

Cost-Effectiveness of Physical Therapy Only and of Usual Care for Various Health Conditions: Systematic Review

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Background. Given continually rising health care costs, interventions of health care providers should be cost-effective.

Purpose. This review aimed to summarize current cost-effectiveness of physical therapy. Specific aims were: (1) to analyze cost-effectiveness of physical therapy only compared with usual care only, (2) to analyze cost-effectiveness of physical therapy added to usual care compared with usual care only, and (3) to specify in which health conditions physical therapy only or physical therapy added to usual care was cost-effective.

Data Sources. Topic-related systematic reviews were searched in MEDLINE, CINAHL, PEDro, and Cochrane Library and manually.

Study Selection. Studies published between 1998 and 2014 that investigated the cost-effectiveness of interventions carried out by physical therapists were reviewed. The methodological quality was assessed with the Cochrane risk of bias assessment for intervention studies and with the Quality of Health Economic Analyses Scale.

Data Extraction. Effectiveness and cost data for calculating incremental cost-effectiveness ratios (ICERs) and the original authors' conclusions were extracted.

Data Synthesis. The 18 included studies presented low risk of bias and contained 8 comparisons of physical therapy only with usual care only and 11 comparisons of physical therapy added to usual care with usual care only. Based on ICERs, physical therapy only or added to usual care was cost-effective in 9 out of the 19 comparisons and in 10 comparisons according to the original authors' conclusions.

Conclusion. Physical therapy only or added to usual care implies improved health in almost all studies. The cost-effectiveness of such interventions was demonstrated in half of the studies. This result might have been influenced by the fact that different definitions of the notion of "cost-effectiveness" exist.



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Health care costs are continually rising, particularly in the richest countries of the European community.¹ This phenomenon is probably due to the increasing number of people approaching the age of retirement and the decreasing number of people engaged in professional life.² Therefore, most European countries, where health care costs are covered due to the income of the working generation, should find new strategies to avoid a financial crisis of the health care system. Kocher³ identified 292 different reasons for the exploding health care costs. The 3 main reasons were: (1) medical technological progress and new pharmaceuticals, (2) demographic aging of the population and increasing number of health care services, and (3) a provider-induced demand.³ The American health care system is also searching for strategies to reduce spending on health care.⁴ Currently, not every American citizen has health care insurance, and those who have health care insurance can either benefit from excellent care or accept poor health care services. With the planned reform, standard health care should be accessible for each US citizen, quality should be high, and costs should be controlled.⁵ Consequently, health care providers should not only guarantee the effect of their interventions but also ensure their cost-effectiveness. Being aware that health care costs are an issue all over the world, we integrated cost-effectiveness results of physical therapy of all countries in our review.

Generally, there are 5 types of economic analyses in health care: cost-minimization, cost-effectiveness, cost-utility, cost-consequence, and cost-benefit.⁶ As recommended for health and medicine,⁷ cost-effectiveness and cost-utility analyses are the most relevant for physical therapy. They enable estimates of costs and efficacy of physical therapy as sole intervention or of physical therapy added to usual care.⁶ The difference between these 2 analyses lies in their denominator: cost-effectiveness relies on a measure of the health change following a treatment, and cost-utility uses the notion of quality-adjusted life year (QALY), an economic indicator. In this review, we focus on cost-effectiveness of

physical therapy. Cost-utility results are reported only when they could be directly extracted from the original articles, because information for the computation of QALYs is missing. Although physical therapy only or physical therapy added to usual care increases health care costs, its effect might reduce costs related to loss of productivity, consumption of medication, or treatments by other health professionals.

