Adherence to Clinical Practice Guidelines for Low Back Pain in Physical Therapy: Do Patients Benefit?

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Background. Various guidelines for the management of low back pain have been developed to enhance the effectiveness and efficiency of care. Evidence that guideline-adherent care results in better health outcomes, however, is not conclusive.

Objective. The main objective of this study was to assess whether a higher percentage of adherence to the Dutch physical and manual therapy guidelines for low back pain is related to improved outcomes. The study further explored whether this relationship differs for the individual steps of the process of care and for distinct subgroups of patients.

Design. This was an observational prospective cohort study (2005–2006) in the Netherlands that included a sample of 61 private practice therapists and 145 patients.

Methods. Therapists recorded the process of care and the number of treatment sessions in Web-based patient files. Guideline adherence was assessed using quality indicators. Physical functioning was measured by the Dutch version of the Quebec Back Pain and Disability Scale, and average pain was measured with a visual analog scale. Relationships between the percentage of guideline adherence and outcomes of care were evaluated with regression analyses.

Results. Higher percentages of adherence were associated with fewer functional limitations ($\beta = -0.21$, $P = .023$) and fewer treatment sessions ($\beta = -0.27$, $P = .005$).

Limitations. The relatively small self-selected sample might limit external validity, but it is not expected that the small sample greatly influenced the internal validity of the study. Larger samples are required to enable adequate subgroup analyses.

Conclusions. The results indicate that higher percentages of guideline adherence are related to better improvement of physical functioning and to a lower utilization of care. A proper assessment of the relationship between the process of physical therapy care and outcomes may require a comprehensive set of process indicators to measure guideline adherence.

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Low back pain can be seen as a largely self-limiting problem, considering the improvements in pain and disability in the first 3 months after onset.[1] Once the back pain becomes recurrent or chronic, it is associated with long-term disability and, consequently, with a significant socioeconomic burden: about 80% of health care and social costs related to low back pain are attributed to the 10% of patients with chronic pain and disability.[2] The management of low back pain in primary care varies substantially among medical and health care professionals within a country,[3] as well as among countries.[4] Various guidelines for the management of low back pain have been developed to enhance the effectiveness and efficiency of care.[4-7] Because these guidelines are based on a combination of evidence and consensus among experts, it is assumed that guideline adherence will improve the quality of care. However, a review of studies in professions allied to medicine showed only limited evidence for a favorable relationship between guideline adherence and health outcomes and could not draw firm conclusions due to the poor methods of the studies.[8] Another review that assessed the effectiveness of tailored interventions to change physicians' performance and the effects on health outcomes found no consistency in the results and concluded that the effect remained uncertain.[9] Despite these findings, there is some evidence that greater guideline adherence in the treatment of patients with low back pain might be advantageous from a cost perspective.[7,10,11]

The number of studies examining the relationship between guideline adherence and clinical outcomes so far has been limited.[12] In addition, previous studies[10,11,13] used a limited number of criteria to evaluate the management of low back pain by physical therapists, for instance, 4 criteria focusing on treatment aim, number of sessions, use of active interventions, and providing adequate advice[13] or the single criterion of whether an activating treatment is applied.[11] However, the comprehensiveness of the physical therapy process of care for patients with low back pain generally leads to a large number of guideline recommendations. Translation of these guideline recommendations into a set of quality indicators makes the various aspects of the process of care measurable[14-16] and, therefore, might yield a more valid impression of routine physical therapist practice. Consequently, using a set of quality indicators might enable a more legitimate assessment of the relationship between guideline adherence and the effectiveness and utilization of care.

The main objective of the present study was to assess whether a higher percentage of adherence to the recommendations of the Dutch physical therapy guideline for nonspecific low back pain[5] and the Dutch man-

The Bottom Line

What do we already know about this topic?

Although various evidence-based clinical guidelines for low back pain have been developed to enhance the effectiveness and efficiency of care, evidence that guideline-adherent care results in better health-related outcomes is inconclusive.

What new information does this study offer?

Adherence to the Dutch physical therapy guidelines for low back pain was measured with 25 quality indicators based on the guidelines' recommendations. The results showed that greater guideline adherence was associated with greater improvement in physical functioning, lower utilization of care, and fewer treatment sessions.

