THE DOCTOR WHO WASN'T THERE

Technology, History,
and the Limits of Telehealth

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Introduction

DISRUPTING CARE, CONTINUING CARE

The early months of the pandemic hit my urgent care clinic in East Baltimore with confusion and crisis. As the map of the outbreak spread from China to Italy to everywhere, our rules and protocols for COVID-19 screening changed weekly, yet somehow still seemed to lag behind common knowledge. Testing was hard to come by, personal protective equipment even more so. There was no known treatment, no prospect of a vaccine. Soon anyone with any fever, cough, or shortness of breath was being screened outside the clinic doors and sent to the hospital—until we realized that people *without* symptoms could spread the virus as well. As clinic staff began getting ill, and we feared our community health center might become a source of community infection, we turned to a technological solution. Within a matter of weeks, all urgent care services shunted to telemedical visits, and I became a teledoctor.

Like other professionals making the shift from in-person to remote work, I appreciated both the advantages (no need to wear dress pants, more time to help my children adapt to their own remote schoolwork) and the challenges (much harder to establish rapport with new patients, new difficulties with wonky Wi-Fi). Some of my telepatients had crisp, well-framed video connections in professional-grade home offices, and could provide me with readouts from at-home blood pressure cuffs, pulse oximeters, and other remote sensors that effortlessly

transmitted clinical data across a distance. They experienced this new ability to see a doctor through their own phone or laptop, in their own domestic space, as a form of liberation. It freed them of the hassle of a drive to the clinic and an uncomfortable period in a waiting room with other sick people. But for people with more complex urgent care issues, like acute asthma exacerbations, who did not have access to these home health technologies, telemedicine posed severe constraints. Had these patients been able to walk into my clinic, I might have saved them the longer wait in the emergency department—but now all I could do was to send them right back there. Telehealth had its limits as well as its advantages, and they were not felt equally by all people.

For me, for my patients, and for the millions of others suddenly engaging in clinical practice through electronic devices, telemedicine was a new medium of care. Yet it was not new to the medical electronics and device industries, which had been lobbying for this transition for decades. A decade earlier, the US Congress had passed the Health Information Technology for Economic and Clinical Health (HITECH) Act as part of the American Recovery and Reinvestment Act of 2009, providing federal incentives to encourage the use of telemedical systems and other forms of electronic health records and wireless "smart" medical devices. Over the next five years, the global telehealth market would more than double, from $11 billion to more than $27 billion. By the end of 2016, more than 600 companies entered the private telemedicine market, with more than $4 billion in new investments in the first nine months of the year. "Telemedicine is so white hot right now it makes *Shark Tank* look like an aquarium in a dentist's office," Robert Calandra wrote in *Managed Care Magazine* in 2017, as nine out of ten healthcare executives were rolling out telehealth plans, with an anticipated $36.2 billion in value by 2020 in the United States alone.[1] Telemedicine (the direct provision of clinical care through telecommunications technologies) and telehealth (the broader use of electronic and digital media for health and healthcare) were understood by tech firms and equity investors to be lucrative,

revolutionary platforms that promised to transform the face of clinical care as we knew it. And that was before the pandemic hit.

Digging a bit deeper into the history of telehealth, one finds another set of promises connecting information technology to health equity instead of equity markets. In the mid- to late twentieth century, a series of new platforms for practicing medicine at a distance were developed with the intention of flattening disparities in access to healthcare. Early forms of remote medicine by closed-circuit television were tested in the early 1960s to link mental healthcare services over hundreds of miles of Nebraska farmland. The term "telemedicine" itself was coined in 1971 by a physician in Boston who built a microwave link connecting a remote urgent care clinic to the emergency room of Massachusetts General Hospital. Within a few years, the concept of telemedicine was picked up by the Rockefeller Foundation and the US Department of Health, Education, and Welfare as a means of reducing barriers to accessing primary healthcare. Federally funded demonstration projects for this technology of community care were set up in Harlem in New York City, on the West Side of Chicago, in rural Vermont and New Hampshire, and on American Indian reservations in Arizona. Telemedicine made a lot of promises, to a lot of people, over a lot of years. While the recent pandemic growth market for telehealth technologies yielded high returns for investors, it is far less clear whether it also increased equity in access to care.

Telemedicine has clearly helped many Americans, especially in rural counties, access care that otherwise would have been unavailable.[2] In the context of the current pandemic, telemedicine made possible care that otherwise had become too risky. But healthcare via video did not provide access equally, at least not for the patients in my care. While established, insured patients found it relatively easy to transition their care from in-person care to video visits through the portal of the electronic medical record, this was trickier for uninsured patients and those who were new to the system. Before the pandemic, anyone could walk into the community health center and be seen on a sliding-scale fee basis, without needing to show documentation of

citizenship or insurance status. During the pandemic, new electronic forms of access presented new barriers to care. Some people could not reliably connect to the video interface, and others could not connect at all. Like so many other aspects of the COVID-19 pandemic, these disparities in access to care were far from color-blind.

