Family Doctor

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Focus:

Artificial Intelligence and Technology in Family Medicine

FEATURE ARTICLES:

- Will Artificial Intelligence Automate Family Practice into Unemployment?
- The Electronic Medical Record Evaluated as a Learning Tool
- Practical Tips for Implementing Automation in your Family Practice Clinic
- Problem Lists: A Data Management Tool
- COVID-19 Vaccine Candidates: The Latest Evidence and How to Counsel Our Patients

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From the Editors:
Artificial Intelligence/ Technology and the Future of Family Medicine

This issue of *Family Doctor* looks at the increasing role artificial intelligence (AI) and machine learning (ML) play in primary care training and clinical practice. Several authors focus on changes in graduate medical education due to both technology and the current COVID-19 pandemic, while others explore the direct impact of automation on not only office procedures, but on the traditional work of physicians themselves, such as obtaining a medical history and performing the physical exam. Positive applications of the EMR are explored in several articles, especially the use of voice-recognition software to facilitate data collection, the creation and maintenance of an electronic problem list, and the incorporation of digital "prompts" to foster the adoption of recommended screening and prevention measures. The rapid development of telemedicine is outlined in several articles, and there is discussion as to what impact this technology has had on patients; also included is an acknowledgement of a potential divide among patient populations based on their socioeconomic status and resultant access (or not) to digital platforms. Finally, one author provides a fascinating historical perspective by reviewing the life and practice of a 19th century rural physician from upstate New York, dealing with what were the explosive new medical technologies of his era.

A common theme in many of the articles is the inclusion *(? intrusion)* of computers into daily clinical practice. While generally accepted now in many aspects of medical care, nowhere has their use been more controversial than in the traditional act of interviewing a patient. This has long been considered *sacrosanct*, the one function for which a human being was considered essential. Attempts to-date have demonstrated the utility of computers in creating a differential diagnosis, once all the appropriate data was provided, and there is little question that programs of this type are becoming better and more refined. Some of these programs are being incorporated into existing EMRs, but in typically limited fashion, and often for specific clinical environments. The thought, however, of engaging in a real-time conversation with a computer using natural language remains the stuff of science fiction, although an MIT professor created quite a stir in 1966 when he appeared to succeed in doing just that. Joseph Weisenbaum wrote a program known as ELIZA which mimicked a psychotherapist, in that a person seated at a keyboard could type in dialogue which would then be answered directly by the computer. After reviewing his original paper and the subsequent response his software engendered among many users (including his own secretary), it appears that he was distressed to find so many individuals quickly embracing this "cyber-therapist" as a true breakthrough in AI, when in actuality it was just an illusion created by very clever programming. I was able to purchase the software program myself many years ago, in the early 1980s, as I was learning about computers and their potential applications to medical practice. Once the program was loaded and running on my COMMODORE 64, it indeed seemed like the computer *was* engaged in a direct conversation with me, including chiding me for the profanity which I had deliberately inserted into one of my responses (*"My, my, such language!"*). But alas, this was just a cheat, as my subsequent examination of the source code revealed detailed instructions for a boilerplate response to the use of swear words, *plus* instructions for the computer to inquire about the user's family (*"Tell me about your mother…"*) within the first five responses of a session.

So, it would appear that it remains the patient-*doctor* relationship, at least for the time being. Enjoy reading this issue's selection of articles, and if you'd like, share your own experiences with us about this topic.

Louis Verardo, MD, FAAFP
Member, Editorial Team, *Family Doctor*

From the Executive Vice President

By Vito Grasso, MPA, CAE

As we contemplate the advent of a Biden presidency it is difficult to suppress concern that the forces which flamed racial division, fostered doubt about science and generated mistrust of our most fundamental precepts of democracy remain powerful undercurrents to be further reckoned with.

I see this as particularly true regarding reformation of our horribly fragmented and dysfunctional health care system and the persistence of institutional racism throughout society. In many respects, health care policy and social justice, and the deep divisions in opinion regarding what we should do about each, reflect an essential anomaly in our principles of governance.

Our political process is designed to accommodate many points of view, which elevates compromise to preeminence in moving us forward. Since perspective is generally informed by personal values, beliefs and cultural norms – all of which are firmly held, largely immune to logic and deeply resistant to modification, a consequence of compromise in politics is that we seldom attain the radical change that is often necessary when institutions decline, systems collapse or injustice escapes reproach.

Our history is replete with examples. The movement to abolish slavery was motivated by moral outrage in the North but opposed by economic considerations in the South. The eloquent language of our Declaration of Independence and Constitution establish lofty ideals which we can be proud of and which we should remain committed to. In reality, we have fallen short of those goals. The economic and cultural divisions in the colonies before the Revolutionary War and among states thereafter, compelled compromises in the application of these ideals in creating public policy in the formative years of our republic. It took a civil war to abolish slavery, but institutional racism has prevented full racial integration even unto the present. Civil rights laws and court decisions have established and reinforced legal equality, but human nature has prevented actualization of racial equality and people of color remain disadvantaged in spite of general public support for equal rights under the law.

Similarly, we have failed to recognize that health is a human right and access to health care is fundamental in assuring that right. The Great Depression created the opportunity for government to intercede in the economy which led to the creation of Social Security and a public commitment to support people into retirement. The Social Security system created the framework for Medicaid and Medicare to assure access to health care just as Social Security provided access to retirement income. But, again, our commitment to health and welfare has been mitigated by resistance from a variety of interests including business concerns about the cost of social programs and political ideology which disparages social welfare as accommodating personal dissipation.

Many well intentioned individuals and organizations have been complicit in sustaining the environment which has tolerated social injustice and dysfunction in health care. Those who are privileged enough to be secure in their personal lives and to have health insurance and health care have no incentive to insist on reforms that are needed and just, but which could disrupt their privileged status. In health care we see this in the efforts of medical societies to tinker with the insurance model of health care payment to obtain better payment and relaxation of administrative burden rather than replacing the system entirely with a truly patient-centered alternative. NYSAFP has been and remains a leader in advocating for wholesale change by replacing the fragmented multiple payer model with a single payer system to reduce administrative costs, elevate the interests of patients above profits, address physician burnout and empower physicians through collective bargaining. Bundled payment, exhaustive quality metrics and continuous data collection and reporting will not produce actual reform and offer no material benefit for patients. They are further concessions to a model that has failed, and which continues to fail in spite of changes in payment models and required benefits.

We can expect change in the national tenor of discussion of social justice and health care reform with the inauguration of a new President. What remains to be determined, however, is whether we will see any alteration in the attitudes of people and interest groups which are central in determining the acceptability of change in our society.

Generations of advocacy have created incremental improvements in both social justice and access to health care. The radical change necessary to truly realize the aspirations of equal access to life, liberty and the pursuit of happiness, however, have remained beyond our reach as preservation of privilege has prevailed.

There is evidence that personal attitudes are changing. Protests against social injustice this year have, remarkably, attracted significant support from white people, perhaps signaling that we are finally reaching a point at which racial divisions may be diminishing and races can be aligned on the existence of social injustice.

The effort to make health care more accessible and patient centered seems still to be hampered by the enormous power of vested interests in health insurance and the mistrust of government which those vested interests have successfully cultivated.

We have much to do to achieve reforms in social justice and access to health care. Some may be tempted to implore divine intervention. We might be better guided by the admonition of President Kennedy in his inaugural address more than a half century ago: "With a good conscience our only sure reward, with history the final judge of our deeds, let us go forth to lead the land we love, asking His blessing and His help, but knowing that here on earth God's work must truly be our own."

President's Post

By Jason Matuszak, MD, FAAFP, FMSSM

For years we have been told about the ways that technology would increasingly meld with medicine, yet we were probably all unprepared for the dramatic upheaval that occurred during the pandemic of 2020. Despite the rapidity of the change, the adaptability of family physicians has aided our patients and our communities. With each presented challenge we have adapted and developed solutions that not only help us now, but will allow us to be more successful in the future. Like Obi-Wan Kenobi famously said, "You can't win, Darth. If you strike me down, I shall become more powerful than you can possibly imagine."

For those who remember it, our last in-person event was the Winter Weekend meeting in Lake Placid back in January. Since that time, we have held three cluster meetings, our Lobby Day, Congress of Delegates and several educational events, all virtually. Our Academy operations including our Board and Commission work has moved online to the BoardEffect platform, allowing for more longitudinal and continuous work and better collaboration on major projects. Our continuing medical education events have been made enduring, allowing more members to learn from the same fantastic speakers that those who have made the trek to in-person events over the years, have benefitted from. Conducting our Congress of Delegates online has taught us more about efficiently running large meetings online, where participation is necessary. This is of paramount importance as we prepare for our Board's virtual strategic planning retreat in January.

The technological demands of providing telehealth services has informed our advocacy efforts over the last several months. Making sure everyone in NYS has access to reliable broadband internet is now not just a luxury, but a medical necessity and a requirement for providing primary care. Telehealth has become an important part of the practices of many of our members, so we have pushed for payer parity for telehealth visits when performed by physicians who also treat patients in face-to-face settings in a brick and mortar practice. While we want to make sure our members have payment parity, we will not permit the rise of telehealth-only providers capturing the same revenue as our members, despite not having to maintain the overhead and infrastructure costs associated with maintaining a true family medicine office.

Just as how we interact with patients is undergoing a technological revolution, so too is how we determine the care that is being provided. EMRs with built in clinical decision rules were just the beginning, now intelligent queries help identify patients with unmet medical needs, and artificial intelligence informs our medical decision making. We can merge together clinical data and geolocation data to determine at risk communities in food deserts and help our patients address the social determinants of health. While advancing artificial intelligence initiatives in medicine have demonstrated proficiency with technical skills like interpreting chest x-rays and CT-scans, and can predict chemotherapy regimens and medications that may successfully treat novel diseases like COVID-19, none have yet demonstrated the mastery of the interpersonal relationship that is the foundation of all of our interactions with our patients. It is this interpersonal relationship that provides true insight into the complexities of care of those who trust their health to us.

Our hometown Buffalo Bills (the ONLY NFL team who plays home games in New York) have won the AFC East for the first time in 25 years. I think about all of the changes that have occurred in medicine during that time. To put it in perspective, the last time the Bills were division champs it was the year before the Health Information Portability and Accountability Act was signed into law (and the Medicare documentation guidelines for Evaluation and Management Services was just 16 pages long). Yet, the future the HIPAA law envisioned, where we would have seamless electronic health records, accessible across the country in a truly unified fashion, still seems as distant of an idea as the Bills winning the Super Bowl. Instead, layers of bureaucracy have added complexity and challenge to the practice of medicine without necessarily improving the quality of the care that we provide. But, with the Regional Health Information Offices (RHIOs) bringing together the disparate records in their regions and now communicating with the Statewide Health Information Network for New York (SHIN-NY), there may soon come a time where the dream of having instantaneous access to a person's complete medical record becomes a reality. (Hopefully, the Bills win the Super Bowl more quickly, though).

This issue delves into technology in family medicine as we are undertaking a metamorphosis in providing clinical care in the face of the greatest pandemic most of us have been through. It is fitting that technology will help us get through this, by helping design new vaccines and medications, by transforming the way we conduct business, see patients and determine care, and by developing new and complex supply chain operations to address previously unconsidered obstacles. Only because you are adaptable as family physicians can we help our society overcome these obstacles.

Making sure everyone in NYS has access to reliable broadband internet is now not just a luxury, but a medical necessity and a requirement for providing primary care.

Albany Report

By Reid, McNally & Savage

Telehealth During the COVID-19 Pandemic and Beyond

The ongoing COVID-19 pandemic has demonstrated just how great a role technology plays in the ability of our society to function, even amid a near complete shutdown of our businesses, schools and many government and community services. With the use of technology, many have been able to conduct business from home, children have been learning virtually and commerce has to a large extent continued through the use of the internet and other technological means. However, the pandemic has also laid bare the gross inequities across NYS with regard to technology gaps including whether individuals have access to computers, smart phones and related equipment along with broadband internet service and the aptitude to use such technology. This situation has only exacerbated these inequities and we must both learn from and make the necessary improvements and investments to address these serious disparities to fully reap the benefits that such advances provide.

The growth in use of telehealth/telemedicine services is no exception and similar lessons must be learned and addressed in order to fully realize the benefits of literally bring health care services to patients where they are in their homes.

Very early in the pandemic in mid-March 2020, Governor Cuomo and his executive agencies (health department and department of financial services) enacted policies via Executive Order or emergency rules that provided more flexibility in the use of telehealth services including the ability to use video-only and audio-only modalities and removing outdated and impractical requirements on the location of the patient or health provider to utilize the services.

As a result, an overwhelming number of health providers converted their practices and service provision to offer telehealth and many report a good reception by patients and an overall positive experience, finding some patients including those with serious mental health and substance use disorders having a greater level of adherence to services and treatments as a result.

We expect this trend to continue in the coming year and beyond and already legislation has been introduced at the state level and in one case, enacted, to make the expanded and easier use of telehealth services permanent. In particular, on June 17, 2020 a measure was signed into law to grant permanent authority under Medicaid and Child Health Plus on the use of telehealth, including audio only and video only modalities pursuant to forthcoming regulations by the State Department of Health. Similar proposals have been introduced to affect commercial insurance and other aspects of telehealth.

However, the existing challenges need to be addressed in order to ensure the equitable and successful growth of telehealth programs are sustainable for physician and other health provider practices.

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As telehealth services become more sophisticated, there is the risk of alienating lower-income communities that lack access to technology. Further, patients have differing levels of digital literacy and those who have encountered issues interacting with telehealth during the pandemic may be less willing to embrace such services going forward. Finally, provider reimbursement concerns have been raised. This is likely due to the fact that many services that cannot be provided via telehealth like blood work have been disrupted, and given that the use of telehealth does not obviate the need for brick and mortar operations for most providers, payment must be adequate to sustain practices providing both in-person and telehealth services.

Given the strong interest to make telehealth authorizations and flexibilities permanent in New York while also addressing these challenges, NYSAFP has been working with MSSNY and other medical specialties to identify solutions and pursue joint advocacy in this regard. Most recently on December 14, 2020, NYSAFP joined with fifteen other medical societies in sending a letter to Governor Cuomo and legislative leaders making a series of recom-mendations for the enactment of robust telehealth policies in the wake of the COVID-19 pandemic.

The recommendations include:

- **Payment Parity to Facilitate Equitable Access** making reimbursement for telehealth services equal to office visits, and requiring payment parity across payers both public and private, while also ensuring uniform coverage and reimbursement for "audio only" and "video only" telehealth services.
- **Permanently Adopt Flexibilities in Telehealth Services** as implemented during the pandemic. Including lifting antiquated requirements on the location of the patient or provider or on the type of modality used to provide telehealth services.
- **Expand Access to Remote Patient Monitoring** as an effective tool for tracking a patient's health status for a variety of conditions.
- **Ensure the Use of Telehealth is Physician-Directed**.
- **Ensure Seamless Extension of Telehealth Provisions After the Pandemic**.

In addition to these recommendations, NYSAFP's leadership has discussed the importance of prioritizing practices that provide both telehealth and in-person health services at brick and mortar NY-based locations for parity reimbursement and expanded authority to ensure that we are not further advantaging out of state/out of country entities that exclusively provide remote telehealth services. In addition, we are exploring whether there are ways to authorize the use of telehealth services for your patients when they may be traveling to other states for vacations or even extended stays since currently there are state and federal limitations in place, despite the great benefits this would have for continuity of care for patients.

Finally, as we work to address broader barriers to the use of telehealth like a lack of access to broadband internet which still exists in parts of our states, there is legislation pending which passed both houses during the 2020 session which would require the Public Service Commission (PSC) to study the availability, affordability, and reliability of high-speed internet and broadband access in New York State, and produce a detailed access map on its website indicating internet service by location. Further, the bill would require the PSC to submit a report on its findings to the Governor and Legislature annually and to hold at least four regional public hearings across the state within one year of the effective date of the bill to solicit public input. The bill also requires the PSC to work with internet service providers in the state to prioritize access to broadband and fiber optic services for communities that have experienced negative economic and social impacts due to absent or insufficient services. The bill was passed in July and must be acted on by the Governor before the end of this year.

Looking to 2021, there seems to be consensus among government officials, health providers and even health insurers that telehealth provides many benefits and deserves a permanent place in our ever-evolving health system. The hard part will be reaching a consensus on what aspects and elements should be permanently authorized in law. We will continue work with NYSAFP leadership and members to fight for the needs of patients and the physicians who care for them to be the priority and focus of these discussions.

Artificial Intelligence in Primary Care

By Uohna Thiessen, PhD; Emmanise Louis, MSN, FNP-BD and Childebert St. Louis, MD, ABFM

There are many challenges faced by primary care providers. Some are the same as other providers in the healthcare system, but others are exclusive to the nature of practice and therefore present a unique set of challenges. The technology revolution and integration of artificial intelligence (AI) and how it impacts primary care is one such challenge. Fortunately, the use of AI can be leveraged by primary care providers to definite advantage, making their jobs easier and even making them better physicians. But for this to happen a synergistic relationship between the physician and AI is needed, and this article presents a window into how that can happen.

Artificial Intelligence, or AI, is nothing more that cognitive computing, where computer technology is used to process massive amounts of data for the purpose of mimic human thinking. Machine learning, deep learning, natural language processing, and robotics are all manifestations of AI. The colossal computing power available today, combined with the almost ubiquitous use of computers, and the surge in quantity of data from electronic health records (EHR) and other systems, have all combined to make AI a potentially dominant force in all of healthcare. The digital revolution is resulting in an explosion of medical data, amassing at a rate that is humanly impossible to manage or use. Fortunately, with AI technology it is now possible to collect, process, store, and use this data in a way that is systematic and reliable.

Artificial intelligence also considered augmented intelligence, can automate repetitive tasks. AI provides the capacity to use data to make sound decisions more quickly, and hopefully provides better insight more reliably. AI is already in use in several industries such as transportation, with self-driving cars; or on social media platforms, when we use our smart phones to connect with the world; or when we use Google Maps to guide us to our destination. Similarly, the goal is for AI to combine the traits that computers excel at, such as pattern recognition, expansive information and evidence collation, and unlimited repetition, with the expertise of a trained physician, i.e. common sense, dilemma evaluation, compassion, and imagination. When this is done properly, AI technology becomes an invaluable tool, and like other tools, helps providers and other users solve problems and generate better outcomes for their patients.

The Power of Primary Care

The patient-centered, integration emphasis of primary care is the perfect model to maximize the leverage provided by AI technology. Primary care, with a delivery platform that is larger than any other in healthcare, is the repository of the largest amount of health data. There were over 500 million visits made to primary care providers in 2016, and though the numbers have declined (due to the visits to physician assistants and nurse practitioners), the totals are still comparable to visits of other medical specialties combined.[1] Additionally, the generalist nature of primary care service, makes for an ideal partnership in collating and

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integrating across disciplines, specialties, and systems which are essential to developing expedient AI technology. It is mainly for these reasons that primary care physicians are positioned to serve as the perfect guides and even lead efforts that drive AI innovation in the right direction.

