Data Sharing Between Providers and Quality Initiatives Eliminate Unnecessary Nursing Home Admissions

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Abstract

Background: The Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) has monitored discharge disposition, after total hip and knee arthroplasties, since inception in 2012 and found the standardized risk of extended care facility (ECF) placement to be highly variable between hospitals. Methods: The variation in standardized risks of ECF placement among MARCQI member sites was reported to the collaborative. At the May 2, 2014 quarterly meeting, a quality initiative was started, emphasizing the wide variability between hospitals, the contribution of hospital and surgeon to that variability using median odds ratios, and the need for outlier hospitals to initiate quality improvement (QI) processes. Patients from 29 hospitals that were members of MARCQI before the intervention were reported to the collaborative. At the May 2, 2014 quarterly meeting, a quality initiative was started, emphasizing the wide variability between hospitals, the contribution of hospital and surgeon to that variability using median odds ratios, and the need for outlier hospitals to initiate quality improvement (QI) processes. Patients from 29 hospitals that were members of MARCQI before the intervention were included in this analysis. We compared standardized risks before and after the intervention in the entire cohort, and for 3 hospitals that implemented institution-specific QI projects. We report changes in ECF placement, length of stay, emergency room visits, and readmissions over time.

Results: This study includes 31,347 patients before and 20,879 patients after the implementation of the quality initiative. The range in standardized risk dropped from 9.4%-46.1% to 9.4%-32.4% and the average dropped from 23.0% to 19.6%. Three outlier hospitals decreased their absolute risk of ECF placement by 12.2%, 8.9%, and 12.4% after QI, without increases in adverse outcomes.

Conclusion: Discharge to ECF after primary hip and knee arthroplasties is highly variable and influenced by hospital and surgeon practices. Hospital-level QI measures can decrease ECF admissions.

There is no consensus on the best methods to achieve effective and efficient discharge after lower extremity total joint arthroplasty (TJA). Numerous patient-focused investigations have attempted to identify preoperative markers for predicting discharge locations [1-4]. Models for predicting risk of discharge to an extended care facility (ECF), also called skilled nursing facility, have had limited success. In general, these efforts predict risk well in the lowest and highest risks groups, but have less utility for patients with intermediate risk [5]. There are patients who may benefit from the services and support of a skilled nursing facility after hip and knee arthroplasties. These patients often live alone, have significant mobility limitations, or have significant medical comorbidities that make a safe discharge home challenging. However, for most TJA patients the decision to go to an ECF after discharge is subjective and depends on patient expectations, physician practice patterns, and facility affiliations [2]. Several studies have shown no advantage of ECF placement over home care [6-9]. Other studies suggest that individuals sent to an ECF may have a higher risk of readmission than those sent home, even with the same baseline risks [10,11].

The utilization of nursing homes or other extended care facilities after hip or knee arthroplasty varies widely, but remains quite common. After knee arthroplasty, national databases such as...
ACS-NSQIP and Premier report rates of 24.4% and 31.4%, respectively, for primary unilateral procedures and 66.7% and 69.8%, respectively, for simultaneous bilateral knee arthroplasties. In the National Inpatient Sample, bilateral knee arthroplasties make up 6% of all primary knee arthroplasties. Since 719,000 knee arthroplasties were performed in 2015, this represents a large number of patients. However, the cost of ECF utilization is not borne by the hospital and not the Centers for Medicare & Medicaid Services (CMS) or insurance payer in a diagnosis-related group system. Under the CMS’s new Comprehensive Care for Joint Replacement Model program, the cost of ECF stay is borne by the hospital and not the Centers for Medicare and Medicaid Services (CMS) or insurance payer in a diagnosis-related group system.

The Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) found in an initial analysis that the standardized risk of discharge to an ECF after total hip or knee arthroplasty (THA or TKA) across Michigan hospitals varied from 0.66 to 0.79 [16]. Three institutions that were proven out—University Hospital (UH), one independent academic hospital (IAH), and one nonteaching hospital (NTH)—were chosen to participate in the MARCQI Quality Improvement (QI) Initiative (MARCQI) currently collects data on 100% of elective, primary THA and TKA procedures from 59 hospitals in the state of Michigan, approximately 95% of the cases performed in the state. The details of MARCQI have been previously reported [17]. MARCQI quality data are shared with providers and data abstractors from participating hospitals at face-to-face quarterly meetings. QI strategies are designed to their own interventions to safely limit ECF placement. Interventions included optimizing pain management programs, timely inpatient therapy, and classroom instruction. The purpose of this investigation is to analyze the impact of this quality improvement (QI) program on rates of discharge to ECF and the association with other outcomes.

