Thirty-day readmission rate and discharge status following total hip arthroplasty using the supercapsular percutaneously-assisted total hip surgical technique

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Abstract

Purpose Recent studies have reported nearly 40 % of costs associated with a 30-day episode-of-care for total joint replacements are due to post-discharge activities and 81 % of those are specifically due to unplanned readmissions and discharging patients to post-acute care facilities. The purpose of this study was to determine these two key variables for total hip arthroplasty (THA) patients implanted using a tissue-sparing surgical technique and to see how these values compare to those previously reported in the United States.

Methods The healthcare databases at three institutions were searched for primary THA patients implanted using the supercapsular percutaneously-assisted total hip (SuperPath) surgical technique between January 2013 and July 2014. Data elements included 30-day all-cause readmission rate, discharge status, transfusion rate, complications, and length of stay (LOS).

Results Data were available for 479 THAs. The 30-day all-cause readmission rate, transfusion rate, and average LOS was 2.3, 3.3 %, and 1.6 days, respectively. Over 91 % of patients were discharged routinely home, 4.1 % to skilled nursing facilities, 3.8 % to home health care, and 0.6 % to inpatient rehabilitation facilities. Complications included dislocation (0.8 %), periprosthetic fracture (0.8 %), and deep vein thrombosis (0.2 %). There were no infections reported.

Conclusions Patients implanted using this tissue-sparing technique experienced reduced 30-day all-cause readmission rates (2.3 % vs. 4.2 %) and more were routinely discharged home (91.5 % vs. 27.3 %) than have been previously reported for patients in the United States. Use of this tissue-sparing technique has the potential to significantly reduce post-discharge costs.

Keywords Total hip arthroplasty · Tissue-sparing · Discharge status · 30-day readmission rate · SuperPath

Introduction

The passage of the Affordable Care Act in the United States has increased attention on healthcare costs and led to the proposal of several value-based payment strategies. One example is a bundled payment option where all activities performed for an episode-of-care are reimbursed in a single fixed payment. The episode-of-care includes an anchor event, in this instance the total hip arthroplasty (THA) procedure, and a window of at least 30 days following discharge. Under this model, no additional compensation is provided for complications or unplanned readmissions occurring within the window. Bozic et al. recently reviewed payments for all total joint replacements (TJRs) performed at a single institution to examine the financial impact of bundling with this model [1]. They found 37 % of the costs incurred for primary TJRs coded MS-DRG 470 were attributable to post-discharge activities, and that over 80 % of those costs were attributable to unplanned readmissions and discharging patients to post-acute care facilities.
One aspect of THA with the potential to impact both read-
mission rates and discharge status is the surgical technique. The
supercapsular percutaneously-assisted total hip (SuperPath)
surgical technique is a tissue-sparing approach that does not
require specialty tables or the forced dislocation of the femoral
head. The technique utilizes the interval between the gluteus
medius and the piriformis to access the capsule without cutting
any tendons or muscles [2]. It also allows for broaching directly
through the femoral neck with the femoral head intact making it
easier to replicate the natural femoral version and length. The
resulting minimization of soft tissue damage allows for same-
day ambulation and no standard postoperative patient restric-
tions. Initial reports with this surgical technique have found a
mean hospital stay of 1.7 days with satisfactory radiographic
outcomes and low complication rates [2].

The primary objective of this multicenter, retrospective
study was to determine the 30-day all-cause readmission rate
and discharge status for patients implanted using this surgical
technique. The hypothesis is that these values will be im-
proved compared to those previously reported in the United
States and could in turn lead to potential post-discharge cost
reductions.

Methods

The healthcare databases at three institutions were searched
for all primary THAs performed by three surgeons who use
the SuperPath surgical technique. The searches covered the
period of January 2013 through July 2014. All primary THAs,
regardless of indication or patient demographics, were includ-
ed in the analysis. Collected data elements included the num-
ber of THAs, 30-day all-cause readmission rate, discharge
status, transfusion rate, complications, and length of stay
(LOS).