Unfortunately, there is a measure of resistance and skepticism from some primary care physicians towards incorporating AI technology into their practices. The trauma of the increased workload that EHR created is partly to blame. But this reason emphasizes the need to involve all stakeholders, especially the end-user, in the planning, designing, and evaluating of these innovations before they are implemented. One of the main problems with the EHR it that it was designed with almost no input from the end-users, and its main objective was to cater to the needs of administrators and EHR vendors, not those of the physicians and their patients.[2] This error can serve as a lesson on the importance of collaboration and diversity of input in technology development, not just in healthcare, but other fields as well.

This EHR burden and current burnout that is being felt most severely by primary care physicians is a result of the excessive amount of time and energy spent on entering the required data into the system.[3] This has made the chart review and documentation capability of AI a high priority, and several companies, including Google and Microsoft, and others, have focused on developing AI-driven digital scribes, that not only listen to conversations, but can also automatically generate notes and automatically complete the EHR entries. There are also new AI tools designed to collect data from various sources, including physicians' notes, conversations with patients, lab test results, imaging information, and more. These tools are 'smart' enough to process, summarize, and enter the relevant data directly in to the EHR system, saving a considerable amount of time and mental energy. Even information from patients' personal monitoring devices, owned by one out of every four Americans, such as a fitness tracker or blood glucose monitor, can be set up for automatic information transfer. With these AI powered systems, physicians can diagnose and treat disease sooner, increasing the likelihood of treatment success. Without AI, the volume, rate of accumulation, and the incompatibility of these data would be overwhelming and ultimately useless to the physician.

The AI Transformation in Healthcare

The advantages of AI technology are usually separated into classes of benefits- (i) management and administrative assistance and (ii) clinical care support. The former relates to the ability of AI to not only collect and collate patient information, but to directly enter it into the EHR making claims processing less of a hassle. AI powered tools can also guide patients through the intake process in the comfort of their homes, saving time for them and their providers. This allows for reduced confusion, more accurate claims labelling, and speedier reimbursement transactions. All of this leaves the provider with more time to spend interacting with their patients, the hallmark of primary care which must be preserved.

Though of great management and administrative benefit, it is in the area of clinical care where AI has the greatest potential to transform how physicians perform their duties. Not only can AI automate and simplify the collection and documentation of patient data quickly and efficiently, it can also synthesize and analyze vast quantities of data in a way that allows for faster evaluations. The use of AI technology can assist in identify inconsistences, reducing medical errors, diagnosing diseases, and predicting complications, all in a more efficient manner. AI is also able to combine patient information with related clinical studies and make recommendations for treatments or follow up tests or medications, in ways that are consistent with the evidence-based practice of medicine.

There are several AI tools that are on the healthcare market and they are showing great promise. The power of AI to recognize patterns and even learning is used in the *IDx*, an FDA approved diagnostic for diabetic retinopathy, and in CaptionHealth, a cardiac ultrasound imaging tool that does not require the interpretation of any specialists. The voice enabled AI chatbots are reminding patients of medications, tests, appointments, etc., as well as offering customized recommendations specific to their health information and medical history. In London *Your.MD*, based on AI's algorithms, is answering general health questions, finding health information, screening for disease risk, and initiating triage. In the US IBM's *WatsonHealth* allows real time collaboration between physicians and researchers, particularly for cancer treatment, from over 200 hospitals and health organizations around the world.

AI Innovations Specific to Primary Care

In the area of predictive and diagnostic medicine- the voice enable AI chatbots are able to remind patients of medications, tests, appointments, etc. Several companies (*Babylon Health, Health Tap, Ada, Buoy*), provide basic medical information and advice for common symptoms and less severe medical issues. These tools help relieve the demand in patient heavy areas and can serve as a replacement in areas where primary care is not readily available or accessible. In particular, the insurer Prudential Asia has spent $100 million on the licensing deal for Babylon Health to use its AI software in its own app for its clients spread across 12-countries in the Asia-Pacific region.[4] The goal of tools like these is *not* to replace human physicians but to allow primary care physicians to serve more patients as the lead out managing patient panels.

The *HumanDx* is a compilation of the opinions of many physicians, following assessment of their patients. Similarly, Google Deepmind Health, analyzes retinal scans and uses an algorithm to detect glaucoma, age-related macular degeneration or diabetic retinopathy without need to consult an ophthalmologist. The Kardia, formerly AliveCor, is an AI tool that works as a single lead ECG that is laced on the fingertips and detects heart disease based on the heart rhythm.

Two AI powered tools are specifically geared towards improving primary care interventions to prevent unnecessary hospitalizations.

The first is KenSci, which, in a partnership with Kaiser Permanente is able to stratify congestive heart failure patients so that they receive more targeted treatment, saving lives, money and cost. The other is Epic and the Oschner Health System which is used to predict several different conditions and the likelihood of deterioration (to a 98% accuracy) and lower unnecessary visits to the ED.

AI in Primary Care Research

There are several other areas of medicine that have been positively affected by the integration of AI. The move from the fee-for-service based payment system to one focused on value-based care, will shift the importance of community and population health. AI tools including Allscripts, Cerner, eClinicalWorks, and Optium, will allow primary care providers to identify health care disparities and healthcare gaps and provide better health care to underserved communities.

In the area of medical research, AI is driving incredible innovations including precision medicine, which creates targeted treatments through analysis of genetic data. AI is also being used to revolutionize the drug creation industry as pharmaceutical companies are able to save billions and years of time by using supercomputers to research combinations of molecular structures and predict the efficacy of drugs without clinical trials. Again, the quality of the research and the utility of the findings will depend on the incorporation of needs and opinions of all the stakeholders.

Patient Perspective

Only recently have the opinions and perspective of patients been systematically evaluated and documented. There are few studies, but the general consensus is wanting the best in technology and care for themselves or their loved one. In a study of radiology patients, researchers noted that patient were less interested in added costs, loss of jobs, or the expediency offered by the AI tools, however expressed concerns about proof of technology, procedural knowledge, competence, efficiency, personal interaction and accountability.[5] Another study, focused specifically on biometric monitoring AI devices (BMD) which allow remote measuring and screening for cancer, found a similar emphasis on efficiency and competency of the technology.[5] This study concluded that while 35% expressed concerns about integration of AI based tools in their care, a mere 11% considered it a danger, and even less (3%) felt the threats (hacking, data misuse and loss of human intelligence) could outweigh the benefits.[6]

In another study on AI in skin cancer diagnostics, while generally patients expected faster, more precise diagnosis, only 41% of the participants considered using AI as a stand along system, and 94% agreed to the use of AI as an assistance to the human physician.[7] In a similar study on use of AI for cancer screening, the qualitative analysis revealed that most (75%) would recommend AI technology to their friends and family and almost all (95%) felt that the symbiosis between human provider and AI-tools is optimal.[6] In a third study related to the use of patient data for AI research and development, most subjects, after being educated on the subject, removed their negative biases and were open to having their personal data anonymously used when for the public good and not for private profit.[8]

A French study on the view of AI in healthcare concluded that patients, like lawyers, patient representatives, and ethicists, find it difficult to express informed views because they were left out of the design, development, and implementation of these tools. The authors cautioned that AI technology must developed "for the benefit of the patients and not in spite of them."[9] Other researchers feel that the black box nature of AI may stem from the inability of physicians to suitably explain to their patients how results are generated and why recommendations are made. Some patients feel that AI could improve the efficiency and the accuracy with which physicians perform their duties while relieving them of the burden of tedious tasks, but could also threaten the already compromised patient-clinician relationship. Researchers articulate that the patient-physician relationship depends of mutual trust, respect, and commitment, and if AI is used correctly, it could provide the time and specificity of information needed to strengthen such relationships.[10]

Overall, patients have mostly indicted acceptance of AI technology, but still believe that the final decision should be the domain of their human provider. In a study on patient's resistance to AI technology, the resistance was not because of a belief that AI was inferior or too expensive, but it was that AI was too inflexible and that it was not able take their individual characteristics and circumstances into consideration. In a study compilation for consumer research, patients showed greater reluctance to utilize healthcare, were more averse to higher prices, and more sensitive to provider performance when the provider was automated.[11] This resistance was eliminated however, by framing AI as providing personalized care and being used to only to support and not replace the human provider.

The Challenges Facing AI Integration into Primary Care

The successful integration of AI depends on the understanding and acceptance of these tools by those who will ultimately use them. Physicians may lack a familiarity with the complicated principles behind AI, which does not foster trust. Hopefully, the AMA's emphasis on the use of the term 'augmented intelligence' will reduce some of this distrust and physicians will come to see AI as the stethoscope of the 21st century.[12]

Although AI is rapidly increasing in healthcare as in other fields, it is still in the early phase and there are some cautions that are worth mentioning. The machine learning method that makes AI so powerful, is essentially programming with data to generate rules and formulas that are refined with incoming data. The quality of the algorithm depends on the quality of the data. If the data supplied is limited by size (small) or by other features (gender or race, etc.) then the algorithms will be biased at best and faulty at worst, and will color the opinion of potential adopters. One previous study emphasized the potential that biased algorithms may

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worsen racial, socioeconomic, and other types of health disparities.[13] This is what happened in the case of a prediction algorithm that was exhibiting significant racial bias, with Black patients given considerably lower scores than their white counter parts.[14] What the research discovered however, was that the algorithm was designed to prioritize the healthcare costs of illness, and reduced access to health care comprised the predictive accuracy of the algorithm.

The issue of patient privacy, ensuring anonymous data, and liability of an incorrect diagnosis or injury as a result of an AI recommendation, are also concerns. The current consensus is that the use of a tool within the specific guidelines for which it was designed releases the medical professional of any responsibility, and the company creating the tool is held liable, at least legally.[15] This is being addressed by the FDA and other regulatory agencies to help ensure efficient, safe, evidence-based AI tools. Currently, there are 64 AI based, FDA approved medical devices and the CDC and WHO have released recommendations on AI for medical professionals.[16]

Being replaced by AI is another concern expressed by physicians. It is important to note that AI technology focuses on repetitive, functions that can be automated and does not affect the roles that are human specific such as delivery of empathy and compassion.

Conclusion

In order for AI technology to be successfully integrated into any healthcare practice it should address the needs of all the key stakeholders: primary care physicians, patients, health systems and the payers. When the integration is emphasized as augmenting provider tasks and allowing for more personalized care, it is more readily accepted by patients.[17] And with proper planning, developing, and implementing, AI can be used to make physician's work easier, patients better served, and the entire system optimized. As was declared decades ago and is remains true today: "The treatment of a disease may be entirely impersonal; the care of a patient must be completely personal."[18]

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TWO VIEWS:
Technology in Medicine – Now and Then

VIEW ONE

BLOODLETTING AND GERMS: PROGRESS REQUIRES GENERALISTS

By Thomas C. Rosenthal MD

Editor's note: Dr. Rosenthal's research on the topic of technology in medicine led to further study of the life of Dr. Jabez Allen and generalism in the nineteenth century. He is an author of an historical novel based on Dr. Allen's career.

In the third century BC, Hippocrates promoted releasing warm, red blood as the most efficient method for reducing the heated flushed-faced condition associated with fever. In the second century AD, Galen theorized that bloodletting rebalanced humors and corrected human moods. In his 1719 novel Daniel Defoe describes Robinson Crusoe undergoing 'venting' blood to cure an illness after his rescue. In an 1805 treatise, Benjamin Rush claimed that if bled to the point of fainting, no victim of the 1793 Philadelphia yellow fever pandemic died. Rush went further, suggesting a regular spring bleeding and bowel cleansing could prevent illness.

By the second quarter of the nineteenth century new speculations challenged the dogma of traditional medicine. First came Samuel Hahnemann's homeopathy, followed by Samuel Thomson's herbal and sweating remedies and Sylvester Graham's wheat germ diet. They offered little in the way of advanced cures, but patients liked the newer, gentler treatments. Dr. Oliver Wendell Holmes was prompted to declare, "I firmly believe that if the whole material medica, as now used, could be sunk to the bottom of the sea, it would be all the better for mankind and all the worse for the fishes." But Holmes hedged, warning that new remedies should be adopted cautiously and long held therapies should not be abandoned lightly.

The science of medicine began in Europe. In 1836, a mentor of Dr. Holmes, Parisian Pierre Louis, isolated patients with pneumonia in separate wards of a Paris hospital and conducted what may be the first published randomized controlled trial. Louis found that bled patients experienced transient relief of symptoms, but if bled repeatedly they were more likely to die. Reluctant to condemn bleeding, he emphasized proper diet, ample sleep, and declared physick a humble and limited art.

The conservative nature of physicians and the fits and starts of science made for slow progress. In a series of quarrelsome essays published in the Boston Medical and Surgical Journal in the 1840s, Dr. Joseph Gallup asserted patients suffered mostly inflammatory disease, therefore bleeding and purging was essential to relieve the body of its excesses. Dr. William Tully countered that Gallup was

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VIEW TWO

MORE MUST HAVE MEDICAL APPS FOR FAMILY PHYSICIANS

By Josh Steinberg, MD

Let's update this article from 2014. (keep?)

Think back. When you were a student and resident, remember how the pockets of your white coat sagged with pamphlets, handbooks, and scribbled notes? Did you carry a Harriet Lane Manual on peds, a Washington Manual on medicine, a pocket pharmacopeia, a Sanford Antibiotic Guide, maybe an OB wheel? Maybe you still keep these around. Why?

Because a doctor can't possibly memorize enough to handle every question which arises in the course of practice every day. Family doctors know this more than most specialties. We try to do everything, yet we recognized long ago that we can't know it all. This modesty is backed up by literature documenting the many questions which arise in busy primary care, most of which go unanswered.[1,2]

These days nearly all of us carry a powerful computer in our pocket, loaded with reference information, and connected to vastly more on the web. If you collect good information resources and know how to get what you're looking for efficiently, you should be able to answer a great number of questions on the fly during patient care with but a few clicks in 20 seconds or less.

Here are reviews of several smartphone apps, all useful to family medicine clinicians spanning both inpatient and outpatient care. A longer list is freely available at the "Apps I Recommend" link at my website here: https://jds91md.wixsite.com/jdspocapps

MDCALC

The same amazing collection of hundreds of clinical calculators that you can find online at MDCalc.com is also available as a searchable, highly functional point-of-care quick-reference app. There are many multi-calculator apps out there, but I find this one is the best. Need a MELD score? Want to correct serum sodium for hyperglycemia? Need the Opioid Risk Tool at your fingertips? How about the PERC rule as you work up pulmonary embolism? They're all there. The user interface is simple, elegant, quick, and effective. But the strengths of this app are not just how many formulas they offer. MDCalc shines courtesy its helpful elaboration. For any formula, rule, or calculator, the app tells you pearls and caveats about which patients the formula does and doesn't apply to. Each formula includes a discussion of the evidence behind the calculator chock full of citations. And they offer "next steps" regarding how to use the scores and guidance in patient care. One more bonus: I wrote to them suggesting a calculator and it appeared the very next week! Amazing.

RADS CONSULT

Whether I'm in the office or on the floors of my hospital, far too often I'm asking myself, "which is the best imaging study for this situation"? Should I get CT or ultrasonography? Should I get bone scan or MRI? This

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old-fashioned and new information confirmed disease is a state of depletion calling for stimulants, which he defined as alcohol and quinine. But as large hospital wards continued to group patients according to symptoms, patterns of illness became more apparent and the search for external causes took shape.

Encouraged by the New York State Medical Society, village doctors used vaccination to nearly eliminate smallpox by the second quarter of the early nineteenth century. But the introduction of regularly scheduled stagecoach service and the opening of the Barge Canal facilitated community to community spread of typhoid, scarlet fever and measles. Case mapping revealed that the 1832 cholera epidemic spread from Europe, to Montreal, to Albany, then to New York City and Buffalo at the speed of human travel. By 1834 cholera disappeared, only to return in 1849, killing thirty percent of its victims.

Rapidly decreasing printing costs emboldened the highly competitive newspaper and magazine trades to ponder the gentler therapies of homeopathy, shocking graduate doctors out of their complacency about the competition alternatives offered. Medical care had to improve, and medical journals that provided information about physiology, biology, chemistry, epidemiology, and microscopic pathology proliferated. The Civil War forced Army surgeons to work in teams, exposing great differences in skills and technique. When the military tried to standardize procedures, they found little science to support even widely accepted traditional treatments. Army records tracking patient outcomes ignited new investigations, and long held provincial village perspectives were shattered as soldiers and doctors marched through previously unheard-of American communities. Newspapers took on national attentions and railroads made America seem smaller.

In 1816, also in Paris, Rene' Laennec found that a hollow wooden ear trumpet amplified lung sounds. He called his technological breakthrough a stetho-scope (chest-scope). In 1852 Ireland, George Cammann perfected a flexible, bi-aural stethoscope with ear knobs, a bell and diaphragm, and a rubber rim to improve patient comfort. With practice a physician could now localize and isolate sounds, or add a forehead brace to amplify fetal heart sounds. Austin Flint of Buffalo and later Bellevue, expanded on Laennec's work by comparing autopsy findings with premorbid heart sounds. Expanded usefulness and functionality resulted in the stethoscope replacing the mortar and pestle as the iconic symbol of physick.

Post-Civil War America also saw marked improvements in laryngoscopes, otoscopes, ophthalmoscopes, clinical thermometers, speculums, forceps, sphygmomanometers and hypodermic syringes. Much improved microscope optics eased the examination of urine, blood and pus as physicians gathered more and more information beyond the patient's perspicacity. Unanticipated inter-operabilities emerged, like using the hypodermic syringe to drain tubercular effusions found with a stethoscope. Anesthesia made advances in surgery possible but demanded improved antisepsis to prevent post-operative inflammations. In 1850, New York's State University coordinated a nationwide study conducted by village doctors who measured humidity and reported patient symptoms daily. The study detected no relationship between illness and miasma. Soon a chemist, Claude Bernard, discovered that chloral hydrate became chloroform in the blood stream and could induce sleep. Then, in 1876, Robert Koch confirmed the infectivity of the anthrax bacillus and established postulates for infectious disease investigations.

Family doctors like Jabez Allen, MD who practiced in East Aurora, New York from 1834 to 1884, tackled the whipsaw of scientific advancement with curiosity and study. His Vermont medical college taught him to bleed and purge and his professors voiced both interest and censure about the role of germs just as medical journals began replacing single case stories and opinions with the methodologies of science. In 1849 the American Medical Association, founded to confront competition from homeopaths and herbalists, encouraged local medical societies to include scientific presentations and promote interactions between community doctors and researchers. These forums gained Dr. Allen an acquaintance with Austin Flint who needed the practical experience of generalists like Dr. Allen to validate his research on heart auscultation. Collaborations encouraged generalists to gain skills in auscultation and made Dr. Flint's medical textbook the bestselling textbook of the 1870s.

