

Clinical Outcomes, Utilization, and Charges in Persons With Neck Pain Receiving Guideline Adherent Physical Therapy

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Abstract

In efforts to decrease practice variation, clinical practice guidelines for neck pain have been published. The purpose of this study was to determine the effect of receiving guideline adherent physical therapy (PT) on clinical outcomes, health care utilization, and charges for health care services in

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patients with neck pain. A retrospective review of 298 patients with neck pain receiving PT from 2008 to 2011 was performed. Clinical outcomes, utilization, and charges were compared between patients who received guideline adherent care and nonadherent care. Patients in the adherent care group experienced a lower percentage improvement in pain score compared to nonadherent care group ($p = .01$), but groups did not significantly differ on percentage improvement in disability ($p = .32$). However, patients receiving adherent care had an average 3.6 fewer PT visits ($p < .001$) and less charges for PT ($p < .001$). Additionally, patients receiving adherent care had 7.3 fewer visits to other health care providers ($p < .001$), one less prescription medication ($p = .02$) and 43% fewer diagnostic images ($p = .02$) but did not differ in their charges to other health care providers ($p = .68$) during the calendar year of undergoing PT. Although receiving guideline adherent care demonstrated positive effects on health care utilization and financial outcomes, there appears to be a trade-off with clinical outcomes.

Keywords

clinical practice guidelines, neck pain, physical therapy, health care utilization, costs, clinical outcomes

Introduction

Health care utilization and medical expenditures for spine conditions including neck pain have increased steadily from 1997 to 2005, and these increases did not correlate with improvements in health (Martin et al., 2008). Number of visits to health care providers for neck pain in a year ranged from 3 to 17.2 visits, with physical therapists being the most frequent provider visited (Goode, Freburger, & Carey, 2010). In 2006, outpatient visits, including physical therapy, accounted for 52.3% of total spine-related expenditures (Martin et al., 2009).

The existing literature suggests that there is variation in the care provided for neck pain and increases in health care utilization and costs may not result in improved outcomes (Martin et al., 2009). Clinical practice guidelines have been published in attempt to improve the effectiveness and efficiency of health care (O'Connor, 2005) and usage of guidelines is advocated as a method to decrease utilization of ineffective therapies and ultimately resulting in improved patient outcomes and more cost-effective care (Grimshaw, Eccles, & Russell, 1995). In 2008, the Orthopaedic Section of American Physical Therapy Association published a Clinical Practice

Guideline for neck pain (Childs et al., 2008). The effects of adherence to this guideline have not been examined and this study aims to fill this gap in the literature.

Therefore, the purposes of this study were to determine the extent to which patients who receive PT adherent with the clinical practice guidelines for neck pain differed in (1) PT clinical outcomes, (2) health care utilization, and (3) charges for health care services compared to those patients who receive care nonadherent to guidelines. We hypothesize that patients receiving guideline adherent care will have improved clinical outcomes, decreased overall health care utilization, and decreased charges for health care services during the calendar year of undergoing an episode of PT.

Methods

Database

Data were collected from the Rehabilitation Outcomes Management System (ROMS) and the AS-400 financial databases maintained by Intermountain Health Care, a private, nonprofit integrated health care system. Clinical data collected from ROMS for this study was retrieved from 13 outpatient PT clinics located in the Salt Lake City, UT, and surrounding regions. At each visit, patients completed a condition specific disability questionnaire, the Neck Disability Index (NDI), and a pain rating scale, the Numerical Pain Rating Scale (NPRS). The NDI is a condition-specific outcome measure comprised of 10 items; each item is scored from 0 to 5. The total score is expressed as a percentage and is reflective of a level of disability related to neck pain where high percentages are related to higher disability. The NDI is a commonly used outcome measure for people with neck pain and is found to be reliable and valid in the neck pain population (Hains, Waalen, & Mior, 1998). The NPRS is an 11-point scale, anchored with 0 rated as *no pain* and 10 rated as *worst pain* imaginable. Patients are asked to rate their current pain using this scale. The NPRS exhibits fair to moderate test-retest reliability in patients with mechanical neck pain and shows adequate responsiveness in this patient population (Cleland, Childs, & Whitman, 2008). Other variables included in the clinical outcomes database utilized in this analysis are the variables including age, gender, clinic code, physical therapist provider code, comorbid low back pain, year of treatment, and duration of treatment (DOT).

