Utilization and Clinical Outcomes of Outpatient Physical Therapy for Medicare Beneficiaries With Musculoskeletal Conditions

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Background. Medicare beneficiaries frequently receive physical therapy for musculoskeletal conditions. Little information is available about this care.

Objective. The purposes of this study were: (1) to describe characteristics, clinical outcomes, and utilization for Medicare beneficiaries receiving physical therapy in outpatient clinics within one integrated health care system; (2) to compare characteristics, outcomes, and utilization based on the body region affected; and (3) to examine factors predictive of outcomes and utilization.

Design. This was a prospective, longitudinal study.

Methods. Medicare beneficiaries aged 65 years or older (n=1,840 episodes of care) participated in the study. Descriptive statistics were calculated for patient characteristics and outcomes. Comparisons were made based on body region. Regression models evaluated factors associated with change in pain, improved outcome, and utilization.

Results. The patients’ mean age was 74.2 years (SD=6.3), and 65.3% were female. The most common body regions were the lumbar spine, shoulder, and knee, collectively accounting for 71.3% of the episodes of care. Patients attended a mean of 6.8 visits (SD=4.7), and 63.9% experienced an improved outcome. Episodes of care for lumbar spine conditions had less reduction in pain, whereas shoulder conditions and foot/ankle conditions showed the greatest improvement. Care for hip conditions was least likely to result in an improved outcome. Knee conditions were most likely to have an improved outcome. Care for shoulder and knee conditions had the highest number of visits. Factors associated with greater reduction in pain and improved outcomes included greater initial pain or disability and attending more visits. Factors associated with greater utilization included a postsurgical condition and higher initial pain rating.

Limitations. The study was performed in one geographic region within a single health care delivery system.

Conclusion. The results provide information on outcomes of physical therapy for Medicare beneficiaries in one health care system. Further research is needed to examine optimal utilization and care for these patients.
Musculoskeletal conditions are highly prevalent in the United States and throughout the world. Musculoskeletal conditions can significantly diminish an individual’s quality of life and impose a substantial economic burden on both individuals and society. In the United States, approximately 1 in 4 individuals is affected by a musculoskeletal condition, and these conditions are a leading cause of work disability. There is some evidence to suggest the prevalence of musculoskeletal conditions is growing. The ubiquity and impact of musculoskeletal conditions have been recognized by the United Nations, the World Health Organization, and numerous government agencies through support for the Bone and Joint Decade initiative.

Musculoskeletal conditions are particularly prevalent among older adults. Results of the 2000 Health and Retirement Survey, administered to adults aged 65 or older across the United States, showed musculoskeletal conditions to be the most prevalent chronic disorder in this age group. Pain related to musculoskeletal conditions has been reported to be present in about half of individuals older than age 70 years, with a higher prevalence in women. Musculoskeletal conditions are the leading cause of disability in older adults and have been associated with lower self-perceptions of general health, increased risk of dependence in activities of daily living, hospitalizations, and mortality.

Many older adults with musculoskeletal conditions seek outpatient physical therapy services. A large, nationally representative survey of individuals over 18 years of age referred by primary care providers for outpatient physical therapy showed 30% were aged 60 years or older, and the majority of these older adults were receiving physical therapy for musculoskeletal conditions. There is research evidence that physical therapy interventions can benefit many common musculoskeletal conditions in older adults. Little research, however, is available describing the outcomes of usual physical therapy care for older adults with musculoskeletal conditions.

Many older adults receiving outpatient physical therapy services are insured through Medicare part B coverage. The Centers for Medicare & Medicaid Services (CMS) reported that 8.5% of all Medicare beneficiaries received outpatient physical therapy services during 2006, equating to 3.9 million individual patients and more than $3 billion in expenditures. One national survey estimated that 15% of all patients who received outpatient physical therapy were insured through Medicare. The utilization of outpatient physical therapy by Medicare beneficiaries continues to expand, despite legislative changes and the imposition of financial limitations. The continued growth of Medicare has led to calls for reform of the current fee-for-service structure, with a move toward alignment of payment strategies with high-quality and efficient care. Moving toward this goal requires information on both the process of care and clinical outcomes of services provided. The purposes of this study were: (1) to describe the baseline characteristics, clinical outcomes, and physical therapy utilization of Medicare beneficiaries receiving outpatient physical therapy for musculoskeletal conditions in community-based, non-hospital clinics of a single integrated health care system in Utah; (2) to compare baseline characteristics, clinical outcomes, and utilization among Medicare beneficiaries based on the body region affected by the musculoskeletal condition; and (3) to examine factors predictive of clinical outcomes and utilization for Medicare beneficiaries as a whole and based on the body region affected.

Method
Data Source
Data for this study were collected from 8 outpatient physical therapy clinics of Intermountain Healthcare Inc (IHC), a private, nonprofit, integrated health care delivery system. Each clinic is located in the region around Salt Lake City, Utah, and is a community outpatient facility that is not hospital-based. All physical therapists working in the participating clinics were salaried employees of IHC. Since 2002, each of these clinics has been tracking clinical outcomes for all patients receiving physical therapy. Data obtained from each new patient are entered into an Internet-based electronic database. At each visit, a region-specific disability outcome questionnaire and a numeric pain rating scale (NPRS) are collected from the patient, and the data are entered into the database. Additional elements entered into the database by the physical therapist performing the initial evaluation include the patient’s sex and date of birth, date of onset of the patient’s current symptoms or date of surgery, the body region involved, and the patient’s diagnostic subgroup. During the 3-year time period of this study, the IHC had a 1.5% Medicare enrollment rate. 

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study, clinical outcome and subgrouping data were collected on 94.5% of the patients who received physical therapy at the participating clinics.

An NPRS, which asked the patient to “rate your current level of pain” on a 0 to 10 scale anchored with the phrases “no pain” and “worst imaginable pain,” was used for all patients regardless of the nature or location of the chief complaint. The NPRS has been used frequently in research for people with a variety of musculoskeletal conditions. Although there is some variation in the literature, the minimum clinically important difference (MCID) on the NPRS has been estimated at or slightly less than 2 points of change for patients with various musculoskeletal conditions.25–27 We used 2 points of change as the MCID for change on the NPRS for all patients in this study as a somewhat conservative estimate.

