



350 BC



603 AD



1206 AD



1529 AD



1731 AD



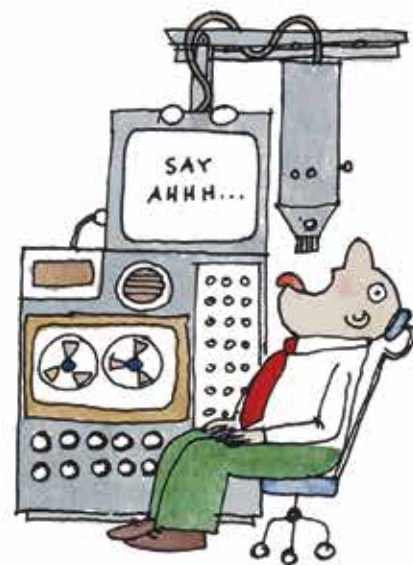
1867 AD



1901 AD



1973 AD



FUTURE

The electronic health record



Are we the tools of our tools?

K. Patrick Ober, MD, FACP, and William B. Applegate, MD, MACP

Dr. Ober (AQA, Wake Forest University, 1995) is professor of Internal Medicine, the former Associate Dean for Education, and is the AQA councilor at Wake Forest University School of Medicine. Dr. Applegate (AQA, University of Louisville, 1971) is professor of Internal Medicine and former Dean of Wake Forest University School of Medicine, and chair emeritus of the American College of Physicians Board of Regents.

But lo! Men have become the tools of their tools.¹

—Henry David Thoreau

Electronic Health Records (EHRs) hold promise for transforming the health care system in remarkable ways by creating new efficiencies as well as possible cost reduction and quality enhancements. Unfortunately, innovations such as EHR that have the potential for ushering in great change have also historically had unintended consequences,

and—as we have seen with new drugs and new devices—the most important unforeseen problems frequently come to light during “post-marketing surveillance.” Once they are used widely, the benefits of new medications and devices rarely live up to their original hype, while newly encountered risks and side effects often exceed expectations. This seems to be the state of EHR today. When a novel drug or a new device or a paradigm-shifting process shows unanticipated negative effects in the early stages of widespread adoption, careful study of the scope, severity, and implications of the undesirable actions is required. We confirm that the harmful effects of EHR use on patient care and medical education have been significant and are ongoing, but we also propose that future harm can be reduced if we change the way we use the system, and soon.

When our academic medical center adopted a newer, more complex EHR system in the fall of 2012, we encountered many of the same problems reported by other health care institutions. Outcries arose almost immediately. Patients, staff, and physicians were frustrated by the inefficiencies and delays in a system that had not been fine-tuned to deal with the normal flow of patient care. Essential tasks such as ordering tests,

Illustrations by Jim M'Guinness

The electronic health record

retrieving test results, and writing prescriptions required more time than previously and sometimes were impossible to complete. Clinic efficiency slowed dramatically, and significant glitches in the billing process led to a drastic fall in collections.²

At first, physician complaints were aimed at the technical, mechanical, and logistical challenges of navigating through a clinic visit and completing all of the required documentation, while maintaining a high quality of patient care. The new system did not make patient care easier; instead it added extra time requirements on physicians while subtracting from the time available for patients. This appears to be a common experience of doctors who use EHRs. A study of emergency room doctors in a community hospital in Pennsylvania revealed that putting information into the computer consumed more of their time than any other activity. Using a “click” of the computer mouse as the standard of measure, a doctor needed to make six clicks of the mouse to order an aspirin tablet, eight clicks to get a chest x-ray, fifteen clicks to provide a patient with one prescription, and forty clicks to document the examination of a hand and wrist injury. Over forty percent of a typical emergency room shift was devoted to entering data into the computer; a ten-hour shift might require almost 4,000 clicks of the computer mouse.³

Even so, initially, an open-minded attitude prevailed among physicians and staff at our center. Perhaps it was just a matter of learning a new system? It was a newer technology, and maybe we just needed more practice and experience. Everyone had heard of the potential for better health care, greater efficiency, lower costs, and fewer errors. Like it or not, all realized, the era of the EHR was here to stay, and so the wise physician committed himself to mastering it. As technical problems came up the programmers worked hard to patch them.