The sample for this study was extracted from the ROMS and AS-400 databases and included patients who were privately insured and underwent

an episode of PT for treatment of neck pain between the dates January 1, 2008, to December 31, 2011. Records from the ROMS database were linked to the AS-400 database using an enterprise master patient index number. The billing database contains current procedural terminology (CPT) codes billed for encounters with health care providers and charges associated with these codes for each patient visit. The CPT codes and associated charges for health care were extracted for 298 patients with episodes of neck pain during the calendar year in which they underwent an episode of PT.

Determining Clinical Practice Guideline Adherent Care

CPT codes billed for PT visits occurring during an episode of PT were recorded. The episode of care for each patient was divided into two phases (Phase I: 0–14 days and Phase II: 15 and forward) to permit the consideration of interventions appropriate in each phase. CPT codes billed in each phase of treatment were examined and categorized as “active + manual therapy” (Phase I), “active” (Phase II), “passive” or “allowed.” Codes classified as “active + manual therapy” and “active” indicated procedures adherent to clinical guidelines for neck pain for physical therapists (CPT Codes 97110, 97350, 97535, 97112, 97150, and 97140; Childs et al., 2008). The codes classified as “passive” indicated procedures that were primarily modalities or mechanical traction (CPT Codes 97035, 97010, G0283, 97032, 97012, 97124, 97024, and 97026). Allowed codes represent procedures that could not be adequately categorized to reflect adherence to guidelines (CPT Codes 97001, 97002, 99070, 97750, 97113, and 97116). In Phase II, manual therapy (CPT Code 97140) is considered an “allowed” code based on prior evidence supporting manual therapy utilization early in the course of treatment (Fritz & Brennan, 2007).

The number of “active + manual therapy” and “passive” codes billed at each visit during Phase I was recorded. In Phase II, the number of “active” and “passive” codes billed at each visit during was recorded. For each phase, to determine if PT care was guideline adherent, the proportion of “active + manual therapy” (Phase I) and “active” (Phase II) codes to overall codes was calculated then expressed as a percentage [(number of “active + manual therapy” or “active” codes)/(number of active codes + number of passive codes)) $\times 100 = \% \text{Active Care}$]. Guideline adherent care was defined as occurring when the percentage of “active + manual therapy” (Phase I) or “active” codes (Phase II) comprised least 75% of the total treatment codes. If the percentage of “active + manual therapy” (Phase I) or “active” (Phase II) codes fell below 75% of the total codes, then the care

was considered nonadherent to clinical practice guidelines. This algorithm has been previously published in a study of adherence to clinical practice guidelines (Fritz, Cleland, & Brennan, 2007).

Clinical Outcomes

Change in pain (NPRS) and change in disability (NDI) scores were calculated for each patient in the sample. This was calculated by subtracting the discharge score from the score at the initial visit for NPRS and NDI. This change score was then divided by the score at the initial visit then multiplied by 100 to create a percentage improvement $[(\text{Change score}/\text{Initial Score}) \times 100 = \%\text{Improvement}]$.

Financial and Utilization Outcomes

For each episode of PT included in the sample, the DOT was defined as the number of days between the initial evaluation and the last visit. The number of visits was defined as the number of visits that a patient attended during an episode of care. Total charges for PT were defined as the total charges for all PT visits provided during the episode of care.

In addition to PT, health care utilization and charges were examined during the calendar year in which the episode of PT occurred. This method was chosen pragmatically to describe a general course of care for neck pain rather than indicate a causal relationship between an episode of PT and downstream health care utilization and charges. Utilization variables included number of visits to health care providers, number and type of prescriptions, number of diagnostic images, and the financial outcome of charges for services to health care providers (all providers). All charges from 2009 to 2011 were adjusted to 2008 charges by adjusting by a rate of 0.968 per year to account for yearly inflation. The rate used was from the Consumer Price Index published by the U.S. bureau of labor and statistics for medical care services ("Consumer Price Index for Medical Services," 2013).