As more signs, symptoms and data revealed more patterns, diagnostic labels became the language of medicine, further enticing observation science and experimentation to search for external causes. Science and improved training came to distinguish the graduate physician from the quack. Post-Civil War medical colleges adopted the French model that required students to observe, examine and keep notes on large numbers of patients quartered in almshouses or hospitals. These concentrated experiences dramatically improved a graduate's ability to distinguish normal from abnormal while expanding the medical faculty's own clinical experience. Faculty taught, conducted research and wrote, but making a living required community physicians to refer their special cases.

The 1878 national AMA meeting was held in Buffalo and germs dominated the dialog. In the 1870s Pasteur had nailed the coffin on spontaneous generation, Tyndall proved that bacterial spores floated in the air, Edinburgh's Joseph Lister toured America lecturing on the use of dilute carbolic acid to prevent post-operative infections, Koch proved that bacteria caused anthrax, and New York recognized qualified graduate physicians by re-establishing licensure. In the next decade the City of New York Health Department established one of the first laboratories for culturing bacteria, leading directly to the discovery of diphtheria anti-toxin by 1896.

Through it all community doctors administered to patients and families. Physician obituaries included phrases like: "The doctor possessed in a very marked degree the confidence of his numerous patients. His devotion to the welfare of those under his care could scarcely have been surpassed and his generosity in other matters was well known to all his friends." Every generation has needed a doctor friend who they could trust to sort through the newest technology and select what was best for them.

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low-echogenic liver nodule on sonogram, does it warrant a CT abdomen with PO contrast, with IV contrast, with both, or with no contrast at all? The best way to handle this is to pick up the phone and talk to my favorite radiologist buddy. I always get relevant accurate guidance, but I also waste lots of time on hold and then waiting for the radiologist to come to the phone. The second-best approach is to dig into the American College of Radiology's Appropriateness Criteria, offering guidance on what test to get in which situation. But the ACR material is notoriously poorly organized and hard to search. So my go-to second-best approach is Rads Consult, which is a well-written, well-organized, searchable resource offering guidance on what image to order in which situation. Now I go to Rads Consult first. Rads Consult used to only be available as a free website which rendered well on a PC or smartphone. The web version is still there but it is no longer updated, and has been replaced by an iOS app. The app costs $15/year, which is pricey for apps.

MAPPP

In 2014 I noted that the app Preop Eval brings together a wealth of guidance on preoperative clearance and perioperative patient management. But back in 2014, when it came to perioperative management of meds that can make a patient bleed, we had essentially only aspirin, clopidogrel, and warfarin to deal with. Now we have several direct oral anticoagulants (DOAC's) and a few more anti-platelet clopidogrel look-alikes. The Preop Eval app has not (yet) kept up with covering this new complexity of guidance. But MAPPP does. IPRO's Managing Anticoagulation in the Peri-Procedure Period app (MAPPP) offers all the guidance from authoritative sources like the American College of Cardiology (ACC) and the American College of Chest Physicians regarding anticoagulants and antiplatelet agents in a variety of surgical and procedural situations. The ACC offers Bridge Anticoag, but this app only addresses the perioperative management of anticoagulated atrial fibrillation patients, not addressing venous thromboembolism, mechanical heart valves, primary and secondary coronary artery event prevention, and post-stent management. MAPPP does. It guides a clinician through a process of identifying surgical bleeding risk, then thromboembolic risk, arriving at medication management guidance. The topic is still an anxiety-provoking mess, but MAPPP makes it somewhat clearer.

ASCVD RISK ESTIMATOR PLUS

Primary prevention of cardiovascular events is driven by 10-year cardiovascular risk. Lifestyle measures are recommended for all, statins for those with elevated risk, and baby aspirin for those aged 50-70 years with highest risk. These considerations all start with estimating that 10-year cardiovascular risk. The American College of Cardiology has made their ASCVD risk calculation the standard of care, and they've made a highly useful app to make these estimates quick and easy on the fly during patient care. The app walks you through entering a patient's age, gender, race, cholesterol, blood pressure, and all the other risk factors, giving you that 10-year risk estimation. The app goes further, offering ACC guidance on initiation of treatment which is expert-based and not as compelling. But the risk estimation is an excellent tool.

Others like it: If you still like the Framingham 10-year risk estimate (I do), it lives on in the multi-calculator app Calculate by QxMD software.

SMI SAFE MOTHERHOOD INITIATIVE

New York's own ACOG District II developed a suite of care bundles and protocols for the management of the most dangerous emergencies of maternity care. Starting with postpartum hemorrhage, severe hypertensive disorders, and venous thromboembolism, the app recently added maternal sepsis. The app offers educational slide sets, interactive patient-care checklists, risk assessment tools, posters, and resources from other organizations. There's so much in the app that it's worth looking around to get used to it before you have to use it for real in a crisis. But the guidance is outstanding.

FHR 5-TIER

Here's another gem for those who manage labor. We all know to be reassured by category 1 fetal heart tracings. We all know to be alarmed by ominous category 3 tracings. But what to do with everything in between, the roughly two-thirds of tracings which are category 2, neither clearly good nor clearly ominous? ACOG has a scheme to subdivide category 2 tracings. But a paper from AJOG in 2007 used big data to look at 5,000 labors and 30,000 tracing samplings to develop their own evidence-based 3 subcategories of category 2, making a 5-tier scheme. Best of all, they have an app, which means you can use their powerful evidence-based analysis tool easily at the point of care. The app walks a clinician through entering variability, baseline, type and severity of decels, yielding a risk of further progression to a category 3 tracing within the subsequent hour. The app also reminds the clinician of the various intrauterine resuscitative measures employed to address fetal distress.

PSYCH ON DEMAND

You probably have the PHQ-9 at the ready for use with patients. Do you have the GAD-7 for generalized anxiety disorder? the MDQ for bipolar disorder? the Edinburgh Postnatal Depression Scale? the DAST-10 for substance abuse screening? Psych on Demand has them and about 25 more. The app walks a clinician through each questionnaire, renders a score, and offers a good discussion on each including references. And just like MDCalc, if you email the psychiatrist app developer, he'll update the app.

ABG ACID-BASE EVAL

How many ABG's do you evaluate every year? My answer is "not enough to stay good at it." There are several ABG interpretation apps out there. But ABG Acid-Base Eval is different. Most apps have the clinician enter blood gas and electrolyte values which then yield an answer like a calculator. ABG Acid-Base Eval leads the user through a short series of evidence-based evaluation steps in order to discover what sorts of acid-base disorders may be afoot. Then the app presents differential diagnoses for each disorder so that you can start thinking about what diseases your ill patient might have. The app quietly evaluates the results behind the scenes to minimize the risk of the user making an error. Every evaluation step offers explanations and physiology rationales for the user if and when they are desired. Because the app teaches an evaluation process, every time you use the app, you get a little bit better and smarter at acid-base analysis.

GOOD RX PRO

ePocrates drug reference is my go-to source for prescribing information. But when it comes to medication cost, ePocrates is good, and Good Rx Pro is better. Good Rx Pro (the Pro means it's for professionals) shows you a variety of prices for any medication at your local pharmacies. Just type in your location and a medication. The app serves up a price at most of your local pharmacies citing the many prices available sometimes via cash, sometimes via coupon (which Good Rx provides to consumers who use the app), sometimes via membership. The app lists prices at local major pharmacy chains like Wal-Mart, CVS, Walgreens, and Costco, but it also includes more regional outlets like New York State's Wegmans. Medication pricing remains quite opaque, and the

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Today, communication far surpasses the speed of the telegraph and our smartphones can access more information than a whole wall of books. It took forty years for science to disprove the miasmic theory of cholera and culture *Vibrio cholerae*. In 2020 it took only weeks to learn that COVID-19 was caused by a virus, a few more months to understand that remdesivir helped, and just under a year to develop a vaccine. Still the family doctor manages patients through a blizzard of discovery, reading the science and making recommendations. Speed challenges practice, but it also excites interest. Discoveries still arrive in fragments, each one battered by diverse opinions. But families will always need a doctor able to match the potential and limits of science with the potential and limits of those suffering illness.

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Good Rx app doesn't dispel all the opacity, but it does help the clinician see what the ballpark pricing on a med may be and lets patients see where opportunities for savings may be found.

USPSTF PREVENTION TASKFORCE

Formerly the ePSS (electronic preventive services selector), the USPSTF app organizes every screening and preventive service which the USPSTF has ever reported on. You can browse all the topics and drill into their discussions for as much detail and depth as you please. You can search via ratings (just the A-rated services or D-rated or I-rated, etc.) or search via patient characteristics, e.g. 43 year- old non-pregnant female. If you want to read in depth to appreciate the controversies on various screening and preventive topics, you probably want to go to the USPSTF website on a nice big screen. But if you want a concise summary organized nicely, the app is better than ever.

VACCINE SCHEDULES

You probably know how many DTaP's to give a child and when. But what about a child with no vaccines from 2 months old until presenting at 14 months old and needs catchup dosing? How about the vaccines appropriate for an asplenic patient or ones to give (and not to give) a fairly advanced HIV patient? For that you need a good immunization resource. Two excellent ones are the CDC's Vaccine Schedules app and family medicine's own STFM Shots Immunizations app. Both give you all the typical schedules for kids, teens, and adults. Both give easy to use catch up schedules. Both offer tables of vaccines by medical indication. Both let you drill down for much greater detail on any particular vaccine.

CONTRACEPTION POINT-OF-CARE

This outstanding reference was made by our family doctor friends at Reproductive Health Access Project (RHAP) in collaboration with Dr. Katherine Holmes and me at the Binghamton FM residency. The app puts numerous contraception essentials at your fingertips. The app offers RHAP's outstanding quick-start algorithms which enable a clinician to get a patient started and protected with contraception as soon as possible. It shows all the formulations of the many OCP's on the market, grouped by dose and progestin generation. It shows a table of contraceptive efficacy statistics for every method with both ideal and typical real-world use. It contains a selected subset of the common contraindications to various methods according to the WHO medical contraindications scheme. It includes comparative tables of safety, tolerability, efficacy, price, and simplicity of use (American Family Physician's STEPS criteria) for all contraception methods, for all emergency contraception methods, and all fertility awareness methods. The app includes discussion of how to choose and adjust OCP's.

If you use excellent smartphone apps that you think other family physicians should know about, please email me so that I can add them to my list and publicize them. And if you have a great idea for an app that family physicians could use, I'm always interested in potential new projects to help family physicians provide great care.

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What are smartphone apps really good for?

– quick information during patient care within a few clicks and 20 seconds
– questions that come up frequently in practice (example: drug dosing)
– the information is too complex to memorize (example: antibiotic regimens)
– the stakes are too high for educated guesses (example: Coumadin management)

What are smartphone apps not ideal for?

– reading articles or chapters – do that on a tablet or laptop, not on a 4-inch cellphone screen
– materials that require a lot of typing interaction like data or search phrase entry which is so much easier on a PC or laptop with keyboard

With our Powers Combined:
Shaping the Next Wave of Health Technology

By Lalita Abhyankar, MD

It was my first New York State Academy of Family Physicians Congress of Delegates as an attending. We had invited Timothy J. Hoff, Professor of Management, Healthcare Systems and Public Policy at Northwestern University, to speak about his new book "Next in Line." (I picked it up recently and man, if you want some dystopian bedtime reading, forget the Handmaid's Tale and read this instead.) In the book, Dr. Hoff expounds on the systematic deterioration of the patient-physician relationship in the age of retail and value based care sold to us with fancy words like "disruptive," "efficiency," "holistic care" and "innovation." He argues that no matter how much we want to go back to the time of the idealized Norman Rockwell version of family doctors, the era is over. And that unless we, as physicians, prioritize and advocate for relational care above all else (lifestyle, salary, etc.), there is no chance that the patient-physician relationship will survive the consumerization and technologization of health care.

You can imagine the effect his presentation had on me. Bright-eyed, bushy-tailed, I suddenly tail spinned into the abyss of an existential crisis. I watched as doctors with thirty years of experience angrily, defensively, and fearfully demanded answers about what this meant for family medicine and the patients they served.

I walked out deflated. But the dread I felt had a curious, palpable quality. It seemed to offer two choices: resist the coming tsunami of digitization, data sets and machine learning, direct to consumer products, and the commodification of health and medicine (start-up founders like to call it "wellness"). Or run towards it as fast as possible with the passion and philosophy of a family physician to break the wave and shape it into something truly revolutionary.

It's been a slow process. While I am what you might call a "native technology user" (I grew up with computers, the internet, cell phones), I am still a tech novice. It wasn't until recently that I understood that "artificial intelligence" is nothing more than a programmed algorithm that needs vast data sets, statistical analysis, and positive and negative reinforcement for right and wrong answers. In order for those reinforcements to occur, someone (a human being) needs to watch the software program and correct it as it "learns."

In health care, the vast data sets are patient information, which we need permission to use from the patient. These data sets can be skewed depending on who has collected them, or who has agreed to provide data. AI algorithms therefore can be biased because of the bias of the people who built them. To rely on these programs alone could lead to worse outcomes by race, sex, income or sexual orientation.

This touches on issues of patient trust. In order to have robust, accurate data sets, patients have to trust that their personal health

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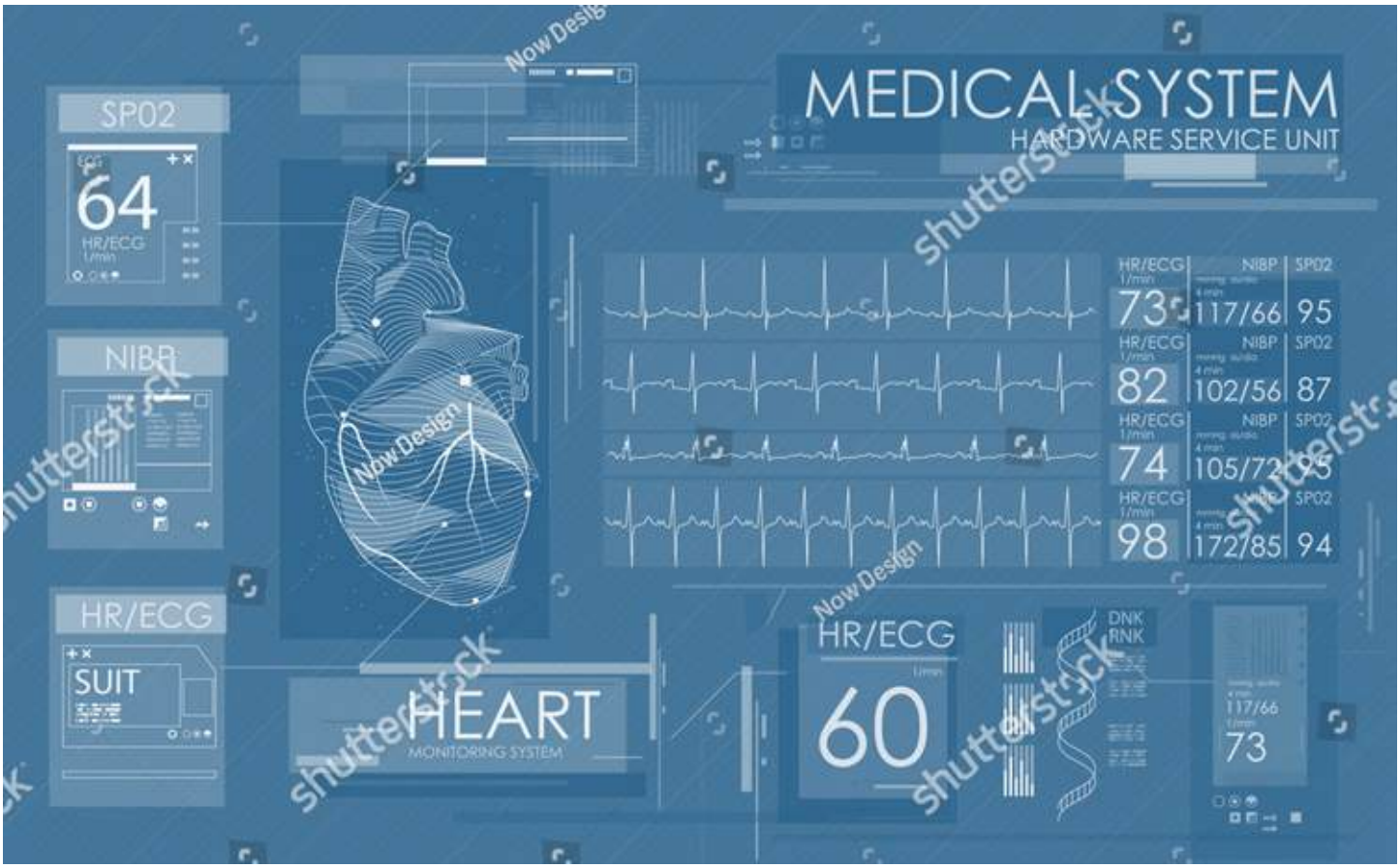

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information is protected, and that new tech companies are managing this information ethically. There are patient advocacy organizations who are leading the way on this path, trying to work with underrepresented groups to build trust and also to protect existing data from undue profiteering.

Money, unfortunately, is a driver for many of these companies that are just starting out. Even the best technologies and clinical concepts need resources to make their ideas a possibility. These groups depend on funders (often venture capital) who have little understanding of health care and want to create the next "disruptive product" in the market.

While private equity money is starting to flow towards "primary care," the field of primary care is so vast that it is almost impossible to create a product that shows improvements fast enough to be financially self-sustaining.

More complex products have another issue. Technology is often trademarked and copyrighted, meaning that a physician who wants to understand how a software program is making its decisions, may not be able to. This lack of transparency can lead to low trust of a product by the physician who uses it, and also can make it difficult for smaller, independent or under resourced practices to buy into technology, even when it could be a clear benefit for a patient population.

These concerns were discussed at the AAFP AI/ML Executive Round Table in February, which included leadership from the Academy, as well as representatives from leaders in health technology, health tech startups, patient advocacy groups, and even a health tech funder.

As an attendee, I was surprised to find that while we, as the AAFP, actively considered all of these, we missed an opportunity to lead in setting standards for the industry, from a family medicine perspective. With our vast and diverse member base, in geography to type of clinical practice, the AAFP could infuse this tech-based health care revolution with the soul of a small town community family doc.

