

MARK I. FROIMSON, MD, MBA

President, Euclid Hospital, Cleveland Clinic Health System,
Cleveland, OH

In-home care following total knee replacement

■ ABSTRACT

To meet the growing demand for total knee replacement (TKR) procedures, health care systems are obligated to design care paths that foster more rational use of resources, including home-based postacute care. Early discharge to home, with home-based rehabilitation and physical therapy, has been associated with reduced cost, improved clinical outcomes, and increased patient satisfaction. The goals of a home-based clinical care path for TKR include patient and family engagement, shared decision-making, and flexibility regarding changes in plans to accommodate changing needs.

Total knee replacement (TKR) is a reliable treatment for end-stage arthritis of the knee, resulting in pain relief and return of function. While surgeons have historically focused on surgical technique and implant selection as important factors on the path to a successful outcome, additional care elements may play similarly important roles. As hospital length of stay continues to decrease, more of the patient's postoperative care occurs in a postacute setting, with home care becoming a more important component of a well-designed care path. Early experience suggests that this shift toward home care has resulted in a more cost-effective approach with improved outcomes.¹⁻⁴

Although TKR has traditionally been viewed as a surgical procedure, an important shift in thinking has increased recognition that TKR is best viewed as part of a spectrum of care required to obtain an end result. Viewing the procedure as an episode of care is gaining significant traction. In this approach, the surgical procedure and its attendant features and factors remain paramount and central in driving outcomes, but the care that precedes and follows the procedure can have a significant impact on important measures

of success. From the patient's perspective, this view is intuitive; ie, the outcome of the intervention can only be assessed when complete healing has occurred and the patient has returned to routine activities of daily living (ADL). As such, a more holistic or global view of the episode is warranted and is receiving increasing attention.⁵⁻⁸

■ INNOVATIVE PAYMENT METHODS AND RESOURCE ALLOCATION

Recently, the Center for Medicare & Medicaid Services (CMS) launched a call for innovative payment methods for episodes of care. Traditionally, CMS has paid for each component of care separately; the new approach, represented in this call for proposals and driven by the Patient Protection and Affordable Care Act (PPACA), is to pay for care based on defined episodes. This method of payment is sometimes referred to as "bundling," in that the payment for a group of services is linked into a single payment. Although the details and definitions of the episodes may vary, the conceptual framework supports the integration of care along a continuum. By paying for care based on the entire episode, CMS believes it can encourage more rational allocation of resources along the care path.⁹

It is widely recognized that one area where care can be better managed is during the transitions that occur at many points along the care path—for example, transition from operating theater to postoperative unit and then to the acute care hospital setting, and transition from acute care hospital to a postacute setting.^{1,4,10}

When a patient no longer requires hospital services but needs the benefits of continued care, the transition to postacute care must be managed carefully. Optimizing this transition and choosing among postacute care venues can significantly affect cost and outcomes of the procedure. In fact, there is increasing evidence that the transition from hospitalization to postacute care has been significantly undermanaged,

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with deferral of some important considerations until after the process has already begun.^{1,4,10} Neglecting this important transition results in unwarranted variation in process and outcomes. For example, physicians often delegate decisions regarding the location and intensity of postacute services to other team members. Patient preferences and, at times, misconceptions can drive the choices for postacute care, with patients erroneously believing that one venue is inherently better than another or that more is somehow better than less. Such patterns can lead to over- or underutilization, with care unmatched to individual need or circumstance. Careful scrutiny by an engaged team of the resources necessary for patients as they transition to the postacute component of the episode is likely to result in a more rational, cost-effective approach to care. It is also likely to increase patient satisfaction and improve patient outcome measures.^{5,10-13}

■ MEETING THE CHALLENGE OF INCREASED DEMAND WITH HOME CARE

With the rising incidence of knee arthritis, the demand for TKR is expected to more than double in the coming years.¹⁴ This increased utilization is driven by an aging population that desires to remain active, as well as by evidence suggesting health benefits associated with increased activity levels. Along with these demographic and utilization trends, another evolution in joint replacement derives from patients' expectation of continuously improving results. Patients measure the success of TKR not only by relative reduction in pain, but also by other outcome metrics, including, importantly, return to sport or work.^{5,7} The tandem challenge posed by increased demand for services and increased patient expectations regarding outcomes is testing health care providers as they consider the resources that will be required to meet the demand.

