AAFP Innovation Lab: Reducing Documentation Burden through the use of a Digital Assistant

Abstract

Objective: The American Academy of Family Physicians has launched a series of Innovation Labs to identify and demonstrate technologies essential to optimizing the family medicine experience. The initial lab studied the use of a Digital Assistant to greatly reduce documentation burden and family physician burnout.

Participants and Methods: The lab studied the impact of a Digital Assistant used for visit note completion for over 15 to 30 days by 10 family physicians. Impact was assessed through a qualitative time and motion study and qualitative provider survey and interviews.

Results: The time and motion results showed a 62% decrease in documentation time per patient, 51% decrease in documentation time during clinic, and 70% decrease in after-hours charting. The physician survey showed 100% of the providers were more satisfied with how they were doing their notes which represented a 48% improvement and how much less time it was taking them to complete them which represented a 108% improvement. Providers had an 84% improvement in their satisfaction with the time needed to use their EHR for other administrative tasks.

Conclusion: The 100% of physician users saw time savings and dramatic increase in their satisfaction with notes completion, time savings and EHR use for other administrative tasks. Providers described how the Digital Assistant allowed them to see their patients, get their documentation done without feeling always rushed or having to finish their notes at home after hours. Several physicians described this impact as a "breakthrough" in their practices. The dramatic impact on these family physicians suggests that Digital Assistant may be an essential technology to optimize the Family Medicine Experience. These results demand further study in a Phase 2 Innovation Lab with over 100 family physicians.

Overview

The American Academy of Family Physicians is dedicated to optimizing the family medicine experience for patients and their families, and family physicians and their care teams. Toward this goal, the Academy supports family physicians in achieving the Quadruple AIM; enhancing their care for individuals, improving the health of their patient population, reducing the per capita cost of their care while also finding joy in their work.

The family medicine experience is based on a deep physician-patient interaction that requires support from technology. Today's EHRs have greatly eroded the experience rather than enhancing it. The vision for the family medicine experience is that family physicians must primarily care for their patients and that IT must work for clinicians not against them. The AAFP sees the innovative use of health information technology (HIT) as essential to optimizing the family medicine experience. Toward this end, our Innovation Laboratory is partnering with industry to drive innovation with the latest proven advanced technologies: cloud, AI/ML, voice and mobile technologies, to optimize the family medicine experience.

Family physicians are facing existential threats. Physician burnout based on clerical burden is at epidemic levels for family physicians[2,3,4,5,6]. Clerical burden requires greater than 50% of the physician's time. At the same time, they are having to transform their practices to population based care and alternative payment models. The associated financial risk threatens to burn down their margins and thus their practices. On top of that, artificial intelligence applied without optimizing the family medicine experience as a design requirement threatens to increase physician burden and sub-optimally impact patients and the specialty.

While nearly $6 billion dollars was invested into the digital health sector in 2017 with over 3 million health apps available, these apps often increase the burden and burnout for physicians rather than improve the experience of care. The AAFP believes that family physicians must help drive technical innovation of essential technologies and to change how medicine is best practiced in the future. Luckily, applications exist today that are making a positive impact. There is an opportunity for the AAFP to curate these applications to drive adoption and influence their future roadmap.

The AAFP's role is to prove and promote innovations as essential technologies and best practices to membership. EHR's have clearly taught us all that technology can greatly affect best practices. Going forward we cannot separate technology from optimizing medicine. Over the past 2 decades, the clerical burden on family physicians has grown with the increase of documentation, reimbursement, and reporting requirements. Family physicians, as with all primary care, make the vast majority of their practice revenues from patient visits and population health. The EHRs that have been built to address these many requirements were designed with many, actually too many stakeholders in mind. For example, the visit documentation has been bloated by the requirements for E&M coding as a proxy for the level of complexity of a visit and therefore the value of the visit. Meaningful Use certification bloated the requirements for EHRs increasing clerical burden and time required of physicians.

The AAFP Innovation Lab's goal is to study solutions that offer not merely incremental improvement, but that truly alleviate the underlying problems in family medicine. Technologies are essential when they are deemed just that, "essential," by physicians and actively promoted by physicians to their colleagues. Their value propositions must promise and then deliver such that the solution is effective and adoptable.

