A Labor History of Health Records: On Medical Scribes and the Ethics of Automation

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Abstract

This paper explores the human labor demands that underpin the utility of patient health records. I examine where these labor demands originated historically, and I consider how they might evolve, given the recent rise of artificial intelligence (AI) being developed to automate the collection and categorization of patient health information. Using a sociotechnical framework, the paper identifies a complicated paradox: the labor of medical scribes has become crucial for the benefits of electronic health records (EHR) to be realized; simultaneously, scribe work has been regarded in medical literature as inconspicuous and transitory, a stopgap measure wholly replaceable by a more efficient solution. The paper thus critically interrogates the premise that automation can replicate and replace scribe labor, and it examines the ethics of moving toward a fuller reliance on AI.

Keywords: electronic health records, artificial intelligence, medical scribes, automation

Introduction

The patient health record is a document with expansive capacity. In its purest form, the record acts as both librarian and detective, holding evidence of a person's most intimate experiences, allowing patterns and predictions to unfold. But beyond the scope of helping to determine individual care trajectories, medical records support broad initiatives, too. Hospital administrators use medical records to measure staff efficiencies, insurance companies use medical records to assess risk, and epidemiologists use medical records to monitor the health of communities and populations. In all circumstances, the medical record's data integrity is critical to its utility. Both glaring data errors and silent data absences threaten this integrity.

Over the past 50 years, U.S. policymakers and health officials have poured significant resources into modernizing the country's system of medical records, pinning a bold promise on the future of electronic health records (EHR). But despite the long-held agreement that heaping bounds of disparate paper-based records are no longer an appropriate method of collecting and cataloging patient health information, and indeed, despite major policy efforts that created financial incentives for hospitals and health systems to switch to EHRs, uptake remains scattered and lackluster.[1] There is a breadth of

[1] The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 encouraged the widespread adoption of electronic health records by providing financial incentives to healthcare settings that could demonstrate meaningful use.

robust literature about the challenges and failures of EHR implementations (Friedman et al. 2013; Hill et al. 2013; Melnick et al. 2020; Mennemeyer et al. 2016; Schulte and Fry 2019). Put simply, the primary barriers associated with EHR adoption stem from the reality that many physicians find EHRs far too difficult and cumbersome to use.

Key among the challenges associated with EHRs is that the systems carry substantial documentation demands, which burden already overworked physicians. EHRs are also commonly regarded as cold and intrusive, requiring physicians to focus their attention on computers or tablets, rather than on patients, during sensitive clinical interactions. Moreover, EHRs can impose quiet constraints on patient information; whether a patient's medical history can be translated accurately and adequately into the structured data formats often required by EHRs remains at the question. Though EHRs have created real benefits, and though there is no serious argument to be made for a return to fully paper-based systems, for a tool championed as the sweeping solution to patient health records, there is consensus in medical literature that EHRs have not lived up to the hype.

But the failures of EHRs weren't unforeseen. In early conversations about the computerization of paper-based health records, physicians identified obstacles quickly, then largely dismissed their own concerns. It was simply expected that advancements in technology would progress rapidly, rendering problems irrelevant, or at least that the technology would advance soon enough to a point where the benefits afforded by the new systems would outweigh any limitations or deficiencies. Across this history, in discussions about the early computerization of health records, many physicians and hospital administrators believed specifically that advancements in speech recognition technology would someday be able to solve a core problem of medical records—the tediousness of data entry.

Technological progress churned slowly, however, and with turn-of-the-century speech recognition technology unable to meet the demands of 21st century EHRs, a new labor force emerged to fill the gaps. Though the medical scribe has existed as a paraprofessional position in U.S. healthcare since at least the 1970s, the field has expanded rapidly in the past two decades (Bossen et al. 2019). Medical scribes are often medical students or other early-career healthcare workers, and they assist physicians by shouldering the documentation burdens brought on by EHRs. In many hospitals and health settings, these workers accompany physicians into clinical interactions, transcribing the patient-physician discussion and translating information about a patient's medical history and care plan into the kinds of structured data formats that EHRs demand. It is no secret that the field of medical scribes expanded in the direct shadows of EHR failures; commonly in medical literature, scribe labor is regarded blatantly and unabashedly as a makeshift solution to the myriad problems posed by EHRs (Bossen et al. 2019; Reuben et al. 2016; Yan et al. 2016).