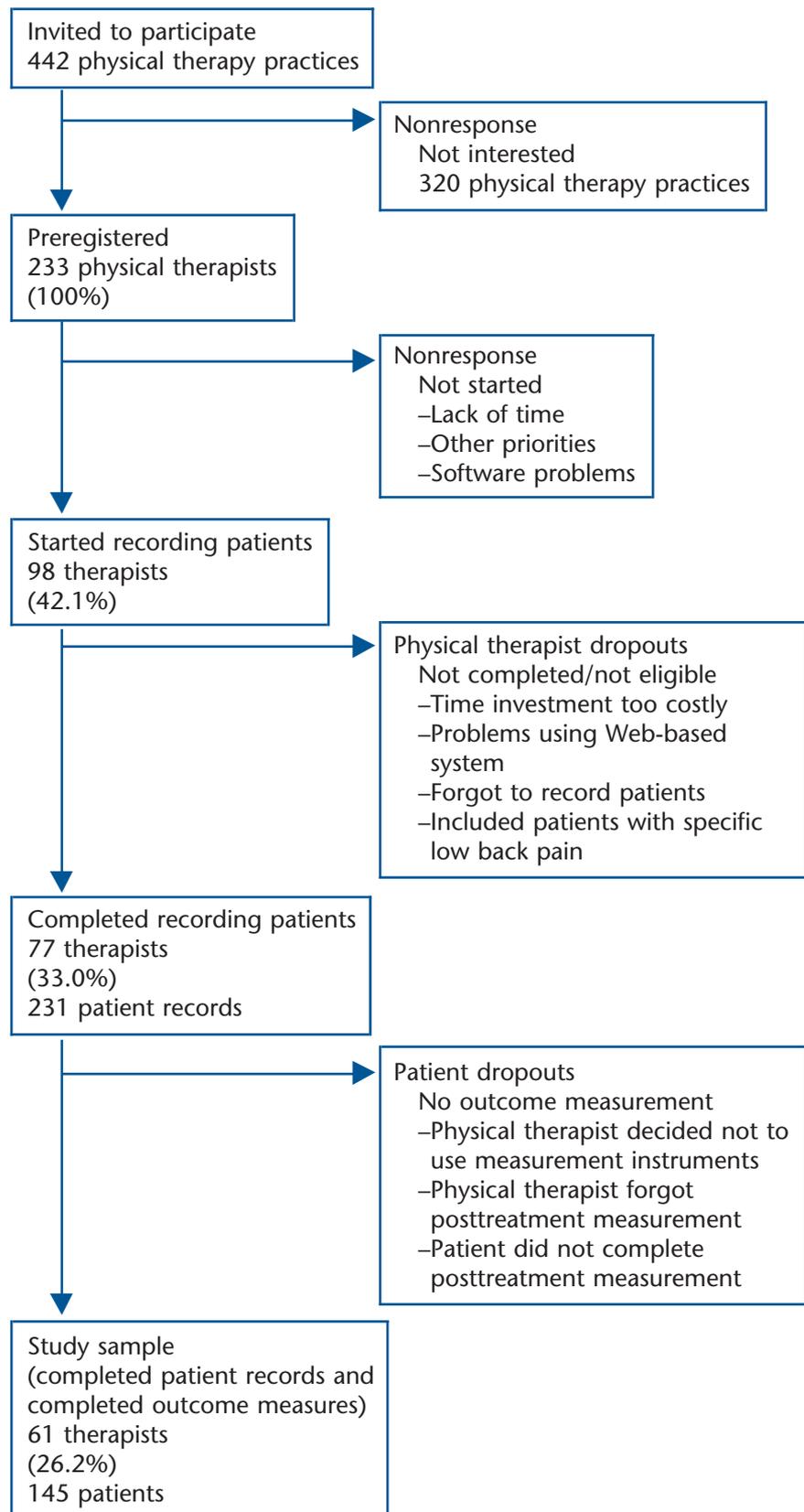### If you're a patient, what might these findings mean for you?

Patients with low back pain should be informed about evidence-based care in a comprehensible way. This enables them to ask for guideline-adherent care when they enter the physical therapy clinic.

ual therapy guideline for nonspecific low back pain[6] (subsequently referred to as low back pain) is related to improved outcomes of care. As the primary focus of the guidelines is to restore physical functioning and social participation, we expected that a higher percentage of adherence to the guideline recommendations, in the short term, would be especially associated with improved physical functioning and, to a lesser extent, with a decrease in pain. The second objective was to explore whether this relationship was equal for different subgroups of patients. Because another focal point of the guidelines is the role of psychosocial factors that could impede patients' recovery process, we hypothesized that in particular patients with chronic low back pain would benefit from higher levels of guideline-adherent care. The final objective was to explore to what extent the level of adherence to the individual steps in the process of care, distinguished in the guidelines, differed in their relationship to health-related outcomes.