A bitter historical irony was at work here. The community health center where I practice in East Baltimore was established by a group of neighborhood activists in the late 1960s to set up a preferential option for primary care for the largely African American neighborhoods surrounding it. In the 1990s the clinic expanded its mission to providing a safety net of medical care for Baltimore's expanding Latino community, many of whom had no access to formal health insurance.[3] Yet in my first full month as a telepractitioner, not a single African American or Latino patient was able to successfully access the full telemedical suite in my clinic sessions. I was not the only clinician to notice this paradox. Similar challenges of equity in access to telemedicine were reported in community health centers and other primary care practices in Philadelphia, New York, and Boston. Video visits were repeatedly found to be less common in telemedical encounters among Black and Latino patients, and in households earning less than $50,000 per year.[4] Telemedicine, a technology that initially promised greater access to care to patients of color in poor urban areas, had in the crisis of the early pandemic come to serve more well-to-do, white patients who needed assistance least.

How could a technology with the potential to provide greater equity in healthcare serve instead to widen gaps between haves and have-nots? The fate of telemedicine in the COVID-19 crisis poses a fundamental problem for those who would see new information technology as a revolutionary means of providing better healthcare for all. But this story, like the story of telemedicine, long predates the pandemic. It does not start in the twenty-first century, or even in the twentieth. Indeed, a repeating cycle of promises and limitations of electronic medicine can be found well before the television was even invented. The history of healthcare information technology is full of

revolutionary promises that did not come to pass, and more mundane ones that did.

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Consider the telephone. Only a few years after Alexander Graham Bell's first demonstration in 1876, medical journals carried exuberant reports of the possible clinical applications of this experimental technology. Soon, many assumed, telephone medicine would become a new medical specialty. Doctors would listen to the hearts, lungs, or abdomens of their patients over the wires using new, telephonic stethoscopes. The problems of access to medical care in sparsely settled areas would be resolved by long-distance lines that instantly linked even the most remote rural residents to urban specialists. The democratic ideal was admirable. But not everyone had access to a telephone in 1880—or in 1900, or in 1920, or even 1940. The telephone user in all of these early narratives was invariably both middle-class and white.

Over and over again, across the twentieth century, new communications technologies promised to democratize access to healthcare. Two-way radio and other wireless devices, interactive cable and community access television (CATV), the "electronic brains" of networked mainframe computers: each of these new platforms promised a radical reformation of the healthcare landscape. Telephone medicine, radio medicine, television medicine, mainframe medicine: each suggested new pathways to improve access to care. If we have forgotten that none of them quite produced the more inclusive, more accessible system of healthcare they initially promised, we have also largely forgotten the transformations they *did* bring about.

The medium of care is never neutral. New communications technologies continuously transform the practice of healthcare, but they rarely deliver on promises of increased health equity. Nor do they tend to produce the singular acts of disruption celebrated in popular accounts that praise innovators and innovations as the driving force

of American medicine, or in the initial public offerings of tech start-ups that monetize their worth. New platforms arrive wreathed in the language of revolution: every year a parade of new devices promise a paradigm shift that will creatively disrupt or radically transform healthcare through sudden and total change.[5] Yet when electronic communications devices *do* drive change in medical practice, the changes they bring about often just as readily entrench existing power relations as overturn them.

This is a book about the history of electronic communications in American medicine, old and new.[6] It argues that the medium in which healthcare takes place—by which I mean the social as well as technical context in which sick people seek help and receive medical advice—matters a great deal. The history of media teaches us that any new means of producing, recording, transmitting, or circulating information quickly becomes an object of cultural as well as financial speculation: a new vehicle for generating possible futures.[7] The history of technology teaches us that when stories are played forward from the past rather than backward from the present, the fate of any given device can be understood as a much more open-ended affair: a speculative repository for broader hopes and fears of designers and users.[8] In the American medical system, where health policy is so deeply entwined with market speculation, the adoption of health communications technologies can carry very different stakes for manufacturers and marketers than they do for practitioners and patients.

History teaches us as much about forgetting as about remembering.[9] This paradox was already apparent within the field of medical electronics as early as 1956. In that year, standing before a group of technological enthusiasts gathered in New York to speculate about the future of this young field, Vladimir Zworykin paused to consider its recent past. The celebrated innovator of modern television asked his audience to consider how the X-ray tube, a new and experimental electronic technology at the turn of the twentieth century, had since "become so familiar that few people think of it as an electronic device."[10] In just a few decades, the new technology had become invis-

ible: not because it had become obsolete, but because it had become so useful that people had come to accept it as part of everyday life.