Data Analysis

Baseline characteristics and utilization variables were compared between patients receiving adherent care and nonadherent care using independent samples *t*-tests for continuous variables and χ^2 tests for categorical variables. When comparing number of visits and DOT, Mann-Whitney *U*

nonparametric tests were used due to violations of assumptions of normality for these variables (Rivas-Ruiz, Moreno-Palacios, & Talavera, 2013). For regression analyses comparing clinical outcomes, utilization, and financial outcomes, all models were built based on a conceptual basis and included covariates that are known to be potential confounders (Carroll et al., 2008; Childs et al., 2008), conceptually driven variables (Donabedian, 1980), and variables that were found to differ at baseline between adherent care groups. Multiple model specifications were examined for each outcome to determine the best model fit and minimize bias.

Separate analysis of covariance modeling was performed to determine the effect of receiving adherent care on the clinical outcomes of percentage improvement in pain and disability scores with PT intervention. Adherent care group was the main predictor of interest in each model and covariates in the models included age, gender, comorbid LBP, and admission score. We examined predictors of health care utilization during the calendar year of undergoing an episode of PT. In separate Poisson regression models, we examined the outcomes of (1) number of visits to PT, (2) number of visits to health care providers, (3) number of prescriptions, and (4) number of diagnostic images. The main predictor of interest in each model was adherent care group and the covariates in each of the models varied slightly depending on the nature of the dependent variable and model estimation. Covariates in each model, Incident Rate Ratios (IRR) with 95% confidence intervals, and β s are reported in Table 1.

Finally, we examined the total charges for an episode of PT and total charges for health care visits during the calendar year of undergoing an episode of PT. The γ regression with log link function was performed to account for the skewedness of the dependent charge variables (Manning, Basu, & Mullahy, 2005). The main predictor of interest in each of the models was adherent care group and the covariates included in each model are reported in Table 2 with coefficients and 95% CI. IBM SPSS 21.0 and Intercooled STATA 12.1 were used to perform analyses. Significance level was set at .05 for all analyses.

Results

Eleven percent ($n = 33/298$) of the patients in the sample were categorized as receiving guideline adherent care during an episode of PT. In unadjusted analyses, patients in the adherent care groups did not significantly differ in baseline characteristics of age ($p = .18$), gender ($p = .70$), admission NPRS ($p = .79$), or admission NDI scores ($p = .42$), but patients did differ in DOT

Table 1. Comparison of PT and Health Care Utilization Between Patients Receiving Adherent Care or Nonadherent Care.

Variable	B	95% CI for IRR		IRR	p
		Lower	Upper		
PT visits					
Nonadherent	Reference	—	—	—	—
Adherent	-0.81	0.36	0.55	0.44	<.001
Age	0.01	1.00	1.004	1.00	<.001
Gender					
Male	—	—	—	—	—
Female	0.07	0.97	1.19	1.07	.19
Admit NDI	0.01	1.00	1.01	1.01	.003
Admit NPR	0.01	0.99	1.04	1.01	.32
Prescriptions the year of PT					
Nonadherent	Reference	—	—	—	—
Adherent	-0.29	0.59	0.95	0.75	.02
Age	0.003	0.99	1.01	1.00	.26
Gender					
Male	—	—	—	—	—
Female	-0.37	0.61	0.79	0.69	<.001
Admit NPR	0.08	1.05	1.11	1.05	<.001
Health care visits the year of PT					
Nonadherent	Reference	—	—	—	—
Adherent	-0.61	0.47	0.62	0.54	<.001
Age	-0.01	0.99	1.00	0.99	<.001
Gender					
Male	—	—	—	—	—
Female	-0.32	0.68	0.77	0.72	<.001
Admit NDI	-0.004	0.99	1.00	0.996	.01
Admit NPR	0.03	1.02	1.05	1.03	<.001
Number of PT visits	0.04	1.04	1.05	1.04	<.001
Number of diagnostic imaging the year of PT					
Nonadherent	Reference	—	—	—	—
Adherent	-0.56	0.36	0.90	0.57	.02
Age	-0.002	0.99	1.00	0.99	.74
Gender					
Male	—	—	—	—	—
Female	-0.41	0.52	0.85	0.67	<.001
Admit NDI	0.001	0.99	1.01	1.00	.84
Admit NPR	0.01	0.95	1.08	1.01	.77

Note. PT = physical therapy; LBP = Low back pain; NDI = neck disability index; NPR = numerical pain rating; DOT = duration of treatment; IRR = Incident Rate Ratios.