Method
Study Design and Study Sample
Data were collected in an observational prospective cohort study from September 2005 to February 2006. Private practices in the south of the Netherlands were invited to participate if they had a contract with the commissioning health insurance company, had a minimum of 2,000 treatment sessions a year, and employed at least 3 physical therapists. Invitations were sent to 442 eligible practices (Figure). After attending a general information meeting, during which the aim and design of the study were explained and a Web-based patient documentation system (Web-based EPD) was demonstrated, 233 physical therapists and manual physical therapists from 122 practices were preregistered for participation. Therapists were eligible for

Invited to participate
442 physical therapy practices

Nonresponse
  Not interested
  320 physical therapy practices

Preregistered
233 physical therapists
(100%)

Nonresponse
  Not started
  –Lack of time
  –Other priorities
  –Software problems

Started recording patients
98 therapists
(42.1%)

Physical therapist dropouts
  Not completed/not eligible
  –Time investment too costly
  –Problems using Web-based
    system
  –Forgot to record patients
  –Included patients with specific
    low back pain

Completed recording patients
77 therapists
(33.0%)
231 patient records

Patient dropouts
  No outcome measurement
  –Physical therapist decided not to
    use measurement instruments
  –Physical therapist forgot
    posttreatment measurement
  –Patient did not complete
    posttreatment measurement

Study sample
(completed patient records and
completed outcome measures)
61 therapists
(26.2%)
145 patients

Figure.
Flow chart of participants' responses and reasons for nonresponse and dropout.

participation if they were willing to include at least 5 consecutive patients in the study during the enrollment period. They were instructed to ask the first patient of each week to participate and to encourage the patients to complete the questionnaires used to measure the health-related outcomes.

Of the 98 physical therapists who started to record the care provided to patients, 77 produced 231 complete patient records. The final sample consisted of 61 physical therapists and 145 patients for whom a complete patient record was available and who additionally completed the outcome questionnaires at baseline (ie, before treatment) and after treatment. Reasons for nonresponse and dropout are listed in the Figure. Patients who enrolled in the study had been referred for physical therapy intervention by a general practitioner or a medical specialist due to a primary or recurrent episode of low back pain. No rigorous inclusion criteria concerning the low back pain were applied in order to include a group of patients who reflected the nonspecific low back pain population in daily practice. The patients were diagnosed with nonspecific low back pain by the physical therapists. *Nonspecific low back pain* is defined as low back pain without a specified physical cause (eg, nerve root compression, trauma, infection, tumor).[17] Patients were included only if they were able to read and understand Dutch. Patients received verbal and written information on all aspects of the study and gave written consent at their inclusion.

Measurement
The use of quality indicators to measure the performance of health care professionals is a common approach in various medical disciplines.[18,19] We, therefore, developed a set of quality indicators to measure the percentage of guideline adherence for

the present study. *Quality indicators* have been defined as measurable elements of practice performance for which there is evidence or consensus that they can be used to assess the quality, and thus change the quality, of care provided.[20] They are related to structures, processes, or outcomes of care.[21] The present study focused on process and outcome indicators, which were based on the recommendations for each of the steps of the diagnostic and treatment process of care as described in the Dutch physical therapy and manual therapy guidelines for low back pain (see eAppendix 1, available at ptjournal.apta.org). The set was developed in an iterative consensus procedure (for a detailed description, see eAppendix 2, available at ptjournal.apta.org). The application of such a procedure is expected to result in a set of indicators with content validity.[14] Various quality requirements, such as relevance, reliability, and feasibility, were taken into account.[14,16]

Process indicators were directly derived from a Web-based EPD, which was developed for this purpose (see eAppendix 2) because the quality of ordinary patient registration generally is poor.[22,23] The EPD replaced the usual patient file of the participating physical therapists. During the patients' visits, the therapists recorded their actual proceedings for the diagnostic and treatment process (see eAppendix 1). Algorithms that followed the decision process of the guidelines were formulated for every indicator in order to transform the data on the process of care recorded in the EPD into indicator scores.[14] One point was scored for each process indicator that was adhered to. The overall percentage of guideline adherence and the percentages of adherence for the various steps of the therapeutic process were calculated using the "patient average method."[24] In this method, the per-

centage of indicators that are successfully met for each patient are computed. These scores then are averaged across all patients. The automated scoring procedure, implemented through the Web-based EPD, was assumed to avoid issues of intraobserver and interobserver reliability.[14]

