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# Description of Clinical Outcomes and Postoperative Utilization of Physical Therapy Services Within 4 Categories of Shoulder Surgery


• **STUDY DESIGN:** Retrospective cohort study.

• **OBJECTIVES:** To describe the clinical outcomes following outpatient physical therapy for postoperative rehabilitation in 4 categories of shoulder surgery. Furthermore, we sought to determine if differences in outcomes between genders existed.

• **BACKGROUND:** Improving the quality of care for patients following shoulder surgery requires an understanding of the clinical outcomes resulting from current clinical practice.

• **METHODS:** This study included 856 patients (43.7% female; mean ± SD age, 51.8 ± 14.2 years) who received outpatient physical therapy following shoulder surgery. Standardized methods for classification of patients to type of shoulder surgery and collection of outcome variables were used. Data were gathered from 57 therapists working in 12 clinics. Patients included had been classified into 1 of 4 surgical categories: repair of a unidirectional instability, rotator cuff repair, rotator cuff repair with a subacromial decompression, or subacromial decompression alone. Descriptive statistics were calculated for baseline characteristics of patients in each surgical category. For all patients, scores on the Disability of the Arm Shoulder and Hand (DASH) questionnaire and a numeric pain rating scale (NPRS) were obtained at the initial and final physical therapy visits, and the change between visits was calculated. Data on number of physical therapy sessions and length of stay (LOS) were collected. For each surgical category, independent-samples *t* tests were used to determine differences between genders for each initial and final clinical outcome of pain and disability, change scores, utilization of visits, and LOS. The percentage of patients who achieved a minimal clinically important difference (MCID) on the DASH was also determined for each surgical group. For each gender in each surgical category, paired *t* tests were used to determine if patients achieved significant change in pain and disability.

• **RESULTS:** Means for each clinical outcome for the initial and final pain and disability scores, change scores, and the percentage of patients that achieved an MCID are provided. Significant differences were observed between genders for clinical outcomes. In the group treated with unilateral instability repair, women reported significantly greater initial disability than men, and their DASH change scores were significantly greater. In the group that had rotator cuff repairs, women reported significantly greater disability initially and at the final follow-up. In the group that had rotator cuff repairs combined with subacromial decompression, women reported significantly greater disability initially and greater change in DASH scores. Females also reported greater change in their pain scores than males ($P<.05$). There were no significant differences between men and women in the subacromial decompression group ($P<.05$). There were no significant differences between genders for number of physical therapy visits or LOS. Men and women in each surgical category achieved clinically meaningful and statistically significant improvement for pain and disability during treatments ($P<.01$). Greater than 75% of patients achieved an MCID (15 points) on the DASH score in each surgical category (range, 75.6%-94.5%).

• **CONCLUSIONS:** Differences were observed between men and women in 4 postoperative surgical categories in each of the clinical outcomes but not for number of physical therapy visits or LOS. Statistically significant and clinically meaningful pain and disability improvements were reported for each gender within each shoulder category. Results from this study may help therapists estimate the prognosis of males and females receiving nonstandardized postoperative physical therapy in 4 different shoulder surgical categories.

• **LEVEL OF EVIDENCE:** Therapy, level 2b.

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• **KEY WORDS:** *DASH, instability, rotator cuff*

The incidence of shoulder pain has been estimated at 11.2 per 1000 persons per year and ranks as the third most frequent musculoskeletal complaint of patients visiting a primary care provider.[35] The prevalence of shoulder pain in the general population ranges between 6.9% and 34%.[15] The etiology and pathology of shoulder pain can be unclear, which often results in a lack of consensus regarding the appropriate classification of shoulder disorders.[15,35] However, once a patient undergoes a surgical procedure for shoulder pain, the categorization of the patient's shoulder problem is typically described on the basis of the surgical procedure itself. Grouping patients postoperatively on the basis of surgical intervention provides homogenous categories of patients whose characteristics can be reported.

The preponderance of literature that describes outcomes of surgical management for shoulder disorders relates to rotator cuff repair,[12,18] subacromial decom-

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pression for impingement syndromes,[19] repair of instability conditions,[7,8,24] and fractures. Although most shoulder pain is related to disorders of the rotator cuff, such as impingement or cuff tears, uncertainty exists regarding the effectiveness of medical and surgical interventions.[10,12,15,18] The quality of the evidence related to the long-term results of surgical intervention for the management of shoulder problems has been questioned, because studies frequently lack appropriate methods of assessing outcomes.[12,15] For example, despite patients' ability to provide valid and reliable judgments of their benefit from treatment, self-report measures of disability are often neglected in lieu of clinical measures; yet the measure of disability is of the utmost importance to the patients themselves.[10]

Specifically, evidence is lacking regarding the status of patients' pain and disability following shoulder surgery, particularly during the episode of care when a physical therapist intervenes postoperatively. Outcome studies of patients with various surgical conditions are typically cohort designs that compare only patients' preoperative and postoperative status.[14,34] Only a few studies have documented outcomes related to the episode of care postoperatively during physical therapy.[3,28] An observed difference in clinical outcomes between men and women is another factor that has received little commentary in the literature related to shoulder surgery; yet there are reports of significant differences in ratings of pain and functional ability that may be of interest to physical therapists in managing patients following rotator cuff repair.[36,37] Small but statistically significant differences between men and women have been observed with regard to improvement in function in 3 of 13 activities of daily living and the performance of usual work.[37] Pain at the time of surgery and persistent pain following surgery have been found to be significantly greater in women.[36] Moreover, in the same study, the mean duration of care for postoperative rehabilitation was slightly over 3 months and significantly shorter in men compared to women.[36]

Given the paucity of evidence related to outcomes during the physical therapy episode of care, there is little to inform patients and clinicians, even descriptively, about the expected improvement following a physical therapist's intervention in terms of pain and disability and the amount of care they might require following shoulder surgery. Moreover, the majority of outcome reports have not addressed the possibility that differences in outcomes between men and women may exist following shoulder surgery.

