

To Err is Avoidable: The Automation of Knowledge and the Clinical Decision Support Revolution

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In the iconic 1999 essay “To Err is Human,” Institute of Medicine authors open with a proclamation whose influence can still be felt today, “Healthcare in this country is not as safe as it should be, or can be... preventable medical errors exceed attributable deaths to such feared threats as motor-vehicle wrecks, AIDS and breast cancer.” Defining medical errors as “the failure of a planned action to be completed or the use of a wrong plan to achieve an aim,” the authors highlight the insufficiency of then-current efforts to reduce human error in medicine and the very significant toll that this challenge was exacting on human lives, medical cost, and loss of trust with the healthcare system.¹

Ten years later, in the *Checklist Manifesto*, Atul Gawande explored one facet of the preventable error epidemic in medicine—and offered a potential solution. “The volume and complexity of what we know has exceeded our individual ability to deliver its benefits correctly, safely, or reliably. Knowledge has both saved us and burdened us.”² Borrowing a page from the airline industry, Gawande advocates the notion of systemizing complicated, repeatable processes as a possible antidote to the unacceptably widespread quality variances in healthcare. Indeed, the exponentially growing body of healthcare knowledge could be broken down into a series of discrete, scalable, decision trees, which would more reliably guide clinicians to the right answer for the right patient at the right time.

Learning From the Past

For many years, the health information technology (IT) industry has attempted to respond to this imperative—the automation of evidenced-based medicine to enhance clinical quality—giving birth to a broad array of clinical decision support (CDS) companies. Yet, despite possessing noble aims, companies in this space fell victim to a set of common traps that constrained their ultimate impact, as described below.

Low Doctor Utilization

The behavior change required to implement evidenced-based content at the point of care has proven, time and time again, to be elusive. Getting surgeons, who are trained to be artists and not line cooks, to meticulously follow a set of coded rules was a failed proposition from inception. For this reason, the usage of CDS applications has always been limited to a tiny minority of progressive health systems. Indeed, Jeff Stolte, partner of Providence Ventures, the venture capital arm of Providence St. Joseph Health, elaborates on this: “Getting doctors to follow cookbooks, no matter how well the recipes are written, has always been an uphill battle. For true CDS to take off, one needs to have a mechanism to either compel physicians to follow clinical rules, or to influence the behavior of the care teams that support them through real, sticky incentives.”

Lack of Flexibility of the Content

Underlying the strategy of the “first generation” of CDS companies was the automation of already published third party content, such as protocols publicized by the American Board of Internal Medicine and other professional societies. Although this approach may have been appropriate for some institutions, many clinicians resented the rigidity of such a program. Rather, healthcare leaders demonstrated an appetite to take their institution’s own evidence-based protocols—frequently a point of pride for leading academic medical centers—and import them into the workflow. The original CDS platforms demonstrated an inability or unwillingness to ingest native content, and were thus marginalized by large parts of the market

General Integration Issues

For any workflow automation regime to be valid, truly seamless integration with the electronic health record (EHR) system, inclusive of bi-directional information exchange, is a key requirement. Getting the EHR companies to play ball with a CDS vendor required both a business deal that produces compelling economics for each party, and technology interfaces that can do the job. It was only very recently that the latter condition existed, and one may argue that the former remains unresolved.

The CDS Renaissance

For the first time ever, we have entered an era where the healthcare IT industry has learned from its mistakes and the government has demonstrated its willingness to provide meaningful encouragement—both financially and programmatically—for the use of clinical decision support. I posit there are 4 dimensions of this renaissance, outlined below.

The Launch of a True, National Decision Support Program

In 2014, Congress passed the Protecting Access to Medicare Act, which instructed CMS to lay out a program to require physicians to use clinical decision support criteria when ordering certain imaging exams. This policy, which was elaborated on in the 2017 and 2018 physician fee schedule, now consists of a far-reaching program, termed the Appropriate Use Criteria (AUC) program. This program delineates evidenced-based guidelines for 7 priority clinical areas, outlines a mechanism by which clinical decision support vendors can apply for certification as qualified clinical decision support mechanisms (CDSMs), and describes how delivery systems can demonstrate their adherence to these protocols, certifying themselves as qualified provider-led entities (QPLEs). This is as advanced, specific, and well-funded an initiative as has ever existed, and I believe that it will transform the industry.

The Evolution of Focused CDS Companies

Abandoning the mistakes of the past, an array of focused clinical knowledge management companies has emerged—several of which

have applied to the AUC program as CDSMs. From inception, many of these companies were designed to be flexible to accommodate diverse bodies of content, as that is what the market has dictated. New business models emerged around protocol and content-based pricing, which has lowered the cost hurdle associated with “experimenting” with CDS. In turn, this has encouraged adoption of CDS technologies by many organizations that might have previously been reticent to dip their toes in the water.

Developments in EHR Integration

For the first time, a philosophical shift among some of the leading practice management technology companies, coupled with advances in cloud-based technology, has resulted in the ability of CDS companies to integrate directly with EHR platforms. This serves the crucial role of allowing CDS companies to become the inextricable part of the workflow that is required to drive adoption. Indeed, Chad Brisendine, vice president and chief information officer of St. Luke’s University Health System said, “It is only in the last 5 years that we’ve seen the type of true, deep, electronic medical record integration that allows what were previously cumbersome point solutions to become true core infrastructure in the provision of care.”

Elevation of Physician Extenders in the Care Team

Driven by the primary care physician shortage, the role of nurse practitioners, physician assistants, and other physician extenders in the provision of care has expanded dramatically in recent years.³ If CDS companies had historically experienced low utilization rates due to physician reluctance to follow rules at the point of care, a whole new user base has now opened for these vendors to target. Furthermore, the nature of the protocol-driven training that most midlevel providers undergo fosters a certain receptivity to using CDS that one does not see in the general physician community.

Renewed Payer Focus on Clinical Protocol Automation

Once solely the realm of providers, CDS has expanded its reach well into the payer arena. In particular, the use of a clinical rules engine for automating prior authorizations in the clinical workflow has seen widespread adoption in recent years. An ever-more-complicated set of utilization management and review rules has rendered existing ways of doing business obsolete and created a virtual requirement for health plans to wire themselves with an industrial strength system to manage the vast set of business rules required to operate in today’s healthcare payment paradigm.

Paradigm Shift

Nearly 20 years after the publication of “To Err is Human,” we may just be approaching the paradigm shift that the authors anticipated the essay would bring about. Although some have attached hyperbolic expectations to the ability of artificial intelligence or machine learning to change the course of healthcare delivery, the CDS renaissance is far

from that. On the contrary, it is about the empowerment of clinicians to operate at their highest levels, to leverage technology to unlock the benefits of hundreds of thousands of hours of clinical research at the point of care. As Anthony DeFurio, chief financial officer and senior vice president at University of Colorado Health, says, “Just like Roku and AppleTV allowed thousands of television owners to realize a revolutionary new experience by making a small incremental investment, so too have we reached a tipping point in health IT, where point solutions have allowed hospitals and health plans to unlock the value of their large IT capital investments. Nowhere is this experienced more prominently than in CDS.” As an investor, I am more excited than ever about what the future holds.

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