### Methods

MARCQI currently collects data on 100% of elective, primary THA and TKA procedures from 59 hospitals in the state of Michigan, approximately 95% of the cases performed in the state. The details of MARCQI have been previously reported [17]. MARCQI quality data are shared with providers and data abstractors from participating hospitals at face-to-face quarterly meetings. QI strategies are designed to their own interventions to safely limit ECF placement. Interventions included optimizing pain management programs, timely inpatient therapy, and classroom instruction. The purpose of this investigation is to analyze the impact of this quality improvement (QI) program on rates of discharge to ECF and the association with other outcomes.

### Table 1

<table>
<thead>
<tr>
<th>Hospital</th>
<th>General Anesthesia, %</th>
<th>Spinal Anesthesia, %</th>
<th>Epidural Anesthesia, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
<td>Before</td>
</tr>
<tr>
<td>UH</td>
<td>57.6</td>
<td>37.9</td>
<td>20.7</td>
</tr>
<tr>
<td>IAH</td>
<td>22.4</td>
<td>21.6</td>
<td>69.1</td>
</tr>
<tr>
<td>NTH</td>
<td>4.7</td>
<td>7.0</td>
<td>95.8</td>
</tr>
</tbody>
</table>

UH, university hospital; IAH, independent academic hospital; NTH, nonteaching hospital.
discussed and outlier hospitals are encouraged to design and implement projects according to the characteristics and needs of their institutions. In addition, each provider has access to its own raw data for use in local QI efforts.

The extended care facility quality initiative (ECF-QI) began in November 2013, with a presentation on the variation among hospitals in their standardized risk of ECF placement. A hospital was identified as an outlier if the 95% confidence limit of their standardized risk fell above the average risk of ECF for the whole consortium. Formal recommendations were made to outlier hospitals on May 2, 2014, to consider implementing projects focused on appropriate ECF utilization. At each quarterly meeting, thereafter, updates were presented in the form of forest plots of standardized risk and control charts demonstrating the risk of ECF placement over time for each hospital and for the whole consortium. At least 3 outlier hospitals designed and initiated specific programs to address the appropriateness of ECF placement at their institutions. One is a UH, one is an IAH, and one is a not-for-profit NTH. Last year, UH completed 812 primary arthroplasties (487 and 325 THA and TKA, respectively) performed by 5 fellowship-trained arthroplasty surgeons. At IAH, 13 fellowship and nonfellowship-trained surgeons completed 1203 TJAs (513 and 690 THA and TKA, respectively). NTH completed 594 primary arthroplasties (221 and 373 THA and TKA, respectively) performed by 2 fellowship-trained physicians, one in arthroplasty and one in sports medicine.

Fig. 1. Forest plots of the distribution of standardized risk of ECF placement before (A) and after (B) quality improvement implementation. ECF, extended care facility; UH, university hospital; IAH, independent academic hospital; NTH, nonteaching hospital.

Fig. 2. Distribution of standardized risk of ECF placement before (A) and after (B) quality improvement implementation for all hospitals in the MARCQI consortium. Standardized risk dropped from 9.4%-46.1% to 9.4%-32.4%. MARCQI, Michigan Arthroplasty Registry Collaborative Quality Initiative.
Once the surgeons realized that their institution was a high ECF utilizer, the UH adopted a new philosophy focused on setting appropriate patient and caregiver expectations about ECF placement. The division head for arthroplasty in the department of orthopedic surgery led a project to educate surgeons, nurses, discharge coordinators, and physical therapists on the importance of appropriately framing the indications for ECF. Surgeons, schedulers, and patient educators were instructed to think of home as the default disposition and to restrict ECF to patients who would be at risk if sent home. Changes were made in the educational class and pamphlets. Providers stressed the need to find support coaches and individuals who could actively care for the patient during the first