Improving the quality of postoperative care for patients following shoulder surgery will require a current understanding of what actually happens in the physical therapy care process and a description of the outcomes. Describing outcomes may help therapists estimate an approximate level of expected improvement, and set patients' goals if they are confident their care process for patients is similar to the reported interventions. The appropriate use of descriptive clinical and physical therapy utilization outcomes may be helpful as a baseline comparison for future authors. Further, such a description may also serve in planning future clinical trials by providing means and variability estimates of outcomes following usual care and by supporting feasibility in showing how many patients are accessible during the study.

The purpose of this retrospective study was to describe the clinical outcomes following outpatient physical therapy for postoperative rehabilitation in 4 categories of shoulder surgery. The clinical outcomes examined in each shoulder surgery category were pain, disability, number of physical therapy visits, length of stay in physical therapy, and percentage of patients achieving a minimally clinical important difference (MCID). Differences in outcomes between men and women were also examined. This descriptive report of clinical and utilization outcomes may assist clinicians in understanding the typical patient response to postoperative physical therapy management.

## METHODS

### Patients

For this retrospective cohort study, all patients who were referred to physical therapy following shoulder surgery from 2004 to 2006 at 12 outpatient physical therapy clinics of Intermountain Healthcare, a private nonprofit healthcare system, were included in the analysis. In these clinics, routine clinical operation involves the collection of the same standard self-reported pain and disability outcomes at each treatment visit, and outcome data are collected on greater than 80% of the patients treated. Patients who received physical therapy treatment for at least 2 visits and had outcome data collected in the database were included. The results are based on a large number of patients, clinics, therapists, and referring surgeons.

Only surgical categories that included more than 100 patients were included in the analysis: unidirectional instability repair, rotator cuff repair, rotator cuff repair with a subacromial decompression procedure, and subacromial decompression. Patients who received multiple surgical procedures at the time of surgery appear only once in the database. Patients with a unidirectional stability repair were grouped as UNI. Patients who had a subacromial decompression, distal clavicle resection, and/or acromioplasty were categorized as SAD. Patients who had a rotator cuff repair alone were grouped as RCR. Patients with rotator cuff repair combined with a subacromial decompression were categorized as RCR-SAD. Rotator cuff repair was rarely combined with other surgical procedures other than the subacromial decompression, therefore such combinations were excluded from the study.

The Intermountain Healthcare Institutional Review Board and the Privacy Board approved an expedited review and waiver of authorization for protected health information.

### Procedures

Clinical outcomes using patient self-reported pain and disability scales were collected for all patients receiving physical therapy services. On admission, each new patient's information was entered into an electronic intranet database, and at each physical therapy session a region-specific disability score and numeric pain rating score were calculated and entered into the database, the Rehab Outcomes Management System (ROMS).

### Outcomes

For patients following shoulder surgery, the Disability of the Arm, Shoulder, and Hand questionnaire (DASH)[2] is the region-specific instrument used at each treatment session. The DASH comprises 30 items to measure the extent to which patients' pain or limited activity affects their ability to perform certain functions, to sleep, to carry on routine daily activities, and social activities. The DASH has been shown to be a valid, reliable, and responsive measure of disability in patients who have various upper limb conditions,[2] and it has been validated for the assessment of shoulder disorders.[1,4,16,27] For each patient, initial and final scores on the DASH and pain ratings were obtained from the database. Only the total score for the DASH is entered in the ROMS database. Standard scoring procedures for the DASH require that at least 27 of the 30 questions be completed.[2] If the requisite number of items was not completed, then the patient was prompted to complete these items. When this was not done the survey score was not entered.

**TABLE 1** Demographics of Patients in Each Surgical Category

| | UNI | RCR | RCR-SAD | SAD |
|---|---|---|---|---|
| Number (percentage) of patients | 119 (13.9%) | 341 (39.8%) | 174 (20.3%) | 222 (25.9%) |
| Length of stay, d* | 64.1 ± 42.7 | 80.2 ± 46.5 | 80.9 ± 39.1 | 53.1 ± 32.1 |
| Number of patients with ≥4 visits | 108 | 269 | 132 | 192 |
| Number of visits* | 11.1 ± 7.1 | 14.8 ± 9.1 | 15.6 ± 8.4 | 10.0 ± 6.1 |
| Number of patients | | | | |
| Female | 33 | 150 | 73 | 118 |
| Male | 86 | 191 | 101 | 104 |
| Age of patients* | | | | |
| Female | 36.5 ± 12.6 | 59.2 ± 11.6 | 55.7 ± 10.9 | 49.5 ± 10.9 |
| Male | 31.1 ± 11.3 | 55.9 ± 11.5 | 57.2 ± 11.1 | 49.2 ± 12.7 |

*Abbreviations: RCR, rotator cuff repair; RCR-SAD, rotator cuff repair combined with a subacromial decompression; SAD, subacromial decompression; UNI, unidirectional instability.*
** Values are mean ± SD unless otherwise indicated.*

The numeric pain rating scale (NPRS) was used to capture the patient's level of pain. Patients were asked to indicate the intensity of average pain over the past 24 hours using an 11-point scale ranging from 0 ("no pain") to 10 ("worst pain imaginable").[23,32]

### Therapists

As part of normal clinic operation, 57 therapists were trained in use of standard