The outcome indicator of physical functioning was measured by means of the Dutch version of the Quebec Back Pain and Disability Scale (QBPDS), a 20-item self-report questionnaire with a score ranging from 0 to 100.[25] A higher score on the QBPDS means more limitations. The QBPDS has construct validity ($r=.80$–.91 with the Roland Disability Questionnaire) and test-retest reliability (intraclass correlation coefficient=.90) for patients with chronic low back pain.[25] Average pain was measured with a visual analog scale (VAS),[26] which scored the level of pain in millimeters, with 0 mm for no pain and 100 mm for unbearable pain. The VAS has construct validity ($r=.91$ with a numerical pain rating scale)[27] and high test-retest reliability (intraclass correlation coefficient=.97).[28] The number of treatment sessions was scored as reported in the Web-based EPD.

Demographic variables of the physical therapists, such as age, sex, practice experience, and work situation, were recorded in the EPD. The same was done with the patients' age, sex, employment situation, educational level, and living conditions. Because the transition from acute to persistent low back pain is supposed to be influenced by psychosocial factors such as coping and catastrophizing,[29] the Pain Coping and Cognition List (PCCL) was included in the EPD. The PCCL is a 42-item self-report questionnaire, in Dutch, developed to assess pain coping, internal and external pain control perceptions, and catastrophizing. The score per

subscale ranges from 1 to 6. A higher score on a subscale means a higher extent of pain coping, internal or external pain control perceptions, or catastrophizing. The internal consistency of the 4 subscales is high (Cronbach alpha=.80–.84). Based on correlations with various other measurement instruments for these constructs ($r \geq .30$), the PCCL shows acceptable validity.[30]

Data Analysis

Descriptive statistics were used to assess the percentage of overall adherence and the percentage of adherence for each step of the diagnostic and treatment processes. The effectiveness of the treatment was assessed by comparing the pretreatment and posttreatment scores for the outcome indicators using a paired-samples t test.

The relationship between the percentage of guideline adherence and outcome indicators was determined with multiple linear regression analyses. To avoid overfitting of the model due to the relatively small sample, we applied the full model approach, meaning that all independent variables were entered in the model and that no exclusion of variables was allowed on the basis of statistical calculations.[31,32] To avoid bias due to regression to the mean, instead of using change scores as dependent variables, the use of analysis of covariance has been recommended.[33,34] In analysis of covariance, posttreatment scores are included as dependent variables and pretreatment scores are entered as covariates.

The percentage of guideline adherence was entered as the main independent variable. The pretreatment scores on 2 of the outcome variables, the QBPDS and the VAS, were included as covariates, along with other variables that have repeatedly been identified as prognostic factors

for health outcomes, persistent disability, or the transition from acute to persistent disability due to low back pain, that is: the duration of the current episode of low back pain (<1 week, >5 years), the extent of catastrophizing,[29,35] the patient's age,[35,36] and having a paid job (yes/no).[35] Because clinical expertise has been shown to be related to better diagnostic[37] and treatment[38] success, the extent of the therapist's practice experience (<5 years, >30 years) also was included. As recommended in the guidelines, we also added the psychosocial variables of external pain control perceptions and coping. A similar procedure was followed for the number of treatment sessions as the third outcome variable. Based on previous findings,[39] external pain control perceptions, coping, and having a paid job were excluded from the model, and having received previous physical therapy treatment (yes/no), the patient's sex, and the therapist's working hours (full-time, part-time) were included.

The association between the percentage adherence to the various steps of the care process and the outcome indicators was explored in regression analyses for every step separately. Posttreatment scores on the outcome indicators were used as the dependent variable, and the percentages of guideline adherence for each of the steps as the independent variable. The pretreatment scores on health-related outcomes were entered as a covariate in the analyses.

The limited number of cases in the subgroups made us use nonparametric statistics to further explore the association between the percentage of overall guideline adherence and the outcome indicators for the subgroups of patients with acute (6 weeks), subacute (6–12 weeks), and chronic (12 weeks) low back pain. Thus, our analyses were based on

the median percentage of guideline adherence, and we used Spearman correlations instead of multiple linear regression analyses to assess the relationship between the percentage of guideline adherence and the absolute change scores of the health outcomes. All statistical analyses were performed using SPSS version 15 for Windows. Cohen's classification for the behavioral sciences was used as a criterion for the effect size of the correlation: $r_s = .10$ is small, $r_s = .30$ is medium, and $r_s = .50$ is large.[40]

Role of the Funding Source

Results

Responses and Characteristics of Participants

The physical therapists (n=61) were an average of 42 years of age, 67% were male, and 66% owned their practice. The median practice experience was 16 to 20 years. The mean age of the patients (n=145) was 48 years, 51% were male, and 57% had a lower-to-average educational level. They were diagnosed by the physical therapists as having acute (50.4%), subacute (23.3%), or chronic (24.8%) low back pain. The remaining 1.5% of the patients could not be classified.