But the practice and experience and fixes didn't seem to change anything. Disquietude grew.

Over time, the optimism for a technical resolution of the system's defects was gradually replaced by a growing and pervasive feeling that the root of the distress went beyond mechanical processes. Something was profoundly wrong, and it became increasingly apparent that the shortcomings of the system were deeper than technical flaws that could be remedied by technical attention. Whatever it was, the cause of dismay seemed to be something essential and elemental.

The problem

Then, during an e-mail discussion of problems related to the EHR, one of our residents succinctly explained the real problem to us:⁴

It had less to do with the machines than the rest of us were assuming, he ventured.

It had everything to do with people.

The core problem with our electronic medical record

system, he told us, was not electronic. It was organic.

What had always been considered to be the most immutable aspect of medicine was under assault. The patient was no longer the most important thing in the examining room. The machine, rather than the patient, had become the center of the doctor's focus. “I can remember my first encounter with one of my clinic patients using Epic,” our house officer observed. “It was possibly one of the lowest times of my residency. Armed with this Rolls Royce of EHRs, I felt miles away from my patient.”

The frustration extended beyond what the technology brought to the examining room; the resident's exasperation came from what had been taken away from his role as physician. The doctor-patient interaction was being warped and distorted; the underlying basis of patient-centered health care had been sacrificed on the altar of computer-centered health care. In his e-mail, our resident summarized the origin of his annoyance: “Still can't seem to get past the urge to just toss the computer aside and actually talk to people when I see them.”

Our resident, in his wisdom, pointed out that our disgruntlement with the EHR was not simply a product of imperfect software or an error-laden code that was hurriedly being patched. The distress was seated much deeper. It was visceral. It arose from the medical profession witnessing an undermining of what has always been the soul of medicine, the doctor-patient relationship.

In the meantime, the programmers continued hard at work creating more templates and encouraging more “smart phrases,” as though the ability to type a single word that would balloon up into a full boilerplate paragraph on the computer screen would be the solution, if only enough of them could be created. Instead, the shortcuts were the problem. “The more bells and whistles these things have,” our resident pointed out, “the harder it seems to be to actually find the patient amongst the sea of ‘phrases’ or ‘presentations’ in the medical record.”

What did he say?

“Find the patient.”

Of course!

Isn't that the very core, the real essence, of what a doctor does? We have taught the process to our first-year students for as long as any of us can remember. Listen to the patient's story, ask some questions, and listen some more. Find the patient, find the problem, find out how the problem affects the patient, seek the cause, talk about options, and help the patient find the best answer. But it always starts with





finding the story within the patient (and then finding the patient within the story). Drs. Rita Charon⁵ and Danielle Ofri⁶ and a multitude of other physician-writers have taught us that we will never find the patient until we find the story. But it is the story itself, the necessary starting place, that has been eliminated from today's EHR with its prefabricated homogeneous scripts and standardized templates.

This dissonance between physician-think and programmer-think is exaggerated on the computer screen. The subtle places in the history where the patient is most likely to be found by the physician are unknown to the non-physician programmer, and so are devalued in the EHR. For instance, descriptors of types of pain, in their standardization, are reduced to click boxes in the EHR, as though there is nothing further unique or noteworthy to be noted about the pain of the patient in the room. Each of the clicks contributes to the formula for "meaningful use," and with enough clicks comes the cynical generation of higher levels of billing, all at the price of bypassing a true understanding of the patient.

Our thoughtful young colleague quickly recognized the tragedy. "With family history and social history just another box in the meaningful use checklist," wrote our resident, "it seems like we've found a way to 'protocolize' even the art of getting to know our patients."

EHR and residency education

As we considered our resident's comments, we began to ponder the impact of the EHR on the education of our young physicians. In our national and local discussions on the role of the EHR, have we overlooked its impact on the future generation of physicians now in training? Has the EHR created incongruity between what we teach our students from the first year of medical school on, and how medicine is now being practiced in our clinics and on our wards? If so, what should change: the values we have traditionally championed to our students and residents, if those values have now become incompatible with their future as users of the EHR? Or something else?