Health care systems, payers, and physicians are looking for ways to more efficiently meet this growing need for TKR services in the context of finite health care resources subject to competing demand from several clinical entities. Regardless of TKR's record of clinical success, the resources applied to this orthopedic intervention come at the expense of the same resources being applied to other health care needs. As demand is unlikely to wane, the only rational approach is to redesign care delivery in favor of a more efficient model. In order to meet the demand with the available resources, several goals need to be achieved: fewer inpatient hospital and postacute bed days consumed by joint replacement services, better

streamlined care paths, and improved engagement of the patient and his or her home-based support network. Key to this process is driving care to the home environment, provided that quality is at least comparable and cost is significantly less.^{3,15-17}

Postoperative rehabilitation and physical therapy is essential to restoration of function after TKR. It is therefore no surprise that rehabilitation and physical therapy make up a significant proportion of the home care services for this patient population.^{8,17,18} Among its advantages, therapy in the home environment gives the therapist the opportunity to identify and address the patient's unique needs in his or her own home. In addition, family and other support personnel often feel more comfortable assuming responsibility for assisting with care in a familiar setting. Tailored therapy in the home setting can improve safety and satisfaction and speed the resumption of ADL; it is increasingly seen as an essential component of the care path.^{4,11}

Recently, care path designs have been subject to careful analyses that compare in-home rehabilitation outcomes with outcomes achieved in an inpatient environment. Observational, retrospective, and prospective study designs have confirmed that the in-home rehabilitation model of care delivery is not only viable, but in many circumstances preferable.^{5,10,12,17,19} The quality is comparable to inpatient care for most TKR patient populations and the cost and resource utilization intensity are considerably reduced. Such reports have lent credence to the movement to incorporate home care services into successful post-joint replacement care paths. The approach appears to have a large potential for benefit with very little risk. Strategies that aim to more rationally deliver needed rehabilitation services at home promise to keep TKR services within the reach of our strained health care resources.

■ THE HOME CARE CLINICAL PATH

The underlying principle of a home care clinical path is that the patient remains at the center of the program and shares in decisions about care strategies (**Table**). One of the greatest concerns patients have about a pending knee replacement is the duration of their expected recovery. To meet this concern, a Rapid Recovery Care Path has been developed that incorporates an integrated approach to acute and postacute care, with increased emphasis on discharging patients to their home environment as early as it appears safe to do so. The goals of a rapid recovery home-centered care program following routine TKR include reduced postoperative pain and early return to function.^{2,15,16} Meeting these goals minimizes the

development of a vicious cycle of pain and stiffness that may lead to chronic pain and fibrosis. As a result, the patient can pursue more aggressive rehabilitation, which maintains joint range of motion, permits earlier hospital discharge and discharge to home rather than another health care facility, and improves patient satisfaction.

The Cleveland Clinic Total Knee Care Path effectively incorporates the rapid recovery approach, with home care taking the lead in discharge planning and transition of care management. Education is essential and should start early, at the time of informed consent; involve the patient and family; and continue throughout the care path.

The key to a successful outcome is patient engagement with agreed-upon principles of care, which form the basis for the care path. In the Cleveland Clinic program, patients are engaged to embrace the following goals:

- Shared decision-making
- A home care environment that includes support of family and friends
- Patient and family education to enhance shared decision-making
- Return to the home environment as soon as it is deemed safe
- Elimination of unnecessary or duplicative treatments, tests, or interventions
- Acceptance of multiple plans or paths in response to changing clinical conditions

All patients undergo a preoperative evaluation, during which they are introduced to and educated about the Rapid Recovery Total Knee Care Path. The Rapid Recovery Path accommodates planned interventions and contingencies depending on clinical course. Every patient envisions a safe return home as a primary goal, with as short an exposure to inpatient acute and postacute settings as is necessary. No fixed length of stay or discharge destination is mandated. Rather, patients are encouraged to articulate their goals, drive their discharge, and return home. Such shared decision-making empowers patients and improves satisfaction.