Now, a fast-moving discourse about the power of artificial intelligence (AI) promises to disrupt this process, with major technology companies asserting their ability to develop AI that can automate the work of medical scribes. These AI boosters claim their tools are able to listen ambiently to patient-physician interactions, identify relevant information from the conversation, turn this information into structured data, then send this data directly into the EHR for the physician to review. In effect, what these companies are proposing is shifting the sensitive, deeply delicate responsibility of chronicling a patient's medical history from a human scribe to the automated whims of opaque algorithms.

Of course, technological developments in medicine, and in patient health data systems specifically, raise a wide range of ethical questions about privacy, surveillance, data storage, data access, and the potential risks associated with incomplete or inaccurate data. In this paper, I focus on examining the ethics of relegating patient health data collection and data entry to machines. AI boosters claim that ambient voice capture in healthcare will be so sophisticated and so inconspicuous, it will "rehumanize" the patient-physician interaction (Nuance Communications 2022, 9). This paper asks: ethically, can the automation of human labor be considered a process of rehumanization?

In order to position these ethical questions in historical context, the paper traces the modern history of patient health records.[2] I begin by examining the early 20th century labor required to gather and organize patient health information, as the people who performed this painstaking labor have often been overlooked in histories about these early data systems. From there, I jump to the 1970s, exploring conversations about the early challenges of computerizing paper-based health records, revealing the prevalence of warnings about the mass collection of patient data. Next, I examine the rise of medical scribes in the early 2000s, the labor force that surged in direct response to the widespread failures of EHR adoption. The paper then concludes by scrutinizing the ethics of AI boosters who seek to replace scribe labor with AI. Ultimately, I argue that just as EHRs could not solve the problems of paper-based records fully, so too will AI be unable to solve fully the problems of EHRs.

The early days of the Mayo Clinic, and the challenges of paper records

In the early 1900s, the new hospital in Rochester, Minnesota, implemented a fairly simple and straightforward system of medical records. Each physician at the Mayo Clinic was responsible for maintaining their own leather-bound ledger, and inside these ledgers, physicians organized medical notes about patients temporally, with some four or five patient summaries listed on each page (Kurland and Molgaard 1981). Handwritten and brief, these summaries often included little more than the patient's name, age, place of residence, reason for visiting, and, if added later, the outcome of their medical issue.

That each physician maintained their own ledgers led to a slew of challenges. The Mayo Clinic at the turn of the 20th century offered a burgeoning model of group practice in medicine, which clashed with its reliance on a system that kept information siloed, distributed across physicians' individual books; to analyze patient information on a common health topic "required a time-consuming and irritating search in many places" (Clapesattle 1941, 522). Practically, too, the ledgers simply could not keep up with the pace of the hospital's growth. As the Mayo Clinic's patient population grew, so too did the number of ledgers, making it increasingly difficult to find relevant information (Kurland and Molgaard 1981). The ledger system also posed problems for returning patients, requiring patients to remember the exact date of their previous visit, so that the physician could find the associated ledger. If found, and if there was still room on the page, notes from the patient's additional visit would then be "scribbled in like a marginal wreath around the original case history" (Clapesattle 1941, 522).

The Mayo Clinic's patient records system certainly needed an upgrade, and Henry Plummer, a young associate at the clinic, is granted a good deal of historical credit for being the person to catalyze change.[3] By July 1907, the first parts of Plummer's newly designed system was in use, with patient

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[2] Throughout the paper, I follow Berg and Bowker's sociological assessment of the medical record, which argues that the record, far more than just passive documentation, is fundamental to the active production of a person's bodily identity (Berg and Bowker 1997). As the authors write, the coexisting descriptions, details, gaps, and absences on a medical record shape a physician's regard for the patient and determine trajectories of care.

