patient is medicine's least valued commodity, from a financial reimbursement perspective. That's especially true in emergency department settings, where physicians are often evaluated on the numbers of patients seen, rather than the amount of time they spend with each one. Clinicians will not take time to educate and counsel patients about addiction — even if they know how — until they are adequately reimbursed for doing so. Currently, it is faster and pays better to diagnose pain and prescribe an opioid than to diagnose and treat addiction. Busy emergency physicians who would like to refer patients with addiction for appropriate treatment have few resources to call on.

To be sure, the recent shift in medicine's and society's approach to pain represents a response to long-standing neglect of patients' subjective experience of pain, as well as an increasing incidence of chronic pain syndromes in an aging population. Although this shift has no doubt benefited many persons with intractable pain that might previously have been undertreated, it has had devastating consequences for patients with addiction and those who may become addicted owing to lax opioid prescribing.

Some short-term changes that can help address this problem include mandating that all physicians complete a continuing medical education course on addiction, just as, since 2001, they have been required to complete one on pain treatment. Physicians need to learn to conceptualize addiction as a chronic illness that waxes and wanes — an illness similar to diabetes, heart disease, or other chronic illnesses that are influenced by patients' behavior. Physicians can master strategies for brief interventions that have been shown to reduce substance misuse without taking too much of clinicians' time and that are effective even in emergency department settings. In my opinion, all physicians in every state should have access to a database for prescription-drug monitoring and should be required by law to query the database before writing an initial prescription for opioids or other controlled substances. Laws to this effect have already been passed in a handful of states, including New York and Tennessee. Physicians must also be made aware of new billing codes that allow them to pursue reimbursement specifically for addiction counseling.

But the problem of doctors prescribing addictive analgesics to patients with known or suspected addiction will be solved only when the threat of public and legal censure for not treating addiction is equal to that for not treating pain and when treating addiction is financially compensated on a par with care for other illnesses. The former will occur only when addiction is considered a disease by medicine and society, for only then will it be treated as a legitimate object of clinical attention. The latter will occur only when time spent with patients is valued as much as prescriptions and procedures.

In the meantime, countless patients come to emergency departments and doctors' offices throughout the country every day reporting pain and receiving opioids despite known or suspected addiction. Health care providers have become de facto hostages of these patients, yet the ultimate victims are the patients themselves, who are not getting the treatment for addiction they need and deserve.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

From the Department of Psychiatry, Stanford University, Stanford, CA.

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# Moneyball and Medicine

Christopher J. Phillips, Ph.D., Jeremy A. Greene, M.D., Ph.D., and Scott H. Podolsky, M.D.

This year, as the *Journal* celebrates its 200th anniversary, we also celebrate the 100th year of another New England landmark about a mile down the road: Fenway Park, home of the Boston Red Sox. The connection is not entirely geographic: if *Journal* articles are any guide, the relationship between medicine and baseball has been enduring and multifaceted. Baseball analogies and meta-

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phors have been used in discussing surgical practice (1938; see box for cited *Journal* articles), pharmaceutical regulation (1961), racial integration in the medical profession (1969), the increasing intensity of hospital complexity and throughput (1982), and even the occasional inability of metaphor itself to capture our anxieties and concerns (2008). Lou Gehrig's disease and Tommy John surgery have demonstrated the power of celebrity patients to draw attention to particular syndromes and procedures.[1] And direct epidemiologic correlations between baseball and health were noted as early as 1908, when the *Journal*'s editors pointed to reports that New York's increased rate of death from cardiovascular causes was due to "the extraordinary excitement prevailing in that city in connection with the baseball situation" (most certainly referring to the epic late-season rivalry between the Chicago Cubs and the New York Giants, rather than the last-place finish of the lowly New York Highlanders — later renamed the Yankees [1908]).

But a more relevant kinship between medicine and baseball may be found in the recent struggles in both fields to use evidence in practice. As Michael Lewis's 2003 best-selling book *Moneyball* explains, the architects of the new evidence-based baseball — most notably, Oakland Athletics general manager Billy Beane — have developed metrics to assess the performance of players in terms of the value they add to the overall team effort.[2] Similarly, architects of new value-based approaches to health care delivery have attempted to develop metrics to evaluate the performance of therapeutic strategies, individual practitioners, and organizations. Although Hollywood has yet to dramatize evidence-based medicine, the casting of Brad Pitt as Beane in last year's film version of *Moneyball* has helped to crystallize for a large audience the divide between aesthetic and numerical logics in performance-based decision making.