Factors that affect recovery are assessed through a detailed perioperative history and physical examination. The patient's readiness for an intervention such as TKR is assessed in three phases:

- The preoperative history, physical examination, and radiographic parameters establish that appropriate indications exist in terms of diagnosis and level of disability.
- The assessment team identifies conditions that

TABLE

Sample care path for total knee replacement

1. Confirm diagnosis
2. Identify conditions that increase risk and plan for perioperative management
3. Assess patient's abilities to participate in care
4. Identify effective and reliable care advocate
5. Evaluate postacute care venues and, with patient's participation, select one that meets the patient's needs
6. Manage transition from inpatient to postacute care venue
7. Evaluate home-based rehabilitation services and, with patient's participation, select one that meets the patient's needs
8. Manage the transition from postacute to home care^a
9. Maintain communications and follow-up with patient, patient's care advocate, and home care providers

^aIf patient does not have a care advocate, transition to home care is not an option.

affect risk and devises plans for their perioperative management—for example, control of blood glucose or decolonization of methicillin-resistant *Staphylococcus aureus* carriers. Plans are made for the perioperative as well as seamless postdischarge management of chronic conditions such as atrial fibrillation requiring anticoagulation or hypertension.

- Psychosocial factors are evaluated for their potential impact on discharge planning and postacute management. Patients must establish their ability to participate actively in their care and consider their access to family, friends, and neighbors who can assist with care management in the home. Successful management of the care episode depends on an effective and reliable advocate. If the patient is unable to perform this function, then a surrogate advocate must be identified. If this role cannot be filled, the patient will require transfer to an inpatient rehabilitation facility.

■ POSITIVE RESULTS, BUT REGULATORY CHALLENGES

Since our 2006 incorporation of an active postacute home care program into our rapid recovery protocol, we have observed several improved outcome metrics:

- Average acute care hospital length of stay has been reduced by an average of 0.9 days.
- Our discharge to home rate has risen from 32%

to 74%. In fact, among surgeons who have fully embraced the rapid recovery protocol, the discharge to home rate is 74% compared with 45% among the remaining surgeons. The difference is statistically ($P < .05$) and clinically significant.

- The readmission rate for patients discharged to home using this protocol is significantly lower compared with the rate before the protocol was implemented and with the rate of a control cohort discharged to a skilled nursing facility. Patients discharged to home consume significantly fewer resources and cost the system about one-third as much as those sent to an inpatient postacute facility.

Despite these gains, the regulatory environment is not structured to reward good stewardship of health care resources. For example, current payment rules penalize institutions that achieve early discharge (less than 3 days) from an acute care hospital when the patient will be transferred to another care venue. In addition, requirements for home care can be stringent, limiting the beneficial application of therapy in the home if alternatives, such as outpatient or subacute care, exist. Fortunately, PPACA and the request for bundled pricing of episodes of care gives providers the opportunity to apply for exceptions to rules that hinder cost containment. As such, relief may be in sight.

OUTLOOK

The future is bright for care path development and incorporation of better methods to manage care episodes.^{20,21} Although the concept of outpatient joint replacement has been considered by some, questions remain regarding the lower limit of resources that should be applied to a given episode and how best to predict which patients can benefit from even less inpatient care. Predictive modeling based on patient-specific factors might assist in this, but prudence suggests that flexibility in care path management will always be the most important element of protection for patients. Specifically, early detection of significant clinical deviation requiring a change in venue is paramount and is routinely incorporated into any well-designed care path. The goal is not to minimize resource utilization, but rather to ensure appropriate and rational distribution of health care resources to meet the clinical needs of each patient. Refining our approaches to achieving this balance will require ongoing work and monitoring of metrics of success.