[3] More than a century later, the Mayo Clinic called its 2017-2018 initiative to standardize EHR systems across the organization's network of hospitals and clinics "The Plummer Project" in honor of Henry

records now kept in one place, no longer distributed across each physician's individual ledgers (Clapesattle 1941). Moreover, each patient was assigned an envelope marked with a unique number, so that case histories, surgical records, lab results, and correspondence could all be found promptly during returning patient visits (Kurland and Molgaard 1981; Clapesattle 1941). Recognizing the potential research benefits of being able to study similar patient records, Plummer also devised two different search indexes, one by diagnosis and one by surgical procedure (Kurland and Molgaard 1981). Plummer even oversaw the installation of a cable carrier system throughout the clinic, with the goal of making patient record circulation speedy and uncomplicated.[4] Eventually, through a hearty combination of telephone, signal lighting, telegraph ticker, and conveyor belt, the physicians in Rochester were able to share patient health records smoothly and efficiently (Clapesattle 1941).

Historically, these innovations have been attributed largely to Plummer, but undergirding their utility was the quiet labor of so many others. In Plummer's new record-keeping system, someone needed to extract all patient health information from the pages of the leather-bound ledgers and transcribe them onto individual patient files. In fact, it was Plummer's secretary, Mabel Root, who performed that work meticulously, writing tediously small notes on "five-by seven-inch cards" (Kurland and Molgaard 1981, 56). Root also became responsible for overseeing the workers of the Mayo Clinic's early records and statistics division, which facilitated the conveyor belt system that made efficient circulation of records possible:

> When a history was wanted on floor three, say, the desk girl there had only to pencil the number on a request card and put it on the carrier. In the file room below the desk girl pulled the history and put it into the proper compartment of the carrier, from which it was automatically tripped off at desk three above—in two or three minutes, with no more trouble for the doctor than a spoken number. (Clapesattle 1941, 532-533)

Indeed, Plummer's infrastructural innovations were rooted in technology, but their utility was powered by the quiet labor of his female secretary and her "desk girls." It was this collective labor, performed by low-pay, low-prestige workers, that propelled the new system for decades, changing the landscape of how patient health information was collected and used.

Computerization, and the birth of the electronic patient record

In the second half of the twentieth century, amid a booming landscape of technological investment, the medical industry looked zealously at computers. The envelopes and filing cabinets that held patient health records had begun literally overflowing, and physicians found themselves forced to sift manually through vast amounts of often irrelevant information. Indeed, by the 1960s and 1970s, many physicians, clinical staff, and hospital administrators had long been demanding better management of patient health records. Now, suddenly, as the computing industry began to emerge as a professionalized field, the computerization of health records seemed not just plausible but increasingly promising.

Plummer (Koh 2019). [4]It took some trial and error for Plummer's cable carrier system to be useful; as designed originally, in humid weather, "the cotton cables would swell and the baskets would get stuck between offices" (Clapesattle 1941, 529).

But though it was widely accepted that computers offered important potential toward improving the information infrastructure of patient health records, some physicians resisted the belief that computers would be a silver bullet. As one physician wrote in a 1969 medical journal, computers would indeed bring major improvements to the data infrastructure of patient health records, but computers served specific purposes and would therefore be valuable only with certain tasks. The medical field, the physician continued, was "in danger of being dazzled by optimistic claims about the usefulness of computers" (Mitchell 1969, 157).

Warnings like these reverberated across medical journals. In the 1970s, medical literature about the computerization of health records contained many messages expressing caution at the premise that computers alone would solve the problems of paper-based records. Concerns about relying too heavily on computers to improve the status quo were twofold. The first major concern was that the increased data storage capacity afforded by computerization would lead to far too much patient data being collected—a scale of accumulated data so large, it might fail to be of use. "The one thing that the computer has stressed is that it is easy to let data get out of control and then you get chaos," wrote a physician in the proceedings of a 1970 conference on medical record information processing (Anderson and Forsythe 1970, 13). Another physician at the conference wrote that the mass collection of patient data without purpose, without any guiding scientific question, is merely "an accumulation of nonsense" (Anderson and Forsythe 1970, 373). In 1979, yet another physician penned a letter to the editor of a medical journal, writing that *more* data might not mean *better* data: "I have a sneaking feeling that new record systems, computers, secretaries, tape recorders, and typists have made us all too long-winded," the physician wrote (Milne 1979, 373).