Zworykin, who had recently retired as vice president for research and development at the RCA Corporation to invest all of his effort into the Center for Medical Electronics at the storied Rockefeller Institute for Medical Research, was in a position to speculate further. If X-rays were electronic, and electrocardiograms (ECGs) were electronic, and electroencephalograms (EEGs) were electronic, why not patch their data, along with patient histories and physical examinations, directly into an electronic medical record that also contained all relevant data from the world's medical literature? Why couldn't the digital computer someday become as familiar a feature of medicine as the X-ray?

Just as the X-ray machine had already become a pedestrian technology by 1956, many of the technologies considered speculative in Zworykin's present—the wireless summoning of a physician by radio-pager, the long-distance evaluation of patients' bodies by radiotelemetry, remote medical encounters by closed-circuit television, or the automated evaluation of an electrocardiogram by computer algorithm—have by the early twenty-first century become everyday aspects of clinical medicine. We no longer include them when we project new visions of digital medicine into the future. Nonetheless they were, in their own time, every bit the objects of financial, cultural, and medical speculation that our smartphones, neural nets, and wearable devices are now.

Then, as now, the role of electronic communications devices in medicine was also vocally contested by physicians who thought their risks would outweigh any benefits. One doctor in the room stood up after Zworykin's speech to challenge his depiction of medicine's electronic future. An "artificial computer," they warned, could never develop bedside manner, or make meaningful connections with patients in intimate matters where life or death might hang in the balance of a single conversation. After this exchange was covered in the *New York Times* and other prominent newspapers, Zworykin argued that electronic medicine would humanize rather than dehumanize

American healthcare. "Freed of much of the routine effort of physical examinations as well as the necessity of keeping abreast of new developments in the diagnosis and therapy of physical disease," he elaborated, the computer-enhanced doctor would be "increasingly concerned with [the] patient's emotional well-being and social adjustment . . . assuming to a greater degree the role of the family physician, a role which had almost vanished before the advent of the central diagnostic computer."[11]

The same argument is taken up by new adversaries today.[12] A continuous debate over how electronics will disrupt medicine can be traced back to the mid-twentieth century, if not earlier. These arguments are not abstract. The medium of care is always contested by different parties with very real professional, political, and financial stakes at play. The source of contention has always been an exchange about technology and power. In the name of empowering the consumer of healthcare, technologists present their new platforms as essential passage points for the future of medicine. In the name of defending the humanity of the patient, physicians assert that no technology should displace the doctor from the bedside. This is as visible in the exchange between Zworykin and his physician critic in 1956 as it is in exchanges between boosters and detractors of digital care platforms today. Disrupting care, continuing care.

In these contests the best interests of patients are repeatedly invoked by those who claim to speak for them, without necessarily providing a space for patients themselves to have their say. When technologists promote the health benefits of a new, disruptive technology, they are placing their own proprietary devices and algorithms at the center of a new system in which they become more relevant, lucrative, and powerful. When physicians resist a new information technology, they are restating fundamental moral concerns of the medical profession and resisting the perceived loss of their own control over the nature of medical work.[13] Early twenty-first-century concerns linking the use of electronic medical records with physician burnout can be traced back to early twentieth-century concerns that the use

of telephones was doing the same thing. But neither party should be credited with representing the true interests of the patient.

This book reframes our current understanding of new forms of digital healthcare in the twenty-first century by examining the continuity—and change—in disputes surrounding earlier forms of electronic telecommunications that promised to transform health over the course of the twentieth century. Today's telehealth devices are far more sophisticated than the hook-and-ringer telephones that became widespread by the 1920s, the FM radio technologies used to broadcast health information in the 1940s, the televisions used to pioneer telemedical evaluation in the 1950s, or the first full-scale attempts to establish electronic medical records in the mid-1960s. But the ethical, economic, and logistical concerns they raise are prefigured in these earlier episodes, as are the gaps between what was promised and what was delivered. Each of these platforms in turn produced more subtle transformations in health and healthcare that we have learned to forget, as promises of newer communications platforms take their place. This forgetting, too, is a consequence of the power dynamics at play when supposedly revolutionary technologies become part of everyday life.

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History is about what we forget as much as it is about what we remember. The stories we tell about the history of medical technology tend to be progressive and triumphant: the advances in surgery enabled by anesthesia and aseptic techniques, the conquest of infectious disease by antibiotics. These stories often focus on the impact of diagnostic machines, like the X-ray, or major therapeutic shifts, like the development of new anticancer drugs or implantable devices like the cardiac pacemaker. The role of information technologies in health and healthcare receives far less attention.[14]

Yet the practice of medicine has been shaped by information technologies for a long time, and physicians have long fretted over

what is lost in these exchanges. In early modern Europe, a great deal of medical practice was conducted at a distance, as patients corresponded with their physicians, described their symptoms, received diagnoses and prescriptions, and reported the outcomes through long exchanges of letters and the occasional shipment of a flask of urine. Doctors often worried about the risk of being deceived in these exchanges, but the practice of "epistolary medicine" was still a widely accepted norm.[15] In turn, in the early nineteenth century, when the stethoscope was introduced into practice as a tool for practicing "mediate auscultation"—that is, listening to the body of a patient through an amplifying device, rather than with the naked ear alone—many physicians expressed concern that the distance between the listening ear and the body of the patient would produce opportunities for dangerous artifacts and misdiagnosis.[16] Although the stethoscope may seem more readily identifiable as a medical technology than a written letter, both should be understood as media of medical care. Both were powerful technologies that shaped and reshaped the experience of health and disease.