**TABLE 2** Disability and Pain Outcomes Within Each Surgical Category and for Each Gender*

| | Number of Patients | DASH (Initial) | DASH (Final) | Change in DASH | DASH Percentage Change | Percent of Patients With MCID in DASH | Pain Rating (Initial) | Pain Rating (Final) | Change in Pain Rating | Pain Percentage Change |
|---|---|---|---|---|---|---|---|---|---|---|
| UNI | | | | | | | | | | |
| Female | 33 | 58.6 ± 22.6† | 18.6 ± 15.7 | 40.0 ± 23.3†‡ | 64.8 ± 34.4 | 81.8 | 4.5 ± 2.5 | 1.8 ± 1.5 | 2.8 ± 2.1‡ | 60.7 ± 35.9 |
| Male | 86 | 47.8 ± 21.7† | 18.3 ± 18.0 | 29.5 ± 20.5†‡ | 58.5 ± 38.9 | 75.6 | 3.9 ± 2.5 | 1.6 ± 2.2 | 2.3 ± 2.6‡ | 62.8 ± 50.1 |
| RCR | | | | | | | | | | |
| Female | 150 | 63.9 ± 23.0† | 28.9 ± 20.8† | 35.0 ± 25.0‡ | 49.8 ± 49.8 | 79.3 | 4.9 ± 2.8† | 2.5 ± 2.3† | 2.5 ± 2.7‡ | 40.1 ± 86.4 |
| Male | 191 | 56.1 ± 20.6† | 21.9 ± 17.4† | 34.3 ± 25.3‡ | 51.3 ± 78.1 | 79.6 | 4.1 ± 2.6† | 2.0 ± 2.0† | 2.1 ± 2.5‡ | 45.9 ± 56.7 |
| RCR-SAD | | | | | | | | | | |
| Female | 73 | 66.7 ± 20.5† | 21.3 ± 16.2 | 45.4 ± 19.9†‡ | 66.8 ± 22.6 | 94.5 | 4.9 ± 2.7 | 1.7 ± 1.6 | 3.1 ± 2.7†‡ | 62.0 ± 37.0 |
| Male | 101 | 56.6 ± 19.3† | 20.4 ± 16.3 | 36.2 ± 22.3†‡ | 59.2 ± 41.4 | 81.2 | 4.2 ± 2.4 | 2.0 ± 2.0 | 2.2 ± 2.4†‡ | 48.9 ± 46.3 |
| SAD | | | | | | | | | | |
| Female | 118 | 55.9 ± 17.9 | 21.6 ± 15.5 | 34.3 ± 20.6‡ | 58.7 ± 28.2 | 83.1 | 5.4 ± 2.2 | 2.5 ± 1.8 | 2.9 ± 2.4‡ | 50.0 ± 44.6 |
| Male | 104 | 52.0 ± 17.8 | 22.7 ± 15.9 | 29.3 ± 20.2‡ | 53.8 ± 32.8 | 76.0 | 5.5 ± 2.3 | 2.7 ± 2.2 | 2.7 ± 2.7‡ | 46.4 ± 41.5 |

*Abbreviations: DASH, Disability of the Arm, Shoulder, and Hand questionnaire; MCID, minimal clinically important difference; RCR, rotator cuff repair; RCR-SAD, rotator cuff repair combined with a subacromial decompression; SAD, subacromial decompression; UNI, unidirectional instability.*
** Data are reported as mean ± SD unless otherwise indicated.*
*† Significant difference between males and females within the shoulder surgery category (independent t test, P<.05).*
*‡ Significant difference between initial and final visit within gender for the given shoulder surgery category (paired t test, P<.05).*

