anecdotal accounts of how hard it was for hospital EMR champions to convince their physician colleagues to adopt the technology early on [8].

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Generational Differences and the "Digital Divide"

Will physicians always be slow to embrace new technologies? Most of our studies and observations around technology adoption have focused on physicians who would be considered

digital immigrants, defined as “a person who started using digital technology, computers, the internet, etc. during their adult life but did not grow up using them” [9, 10]. This group tends to be comprised of Baby Boomers (born 1946–1964) and Generation X (born 1965–1980) [11] who never had cell phones when they were growing up (see Table 1). These older generations of physicians tend to have higher anxiety associated with technology use, take longer to adopt new technologies, and use less variety of technologies [12–14]. Few studies have focused on or included Millennials (born 1981–1996) or Generation Z (born 1997–2012) since they were not practicing physicians when EMR, telemedicine, and other digital technologies were introduced into practice. In fact, most of them were born after the Health Insurance Portability and Accountability Act of 1996 (HIPAA) was enacted (see Table 1).

Baby Boomers and Gen Z are quite different in their cognitive styles, communication preferences, and information consumption (see Table 1). Older generations like Traditionalists and Baby Boomers lived in a world with less digital technology and more limited sources of information to focus on. Younger generations have more digital “distractions” with the Internet, social media, and many potential sources of information to manage. They are also better suited to cognitively multi-task [15]. Because the current healthcare system requires physicians to process and manage so much digital information, Gen Z is naturally more adept and efficient with managing the digital aspects of their work. Gen Z is comfortable with medical software updates, video conferencing, and other technologies since they were introduced to these technologies at a young age.

However, most of our technology decisions in healthcare have been made by Baby Boomers. From policies and regulations to implementation decisions at hospitals and clinics, the leaders who shepherded the use of faxes, pagers, and EMR have been digital immigrants. They had to learn and understand the technologies as they were being developed. This had major implications for the pace and process of how technologies were introduced into clinical practice.

Since the culture of medicine was founded on the Hippocratic principle of “do no harm,” physicians have always had to balance patient safety with innovation. Historically, digital immigrants were the ones making these decisions, which have tended to be, not surprisingly, generally conservative in nature. Not only were Baby Boomers less comfortable with digital technology compared with Millennials and Gen Z (see Table 1), they also had to make decisions on technologies before they were even available to use in clinical practice. For example, HIPAA was enacted when less than 25% of the U.S. population had used the World Wide Web [16]. And yet, HIPAA is one of the most influential policies enforcing how data is used, shared, and protected in the digital age. When digital natives are in similar

positions to craft policies and champion technologies in healthcare, their approach could be very different.

The Millennials and Gen Z will be the first group of practicing physicians who would be considered digital natives, defined as “a person who is very familiar with digital technology, computers, etc. because they have grown up with them” [9, 17]. Studies have shown that this group processes information differently, are more comfortable with adopting new technologies, and are better equipped to keep up with the speed of technology change [15]. When digital natives are in charge of healthcare technology, change will likely be managed differently.

Technological Change Unleashed

Healthcare is notoriously slow at adopting new technologies. While there are likely many contributing factors for this such as regulatory hurdles and safety concerns, the fact is that healthcare and physician leaders were mostly digital immigrants who tend to be less comfortable with technology. This is about to change.

The incoming generation of digital native physicians will be the first to be able to keep up with the rapid pace of technology change, and they will soon represent the majority of the physician workforce [18]. Millennials and Gen Z physicians will allow technology to iterate more quickly. For this group, change is good and often implies improvements for their own benefit. One analogy comes from Google’s smartphone operating system, Android®. In the past, customers looked forward to buying a new phone because they would get new software features that came with the new phone and operating system. Google recently transitioned to releasing periodic upgrades every few months called “feature drop” [19] where customers using Android® get regular feature updates throughout the year without having to buy a new phone or waiting a year for any new features. Interestingly, feature drop is similar to what already happens with EMR (i.e., quarterly or semi-annual upgrades), but it is often a point of despair for many older physicians who complain that the workflows they have gotten comfortable with get broken, requiring them to relearn how to use the “new” EMR. Digital natives will likely welcome these frequent upgrades as improvements to their daily workflows, supporting the iterative improvements that the software industry now implements as standard practice. They may eventually drive the industry to push more frequent upgrades to software including the EMR throughout the year.

