"Doctors, HIT marketers claim, are recoiling against HIT products' incursions into their previously unchecked hegemony."

outcomes analysis.

Even assuming that such differences among data sets could be rectified, the current state of the art for adjusting even the most uniform claims data sets for severity—despite the tens of millions of dollars invested in technologies to do just this—still has failed to produce a reliable severity-adjustment system. Lisa Iezzoni has studied this subject extensively. When she tested several competing severity-adjustment methods by applying each to the same inpatient data set, she found that each of the competing methods was equally weak at predicting costs and outcomes. This failure flows not from the lack of energy or intelligence built into the methodologies, but rather from the origins of the data sets themselves.

At their core, these data-capture systems are based on classifications designed to manage reimbursement, not describe clinical realities. As an example of this problem, one of the most market acceptable methods—the Refined DRG (R-DRG) classification system—considers a patient who has a hip replaced to be as sick as a patient who has a knee replaced. They do so because from the perspective of the hospital these patients cost roughly the same to treat. In reality, patients who have had knee replacements are generally able to jog a year later; most patients who have had a hip replaced are barely able to climb stairs a year later. These are not equivalent clinical conditions; they do not cost the same to manage over time; and they do not represent the same economic risks for anyone other than the treating hospital. This will emerge as an enormously important issue as the Health Care Financing Administration (HCFA) begins using these data sets and tools to risk-adjust payments to HMOs for Medicare beneficiaries.

‘But My Patients Are Sicker’

Given all of these problems, is it any wonder that physicians so fiercely resist attempts at using information technology to analyze and ultimately manage the process of care? As many disappointed HIT executives and their investors know too well, the medical profession has not been quick to embrace the great leap of “progress” for the health care system embodied in the development and use of clinically oriented HIT products. It would be easy to attribute this reaction to providers’ broader disdain for the originating source of “digitized” scrutiny (managed care operators); HMOs’ use of these
and other analytical tools can readily be viewed, fairly or not, as so many more bludgeons of utilization management and care denial. However, the biggest proponents of HIT products are hospital organizations themselves, forced by the advent of reimbursement reform to reduce their own clinical variations and operating costs.\textsuperscript{6}

When initiating such efforts, hospitals and their HIT vendors are confronted with an almost mantralike utterance—"My patients are sicker"—usually from physicians never before challenged by their own performance data. When I was an executive with an HIT vendor, my speeches frequently included the quip, "It's a little known fact that 90 percent of the physicians in the United States treat patients who are sicker than average." It may be a funny line, but it is not an entirely fair one. It is, however, illustrative of the HIT sector's tendency to brush off physicians' objections to its products as the profession's resentment of any imposition of accountability. Doctors, the HIT marketers like to claim, are simply recoiling against HIT products' incursions into their previously unchecked clinical hegemony.

Regardless of why this is so, it is bad news for those marketers: Physicians' "buying into" HIT products is critical if the products are to gain market acceptance.\textsuperscript{7} When physicians refuse, market failure ensues. This helps to explain why the more purely clinical the HIT product (the further it is up in the information systems hierarchy), the greater its marketability problems. This further explains why "clinical infrastructure" applications, according to one Wall Street research report, will lag behind all other subsectors of the HIT industry in the coming years.\textsuperscript{8} The most rarefied of clinical applications, an expert system for predicting mortality for intensive care unit (ICU) patients marketed by APACHE Systems, never attained the broad market acceptance that its research and development (R&RD) costs—and the investors funding them—required. As a result, the once visionary company was the first of the high-flying, publicly traded HIT companies to miss Wall Street expectations and see its fortunes decline sharply.

Although the HIT marketers' claims about physicians' knee-jerk resistance is no doubt true for many who do not trust or understand the technology, the source of this resistance has never been sufficiently studied. Despite the billions of dollars invested in information technology generally, we have a dearth of good research into how such technologies mesh within their broader cultural context—a sort of techno-anthropology. Progress on HIT products would benefit greatly from precisely this kind of research. As an invocation to this research, I hypothesize that cultural problems are at the heart of physicians' resistance to much of what the HIT sector

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has to offer. After the second year of medical school, physicians are trained through a pure apprenticeship model. In the third and fourth years of medical school, and then throughout the ordeal of residency, physicians are introduced to each new disease by encountering it in an individual patient, not the other way around. Even the most cursory view of any case record in the New England Journal of Medicine, with its Proustian narrative of environmental factors, mutating symptoms, numeric scramble of lab values, and subtle changes in imaging studies, reinforces the idea that the culture of medical training has, by necessity, evolved in ways that focus physicians on treating patients, not the "patient-types" that are the units of analysis in an HIT system.

For clinical HIT applications to work properly, they need to incorporate a level of clinical data sufficient to address this fact. The current reimbursement-based systems are not sufficient, and physicians know this both directly and intuitively. The objection, "My patients are sicker," is really a proxy for the more reasoned but less frequently articulated, "I do not trust administrative data to reflect the clinical nuances and complexities of the patients we all treat."