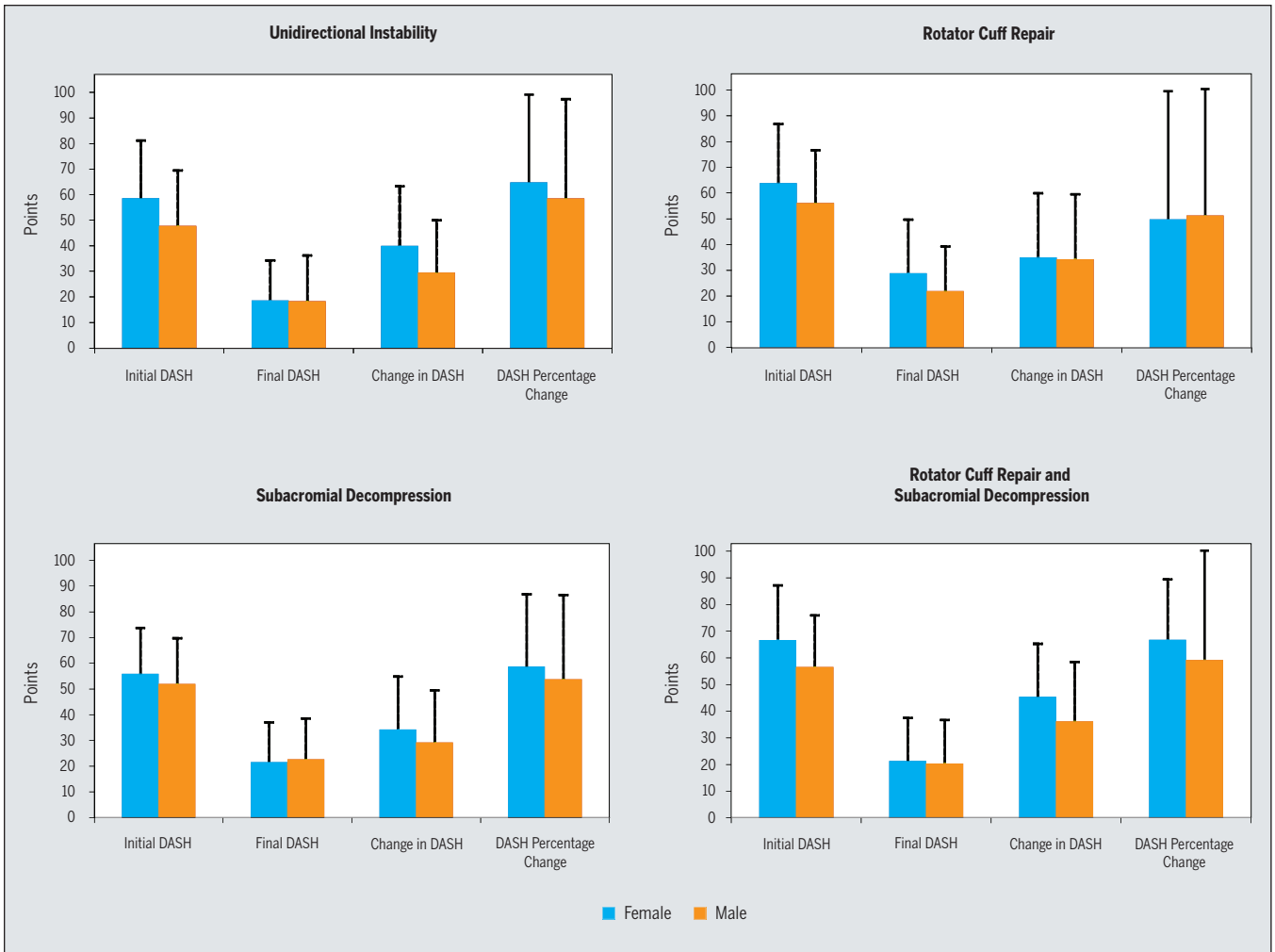


**FIGURE 1.** Disability of the Arm Shoulder and Hand questionnaire (DASH) mean outcome scores at the initial and final visits, the change score, and percentage change for men and women in each shoulder surgical category. Bars indicate standard deviations.

classification forms and in the use of the electronic medical records to access the operative report to classify patients' postoperative surgical condition accurately. Therapists classified patients as they came to physical therapy, without knowledge that the data would be used for research. The investigators extracted data (retrospectively) at the end of the study period. Formal training and instruction in the use of the "Shoulder Surgery Classification" data collection form and the electronic medical record were provided at regularly attended meetings for physical therapists and clinic directors. Written definitions of the various surgical classification terms were provided as reference on a central intranet site for rehabilitation services. Therapists were able to access these documents easily in the clinics. Therapists could also rely on written communication from the referring surgeon to determine the surgical category if the patient's surgery was performed outside of Intermountain Healthcare. Surgery information for procedures performed outside of the Intermountain system was not available in the electronic medical record. Patients included in this study were categorized into 1 of 4 postoperative surgical conditions (**TABLE 1**). The patients' respective physical therapist determined the types of interventions, and the frequency and duration of visits within the usual constraints of the healthcare community. The number of physical therapy visits and length of stay (LOS) in days in outpatient physical therapy were obtained from the ROMS intranet database. LOS was defined as the number of days between the initial and final visit. Reasons for discharge were not available.

## Data Analysis

The number of patients and the proportion of patients within each surgical classification category and the gender distribution for each category were determined. Descriptive statistics were calculated for baseline characteristics of patients in each surgical classification category. The average DASH and NPRS were calculated for the initial and final physical