The second genre of concerns about the computerization of patient records surrounded the challenges of data acquisition; with the rise of computers came a desire for the mass collection of patient data, and accompanying this rise was a growing conflict about who specifically should be responsible for collecting this data. Almost immediately, it became clear that physicians themselves were either unequipped or unwilling to do this work. Attendees at the 1970 conference deliberated the matter, knowing full well that data collection, error checking, and documentation would need to be incentivized, as many physicians would consider the tasks not research activities or direct patient care but rather "just hard work" (Anderson and Forsythe 1970, 252). "I am very skeptical that senior physicians with very crowded clinical lists will become data clerks," one physician remarked (Anderson and Forsythe 1970, 342). As the years and decades progressed, this physician reluctance to perform the labor associated with patient data collection became a major obstacle to the widespread adoption of electronic medical record systems (General Accounting Office 1991). Computer-based records often require information to be entered into predefined structured database formats, which some physicians have seen as too limiting or too disruptive to their existing processes of free-text entry (General Accounting Office 1991). For others, there has been "a real attitudinal problem" (Ball and Collen 1992, 242), as perceptions associated with the lowly work of data entry conflict with the prestige of the medical degree. As two physicians wrote in 1992, the "time-consuming, repetitious, and tedious nature of data recording in manual systems was only intensified by early automated data entry systems," with many senior healthcare professionals deeming the work of data entry "unworthy of their time or consideration" (Ball and Collen 1992, 128). Recognizing that ease of data entry would be crucial for electronic records systems to succeed, many physicians began to invest a good deal of hope in the prospect of technological advancements. Specifically, advancements in voice-input technologies and natural language processing became "widely anticipated by both physicians and patients as a solution to this data entry problem" (Ball and Collen

1992, 256). After all, the thinking went, if it was merely a more optimized and efficient system of data entry that computer-based records needed, then surely the technology would progress soon enough to be able offer a fix.

The rise of medical scribes

Despite the belief commonly held in the 1990s that voice-recognition technology would mature quickly and significantly enough to meet the needs of EHR growth, the 2000s arrived, and critical usability problems with EHRs remained. Physicians attributed surging feelings of burnout to the demands of EHR documentation, which led many hospital and health system administrators to begin hiring medical scribes. These "low-paid, unskilled employees" (Bossen et al. 2019, 78)—often medical students or other early-career unlicensed workers—were brought into healthcare settings specifically to perform the tedious EHR labor that physicians disliked and tended to resist. In medical literature, there is consensus that the rise of medical scribes "is clearly linked to the spread of EHRs" (Bossen et al. 2019, 77). Medical scribing had previously been considered a "niche industry" (Berger 2015, 11); suddenly, following the HITECH Act of 2009 and its associated expansion of EHRs, the field of medical scribes began "rapidly proliferating" (Schiff and Zucker 2016, 979).

By the 2010s, EHRs remained unable to support physicians' needs, but hegemonic thinking at the time nonetheless held that scribes be regarded as "temporary solutions" (Reuben et al. 2016, 963)—mere stopgap measures that ought to be in place only until voice recognition software could finally catch up. As three physicians wrote in a joint 2015 JAMA commentary, despite the reported value of scribe labor, "[t]he answer to today's inadequate EHRs is not scribe support. Instead, physicians should demand improved products" (Gellert et al. 2015, 1316). So, as technologists began reassessing EHR functionality, and as computer scientists continued to grapple with the linguistic challenges of advanced speech recognition, the field of medical scribes boomed, and the scribes themselves labored away.

The work of the medical scribe is time-consuming, mentally laborious, and technologically meticulous. Typically, the scribe's primary role is to accompany a physician into a patient interaction and document the encounter into the EHR, allowing the physician to focus their attention fully on the patient. (Physicians must review the scribe's report prior to the data being finalized on the patient's health record, though the extent of time and attention that physicians give to these reviews likely varies.) But the job of the scribe extends far beyond basic transcription. Scribes must make extemporaneous judgment calls about whether information is relevant enough clinically to merit documentation. If the data is deemed relevant, scribes are then also responsible for "rephrasing and transforming" information into formats that will be accepted by the EHR's predefined database structures (Tran et al. 2021, 909). As researchers have found, there is a "high cognitive load associated with breaking up patient stories into fragmented pieces in order to enter the data into rigid structured forms" (Tran et al. 2021, 912).

