

reduced without increasing readmissions. The second is whether new payment models can encourage safe reductions in home-to-home time and how health systems will achieve such reductions (by limiting discharges to post-acute care facilities, reducing length of stay at such facilities, or both). These questions are particularly relevant for health systems operating under bundled-payment models, such as the Comprehensive Care for Joint Replacement model, which adjust payments solely on the basis of average regional spending. Hospitals that care for patients with complex conditions who need more post-acute care may struggle to respond to this new payment model. More sophisticated risk adjustment could mitigate the potential danger from hospitals working aggressively to reduce home-to-home time for vulnerable patients. The third question is what patients want, given the po-

tential trade-offs between more time in a facility and more time at home.

Together, these questions recapitulate the concerns about discharging patients “quicker and sicker” that arose when the inpatient prospective payment system was introduced in the 1980s. A single-minded focus on reducing overall post-acute care use and home-to-home time could easily backfire, since patients using post-acute care are among the sickest and most vulnerable in the whole health system. When done responsibly, however, shifting the conversation from length of hospital stay to home-to-home time could drive meaningful conversation about how to reconcile new payment models, efficiency of care, and the goal of improving patient care.

Disclosure forms provided by the authors are available at NEJM.org.

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Patient-Reported Outcomes — Are They Living Up to Their Potential?

Judith F. Baumhauer, M.D., M.P.H.

As part of a nationwide movement toward giving patients more of a voice in their health care, an increasing number of organizations are collecting and assessing patient-reported outcomes (PROs). There is a growing chorus of support from clinicians, researchers, and payers for embracing PRO measurement instruments in clinical care. But there are still important practical questions about how data on these

outcomes should be collected, visualized, shared, and used to improve the quality of care.

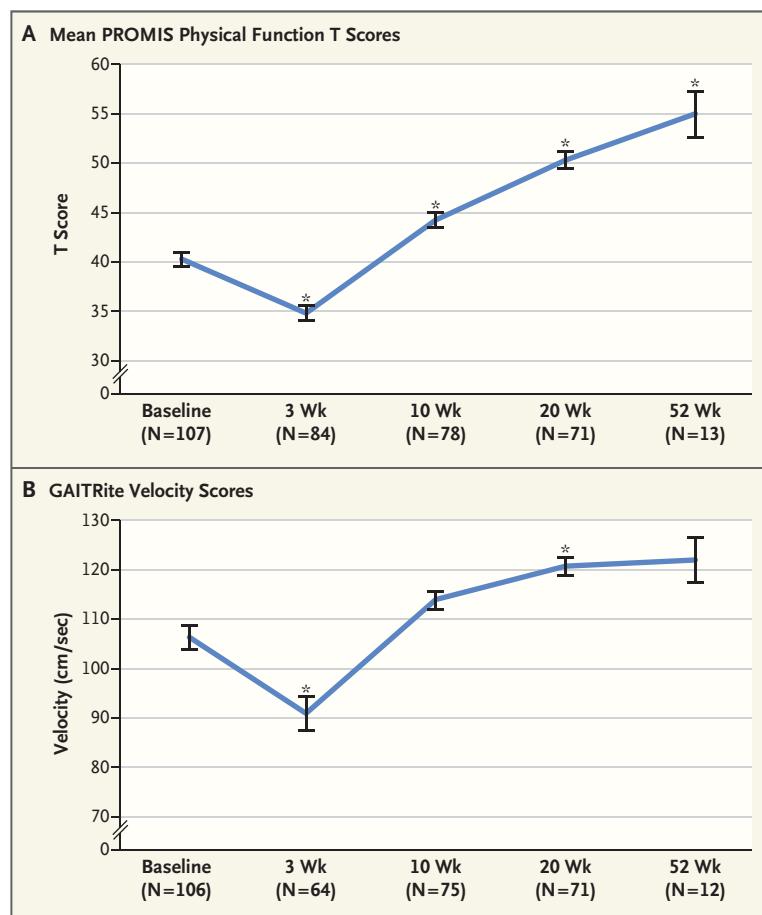
At the orthopedic surgery department at the University of Rochester Medical Center, we have collected PROs during every outpatient clinic visit for the past 2 years, a practice that was expanded throughout 30 departments and divisions over the past year.¹ Our decision to commit to PRO assessments was inspired by a

study that compared physical function scores obtained in the office using the Patient-Reported Outcomes Measurement Information System (PROMIS) with the GAITrite temporal and spatial gait-analysis system, which measures walking speed, cadence, stride length, and other gait parameters directly — and costs \$52,000.^{2,3} The study included 106 patients who underwent knee-ligament reconstruction. It showed

that the PROMIS physical function assessment took 1 minute and was more precise than the gait-analysis approach, which took 10 to 15 minutes to complete. What's more, the PROMIS assessment had less of a ceiling effect: none of the participants had the system's highest possible score, whereas some using the gait-analysis approach did (see graphs).