The region-specific disability questionnaire used for each patient was based on the body region of the patient’s chief complaint at the time of the initial physical therapy session. A modified version of the Oswestry Disability Questionnaire (OSW) was used for patients with a chief complaint related to the lumbar or thoracic spine.28 The OSW is a 10-item scale, with the total score expressed on a scale of 0 to 100 points. Higher scores indicate greater disability. The MCID for this version of the OSW has been estimated as 6 points.29 The Neck Disability Index (NDI) was the questionnaire used for patients with a chief complaint of neck pain.29 The NDI is similar in structure to the OSW, with the total score expressed on a scale of 0 to 100 points. Higher scores indicate greater disability. The MCID for the NDI has been estimated as 7 points.26 For patients with chief complaints related to musculoskeletal conditions of the upper extremity (shoulder, elbow, wrist, or hand), the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire was used. The DASH is a 30-item scale designed to measure symptoms and function in individuals with a variety of upper-extremity conditions.30 The total DASH score also is expressed on a scale of 0 to 100 points. Higher scores indicate greater disability. The MCID for the DASH has been estimated as 12 points of change.31 The Knee Outcome Survey (KOS) was the questionnaire used for individuals with knee conditions.32 The KOS consists of 16 items, with the total score expressed on a scale of 0 to 100 points. Lower scores indicate greater disability. The MCID for the KOS is estimated at 7 points.27 The Lower Extremity Functional Scale (LEFS) was used for conditions affecting the lower extremity other than the knee (ie, hip, foot and ankle).33 The LEFS has 20 items, and the total score ranges from 0 to 80, with lower scores indicating greater disability. The MCID for the LEFS is estimated as 9 points.33,34

The Bottom Line

What do we already know about this topic?

Musculoskeletal conditions are common among older adults insured by Medicare. Many Medicare enrollees with musculoskeletal conditions receive physical therapy, yet little information is available on the types of physical therapy provided or the outcomes of physical therapy for these patients.

What new information does this study offer?

Low back pain was the most common musculoskeletal condition among the Medicare enrollees in this study, followed by shoulder and knee conditions. The majority of patients improved with physical therapy treatment. Factors associated with better outcomes of physical therapy included greater initial pain, greater initial disability, and attending more physical therapy sessions.

If you’re a patient, what might these findings mean for you?

The study results suggest that physical therapy is helpful for older adults with musculoskeletal conditions.
included in the episode of care, and Medicare insurance provider for the episode of care. Records of patients meeting the inclusion criteria were linked to the billing database using the enterprise master patient index number. The primary insurance provider to which the episode of care was billed and the number of physical therapy sessions during the episode of care were extracted from the billing database. The insurance provider was categorized as Medicare, Medicaid, private, workers' compensation, or "other" (eg, self-pay, charity care).

**Patient and Care Characteristics**

For each included episode of care, the length of stay was recorded as the number of days between the initial and final physical therapy visits. The body region involved with the patient's musculoskeletal condition was recorded based on the data indicating the body region of the patient's chief complaint that were entered by the physical therapist into the electronic database. Body region was categorized as lumbar spine, cervical/thoracic spine, hip, knee, foot/ankle, shoulder, or elbow/wrist/hand. Within each body region, the diagnostic subgroup, as recorded in the electronic database, also was extracted. For patients with musculoskeletal conditions involving the spine (lumbar or cervical/thoracic), the diagnostic subgroup was recorded as: (1) postsurgical, (2) nonsurgical acute (onset of current symptoms <90 days), (3) nonsurgical chronic (onset of current symptoms ≥90 days), or (4) nonsurgical radicular. For patients with musculoskeletal conditions involving peripheral body regions (hip, knee, foot/ankle, shoulder, or elbow/wrist/hand), diagnostic subgroups were recorded as: (1) surgical (joint arthroplasty, ligament repair, and so on, depending upon the region), (2) nonsurgical soft tissue condition (eg, tendinitis, bursitis), (3) nonsurgical degenerative joint condition, or (4) other region-specific nonsurgical condition.

**Clinic and Physical Therapist Characteristics**

The proportion of episodes of care provided to older adult Medicare beneficiaries was recorded for each participating physical therapy clinic by dividing the number of episodes of care provided to individuals aged 65 years or older at the time of the initial visit who were Medicare beneficiaries by the total number of episodes of care provided during the study period. A similar procedure was used to calculate the proportion of older adult Medicare beneficiaries for each physical therapist included in the study sample.

**Clinical Outcomes and Utilization**

Clinical outcomes of care for included patients were based on the change in the NPRS score and region-specific disability score from the initial physical therapy session to the final session. Change in pain was calculated for each patient by subtracting the final NPRS score from the initial score for the patient. The points of change on the region-specific disability questionnaire were used to categorize the episode of care for each patient as "improved" if the improvement from the initial to the final session met or exceeded the MCID for the particular questionnaire used with the patient. If the patient did not improve by an amount at least equal to the MCID value, the episode of care was categorized as "not improved." Patients whose initial disability score was less than the MCID value were categorized as improved if the discharge disability score indicated no disability (ie, a score of 0 for the DASH, NDI and OSW, a score of 100 for the KOS, or a score of 80 for the LEFS). Utilization outcomes included the number of physical therapy sessions attended during the episode of care. The duration of care was calculated as the number of days from the initial physical therapy session to the final session of the episode of care.

**Data Analysis**

Data analysis was performed using SPSS statistical software (version 17.0). Descriptive statistics were calculated for all Medicare beneficiaries, including means and standard deviations for normally distributed variables, medians with interquartile range for variables with skewed distributions (length of stay and duration of current symptoms), and frequency counts with percentages for categorical variables. Descriptive characteristics were calculated based on the body region involved (eg, lumbar spine, hip, knee). In addition, we evaluated diagnostic subgroupings within each body region and calculated descriptive statistics for any subgroup with at least 50 episodes of care to provide more-specific information for the most commonly encountered conditions.

**Comparison of baseline characteristics, clinical outcomes, and utilization by body region.** Baseline characteristics, physical therapy utilization, and clinical outcomes were compared among episodes of care based on body region using chi-square and one-way analysis of variance procedures for categorical and continuous baseline characteristics, respectively. Variables with skewed distributions were compared using Kruskal-Wallis tests. Comparison of baseline NPRS scores among body regions was performed using linear mixed model analysis in order to risk-adjust scores for available demographic data, including age, sex, and

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duration of symptoms, and for the effect of clustering of patients by physical therapist and within clinics using mixed model analysis. Age, sex, and duration of symptoms were included as fixed-effect covariates. Because of the degree of skewness, duration of symptoms was transformed to an ordinal variable as acute (0–29 days), subacute (30–89 days), or chronic (90 or more days). The physical therapist responsible for the episode of care, nested within the physical therapy clinic, was included as a random factor with a variance components covariance structure. Comparison of risk-adjusted change in NPRS scores among different body regions was performed in a similar manner, with addition of baseline NPRS score as a fixed effect covariate. Comparisons of disability scores among different body regions were not performed because different questionnaires were used. The proportion of episodes of care resulting in improvement were compared using multivariate logistic regression, controlling for age, sex, categorized duration of symptoms, the physical therapist and physical therapy clinic, and the proportion of Medicare beneficiaries at the physical therapist and physical therapy clinic level. A significance level of .05 was used for all comparisons.

Examination of predictors of clinical outcomes and utilization.