In his e-mail, our resident cited the spectrum of damages inflicted by the new EHR: "Education; rapport; compassion; bedside clinical reasoning; the physical exam; all seem to take a back seat in the current system."

All of these are essential to the development of a physician. The patient record has traditionally played an irreplaceable role in assessing and developing clinical reasoning skills. Each patient is unique, and the medical record has allowed us as teachers to see how our young colleagues incorporate that uniqueness into the care of the patient. Historically, reading the written note of a resident (or any physician) has been a rich source of information showing what she knows and understands about her patient, her differential diagnosis skills, and her ability to consolidate information and to demonstrate clinical reasoning. Dr. Deborah Nelson at the University

of Tennessee-Memphis explains the educational scope of the clinical note. "Writing notes is a means of documenting history-taking and exam skills and the thought process that culminates in an assessment, differential diagnosis, and a plan of evaluation and treatment," she states.

"Writing the daily progress note is an important training tool by which residents experience and internalize the cognitive processes that constitute medical reasoning and analysis, and it is a means for a learner to demonstrate the development of these skills."⁷ The note is crucial to documenting the *context* and *implications* of each visit and of each episode of care.

And that is where the EHR has become a problem. Dr. Robert Wachter, chair of the American Board of Internal Medicine and professor of Medicine and chief of the Division of Hospital Medicine at the University of California, San Francisco, describes the challenges he now encounters in the EHR era as he supervises residents on an inpatient clinical service: "One really doesn't 'write a note' anymore; rather one charts on each of the patient's problems, one by one." This creates a string of verbiage that "outwardly appears to be the patient's progress note." But, Wachter observes, "It's not really a note, it's a series of problems (each accompanied by a brief assessment and plan) held together with electronic Steri-Strips."⁸

With the carry-forward option of the EHR that duplicates a prior note, it is not easy to see any semblance of a reasoning process after the original note was crafted, and the copy-and-paste process even makes it hard to identify the original author of a note, or the date of origin. The same note can appear day after day with minimal alteration beyond the addition of a new set of laboratory results, even when the patient's status changes dramatically.

The result of this word-shifting from day to day is predictable. The note becomes a snowball rolling down a snowy incline, becoming more massive by the day. The patient is lost in voluminous data with amazingly little evidence of any effort to synthesize or prioritize it. The noise-to-signal ratio is immense. The implications are frightening. "When I was on clinical service in July and read the notes written by our interns and residents," Wachter reports, "I often had no idea whether the patient was getting better or worse, whether our plan was or was not working, whether we need to rethink our whole approach or stay the course."⁸

Our experience has been the same. It is almost hopeless to try to follow the progress of a patient's care through

The electronic health record

EHR-templated notes, and it is virtually impossible to analyze any given resident or student's reasoning process. The strings of inpatient or outpatient notes rarely contain any perspective on the patient's overall health status and implications for future care. Verbal team communication on rounds can fill in many of the gaps, but it is the written record that trumps everything else, and the written record as delivered by current EHR is a dismal failure. EHRs are tools that may be able to count the number of times an event takes place, but not whether the event even needed to take place, and assessment of the quality of underlying reasoning around the plan for complex care is all but impossible.

In addition, the EHR appears to be reshaping behaviors in undesirable ways. As we observe the activities of our trainees throughout the day, they often appear to have been converted into "electronic processors" whose focus is on completing the mechanics required of each encounter, and maximizing their efficiency by minimizing the time spent with the patient. Our residents often resemble air traffic controllers, focusing more on the logistics of arrivals and departures than on understanding the patient's journey. As physicians trained in an earlier era, we considered the time spent in documentation as secondary to the actual patient encounter. Now the completion of the note is the primary goal.

