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Home Health Services Are Not Required for Select Total Hip Arthroplasty Candidates: Assessment and Supplementation With an Electronic Recovery Application

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ABSTRACT

Background: At our institution, all postoperative total hip arthroplasty (THA) candidates have received home health services (HHS), consisting of visiting nurses, physical and occupational therapists. However, with a more technologically inclined patient population, electronic patient rehabilitation applications (EPRAs) can be used to deliver perioperative care at the comfort of the patient's home. The aim of this study is to investigate the clinical utility and economic burden associated with digital rehabilitation applications in primary THA recipients.

Methods: We conducted a single-center, retrospective review of patients operated between November 2016 and November 2017. Before surgery, and at the discretion of the surgeon, patients were assigned to EPRA with HHS or EPRA alone. Patient baseline demographics, EPRA engagement, and validated patient-reported outcomes (PROs) were (Veterans Rand 12-Item Health Survey [VR-12] and Hip Disability and Osteoarthritis Outcome Score Junior) at baseline and 12 weeks. These PRO scores were correlated with cohort assignments to assess noninferiority of EPRA alone.

Results: In total, 268 patients received either EPRA-HHS (n = 169) or EPRA (n = 99) alone. Patients receiving EPRA only were on average younger (60.8 vs 65.8; $P < .0001$), but otherwise similar to patients in the EPRA-HHS cohort. EPRA-only patients demonstrated no differences in VR-12 ($P > .05$) and Hip Disability and Osteoarthritis Outcome Score Junior ($P > .05$) when compared with EPRA-HHS.

Conclusion: The integration of electronic rehabilitation tools is gaining acceptance within the orthopedic community. Our study demonstrated that EPRA alone was clinically noninferior while substantially less costly than EPRA-HHS.

Total hip arthroplasty (THA) is one of the most successful surgical procedures available for patients with degenerative joint disease and has been shown to consistently improve quality of life, alleviate pain, and restore function. Historically at our institution, all postoperative THA candidates have received home health services (HHS), consisting of visiting nurses and physical therapists. However, improvements in multimodal anesthesia and minimally invasive surgical techniques have enabled THA recipients to rapidly return to activities of daily living. In addition, a technologically inclined patient population has been more receptive to the advancements being made in telemedicine and rehabilitative computer applications. Several recent studies have demonstrated that customizable electronic applications may be effective at rehabilitating primary THA recipients [1–3].

Electronic application-based rehabilitation is of particular interest in the current value-based healthcare environment. Application-based rehabilitation platforms are seen as a method of promoting patient buy-in, improving patient compliance, and reinforcing patient-centered shared decision-making principles. In addition, electronic rehabilitative applications have the advantage of recording real-time patient outcomes, which can be used to identify patients who warrant close monitoring or more robust rehabilitation. This patient-specific customizable approach is

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thought to promote highly reliable orthopedic care while minimizing the economic burden associated with postoperative rehabilitation.

The purpose of our study is to comparatively evaluate postoperative patient-reported outcomes (PROs) among THA recipients who received electronic patient rehabilitation application (EPRA) with HHS vs those who received EPRA alone. Through such an approach, we aim to assess whether self-care with EPRA alone is a safe, effective, and noninferior alternative to HHS in a post-THA population. In addition, we will evaluate the cost burden associated with EPRA and HHS to better understand the financial implications of these 2 very different rehabilitative modalities.

Materials and Methods

Study Design

All consecutively scheduled patients undergoing primary THA by a single surgeon between November 2016 and November 2017 were identified for potential inclusion in this retrospective, quality assessment project. Patient baseline demographics, EPRA engagement, and PROs were recorded. Baseline demographics collected included age at the time of surgery, gender, body mass index, race, ethnicity, American Society of Anesthesiologists, and the Risk Assessment and Prediction Tool (RAPT) scores. Technological inclination was assessed based on the number of preoperative user logins, video views, and user download of the mobile EPRA platform. PROs consisting of the validated Hip Disability and Osteoarthritis Outcome Score Junior (HOOS-Jr) and Veterans Rand 12-Item Health Survey (VR-12-mental component scores [MCS]/physical component scores [PCS]) were collected via an online survey form integrated into the EPRA at baseline and 12 weeks postoperatively [4–7].