Most doctors still carry stethoscopes today and use them to listen to the hearts, lungs, and abdomens of their patients, even when that information may be irrelevant to the case at hand. While patients tend to experience the touch of the stethoscope as a cold lump of metal, physicians have warmer feeling toward the device. Older physicians frequently complain that in an era of portable ultrasound machines, younger physicians aren't learning how to use their stethoscopes properly anymore. The stethoscope here is a humanizing technology, a metonym for an older, humanistic physician who *listens* to their patients. How easy it is to forget that in its own time of novelty the stethoscope was also feared as a technology that brought distance between doctor and patient.[17] It was a tool that (like the pocket ultrasound today) increased diagnostic power but did so at the expense of direct contact with patients. The fear in both cases—that the clinician might lose control of the diagnostic or therapeutic process through the intervention of newer, disruptive technology—is the same.[18]

Both the stethoscope and the pocket ultrasound—like the telephone, the radio, the television, and the computer—offer powerful new opportunities to the practicing physician. Both threaten to introduce new forms of distance and artifact between doctor and patient. And yet in our present concerns with the Internet of Things, the allure of artificial intelligence (AI) as applied to healthcare, and other forms of electronic care, we tend to selectively forget that similar concerns were also expressed over earlier technologies of care. Instead, the stethoscope, an object of concern in the early nineteenth century, becomes a technology of nostalgia for twenty-first-century physicians who lament those arts of bedside diagnosis that might soon become lost.

Nostalgia is just one of many forms of history, and it requires selective erasures. Historians work to investigate other narratives, to find traces of that which has been omitted or overlooked. We read other people's mail. We track ideas back through published and unpublished literatures. We look for the shape of the dominant discourse in mainstream media—and try to search out other voices not included in this narrative, especially those which might counter it. We look at promises made and ask: whom did they serve? Were they kept or were they broken? Did anyone notice? We study how formerly extraordinary things become commonsensical objects, how front-page news items become forgotten structures of the world we live in, the accepted reality of the world-as-it-is.

The stethoscope of the early nineteenth century was a new technology with many boosters and detractors. Now the stethoscope is a symbol of close presence and concerned listening, threatened by newer technological forms of care. The early telephone, too, had its boosters and its detractors. Like the stethoscope, it promised access to better care, while threatening to introduce diagnostic artifacts and to mechanize the life of physicians. Soon, however, being "on call" by telephone (and, a few decades later, by radio-pager) was how physicians defined themselves as an accountable human presence in the lives of their patients. The earlier promise and threat of the telephone

had been forgotten. How quickly we erase that which was transformational a generation ago. How quickly we revise prior controversies into seamless narratives of progress.

Time, then, to take a closer look, or better yet, to *listen*. Our story starts with the ring of the telephone. Ring ring, little bell: it's the early twentieth century, and the doctor is on call.

1

ON CALL

CliniCloud, a smartphone-enabled health platform, was the darling "disruptive technology" of Silicon Valley's 2015 TechCrunch festival. Its creators, Australian physician-inventors Hong Wen Chin and Andrew Lim, promised an entirely new mode of medicine, "empowering every parent and carer to play an active role in healthcare."[1] By plugging an electronic stethoscope and an electronic thermometer into their proprietary CliniCloud app, parents could have their feverish, coughing children seen by a doctor without being coughed on in an overcrowded clinic waiting room. The initial pitch generated $5 million in venture capital funding and an exclusive co-marketing deal with the Best Buy big-box chain store to build a new Doctor on Demand service. The future of healthcare in the cloud seemed imminent.[2] Soon all patients could be seen in their own homes, on their own schedules, on their own terms.

Every new technology seems to promise a break from the past. Yet while CliniCloud may have seemed unprecedented, the application's promise was not altogether new. More than 130 years earlier, the *Cincinnati Lancet and Clinic* reported the same revolutionary potential in the landline telephone. Just three years after Alexander Graham Bell's first demonstration in 1876, the telephone was already being promoted as a game-changer in healthcare. Late one night a Cincinnati physician was summoned by a caller who feared his coughing child had an emergent case of the croup. Instead of making a mid-