Our observations are not unique to our medical center. A time motion study of internal medicine house officers in Baltimore in January 2012 revealed that interns spent twelve percent of their time in direct patient care and forty percent of their time in front of computers. On average, medical interns interacted with each patient for 7.7 minutes.⁹

Can a doctor-patient relationship be developed in less than eight minutes of daily interaction?

We wonder and worry about the message we are sending to our residents and to our students—and ultimately to ourselves—about the focal point of patient care. Both of us have observed that our younger physicians seem increasingly drawn to the computer at the expense of the patient interaction, consistent with the observations from Baltimore.

On rounds, we find our house staff fixating on the computer as they order more diagnostic tests or radiographs to diagnose congestive heart failure or stroke—instead of simply examining the patient. Are our younger and more technologically oriented colleagues aware of both the benefits and the costs of new technology?

Are we aware?

And the disruptive influence of the EHR is not just a problem that happens in residency training, or a dilemma unique to internal medicine, or a frustration limited to practice in academic medical centers. A recent survey showed that emergency room physicians in a community hospital spend forty-three percent

of their time doing computer data entry (not counting the twelve percent they spend reviewing records and test results, the traditional role of a medical record), far overshadowing the twenty-eight percent of their time devoted to direct patient contact.²

The core of the problem

The inherent design of the EHR is the real culprit. Information technology designers are apparently under the impression that patient care and computer programming utilize identical reasoning processes, and that, once identified, each patient with dementia or diabetes is the same as all the others. In the point-and-click world of EHR orientation sessions, the trainers of physicians actively discourage the actual writing of words and sentences to describe nuances and report individual variations. The EHR is designed to be a tool for creating sameness out of individuality. Each alteration to make the EHR more useful for the billing office diminishes its value to the medical profession that depends upon it for patient care. Attentiveness to the nuances of communication is an essential attribute of a skilled physician; in its quest for medical standardization, the EHR discourages nuances and promotes functional medical illiteracy.

Dr. James Cimino explained these concerns in an article in *JAMA* in 2013. The routine use of check boxes and various shortcuts encourages the "rapid inclusion of standard phrases and even boilerplate paragraphs," he writes, but these methods come with the liabilities of diminishing any likelihood "for capturing the complex concepts related to patient conditions and decision making." The injudicious insertion of previously recorded data into the new note not only adds to the substantial problem of "note bloat," but it contributes immensely to "inclusion of irrelevant or even erroneous information."¹⁰

Dr. Faith Fitzgerald wrote a cautionary paper in the *Annals of Internal Medicine* of 1999, prescient in its insight.⁹ She reported the story of a student standing at the bedside of a patient who possessed two intact legs as he presented his patient's history of bilateral below-the-knee amputations. An incredulous Dr. Fitzgerald asked the student how he had come to such a conclusion in the presence of two obvious legs. He reported, "It said so in the chart." A chart review confirmed that "BKA times two" had indeed been reported on three prior admissions and copied by the student. Due to a transcriptionist's error, a history of two episodes of diabetic ketoacidosis ("DKA times two") became bilateral amputations, and the error "became enshrined chart lore," even in the presence of overwhelming information to the contrary. "Technology is wonderful and seductive, but when seen as more real than the person to whom it is applied, it may also suppress curiosity," Fitzgerald noted. "For whatever reason—economics, efficiency, increased demands on physicians for documentation, technology, or the separation of education from patient care—curiosity in physicians is at risk." This was in 1999, in the era





of paper records when errors had to be transcribed one at a time in long hand with opportunities for double-checking and possible correction, and prior to

the era of the EHR and its copy-forward and cut-and-paste functions that allow mistakes to “go viral” at the speed of light. The drive for “efficiency,” in which patients are seen as “work units,” Fitzgerald warned us in 1999, suppresses curiosity about the patient—such curiosity is essential to active thinking and quality care.

It is this “drive for efficiency” that keeps us from connecting with our patients.

Focus on the patient: Does it matter?

Our resident noted the loss of connection with his patient as he was obliged, first and foremost, to attend to the needs of the “visit navigator” on the computer screen; the needs of his patient were secondary.