Study Cohorts

Before surgery and at the discretion of the surgeon, patients were placed into 1 of the 2 rehabilitation cohorts: EPRA with HHS (EPRA-HHS) or EPRA alone. During this 12-month period, 566 primary THA recipients underwent surgery. All patients included in the study underwent a chart review by a trained research coordinator. PRO scores and metadata were abstracted from the EPRA for all patients. After thorough review, a total of 298 patients were excluded from this study for the following reasons: refusal of EPRA enrollment (n = 28), discharge to a rehabilitation facility (n = 3), cancellation of surgery (n = 7), and no baseline (n = 44) or 12-week PRO scores (n = 216). The remaining 268 patients were included in this study.

The EPRA platform used in this study was Force (Force Therapeutics; New York, NY), a customizable electronic application specifically designed for rehabilitation after lower extremity joint arthroplasty. Through this application, THA candidates are able to preoperatively watch high-quality, surgeon-specific, videos preparing them for their procedure. Online videos presented postoperatively focus on proper wound management and rehabilitation techniques. The EPRA platform also provides patients with easy to interpret rehabilitation metrics promoting patient activation. Lastly, a chat function has been built into the application allowing patients to communicate and share images with their care teams via encrypted channel.

Integration of the EPRA platform into the clinical setting is initially facilitated by trained representatives from Force Therapeutics. These specialists train and onboard physicians, surgical schedulers, and their care teams. Once onboard, the surgical coordinator is responsible for introducing the application to the patient.

Historically, most THA recipients at our institution are discharged home with HHS. Although it is well recognized that HHS are highly variable, our institution has developed a minimum requirement to which all HHS vendors must adhere. One day after discharge, the patient will be evaluated by a visiting nurse, with subsequent nursing visits scheduled on an as-needed basis. After the nurse visit, physical and occupational therapists will visit the patient 1-3 times during the first week home. Home health visits range approximately from 30-60 minutes in length.

Outcomes of Interest

The primary outcome of interest is whether EPRA alone is noninferior to EPRA-HHS. Noninferiority was assessed by the change in PRO scores: VR-12-MCS, VR-12-PCS, and HOOS-Jr preoperatively, and at 12-weeks (±2 weeks) postoperatively. The VR-12-MCS assesses the role-emotional, vitality, mental health, and social functioning of the patient [4,5]. The VR-12-PCS places greater emphasis on the patient's general state of health, physical functioning, role-playing, and bodily pain. The HOOS-Jr is a validated short-form replacement of the full-length HOOS survey, which evaluates functional outcomes including stiffness, pain associated with activity, and functional ability. All PRO scores are based on a 0-100 scale [6,7]. Secondary outcomes of interest included changes in EPRA engagement and its relation to changes in PRO as well as the economic burden associated with EPRA vs HHS.

Resource Utilization

To approximate the cost associated with HHS, our institutions quality and care management team was consulted. In addition, a Force representative was contacted for the total per patient cost associated with EPRA.

Statistical Analyses

Statistical analyses were performed using the MATLAB 2017a (MathWorks, Natick, MA). All patient variables were reported using a combination of descriptive statistics including means, medians, standard deviations, absolute counts, and percentages. Comparative analyses of independent continuous variables were conducted using a 2-tailed unpaired *t* test. Categorical variables were analyzed using Fisher exact test for 2×2 contingency tables and chi-squared test for comparisons involving more than 2 groups. A $P < .05$ was deemed to be statistically significant.

Results

Patient Demographic Characteristics

Of the 268 consecutive patients included, 169 patients received EPRA-HHS and 99 received EPRA alone. Baseline descriptive characteristics were compared between the 2 cohorts (Table 1). Patients in the EPRA-only cohort were significantly younger (60.8 ± 10.5 vs 65.8 ± 9.5 years; $P < .0001$); however, gender, body mass index, race, ethnicity, American Society of Anesthesiologists, and RAPT scores were otherwise similar. With respect to PROs, baseline VR-12-PCS, VR-12-MCS, and HOOS-Jr were similar between cohorts. Technological inclination trended toward significance in the EPRA-only group at baseline: total number of logins (7.8 vs 6.4; $P = .07$) and total instructional/exercise video views (20.4 vs 15.5; $P = .05$). In addition, the EPRA-only cohort was significantly more likely to download the mobile platform than the EPRA-HHS group (53.5% vs 30.8%; $P < .05$).