Additionally, scribe labor often includes tasks beyond the immediate patient-physician interaction. The work of the scribe might include finding a patient's past medical records and test results, along with gathering potentially disparate notes from other physicians. As researchers have described, this work is neither straightforward nor simple: "Conducting such information foraging and assembling tasks usually requires medical scribes to interact with multiple noninteroperable health IT systems" (Tran et al. 2021, 910), the results of which must then be morphed into comprehensive and cohesive summaries. Scribes also facilitate communication between various members of the patient's care team and often are tasked with reminding providers of regulatory and billing requirements (Tran et al. 2021).

Again and again, literature on medical scribes has shown that this quiet and unobtrusive labor force has been key to optimizing the physician's time, enhancing the patient's experience, and salvaging the EHR's reputation (Yan et al. 2016). But the literature also points to the costs associated with scribe programs, essentially ruling out the feasibility of supporting scribe labor long-term, as scribes are "cost-prohibitive" for many hospitals and health settings (Tran et al. 2020, 809). It is important to tie these two threads together, that the clerical connotations of scribe work tend to obscure the actually arduous demands of the role, which itself is quite costly to support; indeed, this fuller picture of scribe labor allows us to recognize why it has long been considered a workforce poised perfectly for automation.

Ambient listening, and the promises of automation

"Why use medical scribes when you don't have to?" (Pelo 2021) is the headline of a March 2021 blog post written by the then chief clinical product officer with Dragon Ambient eXperience, an "ambient clinical intelligence solution" from Nuance Communications, which was acquired by Microsoft in March 2022 for $19.7 billion (Bishop 2022). The product's leadership team purports that its AI-powered tool can listen ambiently to physician-patient interactions, extract relevant portions of the conversation, perform an automated quality review, then send data directly to the EHR for the physician to vet. Moreover, the blog post explicitly says that the company's AI solution can "replace scribe programs and all the associated hassle," which the author defines as the training needs associated with a constantly churning workforce and the inconsistency of scribe output (Pelo 2021).

Of course, neither training needs nor consistency of output is a concern unique to scribe labor; AI-powered tools require just as much reevaluation and iterative training as human-powered programs, and they are similarly just as susceptible to the production of flawed work. AI might even obfuscate problems or introduce new ones. When a physician works alongside a human scribe, reviews an EHR and notices a problem in the documentation, they can address the issue directly with the worker; an AI's quality control feedback loop is certainly much slower and more convoluted.

In the context of EHR documentation, which risks severe patient health consequences in cases of inaccurate or incomplete information transfer, it is critical for physicians to understand the limitations of AI systems, especially when these systems claim to perform automated quality reviews. As the Institute of Medicine found in 1991, in their comprehensive report on the future of computer-based health records systems, data can be absent from patient records for three primary reasons: "(1) questions were never asked, examinations were never performed, or tests were never ordered; (2) the information was requested and provided, but either it was not recorded by the clinician or delays occurred in placing the information in the record; and (3) the information was requested and delivered but was misplaced or lost" (Dick and Steen 1991, 15). There is no doubt that voice recognition technology has progressed significantly in the decades since the report's publication, but present-day AI is simply unable to address all three known scenarios fully and equitably.

As AI continues to develop, whether it even holds the potential to be applied equitably and ethically deserves heightened scrutiny. As Halcyon M. Lawrence argues, speech technology is innately biased, privileging speakers of Standard English and disciplining all others (Lawrence 2021); is medical records AI capable of understanding a range of languages, accents, and dialects as diverse as patient populations? Is the AI able to distinguish clearly and consistently between multiple voices in clinical interactions, especially in situations when a third voice—say, a parent, caregiver, health advocate, or additional physician—is present? Is the AI able to grapple fully with the subtle complexities of spoken language, like sarcasm, laughter, or the shared understandings expressed through silence? Practically, too, is the AI able to be trained properly on the medical vocabulary required by contemporary EHR naming conventions? Most importantly, the AI's ability will be limited for social reasons, not technological ones, if patients are unwilling to disclose information honestly and fully while being surveilled by technology. "The upshot of the loss of privacy of medical records is that highly pertinent clinical information may never appear in charts," wrote a physician in 1989, concerned about technological advancements in medical records (Burnum 1989, 483). After all, patients might rightfully be wary of sharing sensitive information—especially on politicized topics like gender identity, reproduction, and infectious disease—in settings with technology that stores its data according to unpredictable security protocols and for unknowable durations of time. "What is not said may be more important than what is said" the physician continued, adding that a "rapid accessibility" of data does not increase its credibility (Burnum 1989, 483-484). Beyond the immediate implications for patients and physicians, it is also worth considering questions about AI's environmental impacts, privacy risks, and basic ability to address physician burnout. What are the environmental consequences of storing vast amounts of patient data? What kinds of physical and environmental harms might various communities be exposed to in the process of building warehouses and facilities capable of handling this infrastructure at scale? Potential users, funders, and regulators should also examine the privacy and security mechanisms required for responsible data storage, inquiring about the ethical risks associated with system downtimes, lags, crashes, or hacks. Finally, it feels worth interrogating the actual sources of physician burnout; if the material effect of AI-powered EHRs is that the physician's time is optimized, their labor made more efficient, then in a capitalist model of healthcare, will that not eventually lead back to larger workloads and a relapse of burnout?