We examined predictors of clinical outcomes and physical therapy utilization using regression models. Separate models were developed for the most common body regions (lumbar spine, cervical/thoracic spine, shoulder, and knee). Regression models were not developed for body regions with fewer than 200 episodes of care (hip, foot/ankle, and elbow/wrist/hand) due to concerns of overfitting the models based on small sample sizes. Patient characteristics (age, sex, symptom duration, postsurgical status, initial pain score), physical therapist and clinic characteristics (proportion of Medicare beneficiaries), and physical therapy utilization variables (number of visits, length of stay) were examined as potential predictors of clinical outcomes. An ordinary least squares model was constructed with change in pain (ie, change in NPRS score) as the dependent variable. An additional model was developed with the number of physical therapy visits as the dependent variable. The utilization variables were removed as potential predictors from this model. Assumptions of homoskedasticity and linearity between the independent and dependent variables were examined by plotting the residuals versus the predicted values. Normal probability plots of residuals were evaluated. Variance inflation factor (VIF) statistics were used to evaluate multicollinearity. A logistic regression model was developed using improved outcome as the dependent variable. Model fit was tested using the Hosmer-Lemeshow test and collinearity was examined with the VIF statistics. Linearity of the continuous independent variables was examined using the Box-Tidwell test.

Results

During the period of this study, a total of 14,060 episodes of care were provided for patients with musculoskeletal conditions in participating clinics, of which 2,396 (17.0%) were provided for individuals aged 65 years or older at the time of the initial visit. Among episodes of care provided for those aged 65 years or older, 332 were provided to individuals with private insurance (13.9%), 23 were provided to those receiving workers’ compensation (1.0%), 5 (0.21%) were provided to Medicaid beneficiaries, 13 (0.54%) were provided to patients who had other coverage (self-pay or charity care), leaving 2,023 (84.4%) episodes of care provided to Medicare beneficiaries. Of the episodes of care provided to Medicare beneficiaries, 20 (0.99%) were not for a musculoskeletal condition, and 165 (8.1%) involved a single visit, leaving 1,840 episodes of care involving at least 2 visits. Patients attending a single visit had a mean age of 75.1 years (SD=6.5), and 72.3% were female. With respect to the body region involved, patients attending a single visit were less likely to have a cervical spine condition ($P=.002$) and more likely to have a wrist/hand condition ($P<.001$). The 1,840 episodes of care with at least 2 visits represented 1,685 unique patients; 103 patients had 2 separate episodes of care during the study period, 18 patients had 3 episodes of care, 4 patients had 4 episodes of care, and 1 patient had 5 episodes of care.

The proportion of all episodes of care provided to Medicare beneficiaries within each participating physical therapy clinic ranged from 9.9% to 22.0%, with a mean of 14.9% (SD=4.8%). A total of 37 different physical therapists provided treatment for patients included in the study sample. The average number of Medicare beneficiaries treated by each therapist was 49.5, with a range from 1 to 205 patients. The proportion of Medicare beneficiaries managed by each physical therapist in his or her case load ranged from 1.4% to 24.3% (mean=9.9%, SD=5.9%).

Description of Baseline Characteristics, Clinical Outcomes, and Utilization

The study sample ($n=1,840$ episodes of care) had a mean age of 74.2 years (SD=6.3), and 1,201 (65.3%) were female. The most common body regions involved were the lumbar spine, followed by shoulder and knee. Patients were seen for physical therapy, on average, for 6.8 visits (SD=4.7) over a median of 27 days. Mean risk-adjusted change in NPRS scores for all episodes of care was 1.9 points (95% confidence interval=1.7, 2.0). The baseline disability
score was less than the MCID value for 54 episodes of care (2.9%). Thirty of these 54 episodes of care involved the DASH questionnaire: 24 for conditions affecting the shoulder (6.1% of all shoulder episodes of care) and 6 for conditions affecting the elbow/wrist/hand (6.3% of all elbow/wrist/hand episodes of care). The remaining episodes of care with baseline disability scores below the MCID value were 12 (1.9%) provided for lumbar spine conditions using the OSW, 4 (1.6%) provided for cervical/thoracic spine conditions using the NDI, 2 (0.7%) provided for knee conditions using the KOS, and 5 (3.6%) provided for hip conditions and 1 (2.2%) provided for foot/ankle conditions using the LEFS. Overall, 63.9% of the episodes of care resulted in improvement, based on achieving at least an MCID level of change in disability across the episode of care (Tab. 1).

### Comparison of Baseline Characteristics, Clinical Outcomes, and Utilization by Body Region

Comparison of baseline characteristics by body region involved showed patients with shoulder and lumbar spine conditions were more likely to be male than patients with cervical/thoracic spine, hip, or foot/ankle conditions (P<.05) (Tab. 2). Lumbar and cervical/thoracic spine conditions were less likely to be postsurgical than conditions affecting any other body region (P<.001). Episodes of care provided for knee, shoulder, and elbow/wrist/hand conditions had shorter symptom durations than those provided for hip, foot/ankle, and lumbar and cervical/thoracic spine conditions (P<.05). Lumbar spine conditions had the highest initial pain ratings, significantly higher than shoulder conditions (P=.002) and elbow/wrist/hand conditions (P=.002) (Tab. 2). Mean region-specific disability scores are reported for the intended disability questionnaire. There were instances of administration of an incorrect region-specific disability questionnaire. The OSW was used for 22 patients with thoracic region symptoms and 11 patients with hip conditions.

Comparison of clinical outcomes among Medicare beneficiaries by body region showed the smallest

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**Table 1.** Descriptive Characteristics of Study Sample of 1,840 Episodes of Care Provided to Medicare Beneficiaries

| Variable                        | Data     |
|---------------------------------|----------|
| Age (y)                         | 74.2 (6.3) |
| 65–69, n (%)                   | 509 (27.7) |
| 70–79, n (%)                   | 927 (50.4) |
| 80–89, n (%)                   | 381 (20.7) |
| ≥90, n (%)                     | 23 (1.3)  |
| Sex                            |          |
| Female, n (%)                  | 1,201 (65.3) |
| Male, n (%)                    | 639 (34.7) |
| Postsurgical                   |          |
| Yes, n (%)                     | 355 (19.3) |
| No, n (%)                      | 1,485 (80.7) |
| Body region involved           |          |
| Lumbar, n (%)                  | 648 (35.2) |
| Cervical/thoracic, n (%)       | 247 (13.4) |
| Shoulder, n (%)                | 391 (21.3) |
| Elbow/wrist/hand, n (%)        | 96 (5.2)  |
| Hip, n (%)                     | 140 (7.6)  |
| Knee, n (%)                    | 273 (14.8) |
| Foot/ankle, n (%)              | 45 (2.5)   |
| Current symptom duration       |          |
| Median days (IQR n=1,834)      | 37.5 (18, 91) |
| Acute, n (%)                   | 736 (40.1) |
| Subacute, n (%)                | 613 (33.4) |
| Chronic, n (%)                 | 485 (26.4) |
| Clinical outcomes              |          |
| Baseline pain rating, X (SD)   | 4.8 (2.6) |
| Unadjusted change in pain rating, X (95% CI) | 1.9 (1.7, 2.0) |
| Adjusted change in pain rating, a X (95% CI) | 1.9 (1.7, 2.0) |
| Improved during the episode of care, n (%) | 1,176 (63.9) |
| Utilization                    |          |
| No. of visits, X (SD)          | 6.8 (4.7) |
| Length of stay (d), median (IQR) | 27 (15, 43) |