There is already a digital divide among physicians. In our market-driven economy, technology vendors will need to decide which group of physicians to cater to—the digital immigrants or the digital natives? As digital natives get promoted into leadership positions in their practices and in health

Table 1 Generational characteristics

Characteristics	Traditionalists	Baby Boomers	Generation X	Millennials	Generation Z
Birth years	1928–1945	1946–1964	1965–1980	1981–1996	1997–present
% of U.S. population ^a	7%	21%	20%	22%	30%
% of U.S. workforce ^{a,b}	< 1%	25%	33%	35%	6%
Defining experience	Great Depression World War II GI Bill Jukebox	Cold War Vietnam War Apollo Moon Landing Color TV	First PC introduced Fall of Berlin Wall World Wide Web Sony Walkman	Dot-Com Bubble Social Media 9/11 Apple iPod Google Search Facebook Digital natives	Climate Change Covid-19 Snapchat TikTok
Defining product					
Experience with technology	No digital	Early IT adopters	Digital immigrants	Digital natives	Digital natives/technologists
Cognitive style	Informational	Transformational	Self-directed	Informal	Multi-tasking
Information sources	Newspapers Magazines Radio	Color TV Newspapers Radio	Cable TV World Wide Web Newspapers	World Wide Web Social media Streaming media	Social media Streaming media World Wide Web
Communication formats	In-person Handwriting Typewriters	In-person Landline telephone Word processors	In-person Cellular phones Computers	E-mail Text messaging Social media In-person	Social media Instant messaging In-person
Learning formats	Classroom lectures Chalkboards Slide projectors Libraries	Classroom lectures Whiteboards Slide projectors Libraries	Classroom lectures Whiteboards PowerPoints Wikipedia	Online lectures Classroom lectures Whiteboards Internet/self-directed	Online lectures Internet/self-directed Massive open online courses (MOOCs)
Healthcare Leadership Initiatives	<i>Medicare Bill</i> (1965) – created Medicare <i>HIPAA Act</i> (1996)	<i>Medicare Modernization Act</i> (2003) – largest overhaul of Medicare <i>HITECH Act</i> (2009) – EHR “meaningful use” and incentive programs Early EHR Champions	<i>Twenty-First Century Cures Act</i> (2016) – updated regulations for digital health technologies <i>FDA Digital Health Innovation Action Plan</i> (2017) – “Pre-Cert” for digital health software	Digital health innovators and entrepreneurs – leading startups and development of digital health apps	TBD

^a 2020 estimate, 2017 National Population Projections Datasets, U.S. Census Bureau, <https://www.census.gov/data/datasets/2017/demo/popproj/2017-popproj.html>

^b 2020 estimate, Current Population Survey, U.S. Bureau of Labor Statistics, <https://www.census.gov/data/datasets/time-series/demo/cps/cps-basic.html>

systems, their mindset may change from viewing technology upgrades as headaches to opportunities for improving clinician productivity and well-being. This has the potential to lead to remarkable levels of technological change, expanded workflow efficiencies, and improved physician well-being.

Technology's Shift From Burden to Benefit

The digital native physician will not only embrace more technology in their everyday practice, they will use it to be more efficient and productive. Studies have shown that Millennials and Gen Z have different attitudes toward work from previous generations including valuing more work-life balance and autonomy [20, 21]. These values will be shared by both physicians and patients of these generations. As much as digital native physicians will be intolerant of faxing and handwriting charts, their patient counterparts will also be intolerant of driving to a clinic an hour early and sitting in the waiting room for 30 min when everything else in their world is delivered right to their doorsteps.

Vendors and employers will need to adapt to meet the expectations of this growing demographic, and the process has already started. Vendors will need to introduce upgrades to their products and services at a much faster rate to stay competitive. Health systems (i.e., employers) will also need to offer tools and work arrangements that keep Millennials and Gen Z physicians engaged and supported at work. In practice, this means health systems will need to incorporate more time-saving and/or productivity-enhancing technologies for their physicians while offering more flexible work arrangements that support a better work-life balance. Fortunately, these factors will likely drive healthcare to be more efficient while reducing physician burnout rates that have now reached epidemic levels [22••].