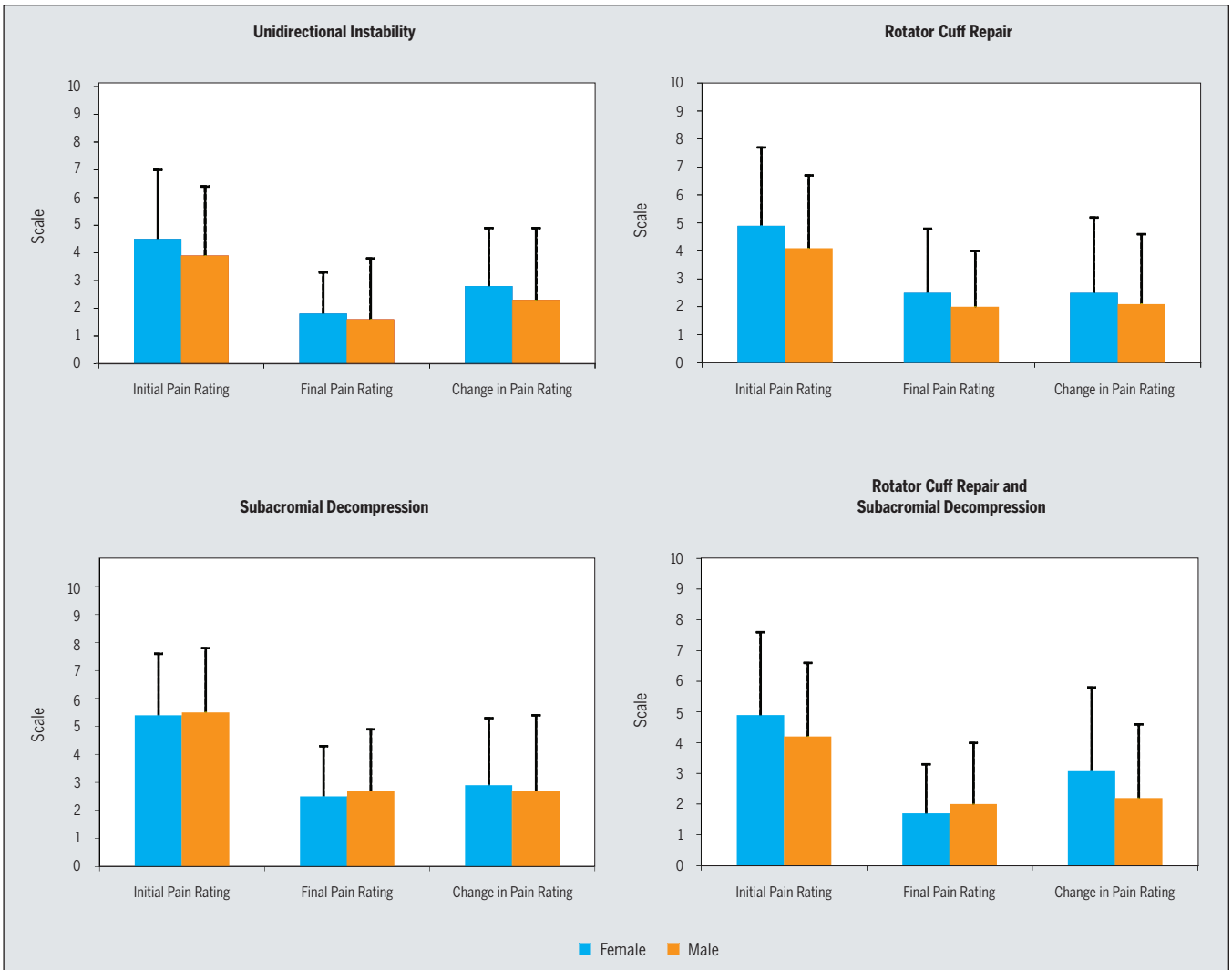


**FIGURE 2.** Numeric pain rating mean outcome scores at the initial and final visits, and the change score for men and women in each shoulder surgical category.

therapy visits for patients in each surgical category. The average change scores of pain and disability for patients within each surgical category were determined. Change scores for clinical outcomes were calculated for each patient by subtracting the final visit pain rating and DASH scores from the corresponding initial scores. The percentage of patients that achieved a difference score greater than or equal to the MCID was determined. A difference score of 15 points on the DASH was considered a MCID.[2,16] The level of statistical significance was set at $\alpha = .05$.

Independent-samples $t$ tests were used to determine differences between men and women for each initial and final clinical outcome of pain and disability, change scores, number of visits, and LOS separately for each surgical group. For each subgroup defined by surgical category and gender, paired $t$ tests were used to determine whether patients achieved significant change in pain and disability from the initial to the final visit.

The number and percentage of patients that had a date of surgery identified in the ROMS database was calculated. Based on these data, the elapsed time in days between the date of surgery and initial and final physical therapy visit was determined.

## RESULTS

A total of 856 patients were included in the analysis (43.7% female). Four surgical categories with more than 100 patients in each category were included. The average ± SD age was 53.4 ± 13.1 years for women and 50.5 ± 14.9 years for men. The ages, frequencies, and percentages of patients in each surgical category are presented in **TABLE 1**. The number of men and women in each surgical category, the average number of visits, and mean LOS are also provided. The means for each clinical outcome for the initial and final pain and disability