The first underlying problem the Labs focused on within clerical burden, is EHR documentation. It has extended the total amount of time physicians spend in their practice and afterhours at home[7]. Physicians are forced to modify their workflow which changes their focus and work during the visit from care delivery to clerical work. Their personal lives also change from focusing on family and personal pursuits to again tackling more clerical work and care tasks that were squeezed out of the workday. Our first lab sought to dramatically reduce EHR documentation burden.

Digital Assistant

Digital Assistants are a new category of innovative products that intend to greatly reduce documentation burden. These clinical Digital Assistants are akin to well-known mainstream solutions such as Alexa or Siri. They use voice recognition, natural language processing and artificial intelligence to provide physicians with a digital assistant that continually listens, learns, and adapts to a physician's practice. The longer term goal is for the digital assistant to behave like an MA or RN who understands the preferences of a physician and can anticipate their needs.

In some specialties, these products are being positioned as virtual scribes to replace more costly human scribes. In family practices where human scribes are often not affordable, these products offer much needed relief of clerical and documentation burden.

Digital Assistants are differentiated from legacy voice recognition solutions such as Nuance, Entrada and MModal. The current use of voice recognition (VR) requires the physician to navigate within the user interface of the EHR and its documentation templates to place the VR entry and then to edit the resultant text. Digital Assistants allow the physician to generate a note without UI navigation or editing.

These clinical Digital Assistants are a new category of solutions from innovators such as Suki, Robin, Saykara, Notable and others. These companies are positioning their Digital Assistant products as being voice and AI-enabled assistants, that more than just replace scribes or the need for scribes, that are assistants that continually learn how to better assist and anticipate the needs of the physician and their patient. Several Digital Assistant companies have focused on selling to specialties that have broadly adopted scribes and have priced their products as a more affordable scribe without the worries of retention and replacement and the associated training time.

The Suki Solution

The AAFP Innovation Lab assessed the companies in this category to find a partner for this first lab. Suki was chosen for several reasons. The Suki solution combines proven voice and AI technologies to provide a solution that was representative of this new category. Suki's reason for being was well aligned with the goals of the lab; helping physicians primarily care for their patients. The company is actively and successfully marketing to primary care and family medicine. The solution is readily adoptable, software only, not requiring any new hardware. Physicians just download the application and sign up. The version of the Suki studied was on the iPhone and on the Chrome browser for Android users.

The Innovation Lab with the Suki Digital Assistant was conducted on the athenaOne EHR from athenahealth. This was based on the fact that this digital assistant was already being used by family physicians with this EHR. Additionally, its adoption and implementation was very rapid and easy given it was being offered and adopted through the athenahealth's More Disruption Please marketplace at a price that could be affordable to family physicians. In short, it was already integrated, readily adoptable, rapidly implemented and affordable.

Methods

The AAFP identified potential pilot participants using various selection criteria, which included: AAFP membership, use of athena EHR, a qualification survey indicating the physician self-identified as having burnout, self-perceived clerical burden, reported being burdened with after-hours work, and self-identified as being motivated to change.

In this initial study the goals were to significantly decrease family physician burnout and HIT-related stress based on documentation burden. The objective is not just that the innovation can meet these goals but that the innovation is a product that is adoptable and the business model sustainable. While the 30 day trial was free of charge, if they wanted to continue to use the Digital Assistant, the physician or their organization must sign-up for a subscription. The study was based on pre and post adoption time and motion benchmarks, a physician survey for qualitative assessments and a physician interview.

Provider Cohort

This Innovation Lab was conducted with 10 physicians in five practices in whose demographics are representative of key practice types within broader membership and described here.

Type	Location	Total Providers	Lab Providers
FQHC	Metro	8	3
Large Group	Suburban	21	1
Small Group	Rural	5	1

Small Group	Suburban	3	1
Mid-Size Medical Group of Health System	National (Suburban)	8	4

Time & Motion Study

A time motion study[1] was conducted before and after 30 days of use of the Digital Assistant. The time study was conducted by shadowing each physician user for a full day and tracking their activities with a stopwatch. The metrics included documentation of time per patient, total time during clinic day and time spent after hours.

Qualitative Survey

A survey was conducted with each of the providers before and after their use of the digital assistant for the trial period.

Physician Survey: Scale of 1-10 with 10 being the highest
How satisfied are you with your current method of note completion?
How satisfied are you with the amount of time you're spending in the EHR completing Notes?
How satisfied are you with the amount of time you're spending in the EHR doing other administrative tasks?
How satisfied are you with the quality of your notes?
How likely are you to finish your notes the same day?
How satisfied are you with the interaction with your patients?