Improving Resilience and Well-being

Technologies often get blamed for causing physician burnout, and physicians consistently rank EMR as one of the top causes of burnout [23••, 24, 25]. A common criticism of current healthcare technologies is that they were “designed and developed by engineers” who had limited understanding of physicians and the nature of their daily work. Millennials and Gen Z physicians are likely to change this narrative. Digital natives were born technologists, and they will use technology to their advantage—helping them become more efficient by reducing administrative tasks, seeing patients virtually, and relying on virtual scribes to type their notes. The introduction of new technologies may have contributed to burnout for digital immigrant physicians, but technologies are likely to make the next generation of physicians more resilient. By embracing

new technological capabilities, the digital native physician will be able to spend less time on administrative tasks, more time interacting with patients and colleagues, and have more time outside of work to spend with family and friends.

Technologies like telemedicine are also enabling medical teams to work together without the limitations of proximity. This has allowed new models of collaborative care used in settings such as the intensive care unit with Tele-ICU [26, 27] and during Covid-19 where groups of physicians and trainees could round on patients virtually to limit exposure [28, 29]. Teamwork and good communication are key elements to building resilience [30], and recent technologies have enabled physicians to collaborate more seamlessly, enabling new models of care delivery and coordination.

Several technologies are already helping to make the next generation of physicians more resilient to burnout.

Telemedicine and Virtual Care

Telemedicine allows physicians to see more patients with increased flexibility. During video visits, physicians can use a dual or triple monitor setup to chart on one screen while seeing the patient on another screen [31•]. Multi-tasking during the visit eliminates the need to chart after the visit, which often causes physicians to stay late at the office or continue charting at home. Physicians can also see patients asynchronously with telemedicine, allowing them to review recorded patient interviews on their own schedule. These models of care offer flexible work arrangements, allowing providers to work from home and allowing patients to save time by not having to travel to the clinic, or to consult with their physicians at mutually convenient times outside of the traditional work day. Covid-19 has already accelerated the adoption of telemedicine, and the positive reception from both patients and providers [4] will likely make virtual care a core pillar of healthcare delivery moving forward.

Virtual Assistants

Technologies including the EMR have increased the clerical burden on physicians, contributing to their burnout [32••]. Virtual assistants developed by companies like Google, Amazon, Microsoft, and Suki can help physicians reduce or eliminate administrative tasks like charting and ordering prescriptions. Digital natives are familiar with these types of technologies from an early age and are comfortable communicating digitally and working with digital tools like search engines. Therefore, they will already be familiar with the experience and interface of working with virtual assistants and should be able to use these time-saving tools successfully.

Search and Information Retrieval

Younger generations are more comfortable with using the Internet, searching for information, and using digital communication tools like e-mail and social media [33]. This gives them an advantage over older generations as the healthcare system generates exponentially more data on each patient through labs and diagnostics, wearables, and EMR that can store large amounts of information for each patient. The ability to quickly find the right information becomes an increasingly valuable skill in practicing medicine, and digital natives are well-equipped to navigate large amounts of information compared with older generations who grew up without the Internet [34].

Inter-generational Effects of Covid-19

Covid-19 has already accelerated technological shifts favoring younger generations. For example, telemedicine use increased by 8336% in April 2020 compared with a year ago [35]. Videoconferencing has replaced many in-person meetings, and teams are increasingly forced to collaborate remotely. These changes favor the younger generations who are more accustomed to communicating virtually. Studies have shown that videoconferencing requires more concentration and emotional quotient (EQ) since it requires heightened self-awareness and more focus on conversation pacing, taking

turns, and coordinating eye contact [36, 37]. For those less familiar with virtual communication, the increased cognitive load required throughout the day can be taxing, often referred to as “Zoom fatigue” [37, 38]. This can have major implications for burnout and mental health since Covid-related technological shifts are likely to continue beyond the pandemic. Although it is unlikely that all-day virtual meetings will continue indefinitely, many of the changes triggered by Covid-19 will likely remain a bigger part of our every day lives moving forward. Many patients have reported that they are happy with telemedicine and plan to continue with virtual appointments beyond the pandemic [4]. Generational differences will likely have an effect on how resilient physicians are to these changes. Health systems should be proactive in their approach to minimizing burnout by providing ongoing training for technology-related products like the EMR, integrating regular evaluations of technology and their effects on clinician well-being, and providing regular communication to staff that recognizes the stresses and challenges (see Table 2) [39, 40].