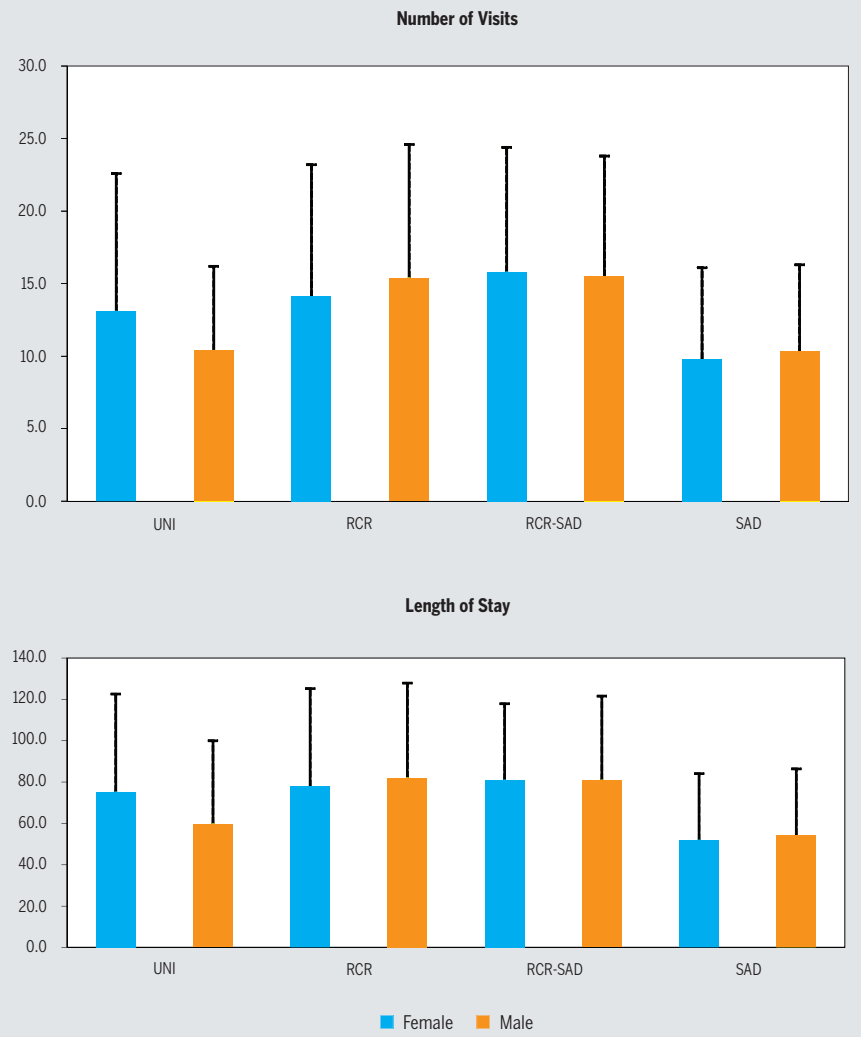


**FIGURE 3.** Mean number of visits and length of stay in physical therapy for females and males in each shoulder surgical category. Abbreviations: RCR, rotator cuff repair; RCR-SAD, rotator cuff repair combined with a subacromial decompression; SAD, subacromial decompression; UNI, unidirectional instability.

**TABLE 3** Elapsed Time Between Date of Surgery and Physical Therapy Admission and Discharge*

| Surgical Categories | Total Cases | Cases With DOS, Initial and Final | DOS to PT Admission | DOS to PT Discharge |
|---|---|---|---|---|
| UNI | 119 | 105 (88.2%) | 32.4 ± 35.1 | 96.9 ± 59.3 |
| RCR | 341 | 282 (82.7%) | 24.5 ± 40.9 | 102.8 ± 48.8† |
| RCR-SAD | 174 | 153 (87.9%) | 16.4 ± 20.4 | 95.3 ± 66.7 |
| SAD | 222 | 175 (78.8%) | 28.0 ± 99.2 | 79.8 ± 103.9† |

*Abbreviations: DOS, date of surgery; PT, physical therapy; RCR, rotator cuff repair; RCR-SAD, rotator cuff repair combined with a subacromial decompression; SAD, subacromial decompression; UNI, unidirectional instability.*

** Data are reported as mean ± SD in days unless otherwise indicated.*

*† RCR greater than SAD (P<.01).*

scores, change scores, and the percentage of patients that achieved a MCID are provided in **TABLE 2**.

Significant differences were observed between men and women for several of the clinical outcome variables in 3 of the 4 surgical categories. In the UNI group, there were significant differences in the initial (men, 47.8; women, 58.6) and change scores for disability (men, 29.5; women, 40.0). In the RCR group, significant differences were observed for the initial pain scores (men, 4.1; women, 4.9), final pain scores (2.0 versus 2.5), and disability scores (initial, 56.1 versus 63.9; final, 21.9 versus 28.9), but not the change scores. In the RCR-SAD group, there were no significant differences in the initial (men, 4.2; women, 4.9) and final (2.0 versus 1.7) pain scores; but women reported significantly greater change in pain scores (3.1 versus 2.2). Women reported significantly greater disability initially on the DASH (66.7 versus 56.6) and significantly greater change in DASH score (45.4 versus 36.2). There were no significant differences between men and women in the SAD group for any of the clinical outcome measures (**TABLE 2, FIGURE 1**) ($P<.05$).

Significant differences between men and women were not observed for the number of visits or LOS (**TABLE 1, FIGURE 3**). The differences between the initial and final visit for pain and disability represented statistically significant improvements for men and women within each surgical category (paired $t$ tests, $P<.01$) (**TABLE 2, FIGURES 1** and **2**).

The date of surgery was retrieved for the majority of patients in each surgical category (range, 78.8%-88.2%). The number of days that elapsed from the surgery to the initial and final physical therapy session is listed in **TABLE 3**. The time from surgery to the final physical therapy visit was significantly longer for patients who had a rotator cuff repair compared to patients who had a subacromial decompression consistent with typical postoperative rehabilitation

protocols for these categories ($P$ =.02). Overall, only 5.8% of patients attended fewer than 4 physical therapy visits, demonstrating that early dropouts are not highly prevalent in these categories.

## DISCUSSION

Numerous investigators have demonstrated the benefits of shoulder surgeries for shoulder instabilities,[11] rotator cuff tear,[3,14,30] and subacromial impingement.[17,21,31] Treatment in outpatient physical therapy clinics is common for these conditions. The patients in this study comprised 4 common surgical categories: repair of unidirectional instabilities, rotator cuff repair, rotator cuff repair with a subacromial decompression, and subacromial decompression. Although a great deal of emphasis in physical therapy practice is currently focused on the need to track clinical outcomes of pain, disability, and the utilization of visits, little has been reported about these outcomes related to the episode of care in physical therapy following shoulder surgery. There is little information available to depict the clinical picture of patients' pain, disability, utilization of care, and LOS for these conditions.

Patients who had surgery for unidirectional instability tended to be young and male (72%). The average ± SD age of all patients in this group was 32.6 ± 11.9 years, which is similar to that found in other studies.[7,8,33] The average ± SD age of patients having a rotator cuff repair in this study was similar to findings of other investigators,[14,25,34,36] but younger than that reported by Boissonnault et al[3] (67.0 ± 8.6 years) and others.[20,37] It is not clear why patients in this study were younger. Boissonnault et al[3] gathered patient data (n = 118) from 30 clinics in 13 states over a wide geographical area in the United States, which may account for the difference. The mean ± SD age for patients having subacromial decompression (49.7 ± 11.7 years) was similar to what has been previously reported.[5,13,17,31]

### Patient Outcomes Related to Disability

Direct comparisons with other studies reporting on pain and disability are limited because of the variation in the use of clinical outcome measures. Several investigators have utilized the DASH as an outcome measure of disability related to the shoulder.[4] The DASH has been used to examine change in disability postoperatively following rotator cuff surgery[3] and also to compare preoperative to postoperative differences in disability.[22,34]