Physician Interview

An interview was conducted with the physician adopters to assess their level of burden, burnout, and adoption. The interviews lasted 45 to 60 minutes. The set of questions used to structure the interview follow.

Interview Questions: Scale of 1-10 with 10 being the highest
How satisfied are you with your overall practice?
How satisfied are you with your EHR?
How satisfied are you with your documentation?
How satisfied are you with after-hours work?
Which of the items below describes you best: 1. "I enjoy my work. I have no symptoms of burnout." 2. "I am under stress, but I don't feel burned out." 3. "I am definitely burning out."

4. "I think about work frustrations a lot. It won't go away." 5. "I feel completely burned out. I may need to seek help."
What percentage of your patient visits feel rushed?
The EHR adds to the frustration of my day: 1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
What percentage of your documentation is completed before your next visit?
How much time do you spend on the EHR at home? Is it acceptable?
How likely is it that you would recommend your digital assistant tools to a friend or colleague?

Results

Below are quantitative results and interview findings for 10 providers after using the Digital Assistant for 15 to 30 days. All measurements are for the time of documentation and are measured in minutes.

Time & Motion Study

Time & Motion	Time Per Patient		Time during clinic		Time after-hours	
	Before	After	Before	After	Before	After
Provider 1	18	5.7	360	114	0	0
Provider 2	15.2	4.1	220	59	60	30
Provider 3	14	5.6	210	84	150	50
Provider 4	14	6	120	90	45	15
Provider 5	12	3	60	55	80	0
Provider 6	18	7	150	85	30	15
Provider 7	14	6	130	90	60	30
Provider 8	10	5	125	70	30	0
Provider 9	10	4	60	20	90	30
Provider 10	10	5	60	60	120	30
Total	**13.5**	**5.1**	**149.5**	**72.7**	**66.5**	**20.0**
Delta	**8.4**		**76.8**		**46.5**	
% Improvement	**62%**		**51%**		**70%**	

Physician Survey

Extensive interviews were conducted with provider users after the trial period. Seven of the ten providers were interviewed. The other three were to be interviewed, but the COVID-19 pandemic forced their postponement. With an incomplete dataset and an *n* of 7 out of 10, the results will be discussed below as anecdotal evidence of these providers' experience; impact on their clerical burden, and burnout.

Provider Survey	How satisfied are you with your current method of note completion?		How satisfied are you with the amount of time you're spending in the EHR completing Notes?		How satisfied are you with the amount of time you're spending in the EHR doing other administrative tasks?	
	Before	After	Before	After	Before	After
Provider 1	8	8	2	7	2	7
Provider 2	6	8	3	8	3	8
Provider 3	2	7	2	7	2	7
Provider 4	7	9	6	9	6	6
Provider 5	7	9	5	8	1	3
Provider 6	6	9	5	8	5	6
Provider 7	4	7	3	7	3	6
Provider 8	5	9	6	8	6	6
Provider 9	6	9	3	8	2	5
Provider 10	6	8	2	7	2	5
Total	**5.7**	**8.3**	**3.7**	**7.7**	**3.2**	**5.9**
Delta	**2.6**		**4.0**		**2.7**	
% Improvement	**46%**		**108%**		**84%**	

Provider Survey	How satisfied are you with the quality of your notes?		How likely are you to finish your notes the same day?		How satisfied are you with the interaction with your patients?	
	Before	After	Before	After	Before	After
Provider 1	8	8	10	10	4	7
Provider 2	8	8	4	7	8	9

Provider 3	2	8	4	6	8	9
Provider 4	6	9	8	9	8	10
Provider 5	7	9	8	10	6	9
Provider 6	7	10	8	10	7	9
Provider 7	6	8	3	6	7	8
Provider 8	7	9	9	10	7	9
Provider 9	8	10	10	10	6	8
Provider 10	6	9	10	10	7	9
Total	**6.5**	**8.8**	**7.4**	**8.8**	**6.8**	**8.7**
Delta	**2.3**		**1.4**		**1.9**	
% Improvement	**35%**		**19%**		**28%**	

Results Summary

Documentation Burden	
Time and Motion	**% Improvement**
Decrease in time per patient	62%
Decrease in time during clinic day	51%
Decrease in afterhours	70%
Provider Survey	**% Improvement**
Satisfaction with note completion	48%
Satisfaction with documentation time savings	108%
Satisfaction with EHR for other administrative tasks	84%
Satisfaction with quality of notes	35%
Finish notes on the same day	19%
Satisfaction with patient interactions	28%