The validated PROMIS measurement tool uses computer adaptive technology and item-response theory. Each question is selected using a patient's previous responses, allowing the system to assign a score from a limited amount of information. Patients answer an average of four to seven questions on a Wi-Fi-enabled tablet, and the system leverages a larger database — in the case of the physical function assessment, one with 121 validated items — to produce an accurate, reproducible score. An independent interface allows physicians to instantly view patient scores, compare them with scores from a reference population, and use them to support shared decision making with the patient. To permit more nimble access, PRO data are stored on a separate server rather than in the electronic health record (EHR), but they can be linked to personal health information in the EHR for the purposes of research and aggregate data assessment.

The University of Rochester collects scores from 80% of patients on three PROMIS domains — physical function, pain interference, and depression — through in-clinic testing that requires an average of 2.4 minutes to complete. Individual departments can choose to collect patient responses on additional domains; for ex-



Physical Function Assessments after Knee-Ligament Reconstruction.

Mean PROMIS physical function T scores (Panel A) and GAITRite velocity scores (Panel B) were obtained at baseline and over 1 year. Error bars indicate the standard error, and asterisks a significant difference from baseline ($P<0.001$). Modified from Papuga et al.²

ample, physicians in our cancer center decided it was important to assess their patients' anxiety and fatigue. Each additional domain increases completion time by approximately 1 minute, and the total number of domains is limited to five to avoid burdening patients. In 2 years, 148,000 unique patients have completed over 1.1 million PROMIS assessments.

After developing a pragmatic, efficient mechanism for collecting, visualizing, and sharing PROMIS scores, we evaluated how these

data could be used to improve the quality of care. For physicians to determine whether a particular treatment option will be worthwhile for a given patient, they must understand the patient's expectations, his or her current functional status, and how much improvement the treatment can be expected to produce. PRO data can be linked with diagnosis codes, surgical codes, and information on coexisting conditions, medications, physical therapy, and other variables in the EHR. Using the large PROMIS database, we

were able to assess the effect of commonly performed surgeries on physical function, pain, and depression over the course of an episode of care.

We then performed receiver operator characteristic analysis to determine whether preoperative PROMIS scores could predict the likelihood that a patient would obtain a clinically meaningful benefit from foot and ankle surgery.⁴ We found that a patient with a PROMIS physical function T score above 42, for example, has a 94% chance of not experiencing a minimal clinically important difference in function after surgery. Similarly, a patient with a preoperative pain T score below 55 has a 95% chance of not obtaining a meaningful benefit in terms of pain interference. Similar assessments have been conducted for spine surgery, spinal injections, total joint replacement, and various other surgical interventions. This information can help guide decisions about surgery: discussions between surgeons and patients can focus on the expected benefit of surgery for the specific patient, rather than on the average benefit in a patient population.

Other institutions have also been incorporating PRO collection into clinical care. Health care organizations in England and Scotland have extensive experience assessing condition-specific PROs and patient scores on the EuroQol 5-Dimension Self-Report Questionnaire (EQ5D) and reporting these data publicly. In the United States, Dartmouth–Hitchcock Medical Center has assessed spine-surgery outcomes using the RAND 36-Item Short-Form General Health Survey (SF-36) for years and was an early champion of

using PROs, having demonstrated the link between preoperative depression and poor surgical outcomes. This finding led the hospital to implement presurgical counseling to prepare patients for spine surgery.

The University of Utah sends PRO assessments to patients at scheduled times through a link sent to the patient's e-mail address and receives responses from approximately 30% of patients before their appointments; scores for the remaining patients are collected in the clinic. The university also uses a supplemental application to provide clinicians with PROMIS data for various treatments, alongside validated cost data, to help inform treatment decisions. Northwestern, Stanford, Washington University, Partners HealthCare, and many other institutions are also using PROs to incorporate patients' perceptions of their health into the medical record.