**Footnotes:**

- a IQR=intercquartile range, 95% CI=95% confidence interval.
- b Scores risk-adjusted for age, sex, and duration of symptoms.
Table 2.
Comparison of Episodes of Care Provided to Medicare Beneficiaries by Involved Body Region

| Body Region | n     | Baseline Region-Specific Disability, X (SD) | Age (y), X (SD) | Sex (% Male) | Post-surgical (% Yes) | Duration of Symptoms (d), Median (IQR) | Baseline Pain Rating, X (SD) | Unadjusted Change in Pain Rating, X (95% CI) | Improved Outcome (% Yes) | No. of Visits, X (SD) | Length of Stay (d), Median (IQR) |
|-------------|-------|--------------------------------------------|-----------------|--------------|------------------------|----------------------------------------|----------------------------|------------------------------------------|--------------------------|------------------------|--------------------------|
| Lumbar spine | 648   | OSW scores (n=644): 39.3 (16.5)            | 74.8 (6.4)      | 36.7         | 3.9                    | 41 (18, 98)                            | 5.3 (2.5)                  | 1.7 (1.5, 1.9)                           | 1.5 (1.3, 1.7)          | 63.9                   | 5.9 (3.4)                | 25 (14, 37) |
| Cervical/thoracic spine | 247   | NDI scores (n=225): 33.8 (15.0)            | 75.0 (6.7)      | 29.1         | 2.4                    | 52.5 (21, 92)                          | 4.8 (2.4)                  | 1.5 (1.2, 1.8)                           | 1.6 (1.4, 1.9)          | 61.5                   | 5.7 (2.9)                | 22 (13, 34) |
| Hip         | 140   | LEFS scores (n=129): 34.1 (17.0)           | 74.7 (6.3)      | 27.1         | 14.3                   | 45.5 (24, 151)                        | 4.8 (2.6)                  | 2.1 (1.6, 2.6)                           | 2.2 (1.9, 2.6)          | 53.6                   | 6.4 (3.6)                | 26.5 (15, 36) |
| Knee        | 273   | KOS scores (n=255): 49.4 (17.3)            | 73.3 (6.2)      | 34.1         | 56.0                   | 28 (17, 63.5)                          | 4.7 (2.7)                  | 2.1 (1.8, 2.4)                           | 2.1 (1.9, 2.4)          | 75.8                   | 8.4 (5.5)                | 28 (17, 48.5) |
| Foot/ankle  | 45    | LEFS scores: 41.6 (20.0)                   | 73.6 (6.1)      | 24.4         | 35.6                   | 58 (28, 118)                           | 4.4 (2.9)                  | 2.0 (1.2, 2.8)                           | 2.4 (1.7, 3.0)          | 60.0                   | 7.1 (3.9)                | 24 (16.5, 46) |
| Shoulder    | 391   | DASH scores: 42.9 (22.2)                   | 73.4 (6.0)      | 40.2         | 23.8                   | 35 (15, 84)                            | 4.5 (2.5)                  | 2.1 (1.9, 2.3)                           | 2.2 (2.0, 2.5)          | 61.4                   | 8.0 (5.7)                | 28 (16, 56) |
| Elbow/wrist/hand | 96   | DASH scores: 43.9 (23.1)                   | 73.9 (6.0)      | 31.3         | 43.8                   | 29 (14, 75.5)                          | 4.0 (2.6)                  | 1.6 (1.2, 2.1)                           | 2.1 (1.6, 2.5)          | 63.5                   | 7.4 (4.4)                | 35.5 (23, 63) |

* IQR = interquartile range; 95% CI = 95% confidence interval; OSW = Oswestry Disability Questionnaire; NDI = Neck Disability Index; LEFS = Lower Extremity Function Scale; KOS = Knee Outcome Survey; DASH = Disabilities of the Arm, Shoulder, and Hand questionnaire.
* a Scores risk-adjusted for age, sex, duration of symptoms, and baseline pain rating.
### Table 3.
Descriptive Statistics for the Most Common Conditions Among Episodes of Care Provided to Medicare Beneficiaries

| Body Region | n    | Age (y), X (SD) | Sex (% Male) | Duration of Symptoms (d), Median (IQR) | Baseline Pain Rating, X (SD) | Unadjusted Change in Pain Rating, X (95% CI) | Adjusted Change in Pain Rating, X (95% CI) | Improved Outcome (% Yes) | No. of Visits, X (SD) | Length of Stay (d), Median (IQR) |
|-------------|------|-----------------|--------------|----------------------------------------|-----------------------------|---------------------------------------------|---------------------------------------------|-------------------------|-----------------------|-------------------------------|
| Lumbar spine|      |                 |              |                                        |                             |                                             |                                             |                         |                       |                               |
| Nonsurgical, acute | 302  | 74.9 (6.3)      | 35.3         | 25 (14, 43)                           | 5.4 (2.5)                   | 1.8 (1.5, 2.1)                             | 1.4 (1.2, 1.7)                             | 69.3                    | 5.6 (3.2)          | 21 (12, 31)                  |
| Nonsurgical, radicular | 212  | 74.5 (6.4)      | 37.3         | 49 (21, 112)                          | 5.4 (2.7)                   | 1.9 (1.3, 1.9)                             | 1.6 (1.3, 1.9)                             | 62.3                    | 6.1 (3.2)          | 28 (17, 41.5)                |
| Nonsurgical, chronic | 108  | 75.4 (6.3)      | 39.8         | 208 (122, 548)                        | 4.8 (2.3)                   | 1.3 (0.86, 1.7)                            | 1.6 (1.2, 2.0)                             | 52.8                    | 6.1 (3.5)          | 26.5 (15, 38)                |
| Hip         |      |                 |              |                                        |                             |                                             |                                             |                         |                       |                               |
| Nonsurgical, soft tissue injury (eg, bursitis, tendinitis) | 78   | 74.6 (6.3)      | 25.6         | 40.5 (21, 152)                        | 5.5 (2.5)                   | 1.4 (0.21, 2.5)                            | 1.9 (1.1, 2.7)                             | 55.1                    | 5.9 (3.6)          | 22 (13, 35)                  |
| Shoulder    |      |                 |              |                                        |                             |                                             |                                             |                         |                       |                               |
| Nonsurgical, soft tissue injury (eg, bursitis, tendinitis) | 203  | 73.5 (6.1)      | 36.5         | 39.5 (18, 94)                         | 4.7 (2.4)                   | 2.0 (1.6, 2.3)                             | 2.0 (1.7, 2.3)                             | 54.7                    | 5.8 (3.0)          | 24 (15, 36)                  |
| Postsurgical, rotator cuff repair | 62   | 71.0 (4.4)      | 56.5         | 19 (11, 47)                           | 4.4 (2.5)                   | 2.5 (1.9, 3.0)                             | 2.5 (2.0, 3.0)                             | 88.7                    | 13.1 (6.1)         | 63 (52, 95)                  |
| Postsurgical, rotator cuff tear | 51   | 75.4 (6.3)      | 45.1         | 35 (16, 69)                           | 4.5 (2.6)                   | 1.7 (1.0, 2.4)                             | 1.9 (1.4, 2.5)                             | 45.1                    | 5.9 (3.3)          | 24 (14, 37)                  |
| Knee        |      |                 |              |                                        |                             |                                             |                                             |                         |                       |                               |
| Postsurgical, joint arthroplasty | 112  | 72.0 (5.4)      | 35.7         | 24 (19, 40.5)                         | 4.8 (2.6)                   | 2.5 (2.0, 2.9)                             | 2.4 (2.0, 2.8)                             | 83.0                    | 11.6 (6.3)         | 40.5 (28, 60)                |
| Nonsurgical, degenerative conditions | 64   | 76.1 (7.2)      | 26.6         | 54.5 (22, 117)                        | 5.0 (2.8)                   | 1.6 (0.88, 2.2)                            | 1.5 (1.0, 2.1)                             | 60.9                    | 5.9 (3.5)          | 23 (14, 34.5)                |
| Cervical/thoracic |      |                 |              |                                        |                             |                                             |                                             |                         |                       |                               |
| Nonsurgical, acute | 153  | 75.2 (6.7)      | 30.7         | 30 (14.5, 60)                         | 4.9 (2.5)                   | 1.7 (1.3, 2.1)                             | 1.6 (1.3, 2.0)                             | 64.1                    | 5.4 (2.8)          | 19 (10, 32.5)                |
| Nonsurgical, chronic | 52   | 74.3 (5.9)      | 28.8         | 153 (109, 322)                        | 4.6 (2.1)                   | 1.4 (0.77, 2.0)                            | 1.9 (1.3, 2.5)                             | 53.8                    | 6.6 (3.2)          | 27.5 (18, 39.5)                |