Discussion

A Breakthrough

In this initial study, the use of a digital assistant reduced documentation burden and showed promise in reducing physician burnout. The time and motion studies illustrate significant time savings and the interviews revealed insights into the impact this innovation can have on the family medicine experience for physicians and their patients. Before the use of the digital assistant, physicians described a deep visceral anxiety and constant time pressure. One physician said:

> *"That anxiety was typically all day every day. When I go over my time on clinic visits, it can lead to frustration from patients who have been waiting. I want patients to feel that I am being considerate of their time, but if I am running behind the opposite message is sent."*

The digital assistant had an immediate and direct impact on this anxiety and its associated dissatisfaction by easing the sense of constantly feeling rushed.

> *"The anxiety of being rushed has significantly decreased. I feel more at ease during longer visits because I know I will be able to make up the time in most cases through quicker charting…. I'm not stressed to squeeze in one more patient if needed. I think it's going to be more sustainable and more enjoyable for physicians as long as we do not use the margin created to overload our schedules."*

The impact of the digital assistant reminded them of why they went into family medicine in the first place.

> *"It ties to why I went into family medicine. I want to feel a connection with patients. I do (now) feel the natural flow is to be more engaged with my patients, not just surviving and going room to room, but actually connecting. And, while I'm getting more labs done and patient cases in my inbox [with new time savings], more importantly I'm getting more connected relationships with my patients and it's gratifying. I am aware that this connection will play a large role in my patients' compliance with instructions."*

A "breakthrough" is how several physicians described the impact. They now had the ability to actually manage their visits and documentation during clinic hours, before going home. For the first time since they started using an EHR, the vast majority felt confident they could get their notes done, focus on the patient and not have to finish up after hours. They were able to do some of the notes with the patient or between patients in the hallway and then only needing 20-30 minutes in their office at the end of the day to get all their notes done.

> *"Now, I finish up about 30 minutes after clinic is done and after that 30 minutes I'm not typically taking anything home."*

> *"Just the ability to give you back control of your time. So at lunch, if I felt like I was getting behind and I needed to go to the next room before completing documentation, I could do it at lunchtime. And, I could do it before I need to leave to go home."*

One physician said that over the past ten years, he typically took home 1.5 to 2 hours of EHR work, mostly leftover documentation. Every weekday evening, he would sit with his wife and watch some braindead

show, like Cheers, so that he could finish his notes. After using the digital assistant, he and his wife now "actually go out to a real movie or to have a nice dinner."

The Digital Assistant was most helpful with notes that required anecdotal or complex histories and assessments. For more structured visits well suited for templates, for example annual wellness visits, physicians did not use the Digital Assistant as at the time of the pilot, it did not support the insertion of structured text in discrete EHR specific fields.

That being said, one physician experience is noteworthy. When he adopted the Digital Assistant, his note completion times went from over 10 minutes to about 2-½ minutes. Then over a few weeks it went back up to over 3 minutes. He attributed the increase to the fact that he is now able to work on preventative and clinical reminders that he just could not even address before the Digital Assistant. Using the Digital Assistant, he felt less rushed and more thorough in his care and documentation. The provider survey suggests discretionary use of newfound time resulted in an 84% increase in satisfaction in the use of their EHR for other administrative tasks. Physicians and providers may feel less rushed and have more flexibility with their time, resulting in being more satisfied with their EHR work overall.

Who Will Adopt First

A key question addressed in this study was how can we identify the physicians that will be early adopters of a Digital Assistant? We found that family physicians were more apt to readily adopt a Digital Assistant if they had the following attributes: They have a significant degree of burnout based on clerical and documentation burden; they were not efficient EHR users or fast typers; never had a scribe because they could not afford one or none were offered by their organization; may or may not have used voice recognition but were open to dictation as a mode of entry. Family Physicians that did not want to adopt were in two classes. The first were family physicians who were very efficient at the use of their EHRs and were fast typers for the narrative portions of the HPI and assessment sections. The second were physicians that were just plain paralyzed by the burden to the point that they could not even make a decision to make a change.