In 2012 Dr. Elizabeth Toll explained in *JAMA* the importance of undivided physician attentiveness to the patient as an essential doctoring skill. “When a physician focuses on a patient with complete attention, this simple act of caring creates a connection between two human beings,” she explained. “Almost immediately, the patient begins to [feel well cared for], and this becomes a first step toward helping that person feel better.” The benefit is bilateral, as the connection between people is “one of the great satisfactions of our profession.” This connectivity has a critical place in this age of physician burnout and early retirement. It is a deterrent to cynicism and anger, she notes. “It makes us feel needed, and generous, and reinforces our sense of ourselves as healers, thereby restoring us and preparing us to give again.” It has a higher function, too, that goes beyond benefit to the doctor. “It also happens to be what patients want from their physicians. This human connection has always been a central tenet of the patient-doctor relationship and that mysterious process called healing.”¹²

That all sounds right and feels right, but is it so? Dr. Arnold Relman was as qualified as anyone to provide us with the answer. Dr. Relman, who served as editor-in-chief of the *New England Journal of Medicine* for many years, was a physician with six decades of experience and an insightful observer of health care delivery. He confirmed the observations made by others on the impact of the EHR on patient care when he required treatment for a severe injury. His time as a patient included both ICU hospitalization and rehabilitative care, and

he saw what the rest of us are seeing: “Doctors now spend more time with their computers than at the bedside.” The extensive focus on the computer appeared to be a factor in the puzzling behavior of his doctors at the rehabilitation hospital, as “neither physician seemed to be actually in charge of my care, or spent much time at my bedside beyond what was required for a cursory physical exam.” It was not as though they were lazy, but they clearly had shifted their focus of attention, Dr. Relman observed. They spent little time with him, but “they did, however, leave lengthy notes in the computerized record.” On further investigation, though, he found little useful information in the notes, which mostly seemed to be “full of repetitious boilerplate language and lab data.” As he reviewed the progress notes that ostensibly described his own medical status, Dr. Relman found they had one overwhelming shortcoming: he could read the notes, but he could not find any accurate representation of his medical condition, much less any part of himself as a person, within the words. Anything that might have been of any importance was missing, and—most tragically to a distinguished physician, communicator, and teacher—he found his medical record to be “lacking in coherent descriptions of my medical progress, or my complaints and state of mind.”¹³

And then we remember our resident’s lament: “The more bells and whistles these things have, the harder it seems to be to actually find the patient.”

The medical profession is at a critical crossroad. We suspect that Dr. Relman and our resident would agree with Dr. Elizabeth Toll’s warning for all of us: “Physicians and patients must speak loudly and clearly, with a unified voice, to address the dehumanizing trends in our profession and insist that the move toward technological reform not leave us with a nation devoid of physician healers.”¹²

Principles and solutions

EHR is here to stay. It will continue to be modified by business offices and programmers. Efficiencies may result from their efforts, but their tinkering will not make the EHR a better tool for patient-centered care. Only physicians are able to do that. It is essential that we do so.

We have a limited window of time to get it right, if we hope to preserve the traditional values of medicine.

We suggest the following as *principles*:

- The encounter time with the patient, in the hospital or examining room, belongs to the patient, not to the business office.
- During the face-to-face interaction, the patient deserves the undivided attention of the physician.
- Every patient has a story; it is incumbent upon us to listen to the story, try to understand the story, and use the medical record as the repository of that story, as we strive for patient-centered health care.

Our *recommendations* and *predictions* are the following:

- Documentation (beyond personal note-taking) of the history and exam should be restricted to a post-encounter activity (outside the clinic or hospital room), to be performed after the patient interaction has been completed. This was how medicine was practiced in the days when notes were either handwritten or dictated, when the note was written for documentation (not in anticipation) of the clinical interaction, and the medical record was in the domain of the physician and not the billing office. The EHR should not change that, but it has. A primary care doctor now focuses his gaze on the computer screen 30.7 percent of the time and on the patient 46.5 percent of the time.¹⁴ We have been heartened to see colleagues, including physicians-in-training, revert to older methods of listening to patients, interacting with patients, jotting notes on paper, re-focusing on the patient's story, and enjoying being doctors again as they collect the data they need, organize it and prioritize it, share their thinking process, and strive to record and communicate it as clearly as they can.