For patients following rotator cuff repair, Boissonnault et al[3] reported slightly lower (less disability) average initial DASH score (mean ± SD, 52.0 ± 18.3) and lower final DASH score (18.2 ± 12.8) compared to findings in this study. We observed an average initial DASH in the RCR and RCR-SAD groups of essentially 60.0 points and a final DASH score of 25.0 and 20.8 points, respectively. However, Boissonnault et al[3] reported a similar mean DASH change score (33.8%) compared to our findings over approximately the same duration of follow-up (mean ± SD, 13.1 ± 5.1 weeks). Tashjian et al[34] reported a lesser improvement (23.2%) for patients who had chronic full-thickness rotator cuff repairs and evidence of significant medical comorbidities. While data on comorbidities and size of the tear were not collected in this study, and duration of follow-up was not controlled, we did not restrict inclusion to these categories. Therefore, the results from Tashjian et al[34] are not surprising, as our sample was likely less severely affected.

A large majority of patients in each surgical category achieved a MCID of 15 points on the DASH.[2] This magnitude of change represents a meaningful clinical improvement in the patients' ability to complete daily activities with their upper extremity. To our knowledge, no other authors have reported the proportion of patients receiving postoperative care achieving a MCID on the DASH. Although the achievement of MCID over the course of treatment is a good outcome and perceived as important by the patient, it may not represent a successful resolution of the patient's symptoms and desired level of function. The patient may have goals that are higher than one level of MCID improvement, and it appears that in many cases patients continue to experience some level of pain and disability at the time of their final visit in physical therapy. This descriptive, clinical outcome information may be useful in establishing realistic goals for postoperative rehabilitation, especially if the patient expects to abolish pain and realize a high level of function by the end of the episode of physical therapy care.

### Patient Outcomes Related to Pain

Patients in each of the surgical categories achieved significant and clinically meaningful improvement in average pain. The change score for pain rating for men and women was greater than 2.0 points for each surgical group. This improvement in pain is clinically significant for individuals and certainly on a group level as well.[9] Pain scores were generally moderate at the initial visit and mild at the final visit in each of the surgical categories. In relation to rotator cuff repair surgery and subacromial decompression, the finding of significant improvement in pain relief and some residual pain at the final assessment is consistent with other studies.[5,17,31,36] Henkus et al[21] used a visual analogue scale to measure initial, final, and change in pain on a group of 30 patients undergoing acromioplasty.[21] The observed pain ratings in the acromioplasty group were slightly higher than the findings in our study, and their duration of follow-up was much longer (2.5 years). The difference in pain rating between the 2 rotator cuff repair groups (RCR and RCR-SAD) and the SAD group is worth noting. The average final pain rating for the SAD group was higher. One might have expected the final pain rating of the SAD group to be lower than the cuff repair groups because it appears a less complicated surgical procedure compared to a cuff repair. Perhaps, the difference in final pain ratings between the groups is related to a shorter average LOS for the

SAD group (53.1 days) compared to an approximate average of 80 days in the 2 RCR groups (**TABLE 1**). The greater LOS in physical therapy following rotator cuff repair surgery might have allowed more healing time for the resolution of pain symptoms. Budoff et al[6] suggested "that many patients" following subacromial decompression felt better immediately after surgery but had a "great deal" of pain after physical therapy, and patients became symptom-free after abandoning the intensive postoperative exercise program.[6] Despite the authors' lack of any clearly reported data to substantiate their criticism of physical therapy, there is little evidence to counter this perception.

## Length of Stay

The date of surgery was identified in the electronic outcome database for the majority of patients (**TABLE 3**). Missing dates were due to patients who received physical therapy care at Intermountain clinics but had surgery at a facility not part of Intermountain Healthcare. The elapsed time (days) from date of surgery to initiating physical therapy was shortest for the patients in the surgical category RCR-SAD (mean, 16.4 days). Patients in the 3 other surgical categories initiated therapy after surgery within an average of 24.5 to 32.4 days. The mean elapsed time from date of surgery to physical therapy discharge, ranged from 79.8 days in the SAD category to 102.8 days in the RCR category. The reasons for these differences have not been investigated in this retrospective, descriptive analysis. The LOS for patients in the 2 categories for rotator cuff (RCR and RCR-SAD) were similar to duration of follow-up reported by Boissonnault et al[3] (mean ± SD, 13.1 ± 5.1 days).[3]

## Utilization

There were no differences between men and women related to number of physical therapy visits. Patients in the 2 categories of rotator cuff repair surgeries (RCR and RCR-SAD) utilized an average of 14 to 16 visits. Other investigations have reported utilization rates that are much higher (23 to 25 visits).[3,28] If other clinics could achieve similar outcomes with as few visits as in this study, this would represent a significant difference in cost to patients and payers. However, in the current study, the treatment process was not standardized, and we did not examine the nature of the treatments provided to determine if there is truly an opportunity to develop more cost-effective methods to intervene and care for these patients. Other factors related to payer policy also might have influenced the utilization of services in this study compared to previous reports, such as restricting access by limiting the number of visits allowed per year for physical therapy, and cost-shifting strategies in the healthcare market that result in the relative rise in cost of patients' copayments during recent years.