At the patient level, PRO data allow people to understand what to expect during recovery. For example, patients who have had surgery often want to know when they can return to work or participate in sports. By comparing an individual patient's preoperative scores with prospective population-level PROMIS data, our system can create a roadmap of recovery that predicts functioning in specific areas over time to help answer patients' questions and set appropriate expectations.

At the aggregate level, PRO data can be used to minimize variation in patient care. For example, institutions can compare data from different surgical procedures performed for the same condition to determine which ones have the best outcomes from the patient's

perspective. For procedures with similar outcomes, other factors such as costs, risks, and time to full recovery after surgery can be compared. When certain procedures are found to have less favorable outcomes, institutions can determine whether an individual surgeon's technique needs improvement or the treatment approach should be abandoned completely.

PROs are already helping to improve patient care. By mastering the efficient measurement of these outcomes in the clinic, minimizing the reporting burden for patients, displaying PRO information at the point of care, and using outcomes predicted from population-level data to inform patient expectations, we can continue to ensure their benefits. Such a strategy allows us to help surgeons identify areas where they need improvement, eliminate procedures with less favorable outcomes, and avoid performing surgeries on patients who are unlikely to benefit from them. It also enhances patient satisfaction with care by helping physicians set appropriate expectations regarding a patient's return to work, school, or sports. Most important, PROs place the patient's voice at the forefront of health care delivery.

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Preserving the Fogarty International Center — Benefits for Americans and the World

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In his proposed budget for fiscal year 2018, President Donald Trump recommended eliminating the Fogarty International Center (FIC) at the National Institutes of Health (NIH). Although the NIH actually received increased funding in the fiscal year 2017 budget that was signed on May 5, the FIC — a leader of U.S. global health research efforts for the past 50 years — may be vulnerable in upcoming negotiations over the 2018 budget. NIH Director Francis Collins has signaled that while awaiting congressional guidance, he is evaluating whether he can justify continuing the FIC if the NIH faces budget cuts down the line.¹ In our view as current or past recipients of FIC support, the center represents a valuable and effective scientific and diplomatic

 An audio interview with Dr. Drain is available at NEJM.org

investment, and the small reduction in the federal budget that would result from its elimination would be far outweighed by what would be lost.

The FIC mission is threefold: to advance NIH goals by supporting global health research conducted by U.S. and international investigators, to build partnerships between research institutions in the United States and

abroad, and to train the next generation of scientists to address global health needs. The center's efforts have produced medical innovations that transcend borders. Its closure would not only be detrimental for global health but would also affect the health of Americans and impede training of U.S. scientists.

The FIC fosters research collaborations between U.S. and overseas institutions to develop treatments that reduce disability and save lives. Although the center has the smallest budget among the NIH's 27 institutes and centers (\$70.4 million in fiscal year 2016), FIC grantees have been among the most productive in publishing peer-reviewed articles (see graph). In 2015, researchers supported by the center published more than 20 articles per \$1 million of annual budget. Applications for FIC grants are highly competitive. In fiscal year 2016, applicants for a K01 career-development award from the center had a 22.7% success rate, as compared with 32.1% for such awards across all NIH institutes.

The FIC has funded wide-ranging studies whose findings are relevant to major health issues in the United States and elsewhere. FIC-supported researchers are

working to improve stroke prevention, treat multidrug-resistant tuberculosis, and evaluate HIV vaccine candidates. FIC-funded efforts are tackling the problem of fake medications that kill millions of patients worldwide and that many Americans purchase unwittingly; identifying new cancer drugs in the waters off the Panama coast; and finding ways to address the number-one killer of young American travelers, road traffic accidents.

About one third of FIC grants focus on scientific discovery, and two thirds support research training. The center's training programs have been a model of sustained, mission-driven efforts to equip U.S. scientists and their colleagues in low- and middle-income countries (LMICs) to collaboratively tackle the world's health challenges. For example, since 2003, the Fogarty Global Health Fellows and Scholars Program has provided yearlong research training experiences for doctoral and postdoctoral scientists at U.S.-funded LMIC research sites. Anchored by leadership and funding from the FIC, the program has leveraged support from many additional NIH institutes and centers.

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