* a IQR = interquartile range; 95% CI = 95% confidence interval.
* b Scores risk-adjusted for age, sex, duration of symptoms, and baseline pain rating.
Table 4.
Predictors of Change in Numeric Pain Rating Scale Scores With Physical Therapy for Episodes of Care Provided to Medicare Beneficiaries by Involved Body Region

| Predictor Variable                  | Lumbar Conditions (n=644) | Shoulder Conditions (n=390) | Knee Conditions (n=255) | Cervical/Thoracic Conditions (n=225) |
|------------------------------------|--------------------------|----------------------------|------------------------|-------------------------------------|
|                                    | b (95% CI) | P          | b (95% CI) | P          | b (95% CI) | P          | b (95% CI) | P          |
| Age                                | -0.016 (-0.043, 0.011)  | .24                      | -0.033 (-0.062, -0.004) | .028       | 0.019 (-0.022, 0.060) | .37        | -0.009 (-0.051, 0.032) | .66        |
| Sex (male)                         | 0.17 (-0.19, 0.52)      | .36                      | 0.14 (-0.22, 0.50)     | .43        | 0.31 (-0.22, 0.84)   | .25        | 0.42 (-0.19, 1.04)     | .17        |
| Categorized duration of symptoms   |                         |                          |                        |           |                         |           |                        |           |
| Acute (<30 d)                      | 0.51 (0.086, 0.94)      | .018                     | 0.28 (-0.17, 0.73)     | .23        | 0.85 (0.17, 1.54)    | .015       | 0.31 (-0.39, 1.00)     | .39        |
| Subacute (30–89 d)                 | 0.30 (-0.12, 0.72)     | .16                      | -0.04 (-0.51, 0.43)    | .86        | 0.25 (-0.49, 0.99)   | .51        | 0.59 (-0.11, 1.30)     | .10        |
| Postoperative condition            | -0.14 (-1.04, 0.75)    | .75                      | 0.28 (-0.27, 0.82)     | .32        | 0.22 (-0.36, 0.80)   | .45        | -0.59 (-2.38, 1.20)    | .51        |
| Baseline pain rating               | 0.61 (0.53, 0.69)       | <.001                    | 0.66 (0.57, 0.74)      | <.001      | 0.66 (0.56, 0.76)    | <.001      | 0.58 (0.45, 0.72)      | <.001      |
| Baseline region-specific disability score | OSW scores: -0.035 (-0.023, -0.048) | <.001 | DASH scores: -0.009 (-0.029, 0.002) | .10 | KOS scores: 0.007 (-0.008, 0.023) | .33 | NDI scores: -0.027 (-0.048, -0.006) | .11 |
| Clinic proportion of Medicare beneficiaries | -0.13 (-4.23, 3.97) | .95 | 6.43 (1.55, 11.32) | .010 | 7.04 (1.04, 13.93) | .045 | 4.09 (-3.38, 11.56) | .28 |
| Physical therapist proportion of Medicare beneficiaries | 0.29 (-4.59, 5.16) | .91 | -4.85 (-10.47, 0.78) | .091 | -6.72 (-14.28, 0.84) | .081 | -2.23 (-11.16, 6.70) | .62 |
| No. of visits                      | 0.15 (0.093, 0.21)     | <.001                    | 0.040 (-0.011, 0.090)   | .12        | 0.025 (-0.046, 0.097) | .48        | -0.020 (-0.16, 0.12)   | .78        |
| Length of stay in physical therapy | -0.008 (-0.015, -0.002) | .017 | 0.00 (-0.008, 0.009) | .93 | 0.006 (-0.009, 0.02) | .45 | 0.022 (0.001, 0.042) | .039 |

Adjusted $R^2=0.30$ Adjusted $R^2=0.45$ Adjusted $R^2=0.43$ Adjusted $R^2=0.26$

a 95% CI=95% confidence interval; OSW=Oswestry Disability Questionnaire; NDI=Neck Disability Index; LEFS=Lower Extremity Function Scale; KOS=Knee Outcome Survey; DASH=Disabilities of the Arm, Shoulder, and Hand questionnaire.
b Chronic symptom duration used as reference category.
### Table 5.
Predictors of an Improved Outcome With Physical Therapy for Episodes of Care Provided to Medicare Beneficiaries by Involved Body Region