Adherence

The mean overall guideline adherence was 67.2% (Tab. 1), meaning that, on average, physical therapists had positive scores on nearly 17 of the 25 indicators per patient. Adherence rates were less than 55% in 8.8% of the cases and higher than 75% in 34.3% of the cases. The percentage of adherence ranged from 2.2% to 99.3% for the individual steps of the diagnostic process and from 47.5% to 88.1% for the individual steps of the therapeutic process. We did not find higher percentages of adherence for those steps of the

Table 1.
Individual Quality Indicators per Step of the Process of Care, Their Level of Evidence, and the Mean Percentage of Adherence for the Entire Therapeutic Process and for the Individual Steps

	Level of Evidence[a]	% Adherence (SD)
Entire therapeutic process		67.2 (8.6)
Phases of therapeutic process/individual steps (no. of indicators)		
Diagnostic phase		
1 Referral (1)		2.2 (14.7)
Contact physician if information on referral is lacking (eg, reason for referral, medical examination data, indication for physical therapy or manual therapy)	IV	
2 History taking (7)		60.5 (10.1)
Assessment of patient's specific request for help	IV	
Use of ICF[b]	III	
Use of measurement instrument	II	
Assessment of low back pain course	IV	
Assessment of "yellow flags" and coping strategies	IV	
Presence of "red flags"	IV	
Assessment of supplementary treatment	IV	
3 Patient profile (2)		99.3 (6.0)
Assessment of patient profile	II	
Contact physician in case of contraindications	IV	
4 Examination objectives (1)		32.8 (47.1)
Examination objectives in agreement with patient profile	IV	
5 Examination (1)		45.5 (50.0)
Examination performed in agreement with objectives	II–IV	
6 Analysis (3)		91.5 (14.6)
Assessment of indication for physical therapy	IV	
Indication of prognosis	III	
Referral to physician in case of insufficient results or if no results are expected	IV	
Treatment phase		
7 Treatment plan (2)		47.5 (33.4)
Treatment plan in agreement with patient profile	III	
Patient participation in treatment plan	III	
8 Treatment (2)		55.1 (38.0)
Treatment strategies in agreement with patient profile	I–II	
No. of sessions in agreement with patient profile	IV	
9 Evaluation (4)		88.1 (19.9)
Regular/systematic evaluation of treatment objectives	IV	
Adjustment of treatment objectives, if necessary	IV	
Contact physician in case of insufficient results	IV	
Final evaluation on the basis of treatment objectives (with measurement instruments)	IV(II)	
10 Closure (2)		73.4 (31.5)
Written report to referring physician	IV	
Arrangement of aftercare	IV	

[a] Level I=systematic review or >2 high-quality randomized controlled trials (RCTs), level II=2 high-quality RCTs, level III=1 high-quality noncontrolled study, level IV=expert opinion.
[b] ICF=*International Classification of Functioning, Disability and Health*.

Table 2.
Association Between Outcome Indicators and Percentage of Guideline Adherence, With Correction for Other Potentially Influential Factors[a]