The 30-day all-cause readmission rate was defined as the
percentage of patients who had a subsequent hospital admission
in the same or a different hospital within 30 days of their
THA procedure for any reason. Discharge status indicated the
disposition of the patient at discharge from the hospital (e.g.
home, skilled nursing facility). Transfusion rate was defined
as the percentage of patients requiring a transfusion of any
kind. Complication rate was defined as the percentage of patients experiencing each complication type (e.g. infection,
dislocation). LOS was defined as the number of nights the
patient remained in the hospital. A patient admitted and
discharged on the same day had a LOS of zero days.

Results

Data were available for 479 THAs (Table 1). Readmission
rates were similar at each site and 95.3 % of patients were
discharged home (91.5 % routinely and 3.8 % to home health
care). The combined transfusion rate was 3.3 % and the mean
LOS was 1.6 days. In total there were nine complications: four
dislocations, four fractures, and one deep vein thrombosis
(DVT). There were no reports of infection or pulmonary embolism.

Discussion

The present study reports the 30-day all-cause readmission
rate and patient discharge status for patients undergoing THA
with a tissue-sparing surgical technique. These two variables
have been shown to contribute up to 81 % of post-discharge costs within the first 30 days following TJR [1].

Thirty-day readmission rate

The American College of Surgeons National Surgical Quality
Improvement Program (ACS NSQIP) database collects read-
mission and complication data from hospitals throughout the
United States. Unlike Medicare claims data, this database has
the benefit of providing information on patients of all ages. A
recent review of this database reported the 30-day all-cause
readmission rate to be 4.2 % for over 8,100 THAs performed
in 2011 [3].

The 30-day all-cause readmission rate from the present
study was 2.3 % (range, 1.5–3.2 %) or a 1.9 % (range, 1.0–
2.7 %) reduction from the described national average. The
lower readmission rate could be due to a reduction in key
complications following THA. A separate review of the ACS
NSQIP reported THA patients with surgical site infections,
thromboembolic events, or sepsis were at an increased risk for
readmission [4]. In the present study, there were no instances
of infection or sepsis and only a single thromboembolic event
(0.2 %). The lack of these complications could be due to
several features of the SuperPath technique including: a re-
duced need for soft tissue dissection with electrocautery; a
lack of need to cut muscles or tendons; and the reduced need
for transfusions, which have been previously linked to an
increased incidence of surgical site infections [5]. The dislo-
cation rate (0.8 %) was also decreased from those reported in
some recent THA studies (2.9–6.0 %) and could help to
further explain the reduced readmission rate [6–8].

As described previously, unplanned readmissions within
30 days of a THA procedure are not reimbursable under
certain bundled payment models and represent approximately
11 % of post-discharge costs [1]. The economic burden of
unplanned readmissions under this model is further illustrated
by Bosco et al., who reported the direct costs to be 4.3 % of
reimbursement their hospital received for all THAs [9]. Or
stated another way, hospital margins would need to be 4.3 %
greater than the reimbursement for all primary THA procedures to cover the cost of the non-reimbursed readmissions.

The potential to reduce readmission rates by 1.9% from the national average could translate to considerable cost savings for hospitals using the described bundled payment options. Bosco et al. estimated the direct cost of each unplanned readmission to be $17,103 [9]. If an institution performed 100 THAs annually and reduced their 30-day readmission rate from 4.2 to 2.3%, direct costs could be reduced by 45.2% or $32,496 per year using Bosco’s estimation (Table 2).

### Discharge status

The Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project (AHRQ HCUPnet) database was reviewed to determine the discharge status of all THA procedures (ICD-9-CM Code 81.51) performed in 2012 [10]. For over 299,000 THAs performed, 27.3% were discharged routinely home, 31.8% to another institution (nursing or rehabilitation facility), and 0.85% to another short-term hospital. In the present study, 91.5% of patients were discharged routinely home, 3.8% to HHC, 4.1% to a skilled nursing facility (SNF), and 0.6% to an inpatient rehabilitation facility (IRF). The cause for this increase in patients being discharged home is likely multifactorial, but could be related to the tissue-sparing nature of the subject surgical technique.