Nevertheless, there is preliminary evidence that patients can achieve greater change in pain and disability with less utilization of visits. Milroy et al[29] retrospectively compared 1 group receiving a standardized postoperative treatment protocol including preoperative patient education for rotator cuff repair to a historical control group receiving nonstandardized treatment as directed by the individual therapists. The standardized treatment group achieved a significantly greater mean difference on the DASH (12.4%; 95% confidence interval: 1.6, 23.2) compared to the nonstandardized group and utilized significantly fewer treatment visits (7.3 versus 15.9).[29]

## Differences in Gender

Statistically significant differences ($P<.05$) were observed between men and women in each clinical outcome for disability and pain, except in the final pain score. Data reporting clinical outcome differences related to gender for these surgical categories are uncommon. Watson and Sonnabend[37] reported a small but significant difference in function between men and women in a cohort of 667 patients following open rotator cuff repairs. Despite their finding, and without a compelling substantiated argument, they suggested that overall outcomes related to rotator cuff repairs do not support the relevance of gender differences. Van Linthoudt et al[36] examined 56 patients before and after rotator cuff repair and observed that women reported significantly greater pain than men preoperatively and during rehabilitation. Differences in outcomes related to pain and disability have not been consistently reported following shoulder surgery.

In the current analysis, women perceived greater limitations to their daily activities than men for the 3 shoulder surgery categories that strictly require a period of immobility during the early postoperative period. Women might have perceived greater activity limitations in their daily lives compared to men due to their social role in the family, domestic requirements, childcare, and community.[26] Men may not perceive the acuity of these activity limitations during the early postoperative period due to the nature of their social role. At the final visit there were no significant differences in disability between men and women in the UNI and RCR-SAD groups. Only in the RCR group did women perceive greater disability than men. As a result, the change scores for women in the UNI and RCR-SAD groups were necessarily greater. Women had elevated initial scores in these 2 categories and similar final scores to men, which equates to larger change scores for women compared to men.

Although there are no standards to describe a clinically important difference between genders, we observed differences between men and women that were of interest clinically. Women reported greater disability than men at the initial visit on the DASH for patients in the following groups: UNI (mean difference, 10.9 points), RCR (mean difference, 7.8 points), and RCR-SAD (mean difference, 10.2). Females also achieved greater change than males on their DASH scores from the initial to the final visit in the following groups: UNI (mean difference, 10.5 points), RCR-SAD (mean difference,

9.2 points). For the RCR group, females reported a higher initial pain score than males (mean difference, 0.9 points). Females achieved greater change in pain in the RCR-SAD group (mean difference, 1.1 points)

### Limitations of the Study

Although this descriptive study provides clinical outcome data related to pain and disability during the episode of physical therapy care following shoulder surgery, the design of the current study inherently presents limitations and potential for bias. The number of visits and LOS in physical therapy was not controlled and may have impacted clinical outcomes. However, in clinical settings it is not uncommon for patients to stop treatments before a formal discharge decision has been made. The results presented in this study may help set goals on the basis of what therapists are likely to encounter. Our results may underestimate the prognosis if patients interrupted their treatment early because of perceived lack of progress. Therapists involved in this study collected outcomes at each visit, thereby limiting the effect of early dropouts on the results reported. Other potential prognostic factors besides surgical categories were not examined, such as duration of symptoms prior to surgery, comorbidities, and dominant-arm involvement, because they were not available systematically in the electronic database. The type of surgical procedure and the criteria for surgery were controlled by the referring surgeon and may also have impacted clinical outcomes.

There was also no attempt to control or to standardize the plan of care within each surgical category of patients. Therefore, the data depict a typical clinical response for patients treated by physical therapists using common and varied approaches. Future research is needed to determine the most important factors and covariates related to patients within each surgical category that will guide us to standardize the interventions for the purpose of achieving optimal outcomes and the most efficient utilization of treatment visits. Future trials need to be reflective of the various interventions employed in clinical practice and yet rely on a core set of outcome measures for analysis.[15] Practice can be improved to the extent that clinicians clearly define the process of care, identify and track outcome measures, and also identify important covariates such as patient factors.

Hopefully, this will ultimately enhance future opportunities to pool data across studies and systematically compare the results. These data may be helpful in planning future clinical trials to estimate sample size based on the means and variability of the outcomes observed in this sample of patients. Further, this study provides data to estimate the feasibility of conducting clinical trials on postoperative care following shoulder surgeries by demonstrating how many patients within the 4 surgical categories were treated during the study period by the study therapists and clinics.

## CONCLUSION

This study was a retrospective, descriptive analysis of observed clinical outcomes, utilization of visits and LOS in outpatient physical therapy of patients in 4 common shoulder surgical categories. Differences were observed between men and women in each of the clinical outcomes except the final pain score. Statistically significant and clinically meaningful improvement was observed in measures of pain and disability. No differences were observed between men and women related to utilization of visits or LOS in physical therapy. Results from this study may help therapists estimate the prognosis of males and females receiving nonstandardized postoperative physical therapy in 4 different shoulder surgical categories. ◉

### KEY POINTS

**FINDINGS:** Meaningful and statistically significant clinical improvement was achieved by approximately 80% of patients following 4 common categories of shoulder surgery. Outcome differences of pain and disability between men and women were observed postoperatively. Women reported greater disability initially in physical therapy following UNI, RCR, and RCR-SAD surgeries. Compared to men, women reported greater change in pain and disability following RCR-SAD.

**IMPLICATION:** The description of clinical outcomes of pain and disability measures presented in this study may help therapists set goals for patients on the basis of what clinicians are likely to encounter in the treatment of patients with these common postoperative shoulder conditions. The planning of future randomized trials aimed at improving the outcomes of care may be helped by utilizing the variability observed in this sample of patients to estimate sample size needed.

**CAUTION:** There was no attempt to control for baseline variables or to standardize physical therapy interventions. The type of surgical procedure and the criteria for surgery were controlled by the referring surgeon and may have impacted clinical outcomes.

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