In the absence of published evidence regarding precisely why physicians resent the imposition of HIT products on their clinical hegemony, I, like so many critics of individual physicians' attitudes toward information technology, resort to anecdote. This particular anecdote reveals not a knee-jerk reaction against HIT's problems, but rather an embrace of its more defensible promises. After weighing the significant pros and cons of accepting a hospitalist job with Kaiser Permanente, a physician friend who recently finished his residency told me that one of his deciding factors was Kaiser's new EMR. "No more wrestling with bulky paper charts and the notes of ten nurses and ten other docs I can't read," he said. Kaiser's EMR may not help him to make clinical decisions, but it is designed to make it easier for him to make those decisions on his own.

Given how many such physicians were trained during residency about the realities of coding for reimbursement, the question should not be, "How can they resist so much of what HIT has to offer," but rather, "Knowing this, how can they still accept so much of it?"

**Unto The Next Generation**

EMRs will prove to be the sine qua non of clinical information technology. All other data capture and transformation efforts—plagued by the technical and cultural problems described above—have fallen short of the rigor and reliability necessary to guide clinical decision making. My empirical evidence is a career's worth of competitive market research into products, methodologies, and information...
technologies designed to replicate in digital form the complexity and nuance captured in a paper medical chart, combined with a grudging recognition of what health care organizations purchase and successfully use.

The existence of an enterprisewide, fully functional EMR at Kaiser here in Colorado offers a number of object lessons for the market conditions and realities of EMR proliferation (Kaiser has piloted EMRs in three regions as a precursor to a national EMR currently in development). Kaiser enjoys several dimensions of critical mass necessary to develop and implement this costly, complex component of HIT: sheer size, investment capital, organizational discipline, and data captivity. This last point is particularly important: With exclusively contracted physician groups and owned hospitals, Kaiser has clinical data that reside under one corporate umbrella, or at least under the control of one corporate umbrella holder. Because of this control, Kaiser has been able to avoid the HIT industry's attempts to foist off-the-shelf clinical products and systems onto a unique organization's data streams. The result is the emergence of a more “homegrown” EMR, an important factor in the future development and marketing of all EMR technologies. Kaiser's EMR—the three pilots in the national effort—has not been imported whole from an HIT vendor but has been in part assembled from commercially available components and in part developed by the organization.

Kaiser's custom “self-development” is enabled by perennial breakthroughs in information technology price and performance. As hardware, software, and database capacity become progressively cheaper, it will be progressively easier for organizations to build larger, more complex systems to their own specification. Similarly, one of the most promising breakthroughs in EMR technology has nothing to do with EMRs per se: It is the proliferation of Internet Intranet software that allows for seamless data capture, sharing, and analysis across and within institutions. Standardized data transfer protocols and browser-based applications significantly neutralize many of the most costly intermural (facility-to-facility and facility-to-physician interface) barriers to EMR development and use. Spurred by these and other technologies, the underlying HIT price/performance curve may be reaching the point at which custom EMR development, affordable only to a Kaiser in the mid- to late 1990s, will be affordable to smaller organizations early in the next century.

But how much smaller? Beyond Kaiser, other successful EMR development has occurred at only a handful of large teaching and Veterans Affairs (VA) hospitals. For such efforts to proliferate around the industry, the recent, historic consolidation of health
“HIT products, like biotechnology products, are complex; they require testing; and many of them will fail.”

system capacity (under for-profit companies such as Tenet Healthcare and not-for-profit systems such as Daughters of Charity) will need to evolve beyond the simple financial/legal combinations of facilities; these emerging systems will need to pursue in earnest the goals of true operational integration meant to leverage those consolidations. For all of their size and capital accumulation, none of the national provider systems has yet developed or operated an EMR. Such an achievement would be a significant step toward delivering on the many promises made by the national system builders about hospital consolidation and capital formation.

If organizational customization is critical for building EMRs, it is even more so for the clinical HIT applications that flow out of them. When physicians involved in the organization become involved in the development of the EMR and its clinical decision-support elements, “buy-in” is virtually certain. Additionally, there are important aspects of medicine that, notwithstanding the nationwide industrialization of numerous care processes, will always remain local. The best example is infectious disease epidemiology. Pathogen proliferation and antibiotic resistance tend to remain localized phenomena; the clinical components of health information technologies need sufficient flexibility to account for this. One of the most effective models for this flexibility is the EMR installed at Latter-Day Saints (LDS) Hospital in Salt Lake City. A New England Journal of Medicine study of the clinical decision-support system, custom-built into the hospital’s EMR, found significant reductions in incorrect drug dosing and adverse reactions to drugs.22

The conclusions drawn by the study’s researchers provide a template for future EMR development and for the HIT industry as a whole. According to the study, “The misuse of antiinfective agents more often results from insufficient information than from inappropriate [clinical] behavior.”23 An editorial accompanying the study stated, “[T]he report shows improvement in clinical outcomes and not just in the performance of physicians. . . . [T]he computer program was designed by clinicians for use by clinicians at the study hospital. . . . [D]ecisions were not driven by guidelines devised by some remote expert consensus panel. . . . Physicians can improve quality of care when they are committed to this concept . . . and use information technology to assist them with the decisions they make at the bedside.”24
Vaporware Inc.