Table 2. Comparison of Charges for PT and Health Care Visits Between Patients Receiving Adherent Care or Nonadherent Care.

Variables	e ^B	95% CI for e ^B		p Value
		Lower	Upper	
Total costs for episode of PT				
Group				
Nonadherent	Reference	—	—	—
Adherent	0.78	0.69	0.89	<.001
Age	0.99	0.98	0.99	.05
Gender				
Male	—	—	—	—
Female	0.99	0.91	1.08	.87
Admit NDI	0.996	0.993	0.999	.04
Admit NPR	1.01	0.99	1.03	.20
Comorbid LBP	1.13	1.05	1.23	.002
Number of PT visits	1.15	1.13	1.17	<.001
DOT (days)	0.99	0.99	1.00	.05
Costs for health care visits during the calendar year of receiving PT				
Group				
Nonadherent	Reference	—	—	—
Adherent	0.79	0.26	2.42	.68
Age	0.993	0.97	1.02	.66
Gender				
Male	—	—	—	—
Female	0.35	0.15	0.77	.01
Admit NDI	1.02	0.47	1.91	.88
Admit NPR	0.89	0.74	1.05	.18
Number of PT visits	1.09	1.00	1.19	.0
Comorbid LBP	0.95	0.47	1.91	.88

Note. PT = physical therapy; LBP = low back pain; NDI = neck disability index; NPR = numerical pain rating; DOT = duration of treatment.

($p < .001$) and number of visits for PT ($p < .001$) and percentage of patients with comorbid LBP with a prevalence of 53% in the adherent care group and 30% nonadherent care group ($p = .02$).

Clinical Outcomes

After controlling for age, gender, comorbid LBP, and admission score, there was a significant effect of group ($p = .01$) where the nonadherent care group

(33.11, 95% CI: [25.99, 40.22]) experienced a greater percentage improvement in pain score compared to the adherent care group (7.04, 95% CI: [-11.73, 25.70]). When examining the effect of group on percentage improvement in disability, there was not a statistically significant effect of adherent care group ($p = .32$).

Health Care Utilization

Patients receiving adherent care attended 54% fewer visits for PT (adjusted mean difference = 3.63 visits) during an episode of care (IRR = 0.44, 95% CI: [0.36, 0.55], $p < .001$). Additionally, during the calendar year of receiving PT, patients who received adherent care had 25% fewer prescription medications (adjusted mean difference = 1.00 prescription; IRR = 0.75, 95% CI: [0.59, 0.95], $p = .02$), attended 46% fewer visits to health care providers (adjusted mean difference = 7.26 visits; IRR = 0.54, 95% CI: [0.47, 0.62], $p < .001$) and had 43% fewer diagnostic images the year of PT (adjusted mean difference = 0.43 images; IRR = 0.57, 95% CI: [0.36, 0.90], $p = .02$) compared to patients receiving non-adherent care (see Table 1).

Health Care Charges

Patients in the adherent care group had 22% lower charges for PT compared to those receiving nonadherent care (Mean Difference US\$172.55; $e^B = 0.78$, 95% CI: [0.69, 0.89], $p < .001$). During the year that patients were admitted to PT patients in adherent care groups did not differ in their costs to health care providers ($e^B = 0.79$, 95% CI: [0.26, 2.24], $p = .68$; see Table 2).

Discussion

This study was the first we are aware of to test whether the recently published clinical practice guidelines for neck pain for physical therapists positively impact measurable parameters of patient care. We hypothesized that patients receiving clinical practice guideline adherent care for neck pain would have improved clinical outcomes from PT, decreased utilization and charges for PT and visits to health care providers. Surprisingly, only a small fraction of the patients in the sample received guideline-adherent care. Those who did receive guideline-adherent care appear not to have had better outcomes in terms of disability, and worse outcomes in

terms of pain, than those who did not receive guideline-adherent care. However, guideline-adherent care appeared to reduce utilization and overall health care costs, suggesting that it poses a trade-off between reducing utilization and cost on one hand and clinical outcomes on the other.