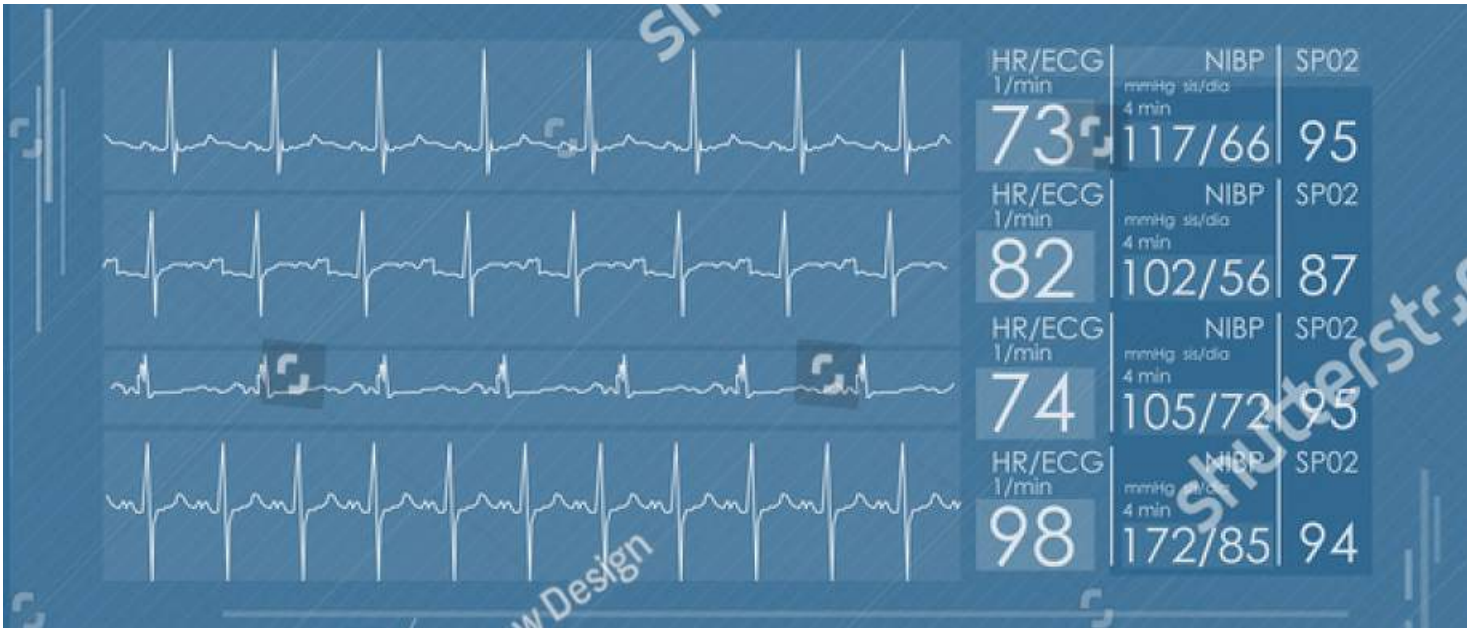
So, in collaboration with the delegation from Hawaii, our very new, very small EMR Optimization Member Interest Group—for which I am an officer—submitted a resolution to the 2020 AAFP Congress of Delegates to establish a work group that will build a set of principles specifically targeted to addressing data collection, anti-bias algorithms, equitable access and agility of use by smaller physician practices, technological transparency, financial costs, and patient privacy. The goal of the resolution was to use the weight of the AAFP to prevent the commodification of primary care, humanize technology within the scope of family medicine, and to build a relationship between tech, primary care and the AAFP.

The resolution passed. But it alone is not enough.

Collectively, we have to learn about these new technologies, what they are, and how they work. We need to compete with new companies by hiring our own software engineers and designers to build the tools that *we* need, instead of us serving as products for tech delivery platforms.

I don't usually gravitate towards technology. I am the quintessential medical humanities family doctor, the one who values the power of storytelling, the philosophy that comes with caring for patients from birth to death, and the power of the patient-physician relationship. But this philosophy is exactly what we need to build technologies that could make diagnostics easier and expand access to care in a way that could grow the joys of primary care exponentially. It's up to us to lead the technology there.

***Lalita Abhyankar, MD** bio?*



Artificial Intelligence:
The Future is here.

By Daniel Azof, MD; Shara Feltheimer, DO; Madiha Qureshi; Joyce Robert, MD, FAAFP and Anubhav Agarwal, MD, CAQSM

Introduction

It has been referenced that artificial intelligence (AI) is the "stethoscope of the 21st century."[1] This innovative technology mimics human cognition using statistical models and algorithms to gather data, infer, and predict outcomes. Family medicine has potential for a great outlook on AI, being that over 50% of office visits are primary care. AI can benefit patients, families, and the communities in which they live. In this paper we will discuss how AI driven innovations can augment the patient-physician relationship.

The goal of AI is to produce the quadruple aim; better health outcomes, lower costs, enhanced patient experience, and physician well-being.[1] We will discuss digital assistants that can transcribe notes and perform ancillary tasks based on the clinic encounter. We will explore programs with the potential to consolidate menial tasks and allow doctors to be more present during encounters with their patients. We will discuss companies focusing on preventive health, the associated benefits and risks including ethical concerns and barriers to care that AI can create, and lastly how our colleagues are using AI in other specialties.

Companies Focusing on Preventive Health

Technology is constantly advancing; personal devices are more powerful and integrated into our lives with every new generation. With faster results, there comes the expectation of instant gratification. There have been numerous concerns regarding a link between impatience and smartphone use habits.[2] Neuroimaging studies even suggest that increased mobile technology use is positively associated with a heightened preference for immediate rewards.[3] While these findings remain correlational, the fact remains that most Americans own smartphones (81%), and the number is rising each year.[4]

Unfortunately, primary care practices are not advancing at this same level. Office visits continue to have long waiting times. Lab results can take days. The patient-physician interaction is brief, independent of the complexity of the visit and strained by documentation burden. The largest areas for startups are now focused on medicine and health care, with a push to provide better care. Startup companies such as mPort, Forward, and Tia are competing to integrate the newest technology that communicates with personal devices and help create a more personal health care plan. Table 1 overviews these companies and their technology.

Table 1. Startup Companies Focusing On Preventative Medicine

COMPANY	How it works	Accessory Device	Unique Feature	Cost
mPort	Scanners measure biometrics such as weight, body fat percentage, and blood pressure. Both companies have apps that help users keep track of their numbers[5]	3D Biometric scanners, mobile app	Placed in malls and other publicly accessible areas to become a routine part of daily errands	Free: Weight, height, BMI, target heart rate. $49.95 / year Unlimited mapping, myHealth, myAvatar, myBody. myProgress, myFashion, weight, height, biceps, chest, narrow waist, hips, thighs, calves, knees, shoulders & neck, BMI, target heart rate, waist/height ratio, waist/hip ratio, body fat %, fat free mass, BMR & ideal weight range
Forward	The patient checks in on an iPad and heads over to an in-house designed body scanner. General assessment of health and medical history as well as genetic analysis and preventive plans[6]	3D Biometric scanner, voice recognition, Bluetooth-enabled equipment/EMR, mobile app	No waiting rooms. 12-minute lab result turnaround. Review labs with provider on same visit. Unlimited access to care team, including unlimited virtual and in-person visits through the Forward mobile app	$149 / month Members can also pay via health savings account (HSA) or flexible savings account (FSA) No co-pay or insurance coverage
Tia	Gynecological services as well as overall health assessments, acupuncture and seminars[7]	Online virtual platform, mobile app	Virtual portion allows more time for physical visit with provider and additional opportunities for check-ins throughout the year to evaluate care plan	$150 / year Insurance coverage available Members can also pay via HSA or FSA

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Companies using Voice Recognition

In 2018, a study by Albahri, et al. examined barriers to effective communication between family physicians and patients in Dubai. The study aimed to identify the main perceived barriers to effective communication between patients and the family physicians from both the physicians' and patients' viewpoints. Out of a total of 1122 patients and 170 family practice physicians, the study concluded that both doctors and patients agree that time pressure is the greatest barrier and that a greater focus needs to be placed on training physicians to convey their messages to patients more clearly.[8]

There are several companies that are using AI voice recognition technology to mitigate time stress and aid physicians in educating patients in more effective ways. Suki and Henreix.ai by Testfire labs are two examples, both of which use voice recognition to maximize the time spent during clinical encounters. Dictation is demanding for physicians. Medical legal concerns as well as billing, coding, and sending prescriptions are just a few things that keep doctors in front of a screen for hours on end. These companies advertise themselves as virtual personal assistants that could change the way modern medicine is practiced while preserving the patient-physician relationship. Examples are listed in Table 2.

In addition to improving the quality of time spent, voice recognition technology can be used in clinical decision-making as well. Table 3 lists two examples that demonstrate how voice recognition can be used to distinguish coughs and discern dementia.

Benefit & Risks Associated with AI

A Delphi study in 2018 explored primary health care informatics on perceptions, issues, and challenges of AI in primary care. The study concluded that AI has the potential to improve managerial and clinical decisions and processes, however, there are ethical concerns and there should be rigorous development of AI applications so that they will be safe and effective.[12] Benefits of AI include the decision support to improve primary health care processes, pattern recognition in imaging results, predictive modelling performed on primary care health data, and business analytics for the primary care provider. Further examples of these benefits are provided in Table 4.

Table 2. Companies Using Voice Recognition Technology for Documentation

COMPANY	How it works	Accessory Device	Unique Feature	Cost
Hendrix.ai by Testfire Labs	Virtual assistant which provides a complete transcript of meetings. The technology is used for both medical and non-medical encounters. Patients leave with a summary of the encounter in hand and doctors can use the transcription for documentation purposes.[17]	Dial in by phone	Useful for patients who can't always have someone accompany them to appointments.[17]	$39/ month with annual discount or $49/month
Suki	Virtual assistant specifically designed for physicians. Physicians can use Suki to transcribe notes into the EMR during patient encounters. Users can open the Suki app on their smartphone and give a command to pull patient data ("Suki, show me the patient's clinical history"), as well as place medication orders.[9]	Suki application on desktop or smart device	Invented specifically to prevent physician burnout. Compatible with various EMRs such as Epic, Cerner, and Athenahealth.[9]	$200/ month, discount if you are a member of AAFP

Table 3. Voice Recognition and Clinical Decision Making

Clinical Scenario	Study	Methods	Conclusions	Future Implications
Pertussis	Parker et al. examined voice recognition to detect paroxysmal coughing in patients with pertussis.[10]	The study collected a series of recordings of pertussis, croup and miscellaneous coughing sounds by children. Coughs were manually categorized as either pertussis or non-pertussis. Using Mel frequency scaled cepstral coefficients (MFCCs) and machine learning algorithms, the data was standardized.	Out of 16 samples of non-pertussis coughs and 31 examples of pertussis coughs, over 90% of all pertussis coughs were correctly identified.	Since many clinicians have never seen a case of pertussis, the data could be useful to prevent outbreaks and distinguish from other cough sounds, croup for example. In the setting of COVID 19, perhaps the technology can be extended to diagnose patients remotely thus avoiding unnecessary exposure to the highly communicable virus.
Dementia	Fraser et al. studied AI as a clinical decision-making tool in the study of speech in Alzheimer's disease patients.[11]	Linguistic variables were used to train a machine learning device to distinguish between two groups, participants with Alzheimer's dementia and healthy controls.	Based on speech patterns, able to distinguish individuals with and without AD 81% of the time.	Using voice recognition, modern machine learning can aid physicians in diagnosis of complex conditions such as dementia.

Table 4. Examples of benefit use cases in which AI can be leveraged in a primary care setting.[12]

Themes	Examples
Decision support to improve primary health care processes	a. Improving accessibility by triaging primary care patients and conduct a preliminary analysis suggesting likely diagnosis b. Learning preferred prescribing patterns of clinicians that use AI-enhanced computerized medical records c. Assisting the prototype development of decision support tools
Pattern recognition in imaging results	a. Automatic detection of tumors using whole slide digital pathology images
Predictive modelling performed on primary care health data	a. Detection of high risk for mental health disorders/ cardiovascular disease b. AI-driven tools for clinicians e.g. prediction of mortality c. Assistance with diagnosis of obscure cases using iterative algorithms of accumulated case histories d. Assistance with management of complex cases, using iterative accumulation of outcome data e. Early diagnosis of diseases in primary care patients
Business analytics for primary care provider	a. AI applications that operate on routinely collected administrative data could provide regular feedback to practice managers, business owners, and individual clinicians (doctors, nurses, and others) to reduce variability and improve quality of care b. AI modelling of administrative data could assist in finding organizational models for an effective comparison among different countries

Table 5. Examples of risk use cases in which AI could result in a potential risk to patients in primary care setting[12]

Themes	Examples
AI technology currently available to deploy in primary care is still not competent to replace human decision making in clinical scenarios	a. Interpreting the results of an analysis using AI without an understanding of the primary health care context b. Overreliance on what AI can do. Using AI as a substitute for due clinical diligence c. Missing competencies/willingness in using AI properly d. In AI, few techniques such as deep neural networks are incapable of explaining the underlying models completely. This makes it hard to interpret the interplay between covariates in a model e. Relying on AI and not using human skills to ensure it is correct f. Going down the primrose path. One of the most dangerous aspects of black-box algorithms is not knowing the source of the data. To take an extreme example, if the AI is built for fever of unknown origin at a major referral hospital in the US, it will not be applicable to a patient with fever in sub-Saharan Africa who in fact has malaria.
Risk of medical errors	a. Potential for errors in prescribing. If a doctor prescribes a medication using adult doses for a child, and the AI doesn't have a guideline to spot the error, the AI could propagate the error into the child's future and that of other children on the same medication. This happens with humans (who are experts and specialists) and can happen in a learning AI scenario b. Incorrect diagnosis leading to unnecessary treatment c. Assumed effectiveness before proper trials undertaken
Risk of bias	a. That the data behind the constructed AI knowledge model was biased, or not compatible with the patient to whom the clinician applies the AI: e.g., a model learned in a population with specific sub-phenotypes may not be adequate to another population, or a model learned with past data models (ICD-9) may not be adequate/ generalizable to new data models (ICD-10)
Risk of secondary effects of utilizing AI	a. Insurance providers using AI for higher premiums or even excluding certain people for insurance

As AI becomes more intelligent and integrated within our lives, the lines begin to blur with ethical boundaries and privacy concerns; and as AI becomes more sophisticated and expensive, access to the latest technologies can create barriers to care. Furthermore, machine-based decisions may be accurate but not always optimal. Often, algorithms assume variables remain independent of each other. However, this is not always the case when considering the complexity of the human body and the decision-making process. Most data analyses include information and patterns on population-level relationships. Although useful for a generalized approach to healthcare, these models are not useful for individual approaches and treatment decisions.[13]

Another major issue with AI is privacy. Physicians are continuously trained and re-trained on HIPAA laws. This is worrisome for vast quantities of patient data that are entered into machine-learning systems, making them vulnerable to security breaches. There is no legal restriction barring technology firms or advertisers from re-identifying patient records.[14] Other examples of risks include incompetence to replace human decision making in clinical scenarios, risk of medical errors, risk of bias, and risk of secondary effects of utilizing AI. Further examples of these risks are provided in Table 5.

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Discussion

AI technology can never replace highly trained physicians with decades of training and experience. However, AI can enhance the practice of medicine by aiding physicians with clinical decision making while also allowing doctors to document, teach, and establish rapport with patients all at once. Forward clinic, Tia online platform for women, and 3D body scanning stations are a few ways in which AI is currently being utilized for preventive health. These methods are useful in holding patients accountable. Furthermore, since data is more accessible to patients, doctors can partner with them to achieve a common goal and improve their quality of life. Virtual assistive devices such as Suki and Hendrix.ai are actively addressing the concern over time constraints felt by both patients and physicians during clinical encounters. Using these technologies, patients leave with a plan in hand and physicians spend up to 70% less time charting.[15]

AI is not only making strides in improving quality time spent between doctors and patients; it is also bringing medicine together. Specialty fields and family medicine can collaborate using the standardization of data, image interpretation, and stratification of patients' risk factors to prevent hospitalizations in patients with chronic conditions. Some examples include identifying pathologic specimens, automatically detecting mammographic lesions, and identifying retinal pathology.[16] AI as a general concept seems vast. However, the technology is making the medical world a smaller, more connected place.

There are benefits and risks of such advanced technology in medicine. Physicians are protective over the patient bond that has been present throughout generations. Privacy is a cornerstone. It is our duty to do no harm and sanctify the quintessential patient-physician relationship. But, even if over time the moral, ethical and legal concerns are addressed, it is important to consider how physician behavior will be affected by the technology in real time. If physicians are constantly being recorded, analyzed, applied to algorithms etc., will doctors begin to act differently in front of patients?[17]

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Joyce Robert, MD, FAAFP *is a family physician who practices academic medicine as core faculty at Mount Sinai South Nassau (MSSN) Family Medicine Residency Program. She is also the Director of the Transitional Year Program at MSSN. Dr. Robert appreciates working in underserved areas and addressing health care disparities. She is also a licensed Zumba instructor and likes music and dance as a way to unwind.*

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IN THE SPOTLIGHT

Thank You – Thank You Very Much!

A big thank you to Dr. Rachelle Brilliant, who retired from the Family Doctor Editorial Review Board with the publication of our winter issue. Dr. Brilliant served the journal well since its inception in 2012, including several years as Editorial Board Chair. Her leadership and experience have contributed greatly to the growth and success of Family Doctor. We wish you many happy edits to come!

NYSAFP Let's Get Immunized NY Campaign Launched

NYSAFP is spearheading a new campaign focused on promoting objective vaccine information and pulling together a diverse range of stakeholders to promote unified messaging and policy to help reduce vaccine hesitancy and increase vaccine rates across New York State. The campaign recently launched with a new website where you can find a summary of activities and media garnered from the launch, as well as a listing of all partners in this campaign. We will be promoting this coverage on our social media accounts and will keep you updated on this very exciting and important endeavor.

2021 Congress of Delegates

The NYSAFP Congress of Delegates will open virtually on Sunday, May16th and will include orientation. Testimony will be held virtually over the next 6 days, ending at 11 pm on Thursday, May 20th. Reference Committees will meet Saturday, May 22nd. Discussions on the Reference Committees' reports will be on Sunday, May 23rd. Our policy & operations manual states that the planning committee approves late resolutions (any resolution submitted after April 16th) that are "particularly timely, time-sensitive, or deemed to be in the Academy's best interest to consider them." We will be strictly enforcing this rule. Any resolutions submitted after April 16th must include an explanation as to their exigent circumstances.

Will Artificial Intelligence Automate Family Practice into Unemployment?