In its aggressive development and marketing of products that fail to accommodate or resolve the problems described in this paper, the HIT industry has promulgated a generation of clinical "vaporware": software that works fine on paper (or in sales presentations) but does not function properly, if at all. Clinical vaporware is the inevitable result of using data sources that are sound in theory and format but when mobilized are incomplete, of suspect quality, or marked by any of the biases or data insufficiencies described earlier. One Wall Street research report refers to this phenomenon as product "noise": confusion created in the market by companies that cannot deliver what they promise, thus distorting customers’ perceptions about price, performance, and capabilities of those vendors that promise only what they can deliver.23

How credible is this observation? One of the more significant initiatives by the health care industry as a whole to promote the use of clinically based HIT systems is the Oryx program created and promoted by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). Oryx requires accredited hospitals to capture and report data on clinical performance indicators (for example, surgical complication rates), using a JCAHO-approved list of clinical decision-support systems. As part of the program’s promotion, the JCAHO published a list of 344 such systems that met its standards. Of these 344 systems, all of which are actively promoted in the marketplace, 100 have no clients. Translation: Nearly one-third of the tools that have been promoted to (and consequently through) the JCAHO as methodologically sufficient and operationally reliable have yet to be tested or used by a single health care provider.

If this contrast between product theory and market reality seems remarkable, consider this: One of the hottest new “technologies” in the HIT sector, dating back to 1996, is the “clinical data repository.” There was scarcely a major HIT vendor that did not build one, service one, or analyze what resided within one. Every major vendor marketed its cutting-edge expertise with—and broad installed customer base for—its clinical data repository products. More than two years later, in mid-1998, a leading HIT users’ trade group, the Center for Healthcare Information Management, announced the results of a survey among hospital chief information officers, HIT consultants, and vendors: They had finally agreed on what a clinical data repository actually is.26

Part of this problem is industry investment structure. The HIT sector is not the first industry to emerge overnight and promise to effect major changes in the way the world works. Desktop software
in the 1980s, biotechnology in the early 1990s, and the Internet in the late 1990s have ushered in revolutions at least as poignant, fueled by highly speculative Wall Street money. However, unlike the HIT sector, those industries were (and still are, in two out of three cases) funded with the classic expectation that the products of an emerging industry need to be created, tested, and successfully launched before that industry’s companies will be profitable. The HIT sector never had that luxury. This is probably attributable to the fact that much of the HIT industry was “built out” from the core systems of vendors that were already profitable, and in part because it was too easy for HIT startups to get to a baseline profitability on quick-and-dirty releases of untested products.

This created a cycle of expectations that HIT products are easy to build, sell, and profit from. Given the technical, intellectual, and market challenges outlined here, this was a foolish proposition. HIT products are complex; they require testing; and many of them will fail. In this regard, they are very much like biotechnology products, and HIT executives should have recognized and communicated this fact to investors from the outset. The market will have to correct for this when it funds the next, inevitable wave of HIT products, most of which will by necessity involve the development and marketing of the EMRs described in this paper.

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NOTES

2. The historical absence of quality and cost data in health care is the premise of M.L. Millenson, Demanding Medical Excellence: Doctors and Accountability in the Information Age (Chicago: University of Chicago Press, 1997)
3. This is the core thesis of J.D. Kleinke, Bleeding Edge: The Business of Health Care in the Next Century (Gaithersburg, Md.: Aspen Publishers, 1998).
5. Ibid., 3.
7. This includes physician-profiling software from GMIS, HCIA, and HPR; clinical pathway analysis software from Cerner Corporation, HBO and Company, HCIA, Iameter, Mediquel, Premier, Summit Medical Systems, TSI, and VHA; and plan performance software from Applied Healthcare Informatics, Corporate Health Strategies, HCIA, and Medstat.

11. Hospital-profiling products sold by Cerner Corporation, CHIPS, HBO and Company, HCIA, Inforum (division of Medstat), Premier, TSI, VHA, and numerous state hospital associations.

12. This reflects my professional observation. Data sets I examined while at HCIA for potential acquisition and product development tended to lack encounter detail for capitated patients, thus representing not only the absence of a key type of data but a skewing in this absence as healthier patients tend to choose lower-cost, higher capitation-based health plans.


14. Ibid.


16. This also reflects my professional observation. Hospitals still represent the bulk of revenue sources for the HIT sector, with HMOs trailing closely and physician groups representing only a small fraction.

17. Professional observation. Physicians at hospitals usually possess, and frequently use, the power to kill the sale of HIT products that hospital administrators want to purchase.


20. Professional observation. Despite its size, Kaiser was not known as a reliable prospect among HIT vendors; it preferred to build its own clinically oriented HIT products rather than buying "off the shelf."

21. Professional observation of EMR installations around the United States.


23. Ibid., 236.


27. Professional observation. The expectation of all HIT companies seeking stock market funding was the preestablishment of profitability on going-forward operations.