This finding is consistent with other studies that have examined using clinical practice guidelines (Cretin, Farley, Dolter, & Nicholas, 2001; Fritz et al., 2007; Oostendorp, Rutten, Dommerholt, Nijhuis-van der Sanden, & Harting, 2013; Swinkels, van den Ende, van den Bosch, Dekker, & Wimmers, 2005). The adherence rate in this study was low with 11% of the sample receiving guideline adherent care and adherence to guidelines did not necessarily improve clinical outcomes (Bekkering et al., 2005). Implementation of clinical practice guidelines can be slow and inconsistent with three main barriers to guideline adherence: (1) knowledge, (2) attitudes, and (3) external factors. These barriers may have contributed to the low adherence rate in this study and contrary findings on clinical outcomes (Cabana et al., 1999). The authors speculate that the low adherence rate may be contributed to both patient preferences for treatment and reluctance of the clinician to adopt guideline recommendations over personal clinical decision making. Despite a multitude of implementation strategies, research has demonstrated unambiguously that clinical practice guidelines are not readily implemented in everyday clinical practice (Maas et al., 2015). The findings of improved cost and utilization but not improved clinical outcomes in the adherent care group may be reflective of this lack of implementation and may indicate that there is a trade-off between clinical outcomes and reducing cost and utilization. Therefore, the robustness of the findings from this study should be taken with caution and further studies are needed to elucidate the reasons for the low adherence rate in this study and unexpected findings for clinical outcomes.

There are limitations to the current study. Research suggests that there are many variables that can adversely affect clinical outcomes, such as low back pain which was adjusted for in the analyses (Hill, Lewis, Sim, Hay, & Dziedzic, 2007), and other factors outside of what was measured in this study such as recurrence (Croft et al., 2001) and severity (Cote, Cassidy, Carroll, & Kristman, 2004) of neck pain. Undoubtedly, these factors may contribute to patient outcome and a physical therapist's choice in treatment based on patient differences (Carlesso, Macdermid, Gross, Walton, & Santaguida, 2014; Charles, Gafni, & Whelan, 1997) and could have introduced selection bias in determining whether patients received adherent care. To address the potential existence of selection bias and improve

confidence in model estimation for clinical outcomes, multiple model specifications were performed including attempting to identify an instrumental variable for adherent care. Although we felt our models adequately controlled for selection bias and included good measures of health and functional status in the sample, we recognize that there may be an unmeasured factor contributing to the difference in receiving adherent care in the groups. Finally, health care utilization and charges were examined during the calendar year in which a patient received an episode of PT. Although the authors feel that this is a strength because it permits the assumption that PT may occur either early, middle, or late in the course of care for neck pain, this may also be seen as a weakness because we cannot infer a causal or direct relationship between receiving guideline adherent PT intervention and downstream health care utilization and charges. Based on the low adherence rate and potential for selection bias, future research is needed to examine the effect of adherent care in a larger, potentially more homogenous sample of patients with neck pain and followed prospectively to validate the findings of the current study.

The findings of this study are valuable to understanding the potential benefit of PT in the course of care for neck pain. In our study, when PT intervention is provided there was an overall positive effect on utilization of both PT and other health care services, suggesting that receiving guideline adherent care can help reduce the cost and resource burden on the health care system associated with treatment of neck pain, but there is a trade-off with clinical outcomes. Policy changes are being linked to adherence to performance on quality measures recommended by clinical practice guidelines; therefore, the findings of this study highlight that the implementation of guidelines may not be beneficial across all metrics of health care delivery and the patient experience (Christianson, Knutson, & Mazze, 2006). This is important from health services research perspective, where caution should be taken before implementing policy changes based on cost and utilization savings alone that may diminish the patient experience. The implications of these findings support that the benefits of providing guideline adherent PT intervention impact other health metrics positively and have the potential to improve the efficiency and effectiveness of care delivered during an episode of neck pain and this is the intent of clinical practice guidelines (O'Connor, 2005) but caution should be taken when considering the effect of guidelines on clinical outcomes.

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Declaration of Conflicting Interests

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