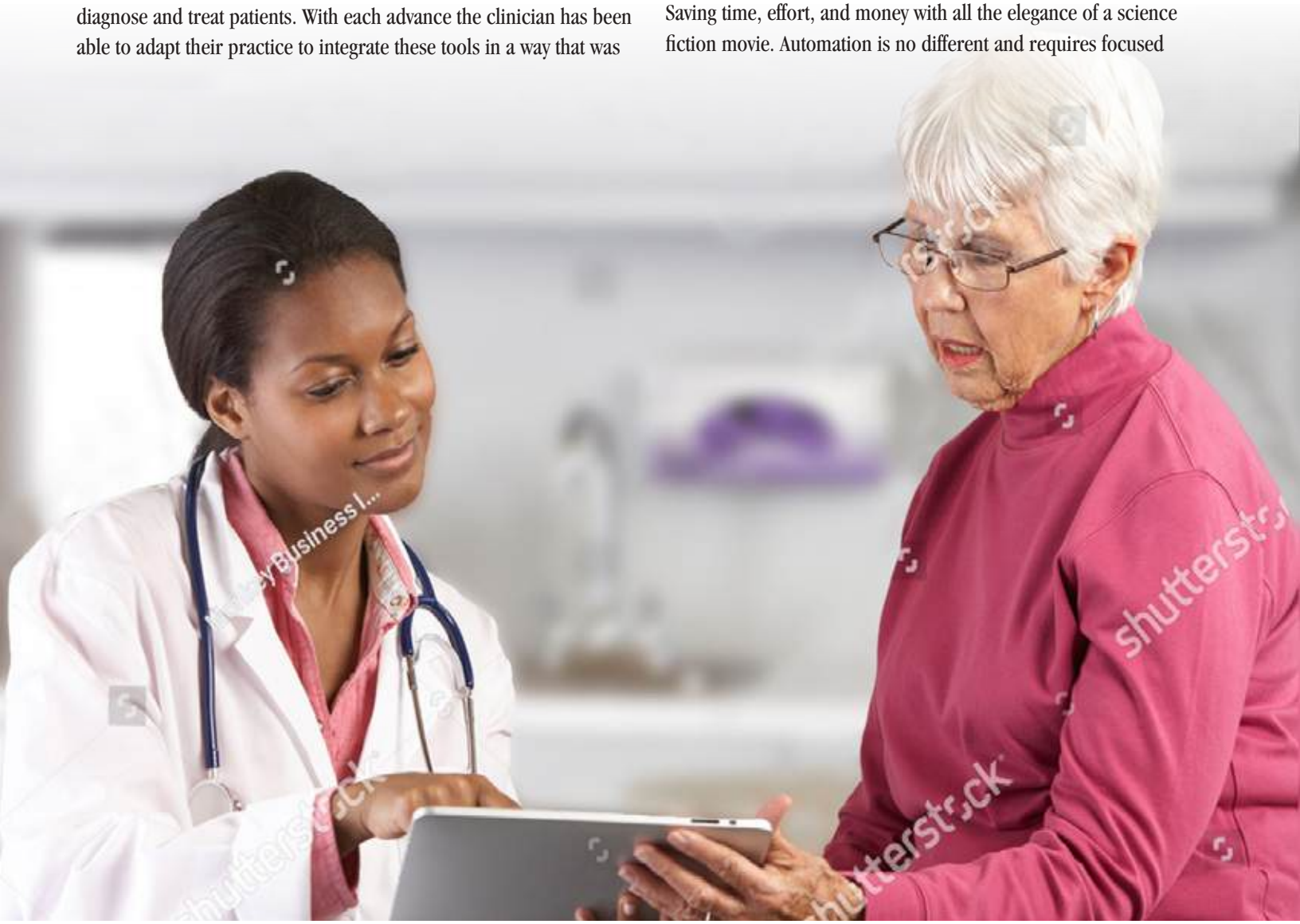
By Paul Dow, MS

Introduction

Family Practice physicians have faced considerable challenges to provide the best care possible with growing emphasis on complex documentation and pressure to keep their practices financially viable, while experiencing symptoms of professional burnout. Automation, often referred to as artificial intelligence or augmented intelligence (AI) in healthcare, is becoming widely available as part of the electronic health record (EHR) or via stand-alone applications with the promise of improving the physicians' work experience without adding extra burden.

Technology has long been integral to the delivery of health care. Simple devices such as the stethoscope and more complex machines like computed tomography (CT) have improved doctors' abilities to diagnose and treat patients. With each advance the clinician has been able to adapt their practice to integrate these tools in a way that was organic and provided benefits to the patient without destructive disruptions to their workflow. However, technology changes in the clinic, while producing benefits for users, have presented more complexities as a tradeoff. EHRs are a good example of this case. These disruptions can be managed to a degree with assessments of workflows, change management strategies, and thorough training before usage in day-to-day practice. Many medical device vendors insist that their solution is easy to learn and does not contribute to burn out. However, this is not always true.

The 2019 annual member survey of the American Academy of Family Physicians (AAFP) found that 97%, or roughly 70,000 out of 72,000 members, were using an EHR. Originally, these tools were meant to offer advancements in care delivery and data collection. Saving time, effort, and money with all the elegance of a science fiction movie. Automation is no different and requires focused



planning and application to deliver quality improvements. While these tools have great promise for improving health care, each technological advancement has added complexity. Some of these complexities have led to dangerous and expensive work-arounds to try and solve the problems. For example, EHRs have become aggregators of clinical data from a variety of sources. Much of the data entry has not advanced past the QWERTY keyboard. This has created a data entry bottleneck for clinicians. Free text entry has proven to be laborious when reviewing a record when pre-visit planning. Patient wearable devices are also now contributing to the deluge of data and bio measurements. Automation could provide summaries of the data and text entries, then present concise summaries with notification of trends that require prioritization of action. It has become more challenging to determine what is signal and what is noise within the documentation of a patient care plan. Unfortunately, I do not foresee a time where electronic medical records are removed from the clinical setting. However, I do see a future that is improved by addressing how data is entered, reviewed, and analyzed in the medical record. Auto-mation will be key in providing clinical support in this regard.

How Do We Define Automation?

Before we ask, and answer, the question, "will robots replace doctors in the next five to ten years?", it might be helpful to describe what is meant by automation. In 2018, the Society for Automotive Engineers International (SAE International) created a standard, SAE J3016™ to describe the characteristics of automation technology within cars (Figure 1). Similarly, each of the tools is meant to augment the skills of the clinician in ways that make them more efficient.

What would that chart look like if we updated it for clinical automation in family medicine? It might have these characteristics. Some of the advanced tools such as the ones in the Level 4 and 5 categories are more science fiction rather than science fact at this point (Figure2).

Figure 1 – Levels of Driving Automation

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SAE J3016™ Levels of Driving Automation						
	Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
What does the human in the driver's seat have to do?	You **ARE** driving whenever these features are engaged.			You are **NOT** driving when these features are engaged.		
	You must constantly supervise and take action to maintain safety.			When the feature requests, you ***must*** drive	These features will not require you to take over driving.	
	Driver support features			**Automated support features**		
What do these features do?	Warnings and momentary assistance	Steering, brake OR acceleration support	Steering, brake AND acceleration support	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met.		This feature can drive the car under ***all*** conditions.
Examples	Blind spot warning	Lane centering OR adaptive cruise control	Lane centering AND adaptive cruise control	Traffic jam chauffer	Local, driverless taxi	Same as Level 4 but in all conditions in any location

Figure 2 – Potential Levels of Clinical Automation

Potential Levels of Clinical Automation						
	Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
What does the doctor have to do?	You **ARE** the primary care physician when these features are engaged.			You are **NOT** the primary care physician when these features are engaged.		
	You must constantly supervise and take action to maintain patient safety.			These features can provide care under limited conditions and will not operate unless all required conditions are met.		This feature can provide care under ***all*** conditions.
	Physician support features			**Automated clinical support features**		
What do these features do?	Warnings and momentary assistance	Diagnosis OR treatment support	Diagnosis AND treatment support	These features can provide care under limited conditions and will not operate unless all required conditions are met.		This feature can provide care under ***all*** conditions.
Examples	Notification of out of range lab values	Clinical diagnosis support	Conditions identified and Clinical Order Sets suggested	Clinical Order sets triggered and sent	Patient assessment and treatment for limited, specific conditions	"Med Pods" found in science fiction

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Benefits

Automation becomes another tool within the clinical toolbox for doctors to use in day-to-day care delivery. The goal of this technology is to make the practice of medicine less dependent on the data entry of physicians. Family medicine skills are honed over time and with tremendous effort. Allowing the technology to handle the mundane tasks and letting the care team contribute to the top of their license will allow physicians to provide deep empathy, as noted by Dr. Eric Topol in his book, *Deep Medicine*.

One of the questions that frequently arises is will this technology replace the need for physicians, both broadly as well as specialists? To me the answer is no. If you remember the early 2000's, computed tomography was beginning to rapidly expand its functionality. Moving from single slice image acquisitions into multi-slice images allowed for a 400% increase in volume of data to be collected with each rotation of the x-ray source and detectors around a supine patient. As the acquisition speed increased it eventually became possible to perform cardiac imaging with ECG-gating, stopping the motion of the heart and cardiac vessels. By placing an IV for an antecubital injection of iodinated contrast during an outpatient visit rather than using the Seldinger technique in the femoral artery, created a revolution in diagnostic imaging pathways. This technology improvement made it much easier, and more cost effective to quickly assess patients from the emergency department with symptoms of chest pain for cardiac issues. Radiologists began to routinely perform these procedures. However, this diverted patient volumes and funding away from cardiology into radiology departments. After a time of angst and hurt feelings between the two specialties, it turned out the radiologists were able to act as a screening tool and eliminated many negative exams from making their way to the cardiac cath lab. The cases that radiologists found tended to be more complex and required more intensive cardiac interventions. It was a win/win for everyone as the time and resources eventually balanced out and everyone was working at their highest capacities performing interesting work without wasting resources. Using this imaging technology experience, it seems like a similar pathway may be travelled for automation in family medicine. The tools may help doctors assess patients and then clarify which patients require referral and which can remain in the care of the family physician when blended with the power of artificial intelligence.

Let's further explore the example of the radiology/cardiology scenario within the scope of family medicine. For family physicians a major question is whether automation would allow an NP or PA to take over the scope of their profession replacing them in many practice settings, as some argue. To me the answer is no, there will not be a similar shift and rebalancing of responsibilities between the two roles. The first reason I'd give is that the clinical automation tools are not meant to be replacements for existing skill sets. A Level 3 or Level 4 clinical tool would still require physician-level expertise. They shouldn't allow a less skilled practitioner to replace someone with more knowledge. For the foreseeable future, automation is analyzing volumes of data and streamlining specific processes. Keeping a car driving at the speed limit between the painted lines on a highway is less complex that keeping a human in homeostasis with automated healthcare. The clinical technology will not be able to handle the full range of nuanced conditions that an experienced physician will have developed. The other reason is the lack of standardization with family medicine. While it is relatively easy to create a decision tree and improve diagnostic tools for specific conditions in a stand-alone situation, it is several degrees of magnitude more complex to encompass discrete pathways that account for all the variables within a patient's condition and myriad variables. The risk/benefit analysis is at the most productive when analyzed by the physician and patient with the addition of relevant information from the automation analysis. The most likely future scenario is that several tools are developed separately by companies that eventually are brought into the same walled garden and implemented within an EHR solution. However, that will require many complex steps and generate even more questions. Would that mean advances would only benefit large-scale EHR implementations? Would it be easier for an agile start-up or outsider tech company to make a move to get into healthcare? This is yet to be determined.

AAFP Innovation Lab

Automation can have the added benefit to help doctors maintain awareness of their competency, or the need to refresh their skill sets in a range of clinical situations, especially in areas that do not have high numbers of patients with those conditions. Some of the clinical tools, like driving automations, can keep you aligned in the diagnostic lane to prevent drifting into oncoming traffic of misdiagnosis. There are two examples of automation that the American Academy of Family Physicians are exploring with pilot programs in its Innovation Lab that are currently available to members. The goal is to find a range of solutions that can help physicians address administrative complexity and decrease the symptoms of burnout. This is a lot to ask from a software as a service (SaaS) platform, but we think with a layering of solutions it can demonstrate substantial value for physicians in a short amount of time.

Suki https://www.suki.ai/ is an AI-powered virtual digital assistant. The physician interacts with the patient's chart via their voice rather than keyboard entry. This tool works more efficiently than pure dictation software as it allows you to request things such as the display of trending lab values and imaging study results. We have seen substantial decreases in the dreaded after-hours documentation with reductions of up to three hours per day in some cases when this software is implemented. Over time the tool learns your clinical

rhythms and will get faster as it spots the trends and patterns of your patient assessments.

Navina https://www.navina.ai/ is another tool that uses AI to assess the entire patient record and creates a one to two-page document that highlights issues for physicians to review. It looks for gaps in care, such as the missed follow-up for a mass found on a mammogram, to billing codes that may not have been submitted. This can be especially useful if the patient's data is fragmented and too lengthy to read through before an interaction. Both tools are available today for use in a clinical setting, with a variety of EHR vendors and at a discount for AAFP members.

Risks in Advancing Technology

Another question to consider is what sort of risks are posed to the patient with this new type of technology? Bias in health care is a topic that is deservedly garnering more attention. AI needs to be taught, though supervised learning, to identify patterns and trends. What is given to the system as a positive or negative case could carry the bias of the development team. This is where the work of the Institute of Electrical and Electronics Engineers (IEEE), which has developed a Global Initiative on Ethics of Autonomous and Intelligent Systems has shown leadership. They have developed these eight topic areas to cover how AI is created, trained, and maintained. The document is free to download and offers much more technical detail about ensuring these goals are met.

1. Human Rights
2. Well-being
3. Data Agency
4. Effectiveness
5. Transparency
6. Accountability
7. Awareness of Misuse
8. Competence

By exploring and adhering to this ethical standard, robust solutions will be developed that are less risky for patients and physicians in clinical settings.

Conclusion

Family practice physicians continue to face considerable challenges to provide the best care possible with growing emphasis on complex documentation and pressure to keep financial viability, while experiencing symptoms of professional burnout. Automation is a tool that can provide direct benefits to physicians as part of their day-to-day clinical practice by providing easy to interpret patient assessments that make interactions more about the physician/patient experience, rather than a frustrating search for information and documentation nightmare.

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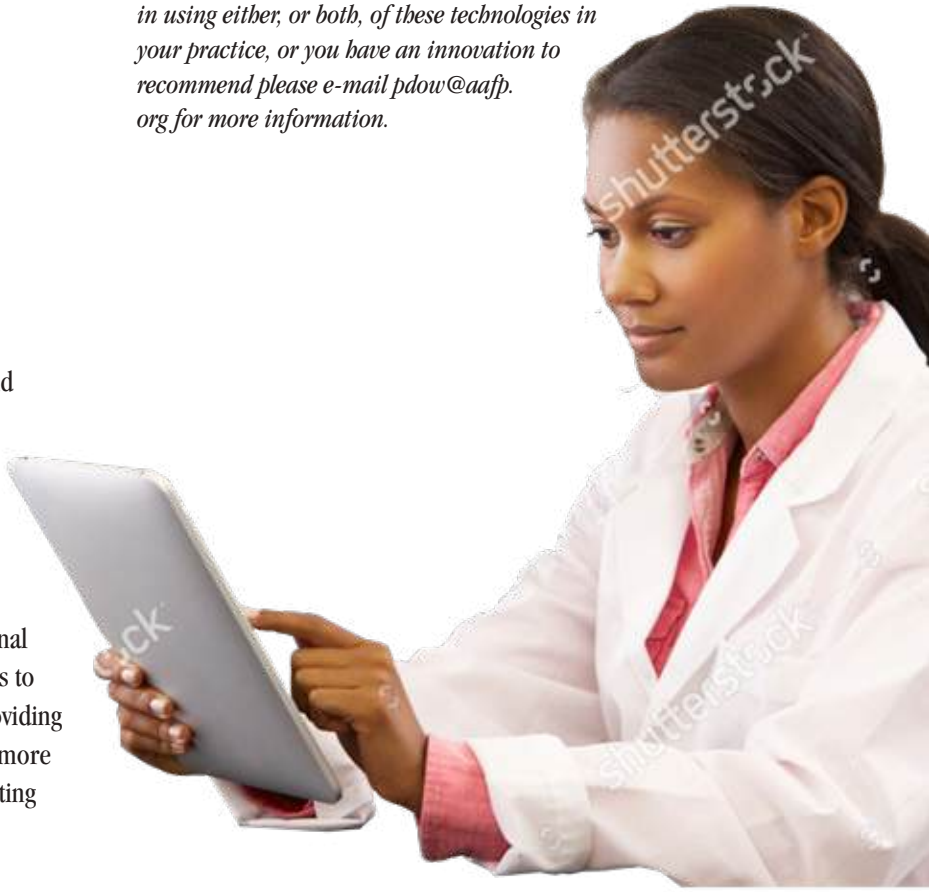

Upcoming Events 2021

January 21-24
Winter Weekend, Saratoga Springs – Virtual

February 28
Winter Cluster, Renaissance Albany

March 1
Lobby Day, Renaissance Albany and Capitol

May 22-23
Congress of Delegates, Desmond Hotel, Albany

For updates or registration information for these events go to www.nysafp.org

COVID-19 Vaccine Candidates:
The Latest Evidence and How to Counsel Our Patients

By Emily Baumert, MD

The topic of COVID-19 vaccination is rapidly evolving, and although the information in this article is current at the time of this writing, information may have changed since the publication date.

Since the genomic sequence of SARS-CoV-2 was identified and shared with the international research community in January 2020, there has been a global effort to produce a COVID-19 vaccine. We are now a year into the COVID-19 pandemic and, with few evidence-based treatments, the virus continues to rage across the United States. However, an effective vaccine is now available to a small subset of the population. Our patients are now faced with the decision to accept or forgo a COVID-19 vaccine. We must acknowledge that a vaccine has never been produced with this speed. Furthermore, never before have we had so many simultaneous attempts to develop a vaccine.

In the meantime, we are deluged with news about the candidate vaccines. There are currently 19 vaccines undergoing phase 3 trials. However, there is a dearth of published literature required to fully analyze the results we see in press releases. We can only base our judgements and recommendations on the information we have available. How do family doctors, many dealing with COVID-19 outbreaks in their own communities, make sense of the evidence? In this article, the current evidence for the vaccine candidates furthest along in the FDA approval process are reviewed in an effort to help fellow family physicians better counsel the increasing number of patients who want to discuss the risks and benefits of a COVID-19 vaccine.