Conclusions

Technology’s increasing role in healthcare will help the younger generations of physicians become more resilient to burnout. While older generations have struggled with incorporating technology into their clinical workflows, digital natives rely on technology to help them throughout the day. This

Table 2 Recommendations to Prepare for Generational Shifts

Recommendation	Examples	Rationale
Incorporate technologies that make clinical workflows and patient experiences more efficient and convenient	Virtual scribes that automate all or parts of clinical documentation. Self-service patient scheduling that allows patients to schedule/reschedule their appointments. Asynchronous telemedicine that gives physicians more control over their schedules and when to see patients	Younger generations of physicians and patients expect more control over their schedule and lifestyle. Physicians will want more control over their schedules, when and where they provide care, and increasing efficiency in their work. Patients will expect more “on demand” convenience and self-service options; less tolerant of waiting times.
Adapt clinical workflows to fit the cognitive processes of younger generations	Incorporate more opportunities to deliver care virtually. Real-time, Wikipedia-like medical charts that physicians and patients can dynamically update.	Younger generations (patients and physicians) are more comfortable communicating and interacting virtually. They also use more collaborative, synchronous documentation methods like cloud-based services like Google Drive.
Less hierarchical culture of medicine	Health systems include younger clinicians and staff in key meetings and decision-making processes.	Including younger clinicians and staff will provide insights into newer technologies, emerging usage patterns, and behaviors that health systems can better anticipate and prepare for.
Technology-based training throughout the year	EMR training offered multiple times throughout the year to accommodate software upgrades, teaching new features, and reinforcing best practices. Training should be encouraged for physicians with above average charting time and/or lower efficiency scores.	EMR upgrades can be disruptive to physicians who have established workflows. Regular EMR upgrades can cause temporary but significant decreases in productivity and efficiency for some physicians. Regular training can help to minimize these detrimental impacts.

healthy reliance on technology will help them be more efficient in their clinical work, leaving more time to spend with family and friends outside of work. Ultimately, these effects will improve the resilience and well-being of Millennial and Gen Z physicians. Their ability to keep up with the rapid pace of technological change will also enable more rapid and iterative technological improvements in the clinical setting, especially when they rise to decision-making positions within the healthcare environment.

With a faster pace of technology integration, older generations of physicians who are slower at adapting may be at risk for increased burnout. Fortunately, data shows that while digital immigrants (i.e., Baby Boomers and Gen X) may not be as comfortable with technology, many can still adapt relatively quickly to new technologies with sufficient use [41, 42] and training. Since health systems can only deploy a single version of any given product, it becomes increasingly important for leadership to assess the overall impact of a given technology on the well-being of their physicians [39]. As digital natives gradually account for a larger proportion of the healthcare workforce, their voice will grow stronger, and employers and vendors will need to adapt to their digital workflows and preferences. Policies and regulations will also need to keep up with this new pace of change [43].

There are a few recommendations for how health systems can prepare for the generational shifts in the healthcare workforce (see Table 2). First, technology should be an increasing focus in every aspect of the healthcare experience from clinical workflows, provider engagement, to patient experiences. As the demographics of patients and clinicians increasingly shift toward digital natives, health systems will need to adapt to their needs and preferences. This also means using technology to enable more convenient access to care for patients as well as more flexible working arrangements for clinicians, such as working from home and outside of traditional office hours. Second, clinical workflows will need to adapt to fit the cognitive processes of digital natives. Technologies like EMR will need to move toward search boxes and user interfaces that model the way digital natives are accustomed to processing information. Finally, the culture of medicine will need to become less hierarchical, allowing younger generations to be involved in the decision-making process to ensure that health systems are prepared for the pace of technology and its impact on medical practice. The younger generations will welcome technology and the constant change that comes with it. They will help our healthcare system become more adaptive, more efficient, and more flexible. As our profession fights a growing epidemic of burnout, digital natives will help us use technology to build a more resilient workplace and culture.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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