Dependent/ Independent Variables	QBPDS (R^2=21.2%)				VAS Average Pain (R^2=7.2%)				No. of Treatment Sessions (R^2=18.7%)			
	B	β	P	95% CI	B	β	P	95% CI	B	β	P	95% CI
Constant	10.85			−21.31, 43.00	12.01			−39.85, 63.88	9.64			3.65, 15.62
% guideline adherence (0–100)	−0.35	−0.21**	.023	−0.65, −0.05	−0.17	−0.07	.499	−0.65, 0.32	−0.09	−0.27†	.005	−0.16, −0.03
QBPDS score at baseline (0–100)	0.21	0.22**	.043	0.01, 0.41	0.12	0.09	.447	−0.19, 0.43	0.01	0.05	.663	−0.03, 0.05
VAS pain score at baseline (0–100)	0.01	0.02	.851	−0.13, 0.16	0.11	0.11	.343	−0.12, 0.33	0.00	0.01	.945	−0.03, 0.03
PT practice experience (<5 y, >30 y)	0.68	0.08	.372	−0.82, 2.18	2.34	0.19*	.057	−0.07, 4.75	0.30	0.18*	.068	−0.02, 0.62
Duration of current LBP-episode (<1 week, >5 y)	0.34	0.05	.615	−1.00, 1.68	0.33	0.03	.758	−1.80, 2.46	0.25	0.17*	.079	−0.03, 0.53
Patient's age	0.13	0.13	.314	−0.13, 0.40	−0.16	−0.10	.458	−0.57, 0.26	−0.00	−0.01	.917	−0.04, 0.04
Catastrophizing (1–6)	3.02	0.17	.105	−0.64, 6.68	−0.57	−0.02	.847	−6.43, 5.28	−0.10	−0.03	.791	−0.83, 0.64
Paid job (yes/no)	−0.84	−0.03	.827	−8.46, 6.78	0.92	0.20	.881	−11.26, 13.11				
External pain control perception (1–6)	0.70	0.04	.682	−2.67, 4.06	1.09	0.04	.694	−4.37, 6.54				
Pain coping (1–6)	1.75	0.10	.297	−1.56, 5.06	1.37	0.05	.602	−3.82, 6.55				
Previous physical therapy treatment (yes/no)									0.41	0.07	.502	−0.80, 1.62
PT working hours (full-time/part-time)									−0.93	−0.14	.170	−2.27, 0.41
Patient's sex (male/female)									0.35	0.06	.594	−0.81, 1.52

[a] PT=physical therapist, QBPDS=Quebec Back Pain and Disability Scale, VAS=visual analog scale, LBP=low back pain, 95% CI=95% confidence interval.
* $P<.10$, ** $P<.05$, † $P<.01$.

care process that included indicators with higher levels of evidence.

Outcome Indicators
The differences between pretreatment and posttreatment scores for both of the health-related outcomes were statistically significant. The mean pretreatment and posttreat-ment scores for the QBPDS were 40.5 and 21.3, respectively, and the VAS scores for average pain were 56.9 and 22.9, respectively. The utilization of care was expressed by a mean number of treatment sessions of 6.70 (SD=3.2).

Associations Between Process and Outcome Indicators
Across the entire study sample, a higher percentage of guideline-adherent care was negatively related to the posttreatment score on the QBPDS (P=.02; Tab. 2). That is, a higher percentage of guideline adherence resulted in fewer limitations

Table 3.
Associations Between Percentage of Adherence to the Individual Steps of the Process of Care and Outcome Indicators[a]

Steps of the Process	Outcome Indicators		
	QBPDS	VAS Average Pain	No. of Sessions
Diagnostic phase			
Referral	0.02	−0.04	0.02
History taking	−0.16*	−0.08	0.02
Patient profile	0.02	0.08	0.03
Examination objectives	−0.03	−0.06	−0.01
Examination	−0.05	0.03	0.00
Analysis	−0.17**	−0.01	−0.02
Treatment phase			
Treatment plan	0.01	−0.11	−0.02**
Treatment	−0.08	0.01	−0.03‡
Evaluation	−0.30†	−0.11	−0.03**
Closure	−0.03	0.00	0.02*

[a] Regression coefficients (β) corrected for baseline scores on outcome indicators. QBPDS=Quebec Back Pain and Disability Scale, VAS=visual analog scale. * $P<.10$, ** $P<.05$, † $P<.01$, ‡ $P<.001$.

in functioning after the treatment episode. No such association was observed for VAS scores for average pain ($P=.50$). A higher percentage of guideline adherence was negatively related to the number of treatment sessions ($P=.00$), indicating that a higher level of guideline-adherent care was associated with lower utilization.

In terms of the individual steps of the process of care, higher percentages of adherence for analysis ($P=.04$) and evaluation ($P=.00$; Tab. 3) were related to fewer limitations in functioning posttreatment. No such associations were observed for VAS scores for average pain. Higher adherence rates for treatment plan ($P=.05$), treatment ($P=.00$), and evaluation ($P=.01$) were associated with lower utilization.

We found no difference in the median percentage of guideline adherence (68%; Tab. 4) among the 3 subgroups of patients with acute (n=69), subacute (n=32), and chronic (n=34) low back pain. The relationship between the percentage of guideline adherence and outcome indicators was strongest for patients with chronic low back pain, showing a medium to large negative correlation with the posttreatment scores on the QBPDS ($r_s=-.38$; $P<.05$), the VAS scores for average pain ($r_s=-.45$; $P<.01$), and the number of treatment sessions ($r_s=-.37$; $P<.05$). For the subgroup with acute low back pain, we found only a medium negative correlation ($r_s=-.30$; $P<.05$) between the percentage of guideline adherence and the number of visits. All negative correlations indicate that higher percentages of guideline adherence were associated with fewer limitations in functioning, lower levels of pain posttreatment, or fewer visits. For the subgroup with subacute low back pain, no significant correlations were found.