| Predictor Variable               | Lumbar Conditions (n=644) | Shoulder Conditions (n=390) | Knee Conditions (n=255) | Cervical/Thoracic Conditions (n=225) |
|----------------------------------|---------------------------|-----------------------------|-------------------------|-------------------------------------|
|                                  | aOR (95% CI) | P  | aOR (95% CI) | P  | aOR (95% CI) | P  | aOR (95% CI) | P  |
| Age                              | 0.98 (0.95, 1.01) | .13  | 0.95 (0.91, 0.99) | .016  | 0.98 (0.94, 1.03) | .48  | 1.0 (0.96, 1.04) | .81  |
| Sex (male)                       | 0.98 (0.69, 1.39) | .92  | 1.31 (0.78, 2.21) | .30  | 1.70 (0.85, 3.41) | .14  | 2.0 (1.04, 3.75) | .038  |
| Categorized duration of symptoms |                           |                               |                         |                                      |
| Acute (<30 d)                    | 1.82 (1.20, 2.77) | .005  | 1.45 (0.78, 2.72) | .24  | 1.58 (0.70, 3.57) | .27  | 1.85 (0.92, 3.72) | .085  |
| Subacute (30–89 d)               | 1.44 (0.95, 2.17) | .083  | 0.79 (0.42, 1.48) | .46  | 1.43 (0.61, 3.36) | .42  | 1.76 (0.88, 3.51) | .11  |
| Postsurgical condition           | 1.03 (0.43, 2.47) | .95  | 0.82 (0.36, 1.84) | .62  | 1.38 (0.68, 2.80) | .37  | 0.35 (0.06, 2.15) | .26  |
| Baseline pain rating             | 0.89 (0.82, 0.97) | .006  | 1.03 (0.91, 1.17) | .61  | 0.97 (0.86, 1.11) | .69  | 0.94 (0.83, 1.07) | .36  |
| Baseline region-specific disability score | OSW scores: 1.03 (1.02, 1.04) | <.001  | DASH scores: 1.05 (1.04, 1.07) | <.001  | KOS scores: 0.98 (0.96, 0.99) | .011  | NDI scores: 1.03 (1.01, 1.05) | .007  |
| Low clinic proportion of Medicare beneficiaries | 0.90 (0.62, 1.32) | .60  | 0.75 (0.38, 1.46) | .39  | 1.61 (0.70, 3.73) | .27  | 1.34 (0.70, 2.58) | .38  |
| Low physical therapist proportion of Medicare beneficiaries | 0.98 (0.58, 1.65) | .94  | 1.21 (0.51, 2.84) | .67  | 0.34 (0.13, 0.89) | .028  | 0.76 (0.30, 1.92) | .56  |
| No. of visits                    | 1.06 (0.99, 1.13) | .085  | 1.16 (1.06, 1.28) | .001  | 1.14 (1.01, 1.27) | .032  | 1.20 (1.03, 1.40) | .020  |
| Length of stay in physical therapy | 0.99 (0.99, 1.00) | .039  | 0.99 (0.98, 1.00) | .22  | 1.00 (0.98, 1.02) | .92  | 0.99 (0.97, 1.31) | .26  |

*Adjusted odds ratio; 95% CI: 95% confidence interval; OSW = Oswestry Disability Questionnaire; DASH = Disabilities of the Arm, Shoulder, and Hand questionnaire.† Chronic symptom duration used as reference category.

### Table 6.
Predictors of Number of Physical Therapy Visits for Episodes of Care Provided to Medicare Beneficiaries by Involved Body Region

| Predictor Variable               | Lumbar Conditions (n=644) | Shoulder Conditions (n=390) | Knee Conditions (n=272) | Cervical/Thoracic Conditions (n=245) |
|----------------------------------|---------------------------|-----------------------------|-------------------------|-------------------------------------|
|                                  | b (95% CI) | P  | b (95% CI) | P  | b (95% CI) | P  | b (95% CI) | P  |
| Age                              | 0.034 (−0.006, 0.74) | .091  | 0.053 (−0.02, 0.14) | .19  | 0.015 (−0.084, 0.082) | .76  | 0.009 (−0.047, 0.065) | .75  |
| Sex (male)                       | −0.052 (−0.48, 0.59) | .85  | 0.24 (−0.72, 1.20) | .62  | −0.74 (−2.02, 0.55) | .26  | 0.26 (−0.56, 1.07) | .54  |
| Categorized duration of symptoms | 0.21 (−0.11, 0.53) | .19  | 0.056 (−0.54, 0.66) | .86  | −0.51 (−1.31, 0.29) | .21  | 0.37 (−0.094, 0.83) | .12  |
| Postsurgical condition           | 1.76 (0.43, 3.10) | .010  | 6.38 (3.10, 7.66) | <.001  | 4.70 (3.43, 5.97) | <.001  | 0.25 (−2.14, 2.65) | .84  |
| Baseline pain rating             | −0.031 (−0.15, 0.091) | .62  | −0.20 (−0.42, 0.023) | .078  | 0.079 (−0.17, 0.33) | .53  | 0.10 (−0.074, 0.28) | .25  |
| Baseline region-specific disability score | OSW scores: 0.042 (0.23, 0.06) | <.001  | DASH scores: 0.061 (0.033, 0.089) | <.001  | KOS scores: −0.041 (−0.077, −0.005) | .025  | NDI scores: 0.021 (−0.007, 0.049) | .14  |
| Clinic proportion of Medicare beneficiaries | 3.61 (−2.43, 9.65) | .24  | 14.17 (1.14, 27.20) | .033  | 5.51 (−11.03, 22.04) | .52  | 1.43 (−8.10, 10.95) | .77  |
| Physical therapist proportion of Medicare beneficiaries | 4.69 (−2.64, 1201) | .21  | −21.07 (−35.99, −6.13) | .006  | −17.65 (−36.88, 0.57) | .058  | 6.50 (−4.68, 19.06) | .23  |

*Adjusted R² = 0.051 Adjusted R² = 0.36 Adjusted R² = 0.22 Adjusted R² = 0.19

*95% CI: 95% confidence interval; OSW = Oswestry Disability Questionnaire; NDI = Neck Disability Index; LEFS = Lower Extremity Function Scale; KOS = Knee Outcome Survey; DASH = Disabilities of the Arm, Shoulder, and Hand questionnaire.
improvement in risk-adjusted pain ratings for episodes of care provided for lumbar spine conditions, significantly lower than for episodes of care provided for hip, knee, foot/ankle, shoulder, or elbow/wrist/hand conditions \((P<.04)\). Shoulder and foot/ankle conditions experienced the greatest reduction in pain, significantly greater than cervical/thoracic and lumbar conditions \((P<.05)\) (Tab. 2). The likelihood of an improved outcome was lowest for hip conditions, significantly lower than for lumbar spine and knee conditions \((P<.05)\). Comparison of physical therapy utilization among Medicare beneficiaries showed episodes of care provided for knee and shoulder conditions had the largest number of physical therapy visits, significantly larger than for lumbar or cervical/thoracic spine or hip conditions \((P<.05)\). Conditions of the elbow/wrist/hand had the longest length of stay in physical therapy, significantly longer than conditions affecting any other body region \((P<.05)\) (Tab. 2).

Descriptive statistics for diagnostic categories with at least 50 episodes of care are outlined in Table 3. The most common diagnostic categories were acute, nonsurgical lumbar spine conditions, representing 16.4% of all Medicare beneficiaries, followed by radicular, nonsurgical lumbar conditions, nonsurgical soft tissue conditions of the shoulder, and acute, nonsurgical conditions of the cervical/thoracic spine. Collectively, these four conditions accounted for 47.3% of all Medicare beneficiaries in this sample.

### Examination of Predictors of Clinical Outcomes and Utilization

Regression models examining predictors of physical therapy clinical outcomes and utilization are reported in Tables 4, 5, and 6. Table 4 presents the predictors of change in pain across the episode of care. Assumptions of the models were met, and no data transformations were undertaken. The contribution of individual predictors is expressed by the regression coefficient. A positive coefficient indicates the amount of change in pain was greater when more of the predictor variable was present, whereas a negative coefficient indicates the opposite relationship. The magnitude of the coefficient indicates the strength of the association between the predictor variable and the dependent variable and is interpreted as indicating the amount of increase or decrease in the dependent variable (change in pain) as a result of a 1-unit change in the predictor variable, with other predictors held constant. The models developed for different body regions explained 26% to 43% of the variance in change in pain occurring with physical therapy. A higher initial pain rating was a predictor of change in pain for all regions examined. Additional predictors by body region are outlined in Table 4.