- There is a role for dictation. The dictation of a patient note demands that the doctor think about the content of the next sentence and the next paragraph and the conclusion, how the information fits together and how it should be woven in, and what doesn't fit, yet. Clicking boxes circumvents all of that.

- Copy-forward and cut-and-paste functions should be eliminated. Yesterday's information is not today's information, despite the impression one gets from reading many EHR entries. For the history and physical, templated paragraphs should be eliminated. Humans are unique; no two stories are ever the same. Transcribing the patient's story and exam can be a time for reflection, thinking, and gaining insights. It is a gift we give to the patient, and more: it is a duty of the physician. Cut-and-paste is coming under increasing scrutiny as a possible mechanism for fraud, up-coding, and overbilling; its days may be numbered.

- Some activities such as prescription writing, test ordering, requesting consults, printing of educational materials, or determining the interval to the next appointment are part of the physician's role, and obvious computer-driven efficiencies and accuracies may require that they be done electronically at the end of the encounter. There is a role for the computer in some components of medical care.

- The current EHR makes it impossible, on many occasions, to determine what is going on with the patient, and what the physician is thinking (or even *if* the physician is thinking). To

provide perspective and insight, a synopsis at the end of each "clicked" note should be required, called "Summary and Implications." This would greatly improve the signal-to-noise ratio in our current EHR notes. It would be useful for education. It would communicate and model clinical thinking for all of us. This usually takes care of itself when the patient note is dictated, and it will come about spontaneously with a reformation of the EHR for use in health care.

The time is here to reclaim our profession and preserve its integrity by refocusing on our patients.

The computer must become our servant, not our master.

References

1. Thoreau HD. Walden. Available at: <http://thoreau.eserver.org/walden1c.html>.
2. Craver R. Wake Forest Baptist has cost overruns, revenue loss with electronic records system. *Winston-Salem J* 2013 Apr 6.
3. Hill RG Jr., Sears LM, Melanson SW. 4000 clicks: A productivity analysis of electronic medical records in a community hospital ED. *Am J Emerg Med* 2013; 31: 1591–94.
4. Strowd R. Personal communication. 2014 Feb 4.
5. Charon R. *Narrative Medicine: Honoring the Stories of Illness*. New York: Oxford University Press; 2006.
6. Ofri D. *Medicine in Translation: Journeys with My Patients*. Boston: Beacon Press; 2010.
7. Nelson DD. Copying and pasting patient treatment notes. *Virtual Mentor* 2011; 13: 144–47.
8. Wachter R. What EMRs are doing to our notes, and our brains. 2012 Oct 11. Available at <http://www.kevinmd.com/blog/2012/10/emrs-notes-brains.html>.
9. Block L, Habicht R, Wu AW, et al. In the wake of the 2003 and 2011 duty hours regulations, how do internal medicine interns spend their time? *J Gen Intern Med* 2013; 28: 1042–47.
10. Cimino JJ. Improving the electronic health record—are clinicians getting what they wished for? *JAMA* 2013; 309: 991–92.
11. Fitzgerald F. Curiosity. *Ann Intern Med* 1999; 130: 70–72.
12. Toll E. The cost of technology. *JAMA* 2012; 307: 2497–98.
13. Relman A. On breaking one's neck. *The New York Review of Books* 2014 Feb 6. Available at <http://www.nybooks.com/articles/archives/2014/feb/06/on-breaking-ones-neck/>.
14. Montague E, Asan O. Dynamic modeling of patient and physician eye gaze to understand the effects of electronic health records on doctor-patient communication and attention. *Int J Med Inform* 2014; 83: 225–34.

Address correspondence to:

K. Patrick Ober, MD
Department of Internal Medicine
Wake Forest School of Medicine
Medical Center Boulevard
Winston-Salem, North Carolina 27157
E-mail: kpober@wakehealth.edu