Discussion
This study examined the association between adherence to the Dutch physical therapy and manual therapy guidelines for low back pain and 3 short-term outcomes: the patient's physical functioning, level of pain, and the number of treatment sessions per episode of care. The

Table 4.
Patient Characteristics, Adherence Scores, and Correlations of Adherence With Outcome Indicators for 3 Subgroups of Patients[a]

Subgroup	Patient Characteristics				Correlation of % Adherence and Difference Scores on Outcome Indicators		
	Age (y), Mean (SD)	Sex (% Male)	Employment Status (% Paid Job)	Median % Adherence	QBPDS	VAS, Average Pain	No. of Sessions
Acute low back pain (<6 wk) n=69	46.3 (15.7)	60	62	68	−.20	−.06	−.30*
Subacute low back pain (6–12 wk) n=32	48.2 (12.5)	42	66	68	−.15	−.14	−.28
Chronic low back pain (>12 wk) n=34	51.4 (12.3)	44	44	68	−.38*	−.45**	−.37*

[a] Number of patients for subgroups do not add up to number of total group due to missing information. QBPDS=Quebec Back Pain and Disability Scale, VAS=visual analog scale. * $P<.05$, ** $P<.01$.
[b] Spearman r_s.

average rate of overall guideline adherence was 67%, and higher percentages of adherence were associated with more favorable posttreatment scores on physical functioning (ie, greater effectiveness of care) and fewer treatment sessions (ie, lower utilization of care). It seems reasonable, therefore, to conclude that higher adherence rates contributed to greater efficiency of care. No such association was found between the percentage of guideline adherence and the level of pain. Further explorations indicated that the individual steps of the process of care might differ in their importance for the effectiveness and efficiency of care. Finally, our results suggest that the relationship between guideline adherence rates and treatment outcomes may be different for the different subgroups of patients with low back pain.

This study demonstrates that a higher percentage of adherence to the Dutch guidelines for low back pain is associated with better clinical outcomes. This finding may be attributed to the more comprehensive set of process indicators we used to measure guideline adherence compared with a previous study that also examined this relationship.[7] The set of indicators was informed by all guideline recommendations and processed by means of an iterative consensus procedure[14] with experts and practicing physical therapists to achieve content validity.[41] As a consequence, these indicators may be considered to yield a more detailed and adequate reflection of the complex process of delivering guideline-adherent care.[15] Less detailed assessments in the past may have concealed the actual relationship between physical therapists' practical performance and health-related outcomes. The use of quality indicators additionally enabled the demonstration of differences in the percentage of adherence to rec-

ommendations in the individual steps of the physical therapy process described in the Dutch guidelines, as well as the possibility that these individual steps may not have the same importance for either the effectiveness or the efficiency of care.

A second, and perhaps even more important, explanation for our positive findings may be the relatively high average percentage of adherence (67%) in our study compared with other studies.[10,11,13] In this perspective, it can be argued that guideline adherence rates should exceed a certain threshold before guideline adherence can result in improved health-related outcomes. This view is supported by a US study that focused on the relationship to the use of an activating treatment,[11] which is a consistent recommendation in guidelines for low back pain.[4,42,43] The US study set the threshold for guideline-adherent care at 75% and observed a larger improvement in terms of pain and disability for patients with low back pain whose care was found to exceed this threshold.

In addition, it can be argued that larger differences in guideline adherence rates are needed to identify a relationship with health-related outcomes. This view is in accordance with the findings of a previous Dutch randomized clinical trial that did not find a difference in improvement of physical functioning or pain between patients cared for by 2 groups of physical therapists who showed a moderate difference of 12% in guideline adherence.[7] The sample size in the present study, however, did not allow us to perform the analyses needed to corroborate these explanations.

In our study, the posttreatment scores for physical functioning and average pain were explained only to a limited extent, despite the inclu-

sion of both the percentage of guideline adherence and the various factors that have been found to be associated with health outcomes of patients with low back pain. First, this finding might be due to the fact that low back pain is a complex problem, with many factors not within the direct reach of physical therapy treatment, thus influencing its onset and prognosis.[29,44-48] Second, different patient categories may seriously confound the assessment of the relationship between guideline adherence rates and health-related outcomes for patients with low back pain. Our subgroup analysis suggested that patients with chronic low back pain may benefit more from guideline-adherent care than patients with acute or subacute low back pain. One explanation for this finding may be the active approach used in the guidelines, which has been shown to be more effective for patients with chronic low back pain.[49] Another explanation is that acute low back pain, due to its more favorable natural course,[1,50] may have favorable treatment results, irrespective of the focus of the physical therapy approach. However, the internal validity of our subgroup analysis is limited due to potential confounding from uncontrolled covariates. Larger samples are needed to enable the more sophisticated analyses required to properly assess the relationship between guideline adherence and patient outcomes for various subgroups of patients with low back pain.