If there is a pioneer of evidence-based baseball, it is Bill James, who in the 1970s insisted on placing the evaluation of players on sounder analytic ground, focusing on measurable outcomes over the traditional aesthetics of the "five-tool" player (who appears to excel at each of the game's five key skills). The inhabitants of Fenway Park eventually came to embody the moneyball ethos themselves when the Red Sox hired James as a part-time consultant in 2002. In the same decades, the field of health care began to increasingly focus on evidence-based medicine and the promotion of outcome studies over the more anecdotal authority of those who argued from "clinical experience." At the level of individual interventions, evidence-based medicine has come to define what is rational in medical practice, with implications for both standardization and reimbursement.

In both medicine and baseball, advocates of evidence-based approaches argued for the enhanced vision of statistical techniques, which revealed what tradition or habit had obscured. The difference between an all-star and an average hitter, for example, works out to about one hit every other week, a distinction that's almost impossible for even a trained scout to recognize. Statistical power can be as relevant as opposite-field hitting power in the assessment of players. Early proponents of controlled medical trials similarly pointed to how difficult it was for an individual practitioner to determine a treatment's efficacy or distinguish real effects from apparent ones after seeing only a small number of clinical cases. Mathematical measurements and calculations were meant to push practitioners away from naive visual biases — a player who "looks right" or a therapy that seems to work. Walks are far more important than they first appear in baseball; walking is more important than it first appears in medicine.

Critics of moneyball approaches have nonetheless been quick to emphasize the way in which perspective can be distorted, not enhanced, by statistics. One might overapply concepts such as Bayes' theorem or develop a habit of plugging data into statistical software simply to gain a patina of precision, regardless of appropriateness (tendencies that cause medical practitioners, in Alvan Feinstein's pithy phrase, to be blinded by the "haze of Bayes").[3] Critics have also pointed to what

might be termed the "uncertainty principle" of statistical analysis: general data (How well does this player hit against left-handers? How well does this therapy work in myocardial infarction?) often fail to take into account consequential distinctions; but more specific data (How well does this player hit against hard-throwing left-handers on warm Sunday afternoons in late September? How well does this therapy work in right-sided myocardial infarction in postmenopausal women?) can involve too few cases to be broadly useful. Individuals, and individual scenarios, might always be idiosyncratic on some level — a truth perhaps borne out by long-standing efforts to appropriately apply the scientific results of clinical trials to individual patients in the clinic.

The true relevance of moneyball to medicine, however, lies not just in the quantification of performance but in the appreciation of value.[4] Numerical records have been kept for both baseball and medicine for well over a century; what has changed recently are the methods of finding the diamonds in the rough, of discovering true (and truly underappreciated) value. This innovative use of numbers to discover and invest in hidden value links both fields to the tradition of value-based investing pioneered by Benjamin Graham and David Dodd in the 1930s and subsequently popularized by Warren Buffett. It's no accident that the first teams to employ statisticians in baseball were among the poorest: you don't need to crunch the numbers when you can afford to pay top dollar for proven stars. Conversely, in health care, we have been spending as if we had the budget of the Yankees — while all signs suggest we'll soon be operating more like the Athletics. Collaborations among leaders in health services research, management sciences, and health care organizations have yielded new models for putting the value framework to work in medicine (2010a, 2010b) — as has already happened in baseball. And yet, cost-effectiveness modeling will always depend on the data and assumptions that are built into the models.

The recent deployment of the accountable care organization model in health care delivery represents an important test of moneyball medicine in practice (2011a, 2011b). If such organizations can demonstrate the delivery of high-value care at lower costs, that would indeed hold promise for a moneyball revolution in medicine.

Finally, demanding evidence of value in medicine does not need to be at odds with the values of medical humanism, much as demanding attention to numerical logic need not be at odds with recognizing the importance of contextualized judgment. After all, it was William Osler who noted that "medicine is a science of uncertainty and an art of probability."[5] Between the editor of Osler's *Aphorisms* — the celebrated internist and medical humanist William Bennett (Bill) Bean — and Billy Beane, there may be more than a nominal kinship. We would do well to ponder the continuing relevance of baseball — along with the potential nuances and limits of metrics themselves — for understanding evidence and value in medicine.

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From the Department of the History of Science, Harvard University, Cambridge, MA (C.J.P.); the Institute of the History of Medicine, Welch Library, Johns Hopkins University, Baltimore (J.A.G.); and the Department of Global Health and Social Medicine, Harvard Medical School, and the Center for the History of Medicine, Countway Medical Library — both in Boston (S.H.P.)

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# Unique Device Identification in the Service of Public Health

Thomas P. Gross, M.D., M.P.H., and Jay Crowley, M.S.

The Food and Drug Administration (FDA) regulates medical devices and electronic radiation-emitting products — goods that range from single-use disposables, to short- and long-term implantables, to multiple-use durable capital equipment. Medical devices encompass products that are low risk (class I), such as tongue depressors and prescription eyeglasses; moderate risk