There are multiple types of COVID-19 vaccine candidates, which include inactivated vaccines, nucleic acid vaccines, and adenovirus-based vector vaccines.[1] Inactivated vaccines, like most traditional vaccines, are composed of virus inactivated by physical or chemical means.[2] There are currently four inactivated vaccines in phase three trials, including Sinovac's aluminum hydroxide adjuvanted inactivated vaccine, Coronavac. Aluminum hydroxide has been used in previous vaccines as an adjuvant with demonstrated efficacy and safety.[3] Sinovac's vaccine has been approved for use in China even though there are no efficacy results from phase 3 trials done in Brazil, Indonesia and Turkey. Recently, the phase 3 trial in Brazil was suspended for two days by the Brazilian government due to a participant death. However, there are concerns that the suspension was politically motivated, as the death is being investigated as a suicide, rather than as a result of the vaccine.[4]

Nucleic acid vaccines are made with mRNA which is delivered into the cells and transcribed into antigenic protein by the cell itself. The mRNA is then quickly broken down by the cell and does not enter the nucleus. Making vaccines from mRNA is a new process, and there are currently no other mRNA vaccines on the market. The Moderna and Pfizer/BioNTech's vaccines are both mRNA vaccines. Although many mRNA vaccines for influenza, HIV-1, and Zika are in clinical trials, the COVID-19 vaccine is the first mRNA vaccine to undergo large scale human trials.[5] Vaccines made with mRNA are attractive candidates because of their high potency, ability for rapid development, and cost-efficient production.[6]

The mRNA fragment used in both the Pfizer/BioNTech and Moderna vaccines codes for the spike (S) protein of SARS-CoV-2, which allows for ACE2 receptor binding and membrane fusion.[6] Pre-existing research on the SARS and MERS virus' S-protein and its stabilization in the prefusion form allowed scientists a head start on creating an mRNA vaccine targeting this protein.[6]

Adenovirus-based vector vaccines are composed of viral genetic material encapsulated in an adenovirus vector. The COVID-19 adenovirus vaccine uses genetic material encoding the S-protein of the SARS-CoV-2 virus encapsulated in an adenovirus. A disadvantage of this type of

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vaccine is that the recipient may already be immune to the adenovirus. Immunity to the adenovirus has been shown to reduce the number of neutralizing antibodies formed in human trials.[7] The phase two trial of China-based CanSino's Adenovirus-type-5 vector vaccine showed that people who had high-immunity to adenovirus produced only half the amount of SARS-CoV-2 spike protein antibodies relative to people without immunity to adenovirus.[8] University of Oxford/AstraZeneca has tried to circumvent this problem by using an adenovirus that infects chimpanzees as a vector, as humans will not have pre-existing immunity.

Three COVID-19 vaccines will likely be available to the general public by the end of 2020 or early 2021: Pfizer/BioNTech's BNT162b1, Moderna's mRNA-1273 and University of Oxford/AstraZeneca's Chimpanzee Adenovirus ChAdOx1. Data from the safety and efficacy trials of these vaccines have trickled out through press releases, publications from safety and efficacy trials, and FDA approval documents. In late November, both Pfizer/BioNTech and Moderna released phase three trial interim results of their mRNA vaccine candidates showing 95% and 94.5% efficacy, respectively, at preventing COVID-19 disease.[9] Efficacy in these trials refers to the relative risk reduction or hazard ratio of contracting COVID-19 disease.

FDA granted emergency use authorization to Pfizer/BioNTech's and Moderna's COVID-19 mRNA vaccines on December 11th and 18th, 2020, respectively. Full data from the Pfizer/BioNTech phase three trial have been released in a New England Journal of Medicine article. For both Pfizer/BioNTech and Moderna's phase three trials, the primary endpoint was symptomatic COVID-19 infection, so there is no current evidence whether or not these vaccines prevent asymptomatic spread. Four serious adverse effects occurred in participants receiving Pfizer/BioNTech's BNT162b1 including shoulder injury related to vaccine administration, right axillary lymphadenopathy, paroxysmal ventricular arrhythmia, and right leg paresthesia.[10] The most common adverse effects of the Moderna vaccine included injection site pain (91.6%), fatigue (68.5%), headache (63.0%), muscle pain (59.6%), joint pain (44.8%), and chills (43.4%).[11] The rate of serious adverse events in the Moderna trial was similar between vaccine and placebo groups, with a rate of 1% per group. Myocardial infarction (0.03%), cholecystitis (0.02%), and nephrolithiasis (0.02%) occurred at numerically higher rates in the vaccine group, but the small numbers of these events did not suggest a causal relationship.[11] As a secondary endpoint, Moderna's vaccine has shown a decrease in risk of severe COVID-19 disease with 100% efficacy.[11] Severe COVID-19 disease was defined as the presence of clinical signs at rest indicative of severe systemic illness, respiratory failure or ARDS, evidence of shock, organ dysfunction, ICU admission or death.[11]

Interim results of AstraZeneca's Chimpanzee adenovirus trial of over 11,000 participants receiving either the ChAdOx1, MenACWY, or saline were recently released. Two different dosing regimens were included in the trials due to a subset of patients inadvertently receiving an initial lower dose. Overall vaccine efficacy was 70.4%. Interestingly, vaccine efficacy was higher in the cohort of patients receiving an initial low dose followed by a higher standard dose (90.0%) compared to the efficacy in the cohort receiving two standard doses (62.1%).[12] This trial included an evaluation of efficacy against asymptomatic infection, which was 58.9% in the low-dose/standard-dose group and 3.8% in the two standard dose group.[13] There were a total of 175 serious adverse events, with three possibly related to the intervention. These events include transverse myelitis occurring fourteen days after vaccine administration, hemolytic anemia in a control recipient, and a fever >40C in a patient masked to group allocation.[13]

When recommending an intervention based on a research study, an important factor to consider is whether the research subjects compare to your patient population. Pfizer/BioNTech's phase three trial initially included 30,000 participants, but another 13,000 were added to increase the diversity of participants, such that a 30% are from 'racially and ethnically diverse backgrounds'.[13] This includes 26.2% Hispanic, 9.8% Black/African American, 4.4% Asian and 0.8% Native American or Native Hawaiian/Pacific Islander.[14] Importantly, results from both Pfizer/BioNTech and Moderna have shown no difference in efficacy of the vaccine across a wide variety of demographics including race, ethnicity, age, sex and history of conditions such as obesity and diabetes.[13] Moderna's United States phase three trial consisting of 30,000 individuals included over 7,000 individuals over the age of 65, over 5,000 adults under 65 with co-morbidities such as diabetes, severe obesity and cardiac disease, and over 11,000 individuals from communities of color.[15] However,

only 3,000 participants identified as Black or African American. The Black and African American participants included in the trial, about 10% of the total participant pool, underrepresents the percentage of Black and African Americans in the United States burdened with COVID-19 (15%).[16] University of Oxford/AstraZeneca's interim results included 87.8% participants 18-55 years old, only 4% of participants over 70 years old and 82.7% white participants.[12]

Overall, studies of the three vaccines likely to be available by the end of 2020 and early 2021 show incredibly promising efficacy and safety results. As family physicians, we have a unique opportunity to be the experts that our patients look to when making medical decisions. As with any intervention, our recommendations must be informed by our patients' demographics, risk factors and medical histories. Discussions should always be shared decision-making processes that factor in the patients' values, goals, and beliefs. Lastly, prepare to answer the question, "Doc, did you get the vaccine?"

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When Life Gives You a Pandemic, Get Dynamic!

By Jasdeep Singh Bajwa, DO and Jingnan Bu, MD

In the 2018-2019 academic year, more than 140,500 medical residents and fellows were enrolled in an Accreditation Council for Graduate Medical Education (ACGME) training program. This group makes up roughly 15% of active physicians in the United States.[4] Medical education is fundamental to the training of residents and demands constant reform and innovation. Residency and fellowship programs have traditionally trained physicians through hands-on clinical experience and didactic teaching. This includes seeing patients at the bedside and discussing teaching points with the medical team, which can consist of an attending, residents, medical students and other members of the comprehensive care team. The COVID-19 pandemic changed the educational experience by disrupting many in-person exchanges. In light of social distancing and increased patient care demands, established teaching and learning opportunities as well as didactic conferences, largely evaporated.[4]

The COVID-19 pandemic has catalyzed an evolution of digital interfaces moving from the margins to the mainstream of medical education.[3] With such rapid change, however, uncertainty is expected. Finding creative ways to deliver educational material and provide virtual interactions that foster the growth of trainees is a critical step in this change. A hybrid model of remote and in-person videoconferencing allows for engaging, yet socially distanced interactions. For instance, a morning report may be live streamed to a broader audience of residents, faculty, and fellows. A small group of in-person resident attendees will present a case and lead the discussion. An in-person faculty moderator will monitor questions submitted online. Virtual meetings also allow residents a greater selection of meetings to attend. For example, one can join a pediatric or internal medicine morning report, or grand rounds at other affiliated hospitals. Audience participation is critical, as many presenters rely on audience response to bridge knowledge gaps, which can be challenging, particularly for those who may be using conferencing software for the first time. Finally, there remains a population of faculty who may be uncomfortable or more reticent to adopt virtual

Table 1. Strategies and Tips to Optimize Virtual Medical Education[4]

- Adjust your camera to the eye level and find a quiet area
- Encourage learners to connect to both audio and video
- To minimize background noise, mute participants and encourage them to unmute as needed
- If hosting a video conferencing session, start the session a few minutes early
- Enable the "waiting room" as needed and admit participants once the speaker is ready
- Orient learners to all different options to interact (e.g., chat, nonverbal feedback, unmute)
- Schedule faculty development or orientation sessions for educators to review use of software before teaching sessions
- Place the chat window in a visible location on the screen while teaching, or designate a chat moderator to consolidate and verbalize questions
- Set up an "ice breaker" poll and introduce participants to software features
- Consider the use of standardized patients via videoconferencing platforms
- If internet connectivity is poor, consider assigning a cohost to ensure that the meeting remains active
- In a setting like "grand rounds," consider unmuting all participants at the end of a session to allow for applause
- If shared more publicly, adjust security settings (e.g., limit chat, unmuting) to avoid disruptions
- For recurring sessions with the same group, consider using one recurrent meeting link

educational platforms. Motivated learners and educators will be tasked with providing technological support for those less savvy to overcome these barriers.[4] Faculty development geared toward these technologies may be required to effectively use virtual platforms to best address learners' needs, implement learning objectives, and deliver educational content.[4] *Table 1* (page 34) identifies tips for using a virtual educational platform.

A growing trend in residency programs is to employ a flipped classroom model and other interactive learning formats. In contrast to a traditional learning model, where a learner's first exposure to educational topics is during a lecture, the flipped classroom model gives learners independence in the first exposure on their own. Subsequently, a cohort of learners is brought together to apply and analyze content at a higher level.[9] This promotes peer-to-peer teaching and these transitions have led to more flexible and effortful learning. Podcasts and downloadable audio files, are tools that can be used in learner-centered education and are increasingly popular in residency training. A majority of these podcasts can be found on Apple Podcast, Spotify, Pandora, YouTube Apps, or streamed on a personal electronic device. Depending on the speciality, 35% to 88% of residents report listening to medically relevant podcasts.[1] Many family medicine residents like to listen to "The Curbsiders" which hosts a large number of relevant outpatient topics as well as "The Clinical Problem Solvers" which has recently gained some interest. Podcasts are portable and accessible anytime, which means trainees can listen at work, at home, or while driving or exercising. Trainees benefit from learning at their own pace and in their own environment, rather than being restrained in a classroom. Additionally, these audio files allow listeners to accelerate, playback, or pause, which allows time to process and further research topics of their interest, and they can also skip topics they find familiar or less relevant.[1] Most podcasts are also shorter than traditional lectures which better serves the attention span of the average adult learner.[1]

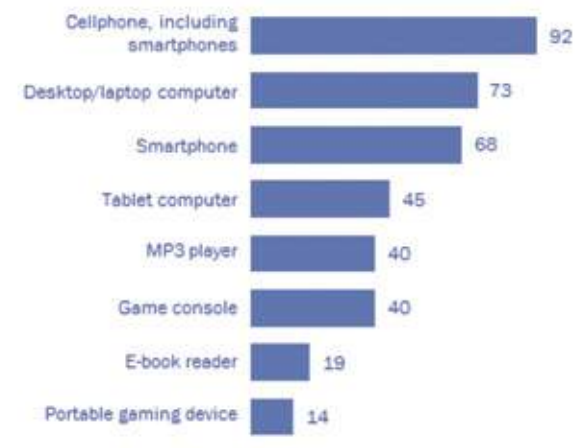
Many podcasts feature a wide variety of medical topics and invite experts and other world-renowned individuals to discuss topics within their domain. The format of these podcast typically includes expert interviews as well as discussions among multiple hosts. This facilitates a sharing of thought processes in addition to factual knowledge.[1] Most importantly, this promotes an environment that is conversational casual, and friendly. The atmosphere is driven by friendly banter, humor and personality.[1] Listeners feel a sense of connection with the hosts, which makes sense when one takes into account the sociocultural learning theory, whereby social roles and norms are important modulators of learning.[1] Additionally, the use of multiple modalities (i.e., a combination of text, visuals, and audio) to strengthen retention of new knowledge is another great feature of many podcasts.[3] This is done by supplementing their audio content with written show notes, infographics, and instructional videos on their websites. Popularity is further amplified by promoting these supplementary materials on social media platforms.[3]

Faculty and residents are faced with many competing demands on their time, including the need to stay current with literature. The COVID-19 pandemic has forced medical educators to move their backdrop from the whiteboard to digital platforms like social media. The internet allows for point of care access to current and relevant information. For this reason, many providers turn to Twitter as a means to stay up to date.[2] Twitter allows for instant posts and exchanges, or "tweets" that can be readily shared, or "retweeted." However, before discussing Twitter as a medical resource, it is important to discuss why it is convenient and becoming increasingly popular among young and seasoned physicians alike. Today, 68% of U.S. adults have a smartphone, up from 35% in 2011.[6] As illustrated in *Figures 1* and *2*, cellphones and smartphones are among the most commonly owned devices.[6]

Figure 1

Cellphones, Computers Are the Most Commonly Owned Devices

% of U.S. adults who own each of the following devices



Source: Pew Research Center survey conducted March 17-April 12, 2015. Smartphone data based on Pew Research survey conducted June 10-July 12, 2015.

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Figure 2

MP3, Computer Ownership Has Dropped Among Younger Adults Since 2010

% of U.S. adults ages 18-29 who own the following devices

	2010	2011	2012	2013	2014	2015
Cellphone	96	95	93	97	98	98
Computer	88	88	89	-	-	78
MP3 player	75	71	-	62	-	51
Game console	62	-	-	71	-	56
Smartphone	-	52	65	79	85	86
Tablet computer	5	13	32	36	48	50
E-book reader	5	8	27	24	28	18

Source: Pew Research Center surveys conducted 2000-15. Dashes represent years when these questions were not asked.

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https://www.pewresearch.org/internet/2015/10/29/technology-device-ownership-2015/

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Considering the majority of adults in the U.S have access to a smartphone, Twitter is easily accessible. A survey conducted in 2011 found that roughly 61% of physicians explore Twitter on a weekly basis for medical information.[7] However, many physicians remain wary of social media's potential benefits in their clinical practice. Twitter can be an important educational channel which connects learners and medical educators. "#Medtwitter" is the medical community on Twitter which features cases, articles and tutorials ("Tweetorials"), and has provided medical students and residents with opportunities to tweet questions and difficult cases to nationally recognized clinicians.[3] Medical journals often host Twitter chats where participants can discuss clinical topics with their peers and post questions and answers that have the potential to reach thousands of followers, in comparison to a few tens or hundreds of attendees confined within the walls of a classroom.[3]

Medtwitter use in this unprecedented era has increased exponentially and new information about the SARS-CoV-2 virus and resultant pandemic is being gathered and disseminated at a lightning-fast pace. The medical education community rallied to expand the existing educational value of this platform as traditional face-to-face learning modalities, such as resident didactics and grand rounds, were disbanded.[8] The benefit of Medtwitter during the current pandemic also must be tempered with words of caution. Although new information is rapidly available, enthusiasm to use tweeted information must be balanced with avoiding the spread of false or misinformation, and critically appraising the validity of the source of tweeted information.[8] That being said, the open format of Twitter can facilitate fact checking between learners, medical educators, peers and readers. See *Figure 3* below as an example of fact checking.[8]

Sometimes, crises accelerate the inevitable. The COVID-19 pandemic has catalyzed nascent trends in medical education and motivated medical educators to increase their digital skills to keep serving learners who long ago shifted to the digital space for their own self-study.[3] Abrupt changes to educational practices can be exciting for some faculty but challenging for others. Medical educators may benefit from faculty development programs and informal support networks that reinforce the development of new skills.[3] In this uncertain COVID-19 era, we can be certain that medical education will likely never be the same. When used optimally, virtual tools can be used by both learners and educators to achieve the shared goal of providing effective and efficient medical education to train our next generation of physicians, despite their inherent limitations.[4] We eagerly anticipate continued innovation as the medical community embraces the benefits of this virtual videoconferencing, medical podcasts and increased utilization of Twitter.