Physician owned groups where the owner was a family physician who had the attributes above were most apt to readily adopt a Digital Assistant. These physicians could make a purchasing decision for their practice group and other physicians in the practice could adopt or not based on their preference. Family physicians employed by a provider organization or multi-specialty practice, although they might be very interested, were subject to the organization's HIT organization and a much longer decision making process. The degree to which the HIT organization would control physician adoption was based on two questions: First, how easily is it for the Digital Assistant to be integrated into a physician's EHR. This will be discussed in more depth below. Secondly, who would be paying for the Digital Assistant. Most often this as typically seen, these HIT departments hold tight control over these decisions.

Larger provider organizations and even one FQHC that we approached were not interested in adding a third-party Digital Assistant. They had made significant investment in standardizing their encounter documentation workflow, user experience and documentation templates. They required structured documentation done in specific fields to drive best practice-based alerts and clinical quality reporting requirements. Anecdotally, an FQHC that had invested in this manner said they recognized clerical burden, but that is "not the EHR's fault;" Rather, the demands to practice primary care had grown and that the EHR helped support these greater demands for documentation, care coordination, patient engagement and clinical quality reporting.

Integration Challenges

It's no surprise that we found that adoption of Digital Assistants varied widely based on a specific EHR's ease of integration and interoperability. In our experience with Suki, as well as other innovations we are exploring, the athenaOne EHR stood out as the easiest to integrate to and to "turn on" for a physician user. Their open platform and business model based on shared revenue made them ready and more than willing to allow third party innovations that drive more efficient and thorough patient visits. A physician who wants to use the Digital Assistant signs up, access to their EHR is turned on, their templates are loaded into Suki, the next day they receive a 15 minute training session, and they are up and running. athenaHealth's open API platform also has allowed Suki to drive their innovation roadmap into use in our labs. Over a 6 month period, Suki has added real-time transcription, problem list ICD-10 coding, chart look-up. Digital assistants can integrate with other EHRs but the speed of innovation and adoption is clearly optimized by a platform and marketplace open to innovation.

A few of the adopters tried using Suki on the chrome browser, as a native Android application was not yet available during the pilot. This required them to use Suki on their laptops. Some laptops had subpar microphones, so these users had to use an external USB microphone in order for Suki to accurately pick up the dictations This workflow was not acceptable to these users. It highlights the usability of a native smartphone application that can be easily carried (akin to a handheld dictation device), "always on" and listening for the Suki voice prompt for convenience in activation. We see the native smartphone application is a key to this essential technology. We do not know if an application well integrated in the EHR would be as adoptable.

As shown from the examples above, a great technology product is only as good as its usability and implementation. Given the fast-paced setting inherent with clinical visits, every second counts and to have a product that increases the time or the burden on the provider will counteract any other intended benefit. A seamless and streamlined usability is mandatory for successful adoption of any new solution. Typically in the EHR era, usability is only achieved by a thoughtful implementation providing robust education and training as well as workflow redesign. Suki's strategy was to create an intuitive, workflow-enabled solution that did not require extensive training or redesign to achieve this streamlined usability. Use of voice coupled with a strong consumer application development background is likely a reason for this new approach. Physicians can be up and running after 15 minutes of simple training. We are hopeful this approach becomes commonplace in health IT.

One of the four practice sites was an FQHC which is unique in many ways beyond this scope of this initial study. It is important to note that the three participating providers from this FQHC had their patient load increased by 2 patients per day during the 30 day trial. This increase in load significantly dulled the impact on their time savings, burden, and satisfaction. They did, however, believe that they never could have seen two more patients per day without the use of a digital assistant. Clearly, demanding family physicians to see more patients per day or per hour will not decrease clerical burden or burnout.

The Innovation Lab validated the alignment of the functionality the physicians wanted next and what Suki is planning and delivering on their roadmap. This list included the immediate transcription of the voice to text, the use of the Digital Assistant to manage the problem list during the assessment and capture ICD 10 coding. Some physicians we talked to during recruiting deferred even trying the Digital Assistant until these same features were included in the offering.

Conclusion

In our initial innovation lab, 100% of the clinicians' use of a digital assistant dramatically reduced documentation time with an increase in their satisfaction with note completion, time savings, and EHR use for other administrative tasks. Digital Assistants can be rapidly implemented and adopted with benefits realized almost immediately.