Logistic regression models examining predictors of an improved outcome are presented in Table 5. The predictor variables of the proportion of Medicare beneficiaries at the clinic and physical therapists were dichotomized for these analyses due to evidence of nonlinearity. A median split was used to create “high” and “low” categories for these variables. Adjusted odds ratios (aORs) are used to express the impact of significant predictor variables. The aOR indicates the effect of a 1-unit change in a predictor on the odds of an improved outcome, with other variables in the model held constant. The total explained variance of the models for predicting an improved outcome by body regions was low (Nagelkerke \(R^2=0.084-0.38\)) (Tab. 5). A higher initial region-specific disability score was predictive of an improved outcome for all body regions, and a greater number of visits was predictive of an improved outcome for all body regions except the lumbar spine. Additional predictors by body region are outlined in Table 5.

Models examining predictors of physical therapy utilization for lumbar and cervical/thoracic spine conditions explained a very small amount of the variance in utilization (adjusted \(R^2=0.051 \text{ and } 0.019\), respectively), but a greater amount of variance for episodes of care provided for shoulder and knee conditions (adjusted \(R^2 =0.36 \text{ and } 0.22\), respectively) (Tab. 6). A postsurgical condition and a higher baseline disability score predicted higher utilization for all body regions except cervical/thoracic spine. Additional predictors by body region are outlined in Table 6.

### Discussion

This study described the characteristics and clinical outcomes, as well as factors predictive of outcomes and utilization, of episodes of outpatient physical therapy care provided to Medicare beneficiaries receiving outpatient physical therapy for musculoskeletal conditions in one health care system. The results showed that Medicare beneficiaries accounted for a consequential proportion of the caseload in the outpatient physical therapy clinics included in the study. Slightly more than half of the Medicare beneficiaries in this sample had conditions affecting the lumbar spine or shoulder. Although there were differences based on the body region involved, a majority of the patients improved with physical therapy.
therapy, as evidenced by achieving at least a minimum threshold of clinical improvement on region-specific disability questionnaires. Predictors of change in pain or an improved outcome differed by body region involved. Attending physical therapy following surgery and a higher initial level of pain predicted a greater number of physical therapy visits for most body regions. The results of this study suggest areas to target to improve physical therapy care, such as focusing on the most prevalent clinical conditions and identifying more-effective strategies for the treatment of Medicare beneficiaries. Determining optimal physical therapy utilization for Medicare beneficiaries also should be a target for further research.

There is a growing focus in health care generally, and by CMS specifically, on measuring the quality of health care services and designing strategies to incentivize more-efficient, higher-quality care. Improvements in health care quality can be facilitated through standardized measurement procedures and information on care processes and clinical outcomes from representative practice environments. The CMS has recognized the need for standardized measurement, calling for the development and implementation of quality measurement focused on the outcomes of care and resource utilization for conditions with a high impact on public health, such as joint conditions and arthritis. In 2007, the CMS established a research project titled “Developing Outpatient Therapy Payment Alternatives” for the purpose of addressing the need for standardized measurements of quality specific to outpatient therapy services and developing strategies to link these measurements to reimbursement strategies. Very little information has been published to date examining the outcomes of care and the factors influencing outcomes of physical therapy, and the available data have not focused specifically on Medicare beneficiaries. Data published on physical therapy for Medicare beneficiaries has focused largely on utilization with respect to various changes in payment regulations. The goal of this project was to take advantage of a standardized measurement system to examine utilization, clinical outcomes, and factors influencing outcomes for physical therapy provided to Medicare beneficiaries with musculoskeletal conditions within one health care system.

Over the 3-year period of this study, 17.5% of all episodes of outpatient physical therapy care for musculoskeletal conditions were provided to patients aged 65 years or older; 14.9% was provided to Medicare beneficiaries. The percentage of patients in this age group receiving outpatient physical therapy is likely to increase in future years, as a greater proportion of the population of the United States comprises older adults. A little more than a third of all episodes of care provided to Medicare beneficiaries in this sample were for conditions related to the lumbar spine. This finding is consistent with other reports in the literature that at least 25% of all outpatient physical therapy episodes of care, regardless of patient age, are provided to individuals with low back pain. Considering low back pain is estimated to have a point prevalence of 30% in community-dwelling older adults, it is not surprising that a large proportion of Medicare beneficiaries receiving outpatient physical therapy have this primary complaint. In our sample, conditions affecting the lumbar spine or shoulder accounted for 56.5% of all episodes of care. More specifically, 36.1% of all episodes of care were provided for either nonradiar lumbar region conditions (acute or chronic) or soft tissue disorders affecting the shoulder (e.g., rotator cuff tear or impingement, tendinitis). Improving the quality standards of care provided for these high-volume conditions could have a large impact on the overall quality of care provided by physical therapists to Medicare beneficiaries.

There have been few reports comparing outcomes of outpatient physical therapy provided for conditions affecting a different body region or based on diagnostic subgroupings, and none have been focused on older adults or Medicare beneficiaries. Our results showed several of the most commonly encountered conditions were associated with lower rates of improved outcomes, based on changes in disability. Episodes of care provided for spinal conditions resulted in the least reduction in pain and lower rates of improved outcomes compared with other conditions. Rates of improved outcomes also were low for episodes of care provided for soft tissue conditions affecting the shoulder. A recent study by Deutscher et al examined outcomes of more than 22,000 episodes of care provided between 2005 and 2008 in outpatient physical therapy clinics in Israel. Similar to the results of the present study, changes in functional limitations were smaller for patients with lumbar or cervical conditions compared with those with shoulder or knee conditions. Di Fabio and Boissonnault, in a study of more than 17,000 episodes of care provided between 1994 and 1996 to patients across the United States, found smaller improvements in function for patients with shoulder and cervical spine conditions than for those with lumbar or knee conditions. None of the previous studies comparing the prognosis of patients receiving physical therapy for different musculoskeletal conditions strictly examined older adults. It is likely that prognosis for particular
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musculoskeletal conditions is modified by age. Prior research has identified age as a risk factor for less-favorable outcomes of care for spinal conditions.\textsuperscript{46-47} Considering the high proportion of older adults affected by spinal pain or soft tissue conditions affecting the shoulder, if the prognosis for these conditions is particularly poor for older adults, it should motivate more research involving older adults to identify effective treatment strategies.