Discharging patients to post-acute care facilities accounts for 70% of post-discharge costs during the 30 days following TJR [1]. Ramos et al. examined Medicare claims data and determined the average costs were $16,464 when discharging to an IRF, $6,678 to a SNF, $4,239 to HHC, and $733 for routine discharge home with outpatient therapy [11]. Using the example of an institution performing 100 THAs annually, there would be the potential to reduce costs by up 69.9% or $280,647 if they were discharged according to the percentages found in the present study as opposed to those reported in the AHRQ HCUPnet database (Table 3). The standard AHRQ HCUPnet database report does not distinguish between SNF and IRF, so it is unclear what percentage of patients were discharged to each. To be most conservative in this example, it was assumed that all 31.8% were discharged to a SNF. If even 25% of these patients were actually sent to an IRF the potential cost reductions would increase to $358,446 or 74.8%.

### Other outcomes of interest

Transfusion rates had the most variability between sites (0.7–8.0%). This was not surprising as there are no consensus indications for transfusion and most centres have their own protocols. For instance, the protocol at site 1 was to transfuse patients when haemoglobin levels were lower than 8 g/dL, while all symptomatic patients with haemoglobin levels lower than 10 g/dL were transfused at site 2. Site 3 is a teaching hospital with junior residents who might be more likely to order transfusions when on-call.

Yoshihara et al. reviewed discharge data from the Nationwide Inpatient Sample database for TJRs performed between 2000 and 2009 to analyse transfusion trends in the United States [12]. They found the overall transfusion rate for THA

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**Table 1** Outcomes from the three institutions presented separately and combined

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of THAs</td>
<td>153</td>
<td>261</td>
<td>65</td>
<td>479</td>
</tr>
<tr>
<td>30-Day readmission rate (%)</td>
<td>3.2 %</td>
<td>2.0 %</td>
<td>1.5 %</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Discharge status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home (%)</td>
<td>95.0 %</td>
<td>89.3 %</td>
<td>92.3 %</td>
<td>91.5 %</td>
</tr>
<tr>
<td>SNF (%)</td>
<td>5.0 %</td>
<td>5.0 %</td>
<td>0.0 %</td>
<td>0.0 %</td>
</tr>
<tr>
<td>HHC (%)</td>
<td>2.0 %</td>
<td>2.0 %</td>
<td>1.5 %</td>
<td>2.0 %</td>
</tr>
<tr>
<td>IRF (%)</td>
<td></td>
<td>0.7 %</td>
<td>1.5 %</td>
<td>0.8 %</td>
</tr>
<tr>
<td>Transfusion rate (%)</td>
<td>8.0 %</td>
<td>0.7 %</td>
<td>0.0 %</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Mean LOS (days)</td>
<td>2.0</td>
<td>1.4</td>
<td>2.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dislocation (%)</td>
<td>1 (0.06 %)</td>
<td>2 (0.76 %)</td>
<td>1 (1.5 %)</td>
<td>4 (0.8 %)</td>
</tr>
<tr>
<td>DVT (%)</td>
<td>–</td>
<td>1 (0.38 %)</td>
<td>–</td>
<td>1 (0.2 %)</td>
</tr>
<tr>
<td>Fracture (%)</td>
<td>–</td>
<td>3 (1.14 %)</td>
<td>1 (1.5 %)</td>
<td>4 (0.8 %)</td>
</tr>
<tr>
<td>Infection (%)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0 (0.0 %)</td>
</tr>
<tr>
<td>PE (%)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0 (0.0 %)</td>
</tr>
</tbody>
</table>

patients was 25.5%, which is similar to the 22.2% transfusion rate reported during a review of the ACS NSQIP [4]. The transfusion rate in the present study was 3.3%. Minimizing transfusions is another key factor that could decrease the economic burden of THA, as Tuttle et al. estimated the cost of each transfusion to be $787.37 at their institution [13]. In addition to directly adding cost, transfusions have also been linked to increased incidence of complications, including deep surgical site infections [5]. Therefore by minimizing transfusions, there is also the potential to reduce other complications that could result in readmissions.