Digital Assistants show great promise as an essential technology to optimize the family medicine experience. In these initial results, physicians recovered the time and focus previously lost to clerical burden. Several physicians described the impact as a "breakthrough" where they could see their patients and get their documentation done without feeling rushed and having to finish at home after hours. This newly found time was used to interact with the patient, synthesize information, more consistently address preventative care needs, document more thoroughly to more accurately reflect care provided, and engage the patient more deeply in their care. Physicians felt that the dictated narrative and assessment made their notes better; personalized, clearer and generally more useful. The reduction in time and urgency dramatically reduced after-hours work at home and reduced physician burnout. The limited number of pilot participants in this initial study is a major limitation, but as hoped the results do demand further and broader study.

While this study was conducted on an EHR whose APIs and business model are open and interoperable, the ~75k family physician members of the AAFP have many different EHRs which are harder to integrate with, slowing the implementation of any third-party innovations.

The value of the Innovation Lab model is the rapid evaluation of efficacy and adoption while creating a proof point in family medicine. It allows innovators to receive tangible feedback from practicing family physicians, coupled with expertise from national experts within the AAFP network. It is the stepping off point to larger scale Phase 2 Innovation Lab driving adoption of essential technology with over 100 pfamily physicians . It is about the adoption of essential technology, not just the specific product tested in the lab. Success is not a successful pilot; rather, it is the adoption of essential technology leading to an optimized family medicine experience for a large cohort of family physicians and primary care.

References

1. Lopetegui M, PoYin Y, Lai A, Jeffries J, Embi P, Payne P. Time motion studies in healthcare: What are we talking about? Journal of Biomedical Informatics Volume 49, June 2014, Pages 292-299. https://doi.org/10.1016/j.jbi.2014.02.017

2. Shanafelt T, Dyrby L, Sinsky C, Hasan O, Satele D, Sloan J, West. Relationship Between Clerical Burden and Characteristics of the Electronic Environment With Physician Burnout and Professional Satisfaction. Mayo Clin Proc. n XXX 2016;nn(n):1-13 n http://dx.doi.org/10.1016/j.mayocp.2016.05.007 www.mayoclinicproceedings.org

3. Wachter R, Goldsmith J. To Combat Physician Burnout and Improve Care, Fix the Electronic Health Record. Harvard Business Review, March 30, 2018,

4. Gardner R, Cooper E, Haskell J, Harris D, Poplau S, Kroth P, Linzer M. Physician stress and burnout: the impact of health information technology. Journal of the American Medical Informatics Association, 00(0), 2018, 1–9 doi: 10.1093/jamia/ocy145

5. Maslach C, Jackson S, Leiter M. Maslach Burnout Inventory manual (3rd ed.). Consulting Psychologists Press (1996)

6. Friedberg M, Chen P, Van Busum K, Chau Pham A, Caloyeras J, Mattke S, Pitchforth E, Quigley D, Brook R, Crosson F, Tutty M. Factors Affecting Physician Professional Satisfaction and Their Implications for Patient Care. www.rand.org, RR-439-AMA

7. Gidwani R, Nguyen C, Kofoed A, Carragee C, Rydel T, Nelligan I, Sattler A, Mahoney M, Lin S. Impact of Scribes on Physician Satisfaction, Patient Satisfaction, and Charting Efficiency: A Randomized Controlled Trial. The Annals of Family Medicine, www.annfammed.org, doi: 10.1370/afm.2122, Ann Fam Med September/October 2017 vol. 15 no. 5 427-433.

8. Ancker JS, et al. Associations between healthcare quality and use of electronic health record functions in ambulatory care. J Am Med Inform Assoc 2015;22:864–871. doi:10.1093/jamia/ocv030

9. Amin RP, Johansen ME. Tethered to the EHR: A Physician Workload Assessment. Ann Fam Med 2017;15(5):iii. https://doi.org/10.1370/afm.2147.

10. Arndt BG, MD, Beasley JW, Watkinson MD, Temte JL, Tuan WJ, Sinsky CA, Gilchrist VJ. Tethered to the EHR: Primary Care Physician Workload Assessment Using EHR Event Log Data and TimeMotion Observations. Ann Fam Med 2017;15(5):iii. https://doi.org/10.1370/afm.2147.

11. Mini Z Burnout Survey. American Medical Association. All rights reserved.

12. https://www.thecoachingroom.com.au/blog/the-three-factors-that-lead-to-better-performance-and-personal-satisfaction

13. https://healthmanagement.org/c/it/news/making-ehr-documentation-painless-the-role-of-ai

14. https://www.aafp.org/news/practice-professional-issues/20181212qualityprinciples.html