Figure 3 – A fact-checking exchange between an internal medicine resident and two faculty experts. Note the supportive, professional tone and dialogue that supports a growth mindset and a culture of safety.[8]

Endnotes

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The Electronic Medical Record
Evaluated as a Learning Tool

By Rachel Bian, MD; Dawn Pruett, MD and Elizabeth Loomis, MD

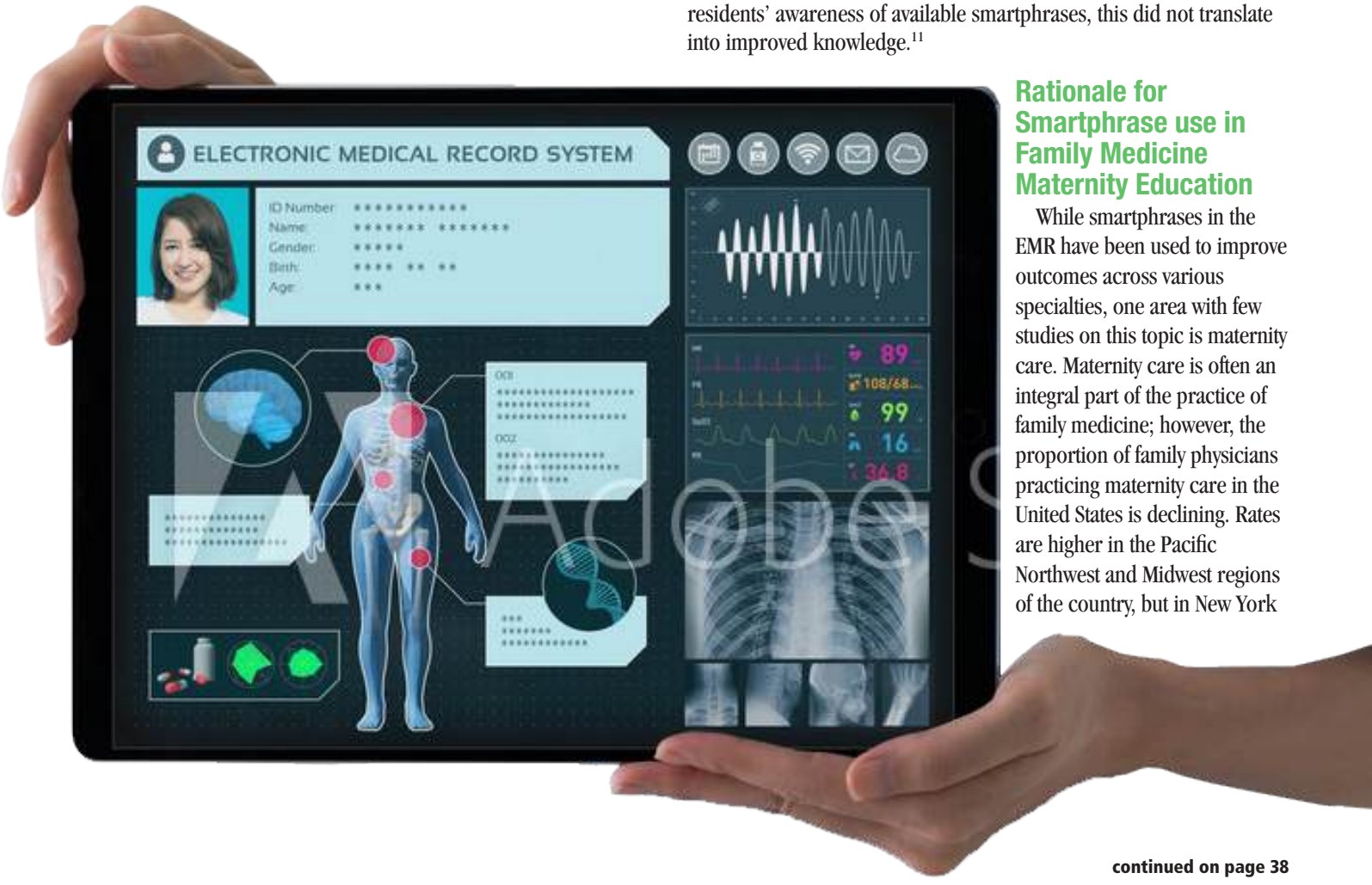
Background

Can we transform the electronic medical record (EMR) into a useful part of medical education? Unintended negative consequences of the EMR have already been demonstrated in small pilot studies. These studies showed diminished note quality due to copy forward functions,[1] decreased time spent with patients,[2] and decreased involvement in patient care for medical students due to restricted EMR use.[3]

Even with these issues, the EMR can be an effective way to communicate within a patient's record, and smartphrases are a frequently used component of the EMR. Smartphrases and other EMR note templates are blocks of text that can be inserted into the patient electronic medical record in areas such as note sections, problem lists, and inter-office or patient communications. They may include text variables that can be selected by the author and/or provide standardized text to document procedure notes, exam findings, and treatment plans. In some instances, they can even be used to pull data from elsewhere within a patient's chart. In addition, a clinician group can summarize its synthesis of available data and guidelines and use smartphrases to communicate its consensus opinion about standards of care.

Several studies done using smartphrases within the EMR have examined their ability to improve patient outcomes. Use of smartphrases led to improved monitoring of thyroid stimulating hormone and complete blood counts in pediatric patients with Trisomy 21.[4] The insertion of smartphrases in patient charts also increased provider documentation and standardized opioid prescribing in oncological practice.[5] Palliative care driven initiatives used smartphrases to better guide and document goals of care discussions with patients and families.[6,7] Standardized documentation around epilepsy improved data recording[8] and improved continuous renal replacement dosing in dialysis patients.[9] These examples show many of the benefits of smartphrase use within the EMR.

Despite these successes, little research has been done on how smartphrases could be used as an educational tool. One study required medical residents to use a discharge checklist in the EMR and, while it found increased confidence and efficiency in discharging patients, it did not assess the effect on medical knowledge.[10] Another study conducted with residents evaluated the use of smartphrases as teaching tools to improve knowledge surrounding integrative medicine topics. While use of the smartphrases in this study increased residents' awareness of available smartphrases, this did not translate into improved knowledge.[11]



Rationale for Smartphrase use in Family Medicine Maternity Education

While smartphrases in the EMR have been used to improve outcomes across various specialties, one area with few studies on this topic is maternity care. Maternity care is often an integral part of the practice of family medicine; however, the proportion of family physicians practicing maternity care in the United States is declining. Rates are higher in the Pacific Northwest and Midwest regions of the country, but in New York

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state, 8-13% of family physicians were practicing maternity care as of 2010.[12] This is compared to 23% of all family physicians ten years prior.[13] Factors that seem to increase the likelihood of graduating residents deciding to practice maternity care include high volume obstetrical training during residency, geographic region in the United States, and presence of a maternity care fellowship.[14] Several programs have, by changing their educational curriculum, been able to increase the proportion of their graduates who go on to incorporate maternity care in their practices.[15] Supporting family medicine physicians in their care of prenatal patients through evolving technology is important to maintain this critical role.

Quality Improvement (QI) Project

At the University of Rochester Family Medicine Residency Program, we have many resources to train our residents in maternity care. Our clinic sees over 200 pregnant patients per year, we work closely with our obstetrical colleagues, and we have a maternal-child health fellowship. While our obstetrical training is well developed, our residents have expressed a desire for more support around managing patients with complicated pregnancies. To address this need, we developed an EMR-based tool using smartphrases to outline patient care guidelines for managing various pregnancy-related risk factors (Figure 1). Our initial goal with this tool was to increase awareness across our practice of the standards of care for managing various prenatal conditions. We also sought to boost our residency training around prenatal care, with the ultimate hope to increase the proportion of our own graduates who decide to practice maternity care.

Project Design:

1. *Assessment:* We identified 15 pregnancy-related risk factor topics, such as gestational hypertension, gestational diabetes, and hypothyroidism. We assessed resident knowledge of management of these topics, as well as resident use of the EMR during prenatal visits.
2. *Design:* We used the American College of Obstetricians and Gynecologists (ACOG) and local maternal-fetal medicine guidelines to develop smartphrases that outlined management guidelines through-out a patient's prenatal course for each of these 15 risk factors.
3. *Implementation:* We disseminated the smartphrases to residents and faculty. We encouraged residents to use the smartphrases to communicate management plans within the EMR to each provider that saw the patients throughout the pregnancy course.
4. *Analysis:* We re-assessed resident knowledge and use of the intervention 8 months after the smartphrases were distributed.

Project Outcomes:

Our analysis of the project showed positive outcomes of using an EMR-based tool to support the care of high-risk pregnant patients. Eight months after implementation, residents reported that they are now using the EMR as a primary source of information for management of various pregnancy-related risk factors. Residents found that the smartphrases helped with their clinic workflow and made it easier to discuss treatment plans with patients within the clinical encounter. Our follow up survey also demonstrated improvements in resident knowledge of the standard of care for management of various risk factors.

Discussion

This QI project demonstrates the ability of the EMR smart phrase tool to provide up-to-date relevant clinical information for patient care, available literally at the clinician's fingertips. At the beginning of the EMR revolution, there was initially great promise that the EMR could provide medical professionals with real-time decision support tools to assist in patient care.[16] However, in practice, development of embedded decision support tools often requires complex high-level programming on an EMR systems-level, and may be rolled out infrequently, such as only during periodic system-wide EMR updates. The effort required for development of these tools may necessitate that they have high-impact across a medical system, rather than tailored to a clinic or specific department's needs. Many decision support tools include alerts or pop-up windows, which can lead to alert fatigue and clinicians inappropriately overriding the message.[17] For these reasons, commonly used clinical decision support tools may have limited versatility; whereas smartphrases developed at the department level can be more individualized with immediate impact.

While not directly studied in our QI project, better adherence to guidelines could lead to improvements in patient outcomes. Clinical practice guidelines are intended to consistently promote evidence-based medicine and improve quality of care, but are not always followed by clinicians. Reasons for non-adherence by clinicians are variable, but include clinician factors of lack of awareness, time pressure, and information overload; and concerns about the guidelines themselves including that they may be out of date or that guidelines from several different groups are in conflict with each other.[18] The smartphrase should be "owned" by an individual or core group of clinicians tasked with scheduled periodic revisions, rather than the templates copied to individual clinicians' smart phrase libraries. This allows edited, up-to-date versions to automatically appear when the smart phrase is accessed.

The scope of family physicians' practice can be daunting at times. While a broad scope of practice is cited by medical students as a reason they are drawn to the specialty of family medicine,[19] there exist knowledge gaps in primary care even for common medical conditions.[20] Readily available, up-to-date guidelines in EMR smartphrases could close these gaps, similar to how this QI project improved resident's knowledge and flow of clinical encounters for prenatal patients.

Future Directions

The applicability of this simple intervention can have broad implications. Especially in rural and underserved areas, primary care physicians are called upon to provide increasingly specialized care in order to improve accessibility for patients who are unable to see specialists, whether due to physical, geographic, or insurance limitations. Examples of specialized care that falls under a family physician's purview include Hepatitis C treatment, medication-assisted treatment for opioid use disorder, pre-exposure prophylaxis (PrEP) for HIV, and others. As with all care that family physicians provide, it is critical that high-quality, up-to-date recommendations are followed. While it is possible that smartphrases are already being utilized in these areas to assist clinicians in diagnosis and treatment options, the literature is lacking. Dissemination of examples and further research about its effectiveness could help improve access and patient care to vulnerable populations.

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Figure 1: Prenatal Smartphrases

Gestational Hypertension
– order baseline HELLP labs + urine spot + 24 hr urine protein, u pon diagnosis
– weekly NST starting at 32 weeks
– US for fetal growth and AFI at time of diagnosis and every 4 weeks afterward
– IOL if not delivered at 39 weeks

Chronic Hypertension
– order baseline HELLP labs + urine spot + 24 hr urine protein
– ASA 81 starting at 12-16 weeks (does not help if initiated after 28 weeks)
– monthly US to assess fetal growth starting at 28 weeks if on meds
– weekly NST starting at 32 weeks if on meds
– IOL if not delivered at 40 weeks if not on meds, at 39 weeks if on meds

A1 Gestational Diabetes Mellitus
– order baseline HELLP labs + urine spot + 24 hr urine protein
– order referral to diabetes education
– goal BGs: fasting <95, 1 hr postprandial <140, 2 hr postprandial <120
– monitor postpartum for development of diabetes

A2 Gestational Diabetes Mellitus
– order baseline HELLP labs + urine spot + 24 hr urine protein
– order referral to diabetes education
– goal BGs: fasting <95, 1 hr postprandial <140, 2 hr postprandial <120
– US at 36 weeks for fetal growth
– weekly NSTs starting at 32 weeks
– induction if not delivered by 39 weeks
– monitor postpartum for development of diabetes

Chronic Diabetes Mellitus
– order baseline HELLP labs + urine spot + 24 hr urine protein
– order referral to diabetes education
– refer to MFM if A1c >9
– goal BGs: fasting <95, 1 hr postprandial <140, 2 hr postprandial <120
– daily 81 mg ASA starting at 12-16 weeks to reduce the risk of preeclampsia (does not help if initiated after 28 weeks)
– fetal echo at 18-20 weeks gestation
– monthly US to assess fetal growth starting at 28 weeks
– NSTs 1-2x/week (depending on glycemic control) starting at 32 weeks
– induction if not delivered by 39 weeks

Hypothyroidism
– TSH at diagnosis of pregnancy and at least once each trimester (more frequently if uncontrolled)
– target TSH 0.1-2.5 in the first trimester, 0.2-3.0 in 2nd trimester, 0.3-3.0 in 3rd trimester
– for h/o thyroidectomy or ablation, consider empiric thyroid hormone supplement dose adjustment of +30% at time of pregnancy diagnosis
– return to pre-pregnancy dosing in the immediate postpartum period

History of Genital Herpes
– Valtrex 500mg BID starting at 36 weeks for prophylaxis
– evaluate for active lesions with SSE at time of admission to determine route of delivery

History of Spontaneous Preterm Delivery
– referral to MFM
– weekly Makena injections from 16-36 weeks (no benefit if start after 24 weeks)
– order serial OB US (transvaginal, specifically asking for "cervical length") every 2 weeks between 16-26 weeks
– if h/o preterm birth <34 weeks and short cervical length (<25mm): cerclage per MFM

History of Preeclampsia
– order baseline HELLP labs + urine spot + 24 hr urine protein
– 81 mg daily ASA starting at 12-16 weeks (no benefit if started after 28 weeks)

Pre-pregnancy BMI over 40
– order baseline HELLP labs + urine spot + 24 hr urine protein
– A1c in OB1 labwork. If normal, early GTT at 16-20 weeks. If normal, then repeat at 24-28 weeks
– US for growth every 4 weeks starting at 28 weeks
– NST weekly starting at 37 weeks
– induction if not delivered at 40 weeks

Advanced Maternal Age
– if >35 yo: refer to reproductive genetics for counseling and testing
– if over 40 yo: weekly NST starting at 37 weeks + IOL if not delivered by 40 weeks

Depression
– PHQ9 each trimester
– consider refer to perinatal consultation clinic if have questions about medications in pregnancy

Post-Dates Pregnancy
– US for growth and AFI, with NST, at 40-41 weeks

History of Intrauterine Fetal Demise
– consult MFM
– weekly NST starting at 32 weeks
– induction at 39 weeks if not delivered

Reasons to start aspirin at 12-16 weeks for preeclampsia prophylaxis
– 1 of the following risk factors: h/o preE, renal disease, autoimmune disease, multifetal gestation, chronic DM, cHTN
– 2+ of the following risk factors: primip, AMA, BMI >30, family history of preE, sociodemographics

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Problem Lists:
A Data Management Tool

By David M. Newman, MD, FAAFP and Shan Dhanda, MD

Introduction

Patient care requires organizing and integrating a large amount of data; the key to managing that data is the problem list. "The problem list is a physician's mental model of a patient's health status."[1]

Whether one is in a solo office or part of a large enterprise, family physicians see patients for myriad issues from all body systems. The severity and relevance of these problems changes over time and we cannot remember it all. The problem list can help us identify the factors that are needed for the ongoing care of the patient.[2] It should be a comprehensive overview of the patient to use for future care.[3]

Not only is the problem list vital at the time of each interaction with the patient, it is increasingly a factor in communication between doctors and other staff collaborating in the care of complex patients, as well as between the doctor and the patient. Furthermore, the problem list "has expanded from a simple table of contents … to a core business process on which decision support tools, registries, and reporting systems depend."[4]

In order to fulfill its mandate, the problem list must be accurate, precise, and contain information that is useful to the person caring for the patient. If it is too long and complex, details will be hard to find or the list will not be consulted; if too brief, it risks missing important information.

To engage the patient in their own care, most patient portals provide patient access to the problem list. The use of jargon and abbreviations interfere with the patient's understanding of their status and this should be minimized. For similar reasons, the wording and content of the problem list should avoid stigma while retaining precision. These aspects will be discussed below.

To summarize, a problem list should be a shared, ongoing, concise, and collaborative tool with input from a multitude of entities, including the patient.[5]

There is currently no single national standard for the content or structure of the problem list.[5] To improve the value and efficiency of this communication it is essential that we come to a consensus on the structure and use of the problem list. Based on our extensive use of multiple electronic medical records (EMRs) in a variety of settings, we present a proposal to begin forming that consensus for the outpatient primary care setting. Most of the examples we cite come from recent experience or discussions with colleagues.

Regulatory

The problem list was first popularized by Weed in 1968 as part of his call for a Problem Oriented Medical Record.[6] In 2009 a current accurate problem list was mandated as part of the "meaningful use" of an electronic medical record.[7]

Most billing functions require that diagnoses be submitted in ICD-10 (International Classification of Disease, 10th Revision) format while the federal Meaningful Use program specifies SNOMED (Systematic NOmenclature of MEDicine) format for problem lists. The former is a multi-character alpha-numeric designation; the latter is all-numeric. The two map imperfectly to each other.

Many EMRs will allow the user to alter the verbal description attached to the code for individual patients. Most will allow the list to be ordered by priority. All have some way to specify start date, end date, and make comments.

Efficiency

The billing functions of the EMR usually link to the problem list. "Having an updated problem list has saved me time when ordering prescriptions and laboratory tests. If the problem is already entered correctly in the chart, I can easily link it to the orders without having to re-enter it."[8]

Maintenance

Maintaining the problem list is an on-going challenge as it needs to reflect the current reality of the patient. Some problems will be resolved, some will be added, and some will need to be updated as more information becomes available or the patient changes. (Examples include the "Right upper lobe lung mass" that becomes "Small-cell carcinoma of the right upper lobe" and "Diabetes" that becomes "Diabetes with nephropathy.")

Solo or single-specialty practices have a relatively straightforward path to deciding how to manage the problem list, a task that becomes much more complicated for multi-specialty or enterprise practices that share the same chart. Because the family physician is the coordinator of care for the patient and touches all aspects of the patient, it most often falls to the family physician to curate the problem list.

Some providers feel a reluctance to change, update, or resolve a diagnosis that was added by another provider, similar to how one may view changing a medication prescribed by someone else. As we see it, the problem list is the shared responsibility of users. No single entity owns the problem list or any individual problem on it.

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Past Medical and Surgical History

The past medical history section of the chart should not be a recapitulation of the problem list but rather should record past (resolved) problems that are important to note but are not needed for the on-going care of the patient. Some examples:

- A hospitalization for pneumonia or diverticulitis goes on the past medical history when resolved.
- History of appendectomy belongs on the surgical history not the problem list.
- History of hemicolectomy can be on either, but not both.
- History of mastectomy is past surgical history while breast cancer is a problem for at least 10 years after remission is achieved.
- History of gastric bypass will remain relevant for the rest of the patient's life and should be on the chronic problem list.
- Hepatitis C should move from the problem list to the past medical history when the viral load is no longer detectable 1 year after completion of treatment.

Chronic Versus Acute Problems

Chronic on-going problems belong on the problem list; acute problems, defined as those which one expects to be resolved before the next visit, should not go on the list; other transient complaints should be removed from the list when symptoms are no longer present and can be added to the past medical history. Examples include healed lacerations and healed fractures.

One way to identify these are problems labeled "acute" or "acute-on-chronic."

Acute problems become relevant when they become recurrent. For example, a single episode of cystitis is acute, a third episode in a year defines a chronic urinary infection.[9]

Specialists Versus Generalists

Problem lists are often seen differently by generalists and specialty providers;[10] primary care providers (PCPs) tend to have more accurate lists than those of specialists.[10] Specialists often view problem lists as too broad, with the majority of information irrelevant to their field of expertise. Perhaps this is why many specialists prefer not to use the problem list, instead using the first part of their notes to review all of the history pertinent to their specialty.[10]

Conversely, the family physician may view a specialist's diagnosis as inconsequential to the care they provide. An example would be the cardiologist and family physician both finding the dermatologist's problem of seborrheic keratosis irrelevant to their future care of the patient and the dermatologist does not find "left ventricular hypertrophy" pertinent to their practice. Until EMR users can filter the problem list to their own unique view, this remains unresolved, but we believe that problems that are meaningful *only* to one specialty should not be included. For examples, see Table 1.