Fig. 3. ECF discharge rates across all hospitals decreased from 21.6% to 18.8% before and after quality improvement implementation (A). Rates at IAH decreased from 37.7% to 28.7% (B), whereas rates at the NTH reduced from 30.5% to 18.1% (C). UH decreased utilization from 30.1% to 17.9% (D).
week after surgery. Postoperatively, nursing staff and physical therapists were also encouraged not to make disposition assessments solely on their initial contact with the patient. In addition, they implemented preemptive pain management protocols that nearly eliminated the use of patient-administered analgesia (Table 1).

Similar to the academic center, the IAH and NTH implemented changes focused on setting appropriate patient expectations. They updated patient education materials, including preoperative booklets and class content. Discharge to home was stressed as the expected disposition, with ECF placement reserved for those with special needs, which could not be met with home care and family
and friend support. This process started at the time of scheduling, as most patients have already made discharge plans by the time of the education. Quality representatives met with surgeons and schedulers to develop a consistent message to deliver to patients preoperatively. They educated social workers about the risks and benefits of ECF and stressed the need to recommend ECF placement only where indicated by the clinical and social circumstances. Physical therapists began working with patients on the day of surgery. Modifications to preexisting pain protocols reduced dependence on epidurals at IAH (Table 2). The preferred anesthesia was changed to spinal anesthetics with adductor canal blocks added to TKA cases as well. New ECF and readmission tracking programs were developed to ensure that quality care was being delivered to patients.

After institutional review board’s approval, we analyzed discharge to ECF in 29 hospitals that were part of the consortium before the QI initiative began. We determined standardize risks of ECF placement before and after implementation of the ECF-QI using a 3-step method developed for CMS by a statistical group at Yale University [18]. The first step is to identify patient-level factors associated with ECF placement, by fitting a logistic regression model to 39 potential predictor variables. This included quadratic terms for age and body mass index. The candidate variables are shown in Table 3. The patient-level factors that were significantly related to ECF placement at \( P < .05 \) significance level were used to predict ECF placement in a generalized linear mixed model, with hospital as a random effect [19]. Ratios of model-generated, hospital-specific, predicted and expected risks were then calculated and multiplied by the average risk over all cases to obtain the standardized risk for each hospital. We generated 95% confidence intervals around that estimate using bootstrap resampling, designed to preserve the hierarchical nature of the data.

We used control charts and distribution graphs to demonstrate how ECF placement varied over time for the whole sample and for the 3 QI hospitals. We determined the pre- and post-ECF-QI risk of ECF placement, readmission by 30 days after discharge, emergency room (ER) visit within 30 days of surgery and length of hospital stay for the whole sample, for the 3 hospitals with focused QI projects and for the remaining 26 hospitals without specific projects.

### Results

Our analysis from the MARCQI registry included 31,347 patients who had primary unilateral TKA or THA before implementation of the ECF-QI and 20,879 patients from the same hospitals after implementation of the ECF-QI. Standardized risks of ECF placement before the initiative are shown in Figure 1A. There was substantial variability between hospitals. The mean risks range from 9.4% to 46.1% and the mean for all the hospitals was 23.0%. Standardized risks of ECF placement by hospital after the initiation of QI are shown in Figure 1B. The mean risks ranged from 9.4% to 32.4% and the average risk for all hospitals was 19.6%. The 3 hospitals with specific QI projects decreased their standardized risks of ECF placement and moved toward the overall mean. The histogram in Figure 2 illustrates the decrease in mean and variability after the initiative was started.

The 3 institutions with specific QI projects showed marked decreases in ECF disposition. UH showed a reduction in raw ECF discharge rates from 30.1% before to 17.9% after the quality initiative (Fig. 3), whereas ER visits (4.0% to 4.1%) and readmissions (8.3% to 6.6%) did not change significantly. Median length of stay decreased by a day, but average length of stay did not change. The other 2 hospitals showed similar improvements (Table 4).