The favorable association we found between the percentage of guideline adherence and the utilization of care confirms the findings of previous studies.[11,13] However, as observed previously,[10] the mean number of treatment sessions for patients with acute low back pain still exceeded the recommendation in the guidelines of 2 or 3 treatment sessions that include coaching and advice.[6,51] This

recommendation was based on the estimation that a large percentage of patients with low back pain would recover spontaneously in 4 to 6 weeks.[52] More recent research, however, has demonstrated a less favorable prognosis for low back pain.[1,50,53] Consequently, the current recommendation might be too optimistic and may be taken into reconsideration during the current revision of the guidelines.

Two limitations of the study should be discussed. First, the participating therapists were a self-selected sample. Despite an instruction meeting, the availability of a help desk, and an e-mail and telephone reminder, there was a considerable nonresponse and dropout rate: a number of physical therapists did not start recording or did not complete the records they started. Compared with the national data,[54] male participants, therapists working full-time, and practice owners were overrepresented in our final sample. Therefore, the external validity of the study may be limited. However, none of these demographic factors were associated with the outcome indicators, and therapists who only recorded the care process did not differ in terms of their average percentage of adherence from physical therapists whose patients also completed all outcome questionnaires. Concerning our primary objective of examining the association between the percentage of guideline adherence and 3 short-term outcomes of care, it seems reasonable, therefore, to assume that the selectivity of the final sample did not greatly influence the internal validity of our study.

Second, apart from the self-selected sample, the external validity of the study may be limited due to the relatively small sample size. A major reason for the low participation rate was the use of a rather extensive EPD. Despite the systematic, iterative consensus procedure we used to assess the relevance and validity of the set of quality indicators, a full Delphi procedure might further reduce the number of indicators without losing content validity.[14] A reduced number of indicators, in turn, could improve the feasibility of the set, allowing for a more user-friendly EPD that would be more suitable for daily practice. Because a major barrier to start recording the care provided to patients appeared to be the fact that (Web-based) EPDs are not yet standard procedure in private practice physical therapy in the Netherlands, such more convenient EPDs, in turn, may contribute substantially to the larger study samples that are needed to further explore the relationship between guideline adherence rates and health-related outcomes of care.

Keeping in mind these limitations, some practical implications can be suggested. In order to improve the effectiveness and efficiency of care, physical therapists might put effort into improving the steps of the process that relate most strongly to patient outcomes. Our findings indicate that they should primarily engage in a regular evaluation; that is, they should frequently monitor the results of their treatment on health-related outcomes and, if necessary, adjust their treatment objectives or treatment strategies. Second, therapists should plan and implement a treatment that suits the applicable patient profile. In consultation with the patient, they should base their treatment plan and treatment strategies on the findings from the diagnostic phase: whether the low back pain is subacute, acute, or chronic; whether its course is normal or delayed; and whether any delay is associated with psychosocial factors. For instance, patients with acute low back pain and a normal course mostly require only adequate information and advice during a limited number of sessions, whereas patients with chronic low back pain with a delayed course in the presence of psychosocial factors may benefit most from an activating approach and strategies aimed at changing inadequate cognitions and coping strategies during a longer treatment episode. Further recommendations for practice improvement require more profound analyses that yield a better understanding of the relationships between patient outcomes and the individual steps of the process of care. Such analyses, however, require studies with larger samples sizes.

Conclusions

In this study, a higher percentage of adherence to the Dutch physical therapy and manual therapy guidelines for low back pain was related to a better treatment effect with respect to physical functioning and lower utilization of care. Additionally, our findings imply that not every step in the process of care is of equal importance for the effectiveness and the efficiency of care. Larger samples are required to adequately test hypotheses about differences in the relationship between guideline adherence rates and health-related outcomes of care for various subgroups of patients with low back pain. A proper assessment of the relationship between the process of physical therapy care and health-related outcomes may require a comprehensive set of process indicators to measure guideline adherence rates, as only such a set may yield the required valid impression of routine physical therapist practice.

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