The mean LOS in the present study was half the national average described in the AHRQ HCUPnet database (1.6 vs. 3.3 days) [10]. This reduction occurred along with a nearly 50% reduction in readmission rates, suggesting that the SuperPath surgical technique can result in more patients returning home in a shorter amount of time without compromising safety or increasing complication rates, at least within the first 30 days. The financial benefit of reduced LOS is more difficult to directly quantify, but higher patient turnover potentially allows for more procedures to be performed or the use of beds for other surgical procedures.

Also of interest is that the collected data from one site (site 3) represents outcomes associated with the surgeon’s first cases performed using this technique or learning curve. Previous studies have shown that perioperative complications are higher during this phase for other surgical techniques [14, 15]. Despite this, outcomes for this site were similar to those reported at the other sites and lower than values previously reported in the United States. This data suggests the possibility of a minimal learning curve for this technique, at least in terms of perioperative outcomes and complications.

### Limitations

There are several limitations to the present study. One site contributed over half of the included THAs, although results were similar across sites. The analysis was based upon an episode of care with a 30-day window following the procedure. There are numerous bundling models with varying window lengths and it is possible findings would differ by looking at longer windows. The provided example calculations are based upon previously published values instead of analysis of actual costs incurred by the sites. Finally, there are numerous factors that could improve the variables analysed in this study outside of surgical technique alone such as early ambulation protocols.

### Conclusions

In conclusion, the SuperPath surgical technique was associated with a decreased 30-day all-cause readmission rate and fewer patients were discharged to post-acute care facilities. Example calculations show the potential for combined cost reductions of up to 66.2% for these two variables alone, which as a previous study reported account for 81% of post-discharge costs overall. Over 95% of patients in the present study were discharged home (91.5% routinely and 3.8% to HHC), and there were no instances of infection in nearly 500 cases. These results show use of this technique has the potential to significantly reduce post-discharge costs associated with THA. Future prospective studies examining the actual costs incurred by hospitals are needed to confirm the

### Table 2

<table>
<thead>
<tr>
<th>Direct cost per readmission ($)</th>
<th>Current study</th>
<th>Previously reported US values</th>
<th>Potential annual reductions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Readmission rate (%)</td>
<td>Cost ($)</td>
<td>Readmission rate (%)</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------</td>
<td>----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>$17,103 [9]</td>
<td>2.3 %</td>
<td>$39,337</td>
<td>4.2 % [3]</td>
</tr>
</tbody>
</table>

### Table 3

<table>
<thead>
<tr>
<th>Discharge status</th>
<th>Average cost per discharge ($)</th>
<th>Present study</th>
<th>Previously reported US values</th>
<th>Potential annual reductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home (%)</td>
<td>$733.00 [11]</td>
<td>91.5 %</td>
<td>27.3 % [10]</td>
<td>–</td>
</tr>
<tr>
<td>SNF (%)</td>
<td>$6,678.00 [11]</td>
<td>4.1 %</td>
<td>31.8 % [10]</td>
<td>$212,360.40</td>
</tr>
<tr>
<td>IRF (%)</td>
<td>$16,464.00 [11]</td>
<td>0.6 %</td>
<td>0.0 %</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>–</td>
<td>$120,435.90</td>
<td>$401,083.50</td>
</tr>
</tbody>
</table>

Note: IRF inpatient rehabilitation facility, SNF skilled nursing facility, HHC home health care

*As stated in text, it was assumed all 31.8% were discharged to SNFs*
improved variables described in this study actually result in cost reductions.

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References