Our results identified several variables that were predictive of clinical outcomes for episodes of care provided to Medicare beneficiaries. Not surprisingly, initial level of pain was predictive of change in pain, with higher levels of baseline pain associated with greater change in pain. Baseline pain, however, was not a predictor of improved outcome, based on region-specific disability scores, with the exception of the lumbar spine. This finding may reflect the fact that some patients with musculoskeletal conditions may have little or no pain, yet have limited function. The finding also may be attributable to the fact that some patients with musculoskeletal conditions may achieve improvements in function with minimal change in pain. Increasing age was associated with less reduction in pain and reduced odds of an improved outcome for episodes of care provided for shoulder conditions, but not other body regions. Other studies examining predictors of clinical outcomes of outpatient physical therapy for musculoskeletal conditions across a broader age range of patients have associated increasing age with a poorer prognosis.\textsuperscript{45-47, 49} Age may be an important prognostic factor, at least for shoulder conditions, even within a cohort of patients aged 65 years or older.

Another predictor of better clinical outcomes in our sample was a greater number of physical therapy visits. Little information has been published on the relationship between physical therapy utilization and clinical outcomes. Our finding that higher utilization was associated with better clinical outcomes contradicts the results of Deutscher et al.,\textsuperscript{45} who reported the opposite association for patients with lumbar or cervical spine conditions across a broader age range of patients receiving outpatient physical therapy in Israel. The discrepancy may be attributable to differences in healthcare systems and payment policies, or it may reflect unique prognostic characteristics of older adults. The overall utilization of physical therapy in this sample also should be taken into consideration. A recent study by Resnik et al.\textsuperscript{42} examined the performance of outpatient physical therapy clinics in the management of patients with low back pain across the United States and reported that the best-performing clinics (those with the highest clinical outcomes balanced with lower utilization) treated patients with low back pain for an average of 7.7 visits, whereas the worst-performing clinics provided an average of 9.3 visits per patient. The average number of visits provided to patients with low back or cervical/thoracic pain in our sample was 5.9 and 5.7, respectively. The generally lower utilization of physical therapy in our sample may partly explain why more visits were associated with greater clinical improvement, at least for episodes of care provided for spinal conditions. Optimal utilization of physical therapy for various musculoskeletal conditions is not known for patients in any age group. Exploring appropriate utilization of physical therapy must relate utilization to clinical outcomes in order to determine the parameters associated with the highest-quality care.\textsuperscript{50}

Previous studies of hospital-based and procedural care have suggested a link between patient volume and quality of care, specifically that higher-quality care is associated with facilities that treat a higher volume of patients with a particular condition or who require a specific procedure.\textsuperscript{51} Research has shown a similar link between patient volume and quality of care in older adults with chronic conditions managed on an outpatient basis, such as diabetes.\textsuperscript{52} Our results identified a link between clinics with a case mix including a higher proportion of Medicare beneficiaries and greater reductions in pain for episode of care provided for shoulder or knee conditions. Resnik and colleagues\textsuperscript{42} recently identified a similar volume-quality link in the physical therapy treatment of patients with low back pain. Physical therapy clinics with a higher proportion of low back pain cases were more likely to be high-performing clinics, achieving better clinical outcomes with greater efficiency. It is likely that the opportunity to provide care for more patients with a particular condition lends itself to more-effective care processes. Our results, however, did not show a similar link between volume of patients and quality of care at the level of the individual physical therapist providing treatment. This finding may be attributable to the differences in the absolute volume of patients seen by the individual physical therapists in this project. Absolute volume may be more important than the proportion of a therapist’s case mix comprising older adults or Medicare beneficiaries. Because not all of the physical therapists included in this project were employed throughout the 3-year data collection period, using the absolute volume of Medicare beneficiaries treated by each physical therapist would not have been an
accurate reflection of a physical therapist’s level of experience with treating these patients in all cases.

Variation in the utilization of health care services among Medicare beneficiaries is a potential threat to overall quality of care, particularly when variation does not appear to be attributable to illness severity or disease characteristics.53,54 Andersen and Newman55 modeled health care utilization as a function of 3 principal components: predisposing characteristics (eg, patients’ attitudes, sociodemographic factors), enabling characteristics (eg, insurance coverage, access to providers), and need characteristics (eg, illness severity, disease characteristics). The most important predictors of higher physical therapy utilization in our sample were treatment for a postsurgical condition and higher initial pain ratings for patients with lumbar, shoulder, or knee conditions. These 3 factors represent need characteristics and would appear to be appropriate reasons for variation in utilization. Resnik et al42 identified disability score at intake and number of prior surgeries as predictors of the number of physical therapy visits for patients of all ages with low back pain. Freburger and Holmes56 examined predictors of physical therapy utilization in a nationwide sample of community-dwelling older adults and found the strongest predictors were primarily enabling characteristics (higher income level, living in a metropolitan community, greater local supply of physical therapists, not being in a managed care plan). We were unable to model most of these characteristics because of either a lack of data or a lack of sufficient geographic variability in our sample. Additional research on the determinants of variation in utilization of physical therapy for older adults may help to identify areas of unwarranted disparity in utilization, resulting in overutilization or underutilization of physical therapy.

The results of this study need to be considered in light of several limitations. This study was conducted in only one geographic region within a single health care delivery system. Regional differences in health care, along with the wide degree of variability in intensity of physical therapy utilization in different regions of the United States,56 may limit the generalizability of the results of this study. There is a need for further research to evaluate these issues in a more nationally representative sample. We were able to risk-adjust our outcome variables for several important factors (age, sex, symptom duration); however, we lacked data on other potential confounding variables such as comorbid health conditions, patient income or education level, and so on. The addition of these factors may have altered our comparisons and prediction models. Although we were able to include data on more than 90% of the patients receiving at least 2 physical therapy visits during the time frame of this study, the elimination of patients who received only 1 visit may have created a selection bias in our sample. Our clinical outcome data relied on patient-report questionnaires. It is possible that cognitive deficits may have influenced patients’ responses on these questionnaires. In addition, only the final score on questionnaires is recorded in our electronic database; therefore, we are not able to determine whether there were missing responses to individual questionnaire items and how missing responses may have influenced the results. We chose the time frame for this study because Medicare caps on physical therapy services were in place beginning in January 2006 and continuing through December 2008. Despite the consistent presence of the therapy cap, it is possible that economic or other secular trends occurring during the course of the study may have influenced the results.

Conclusions

This study provides information, including utilization and clinical outcomes of care, for Medicare beneficiaries with musculoskeletal conditions who received outpatient physical therapy in community-based, non-hospital clinics within one integrated health care system. We found that slightly more than half of all episodes of care were provided for musculoskeletal conditions affecting the lumbar spine or shoulder and that the least amount of clinical improvement tended to occur for spinal conditions. We identified several factors that were associated with greater clinical improvement among Medicare beneficiaries, including a greater number of physical therapy visits and treatment in a clinic with a greater proportion of older adults in its case mix. The results of this study provide information on utilization and outcomes of physical therapy for Medicare beneficiaries with musculoskeletal conditions and identify potential target areas for quality improvement.

Dr Fritz, Mr Hunter, and Dr Brennan provided concept/idea/research design. Dr Fritz provided writing and project management. Dr Brennan provided data collection, participants, and institutional liaisons. Mr Hunter provided facilities/equipment. Mr Hunter and Dr Brennan provided consultation (including review of manuscript before submission).

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