### Discussion

Discharge to ECF has not been clearly associated with improved outcomes and is costly. With the move toward bundled payments and value-based reimbursement, clinicians and hospitals need to pay closer attention to discharge destination and after-hospitalization care. The costs associated with discharge to an ECF are significant [14,20]. CMS has previously recognized the added cost of ECF discharges, or at least the potential for cost shifting, mandating a 3-day inpatient stay before discharge to ECF. Whether this extra cost is commensurate with improved outcomes is an open question.

Some studies suggest that, controlling for patient differences, outcomes are similar when patients are discharged to ECF compared with home [6-9]. Furthermore, one study has reported increased rates of readmission with discharge to ECF for matched patients [10]. Therefore, it is very important to limit ECF placement to those individuals who will benefit from it. Many investigations have researched patient factors and predictors for those individuals who would require ECF placement [1-3,21,22]. Current literature suggests that patient expectation is the most important predictor of discharge destination after primary TJA [23-26]. To our knowledge, no study has identified a successful, large-scale QI program aimed at effectively reducing ECF utilization. Such a program could not exist without focusing on this aspect of discharge destination.
potentially increase the delivery of quality care and substantially reduce healthcare costs.

The median length of stay before and after ECF-QI implementation was 3 days and 2 days, respectively. This association may be due to many factors: avoiding the 3-night length of stay requirement for ECF placement in Medicare patients, a shift to earlier discharge, the introduction of same day surgery, or better pain management protocols. This trend was observed in both QI and non-QI hospitals. During the time of this study, anesthetic practices at MARCQI sites also shifted toward more regional anesthesia. The type of anesthesia before and after the ECF-QI project initiation is reported in Table 5. There was a trend toward increased use of spinal anesthesia at both UH and IAH after the intervention.

We attempted to ensure patient safety after the quality intervention by monitoring ER visits and readmissions over time. We did not observe any increases in these outcomes for all the hospitals or for the 3 hospitals that initiated institution-based QI. Although we cannot conclude an underlying decrease in baseline rates had occurred, masking an adverse effect of the ECF-QI, we did not find such a trend in the non-QI hospitals.

Some institutions with a higher percentage of ECF discharge did not demonstrate significant reduction in rates over time. Four of these hospitals have since instituted QI improvement projects, but they began after January 2015. This analysis did not reflect those effects. Other outlier hospitals may not show improvements due to multiple other factors. Some participants have cited entrenched practices, institutional policies, and patient expectations. For example, some sites own or have an affiliation with an ECF, influencing the incentives to develop an ECF utilization reduction program. Furthermore, it has also been shown that simply participating in a quality reporting program and receiving feedback does not necessarily confer improved outcomes or reduced cost [27]. This underscores the importance of active investment and collaboration at the surgeon and hospital level for quality implementation to be effective and foster change.

There are several limitations to this study. The investigation included only primary THA and TKA and excluded revision arthroplasty and bilateral cases as these patients are more likely to need more rehabilitation services. The specifics of quality changes across all institutions were not tracked. Compiling registry data among multiple institutions with a variety of ongoing improvement efforts inherently creates confounding effects. For example, we are not able to control for changes in pain management protocols, CMS readmission projects driving hospital behaviors or other MARCQI projects that occurred during this period. Furthermore, we did not track demographic data related to race and ethnicity. Socioeconomic factors likely affect disposition and placement and were not adjusted for in the risk standardization.

Because of the descriptive nature of this study, a causal inference cannot be made. We observed a decrease in ECF utilization associated with the timing of the ECF-QI efforts, but other factors may have influenced this and the other outcomes that were tracked. The national focus on value-driven health care such as bundled payments might be such an influence. Of note, however, ECF placement did not substantially fall in the non-QI hospitals compared with the QI hospitals, over the same period.

In conclusion, collaborative registries can be instrumental in identifying inefficiencies, inflated costs, and disparities in health care delivery. The MARCQI registry found significant variations in rates of discharges to ECF across the state of Michigan. Outlier hospitals were identified and their representatives were encouraged to develop QI programs to optimize ECF placement. Simply presenting the data to hospitals did not result in dramatic changes, likely due to multiple influences and factors. Sites that took on specific efforts and adopted best practices to improve ECF utilization saw decreases in ECF placement. This was not associated with increased length of stay, 30-day readmissions, or ER visits.

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References