Discussion

As Marion J. Ball and Roger H. Shannon argued in 1980, future advances in computing would almost certainly solve the technical problems of patient health records, but "problems of social context remain more resistant" (Ball and Shannon 1980, 108). They wrote that a focus on purely technical solutions, without regard for social context, would in fact make the process of improving patient health records "not only worthless, but often dangerous" (Ball and Shannon 1980, 108). Nearly fifty years later, as AI applications proliferate in healthcare, it is worth asking whether Ball and Shannon's prediction was realized. Has this social context—the often alarming, distressing, awkward, and painfully sensitive nature of patient-physician interactions—been considered adequately in the development of ambiently-listening healthcare AI? Perhaps it is still too soon for these consequences to be realized. Perhaps we won't know for some time.

But the sensitivity of the topic demands a deeper line of questioning, too, not simply about whether a novel technological solution can or should replace an old-fashioned manual system, but about the purpose of this data more broadly. Ultimately, if patient health data is so important, then why do we relegate its collection and categorization at all, be it to a subordinate class of low-paid workers or to a hazy web of impenetrable calculations? In a society with such profound legacies of health disparity, and with such colossal burdens of medical debt, might concerns about data integrity act as a kind of façade, rooted not in altruistic care for the patient but rather in a capitalist desire to optimize medical billing? For whom is this data intended to serve, and who reaps its benefits most often?

Scribe labor will never be perfect. An overwhelming reason why so many physicians have long championed advancements in speech recognition technology is precisely because of the fear that adding a human data broker to the data entry process—often someone younger, unlicensed, and with limited training—heightens the risk of errors. As one physician wrote in 1970: "If a girl has to interpret what you have said and then put this in some form that she thinks the computer will understand, I think we increase the error rate" (Anderson and Forsythe 1970, 257). But to think of the secretary as universally more error-prone than the mathematical model is itself a flawed and dangerous mindset.

Besides, as the literature shows, a primary limitation associated with medical scribes has nothing to do with the quality of their labor but rather with the prohibitively expensive costs involved with scribe system implementations (Tran et al. 2020). "Couldn't the incremental operating costs associated with automation of medical records be better spent on increasing salaries and wages for nurses and technicians in short supply?" asked a hospital president and CEO in 1992 (Ball and Collen 1992, 34-35). The question was prescient; the costs associated with developing, implementing, and maintaining AI systems at scale certainly will not be cheap.

Conclusion

By interrogating the history of the labor behind patient health records, a pattern starts to emerge. When we frame the successes of patient health records as stories fundamentally about the quiet labor performed by secretaries, "desk girls," data clerks, support staff, paraprofessionals, medical students, and early-career healthcare workers, what we find is that throughout the past century, regardless of the technology at hand, infrastructural advancements in the design, maintenance, and implementation of health records have required vast amounts of difficult and underpaid labor.

In the historical record, this labor has been regarded largely as inconspicuous, tangential, and transitory. What is remembered about the story of Henry Plummer is the patient dossier system he designed, not the tedious labor of his secretary, Mabel Root, who transcribed the actual patient records; what stands out in the literature about medical scribes is that their services, however valuable, have always been regarded as makeshift. When the human complexities of what it takes to achieve technological advancement are left unknown, either ignored or obscured, it becomes easy to place faith in the promise of AI. By foregrounding these labor stories, we are able to have a richer, more honest conversation about the negotiations and consequences involved with automating this work.

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