Table 1

Include	Omit
Macular Degeneration	Seborrheic Keratoses
Hydronephrosis	Coronal Hypospadias
History of Shoulder Replacement	Class III Acromion
Edentulous	Amalgam tooth #6
Illiterate	

Input from specialists can, however, improve the specificity and detail of diagnoses. For example, a primary care provider will record "chronic headache," while the consulting neurologist may diagnose "migraine headache with aura." Similarly, "left shoulder pain" entered by a PCP could be further specified by orthopedics as "incomplete rotator cuff tear or rupture of left shoulder, not specified as traumatic."

Accuracy

The problem list should be accurate. That means that the items on the problem list should pertain to the patient, be applicable to current and future care, and avoid unnecessary duplication.

It is common for problem lists to omit pertinent diagnoses.[10] In one study 59% of patients with coronary artery disease had it on their problem list and only 62% of patients with A1c greater than 7 had diabetes noted.[10] These factors are important for evaluating current medications and the status of the patient.

The opposite issue is problems that do not pertain to the patient. For example, a patient with steroid-induced hyperglycemia will be labeled, incorrectly, as having diabetes or a patient seen for chest pain has myocardial infarction entered on the problem list despite that having been ruled out. Inaccurate diagnosis can lead to inappropriate care and should be removed.

When no longer under active treatment the problem should be recorded as "history of" rather than implying that the issue is still present.[13] For example "history of breast cancer" should be on the list when the patient is no longer being treated for their cancer; "history of knee replacement" replaces "knee replacement" or "osteoarthritis of knee" after the post-operative period. Many would assign these diagnoses lower priority so they go to the bottom of the list.

Diagnoses should be kept accurate and reflect current guidelines. When the definition of vitamin D deficiency went from < 30 ng/ml to < 20 ng/ml, those patients with vitamin D levels between 20 and 30 should have had the problem removed from their list.

Some diagnoses remain controversial. With the various definitions of hypertension from different specialty societies, who gets labeled with "hypertension" or "pre-hypertension" may be debatable.

Precision

Descriptions should be as precise as possible. For example, either "heart failure with reduced ejection fraction" or "systolic heart failure" is preferred over "congestive heart failure unspecified." Recurrent cystitis is different than recurrent pyelonephritis and neither should be recorded as "recurrent UTI."

Even accurate diagnoses can be misleading. We recently saw a patient where a colostomy was recorded as a "colo-cutaneous fistula" – not entirely wrong but creating much confusion because of the failure to distinguish between a pathologic condition and a therapeutic one.

Lack of precision is also a source of duplication. "Bipolar" includes "depression" so the latter is a duplicate. Emphysema or chronic bronchitis or COPD – pick one and only one. The problem list does not need hepatitis C infection and hepatitis C carrier state and hepatitis C antibody positive - only the most precise should be used.

Patient Interaction with the Problem List

As noted above, patients frequently have access to their problem lists. The person entering items on the list should be facilitating the patient's understanding of their conditions; this requires clear descriptions. Jargon should be minimized. For example, the ICD description "DM II without ongoing long term use of insulin without complication (CMS HCC code)" will mean little to the patient while the same condition can be rendered simply as "diabetes" without a loss of precision. Another example is that "idiopathic chronic gout of multiple sites without tophus" can be renamed to "gout."

Patients do not always agree with our descriptions and may challenge us. They frequently give different priorities to their problems than we do.[10] We will need to consider those priorities as we curate the list.

As a colleague said, "Problem lists that become bloated with resolved acute problems or symptoms can cause patients to think they are sicker than they actually are. Adding modifiers such as well-controlled or at goal can conversely encourage patients to focus on health rather than disease."[8]

To minimize conflict with the patient the problem list should avoid stigmatizing diagnoses when possible. For example, we feel that BMI of 55 kg/m2 is accurate and avoids the stigma of "morbid obesity." In addition to avoiding stigma, the use of BMI as a problem also provides a numerical measurement for improvement when viewed by the patient.

Problems that do not Belong on the List

The problem list is for items that will influence future care. "Encounter for," and "screening" diagnoses should never go on the problem list. Well visit codes should likewise be omitted.

Conclusion

Accurate and precise problem lists provide a snapshot for the rapid assessment and on-going care of the patient. They are also used for communication with other members of the team and with the patient. We propose herein a set of principles as a start toward a consensus definition of the structure of the problem list in primary care. Implementation of these suggestions will require education of everyone who contributes to the problem list.

Endnotes

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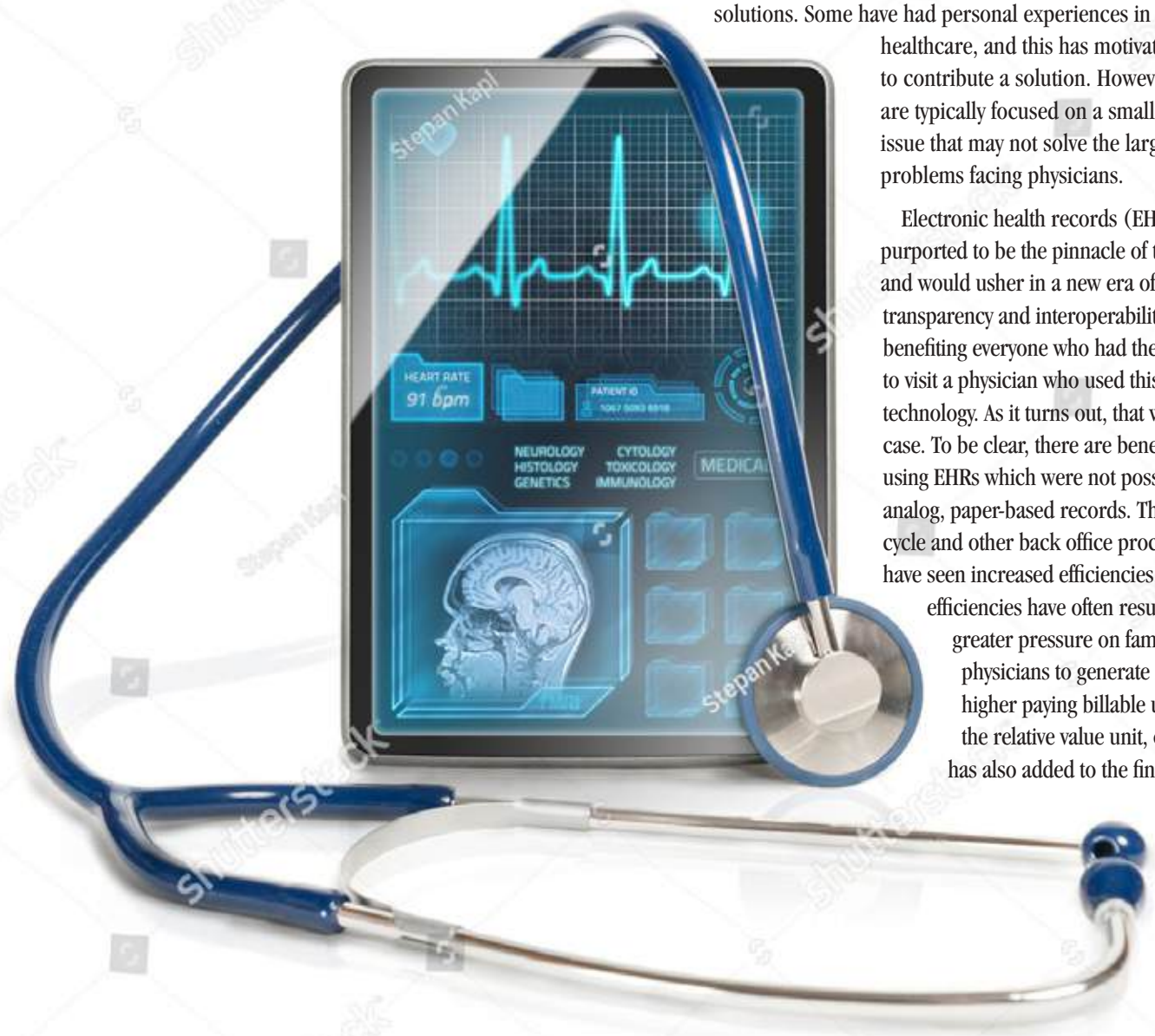
Practical Tips for Implementing
Automation in your Family Practice Clinic

By Paul Dow, MS

The American Academy of Family Physicians understands the pressure to find an efficient solution, without wasting money or time, is immense. Our Innovation Lab offers insights into the processes of identifying, installing, and optimizing a technical solution that a clinician should consider when selecting a tool to solve a problem. These real-world experiences can be valuable to physicians to determine if a specific solution is a good match for their workflows in a low-risk way. Is the vendor offering an EHR compatible product, that does not introduce more frustration into the care episode, at a reasonable price? This article will provide a description of the challenges faced in the clinical world as well as providing some guiding principles for assessing if an addition to your practice is the best choice or whether the issue may be a flaw in the practice itself that needs attention.

Introduction to the Problem, Innovation

Technology is now a permanent part of health care delivery. With each passing year new hardware and software tools are created for physicians to help improve the quality of healthcare. Many of these are useful and do contribute to more efficiently diagnosing and treating patients. However, these tools are frequently developed without a substantial amount of feedback from the end user and added to an existing clinical workflow that was not modified to suit the new technology. To address these challenges, the AAFP has created an Innovation Lab to help members assess the usefulness of tools in a real-world setting. These pilot programs also help attract startups and technology vendors who might not have previously considered developing solutions for family medicine physicians. Many developers are genuinely interested in workable solutions. Some have had personal experiences in healthcare, and this has motivated them to contribute a solution. However, many are typically focused on a small, specific issue that may not solve the large problems facing physicians.



Electronic health records (EHR) were purported to be the pinnacle of technology and would usher in a new era of data transparency and interoperability, benefiting everyone who had the good luck to visit a physician who used this technology. As it turns out, that was not the case. To be clear, there are benefits to using EHRs which were not possible with analog, paper-based records. The billing cycle and other back office procedures have seen increased efficiencies. But, these efficiencies have often resulted in greater pressure on family physicians to generate more and higher paying billable units while the relative value unit, or RVU, has also added to the financial

quantification of care delivery. This is one of many factors that has led to the increased demand for clinicians to treat a greater number of patients. The hamster wheel of medicine began to spin more quickly and increased the levels of burnout. Adding to this challenge was the EHR. Clinical documentation has become the bane of existence for so many physicians. Pajama time, so called due to the necessity to continue working late into the evening at home, became a staple as the work began to pile up due to inefficient EHR design. Much of their development was a patchwork of modules that didn't contribute to a smooth workflow from the physician perspective. As the systems grew in complexity, the physician became the interface to fix the shortcomings by working harder to document effectively.

An example of this from the consumer world was the Amazon Dash button. This web-connected device was used to quickly order a frequently used product with the press of a button. It was a device that tried to solve a problem like ordering toilet paper or laundry detergent and make the process frictionless. Just press the button. Your credit card is charged, and it's shipped to your home address. The challenges that came about included where do you store the button, how is an accidental activation handled? As it turns out, ordering from the smartphone app or the web site was just as easy and had fewer errors. The Amazon Dash button program was eventually discontinued.

How Could I Use Automation in My Practice?

The goal of many of these tools is to address the ever-increasing workload of family practice physicians but how quickly can these tools be integrated into a practice? Let's create an example that might be instructive. After attending the AAFP Family Medicine Experience annual meeting and visiting the Office of the Future in the expo hall you learn about a company that offers a virtual digital assistant. On the show floor it sounds like a miracle that will solve documentation and chart review problems immediately. Would it really be as effective when your away from the bright light and sales promises? Can a technology solution designed for the middle-of-the-road clinician be effective for all clinicians? What would it take to convince a less enthusiastic partner to adopt a new technology?

Sample Practice

MD	Years post res	Adopter Category	Avg # Pts Seen/Day	Maslach Burnout Inventory Levels	Most Advanced Personal Technology
1	21	Late Majority	20	Moderate	Touch screen in 2017 model SUV
2	15	Laggard	15	High	2016-era smart phone
3	7	Early Majority	22	Moderate	Uses Password management software for all websites
4	7	Innovator	19	Moderate	Orders newest flagship smart phones each year

You represent an independent practice in Binghamton, New York. Four MDs, each see between 15 to 22 patients per day. The pressure of running an effective practice has been building for a while. The senior partners have seen some turnover as the positive working conditions at other sites have drawn the attention of physicians and pulled them away. The technology for your practice is a patchwork dominated by a mid-tier EHR that has some flexibility but doesn't really make anyone's life easier. It was the right price for most of the functionality that was needed. The back-office software has been reliable, but the original company no longer exists, and transitioning to a newer version is expensive, but not cost prohibitive. The disruption to the clinic workflow is the greater risk. The goal for attending FMX is finding a cost-effective solution that helps increase clinical effectiveness, while decreasing cognitive burden and also decreasing the symptoms of professional burnout. How can a practice find the right tools to balance these concepts? This is where the AAFP can bring value by sharing experiences between clinicians with the Innovation Lab.

Innovation Journey for a Practice

FMX Day Zero – Doctor Four attends the AAFP's annual FMX meeting and observes two demos for virtual digital assistants in the Office of the Future. Suki, offers voice interactions with an EHR to streamline documentation. Each vendor discusses the overview of the product and the goals to reduce documentation burden as well as reduce the symptoms of burnout. The other solution, Navina, uses artificial intelligence to create a one-page patient summary from data within the EHR. After a conversation with the sales associates, the site seems like a promising candidate for a successful integration of this technology with their practice. The vendors both state they have done several integrations with the brand of mid-tier EHR.

FMX + 14 Days – Doctor Four shares their findings from FMX about the products during a scheduled meeting of the practice leadership. There is some hesitation from the other partners due to the empty promises from other technology vendors, but they are intrigued by the idea of better pre-visit planning. The feelings of burnout have made them less trusting without a more in-depth evaluation.

FMX + 35 Days – Navina schedules a virtual demo with the practice and includes referrals and experiences from other clinicians. The other physicians in the group are unsure but their burnout symptoms are getting worse and would be open to taking part in a short-term pilot through the AAFP's Innovation Lab. The low financial risk for the partners makes the offer more intriguing.

FMX + 45 Days – The practice agrees to take part in the Innovation Lab for 30 days at no charge. Doctor One and Doctor Three are very interested and ask numerous questions. Doctor Two will need several rounds of convincing and may be the control group for the pilot. Forcing someone who does not believe in the technology to participate can lead

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to disaster. Navina begins arranging the paperwork and includes discussion with the practice's technical staff, the EHR vendor, and the AAFP. Before the product is installed, select staff are interviewed to document the status of the practice before the solution use begins.

FMX + 58 Days – The EHR vendor and Navina have completed their assessments and have begun integration. Clinicians and staff are trained on the new tools and new workflows are developed with input from previous users. Adjustments may need to be made during the pilot to adapt to situations unique to the practice.

FMX + 65 Days – The first day of the pilot. The solution is working as designed.

FMX + 74 Days – All of the stakeholders meet for a virtual discussion regarding how the tool is working, what is proving to be a continuing challenge, and what needs to be adjusted for optimal usage. By now the physicians involved in the pilot are getting a sense about whether the tool is providing value. Is it delivering as promised? Conversations in the practice should be occurring about the continuation of the pilot period if it suits the goals of the practice.

FMX + 95 Days – The pilot is complete. The technology has delivered on its value premise and has improved the quality of life for the practice. Some physicians have seen better results than others, but overall, they decide to continue using the product. The holdout, Doctor Two, begins to see the benefits for the other partners and begins to consider the idea of using this tool. The partners are able to help guide and offer insights from their recent experiences. As an added benefit, AAFP Innovation Lab has negotiated a lower cost for members and the vendor has agreed to add another month of free usage.

FMX + 110 Days – The AAFP conducts a post pilot interview and assesses the lessons learned by the clinical staff as well as Navina's experience and develops a white paper to share with the larger membership. Overall, the product did deliver on the value proposition and improved the quality of work life for the practice.

Questions to Consider

Bringing new technology to a practice is a complex, but manageable task. Here is a list of questions that may be helpful to ask as you consider implementing a new tool.

1. *Will this tool solve the problem(s) we have?* Some problems in a practice cannot be solved with software. There are clinic challenges that need to be addressed with a direct conversation, or an honest assessment of a professional skill set. In those cases, new tools will not provide value.
2. *How does the technology work?* Many technical advances require new complex technology. Sometimes these advances come from a proprietary solution, however it should still be explainable. If you are unsure how these tools work, ask questions until you are satisfied with the answer. As a paying customer it's within scope to understand how the patient's data is being accessed, reviewed, and processed. Good tools are interpretable at a level that can be understood by clinicians. A recent example of a kind of magical technological thinking is the Theranos lab kit. It was never explainable how a few drops of blood could replicate the success of a gold-standard lab draw. As it turns out, there was no way that experts could validate the system and it was eventually found to be fraudulent.
3. *What do we do if the technology doesn't work?* Hopefully, this will be unlikely as there are many steps in the process to discover flaws in a system. From the perspective of a practice there are legal agreements to spell out the details for responsibilities in this situation. To find the cause will require more exploration to determine the exact nature of the failure. Was it the solution? Did the workflow conflict with the recommended method to optimize the product? If the problem is a deeper, systemic issue within the practice there might not be much that can be done. In that case ending the pilot would be the most useful step.

Conclusion

Clinical technology has advanced to levels that are suitable for day-to-day use. The American Academy of Family Physicians has developed an Innovation Lab to help physicians sort through potential vendors and test products in a real-world setting in a low-risk way that benefits other members by sharing the lessons learned from the pilot program. If you are interested in learning about the companies involved with the Innovation Lab, Suki or Navina, or you have a recommendation for a solution please contact Paul Dow at pdow@aafp.org for further discussion.

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- Representation at the AAFP
- Representation of the local county chapters at the NYSAFP Congress of Delegates
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- Sponsorship of students and residents to Academy meetings (Winter Weekend, Regional Family Medicine) and the Congress of Delegates
- Cultivation of the next generation of family physicians by offering scholarships and awards to pre-medical students, medical students, and residents to participate in family medicine conferences and programs
- Support of residents and new physicians in development of leadership skills and practice opportunities

AAFP Member Services: http://www.aafp.org/online/en/home/membership/resources.html

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- A list of the AAFP "Member Advantage"
- Additional Partnerships: http://www.nysafp.org/index/resources-6/partner-programs-106.html
- Jobs Board