REFERENCES

1. Chimenti CE, Ingersoll G. Comparison of home health care physical therapy outcomes following total knee replacement with and without subacute rehabilitation. *J Geriatr Phys Ther* 2007; 30:102–108.
2. Iyengar KP, Nadkarni JB, Ivanovic N, Mahale A. Targeted early rehabilitation at home after total hip and knee joint replacement: does it work? *Disabil Rehabil* 2007; 29:495–502.
3. Mitchell C, Walker J, Walters S, Morgan AB, Binns T, Mathers N. Costs and effectiveness of pre- and post-operative home physiotherapy for total knee replacement: randomized controlled trial. *J Eval Clin Pract* 2005; 11:283–292.
4. Stevens M, van den Akker-Scheek I, Spriensma A, Boss NA, Dieckmans RL, van Horn JR. The Groningen Orthopedic Exit Strategy (GOES): a home-based support program for total hip and knee arthroplasty patients after shortened hospital stay. *Patient Educ Couns* 2004; 54:95–99.
5. Tousignant M, Boissy P, Moffet H, et al. Patients' satisfaction of healthcare services and perception with in-home telerehabilitation and physiotherapists' satisfaction toward technology for post-knee arthroplasty: an embedded study in a randomized trial [published online ahead of print April 14, 2011]. *Telemed J E Health* 2011; 17:376–382. doi:10.1089/tmj.2010.0198
6. Kramer JF, Speechley M, Bourne R, Rorabeck C, Vaz M. Comparison of clinic- and home-based rehabilitation programs after total knee arthroplasty. *Clin Orthop Relat Res* 2003; 410:225–234.
7. Loft M, McWilliam C, Ward-Griffin C. Patient empowerment after total hip and knee replacement. *Orthop Nurs* 2003; 22:42–47.
8. Harris MD, Candando P. The physical therapist as a member of the home healthcare team: caring for patients with replacements. *Home Healthc Nurse* 1998; 16:153–156.
9. Collins T, Herness J, Martenas J, Roberson A. Medicare prospective payment before and after implementation: a review of visits and physical performance among Medicare home health patients after total knee replacements. *Home Healthc Nurse* 2007; 25:401–407.
10. Mallinson TR, Bateman J, Tseng HY, et al. A comparison of discharge functional status after rehabilitation in skilled nursing, home health, and medical rehabilitation settings for patients after lower-extremity joint replacement surgery. *Arch Phys Med Rehabil* 2011; 92:712–720.
11. Stineman MG, Chan L. Commentary on the comparative effectiveness of alternative settings for joint replacement rehabilitation. *Arch Phys Med Rehabil* 2009; 90:1257–1259.
12. Lin CW, March L, Crosbie J, et al. Maximum recovery after knee replacement—the MARKER study rationale and protocol. *BMC Musculoskelet Disord* 2009; 10:69.
13. Thomas G, Faisal M, Young S, Asson R, Ritson M, Bawale R. Early discharge after hip arthroplasty with home support: experience at a UK District General Hospital. *Hip Int* 2008; 18:294–300.
14. Tian W, DeJong G, Brown M, Hsieh CH, Zamfirov ZP, Horn SD. Looking upstream: factors shaping the demand for postacute joint replacement rehabilitation. *Arch Phys Med Rehabil* 2009; 90:1260–1268.
15. Bade MJ, Stevens-Lapsley JE. Early high-intensity rehabilitation following total knee arthroplasty improves outcomes [published online ahead of print September 30, 2011]. *J Orthop Sports Phys Ther* 2011; 41:932–941. doi:10.2519/jospt.2011.3734
16. Doman DM, Gerlinger TL. Total joint arthroplasty cost savings with a rapid recovery protocol in a military medical center. *Mil Med* 2012; 177:64–69.
17. Liebs TR, Herzberg W, Rüther W, Haasters J, Russlies M, Hassenpflug J; Multicenter Arthroplasty Aftercare Project. Multicenter randomized controlled trial comparing early versus late aquatic therapy after total hip or knee arthroplasty [published online ahead of print December 21, 2011]. *Arch Phys Med Rehabil* 2012; 93:192–199. doi:10.1016/j.apmr.2011.09.011
18. Mahomed NN, Koo Seen Lin MJ, Levesque J, Lan S, Bogoch ER. Determinants and outcomes of inpatient versus home based rehabilitation following elective hip and knee replacement. *J Rheumatol* 2000; 27:1753–1758.

19. Mahomed NN, Davis AM, Hawker G, et al. Inpatient compared with home-based rehabilitation following primary unilateral total hip or knee replacement: a randomized controlled trial. *J Bone Joint Surg Am* 2008; 90:1673–1680.
20. Aprile I, Rizzo RS, Romanini E, et al. Group rehabilitation versus individual rehabilitation following knee and hip replacement: a pilot study with randomized, single-blind, cross-over design. *Eur J Phys Rehabil Med* 2011; 47:551–559.
21. Russell TG, Buttrum P, Wootton R, Jull GA. Rehabilitation after total knee replacement via low-bandwidth telemedicine: the patient and therapist experience. *J Telemed Telecare* 2004; 10(suppl 1):85–87.

Correspondence: Mark I. Froimson, MD, MBA, Euclid Hospital, 18901 Lakeshore Boulevard, Euclid, OH 44119; froismm@ccf.org