In 2007, at the request of the American Physical Therapy Association (APTA), a team of researchers wrote a review on cost-effectiveness in physical therapy.⁶ They found a very small number of references related to cost-effectiveness prior to 1998. Therefore, they decided to perform their search from 1998 through April 2008. Their review, published in 2009, is exhaustive and of excellent quality.⁶ However, no update has been provided since then. Consequently, our review aimed to provide an overview of the current knowledge of cost-effectiveness of physical therapy. The specific aims were: (1) to analyze current cost-effectiveness of physical therapy only compared with usual care only, (2) to analyze current cost-effectiveness of physical therapy added to usual care compared with usual care only, and (3) to specify in which health conditions physical therapy, compared with usual care, or added to usual care was cost-effective. Thereby, this review should support clinical decision making when physical therapy is offered as a single treatment option or is added to usual care. "Usual care" includes medication, diagnostic services, physician counseling, and physician office visits.

Method

Data Sources and Searches

We performed a systematic review. It synthesized cost-effectiveness studies completed between January 1, 1998, and March 31, 2014. To identify articles, we chose a free search on the MEDLINE, CINAHL, PEDro, and Cochrane Library databases using the following key words: cost-effectiveness [Title/Abstract] AND (physical therapy [Title/Abstract] OR physiotherapy [Title/Abstract]). A free search method permitted us to identify a greater number of articles than a search

method with MeSH (Medical Subject Headings) terms. We agreed on this search strategy, which has been approved by an experienced librarian of the University of Applied Sciences and Arts of Western Switzerland, Geneva.

Study Selection

We selected articles written in English, French, German, or Italian. We considered study designs with a control group. Regarding economic analyses, we considered cost-effectiveness and cost-utility analyses. Articles published between January 1998 and January 2008 were identified through a manual check of the references included in the specific physical therapy-related review by Peterson et al.⁶ The computerized search was conducted between January 1, 2008, and March 31, 2014. In addition, we checked the reference list of all identified systematic reviews that fulfilled our selection criteria. We selected only references in response to our selection criteria and on the condition that they were not already included in the review by Peterson et al.⁶ We checked whether the terms "cost-effectiveness" and "physical therapy" appeared either in the title or in the abstract. Articles were excluded if a multidisciplinary team or health professionals other than physical therapists applied the interventions. This criterion is different from the review by Peterson et al.,⁶ who had defined the interventions (exercise for arthritis, back pain, heart conditions, fall prevention, or joints; use of hip protectors; and continence training) but who did not consider whether the health professional who applied the therapy was a physical therapist. Cost-effectiveness of interdisciplinary collaborations is a result of coordinated interventions of different health care professionals; it cannot be attributed to only one of them. If there is evidence that physical therapy is cost-effective, its use in health care is justified, and its integration in interdisciplinary teams will not be questioned.

Other exclusion criteria were: (1) study design without a control group; (2) missing calculation of cost-effectiveness; (3) utilization of cost-effectiveness for another purpose (eg, if continuing education influenced cost-effectiveness or

introduction of guidelines or economic comparison of 2 clinics); intervention concerned a diagnostic test; and (4) cost analysis concerned comparison of different physical therapy interventions, different numbers of physical therapy sessions, or different access modalities to physical therapy.

It should be noted that we included only studies with a cost-effectiveness analysis. It is likely that other high-quality studies that assessed the clinical effectiveness of an intervention do exist.

Data Extraction and Quality Assessment

We extracted the study design, year of publication, country, sample size, health condition, number and duration (in weeks) of applied interventions, duration of observation (in months), the physical therapy intervention and control intervention and their effects, and whether physical therapy was applied to groups of patients or in individual sessions. In addition, we extracted data necessary for the computation of ICERs (incremental cost-effectiveness ratios). Regarding costs, we considered the mean difference of total costs of the experimental group and the control group. We extracted the amount in the original currency, added the inflation rate until January 1, 2014, and finally converted the amount into US dollars when it was given in another currency. While reporting the outcomes, we considered only the final result, without taking intermediate measures into account; this approach is similar to the review conducted by Peterson et al.⁶ When the follow-up measurement was shorter or longer than 12 months, we extracted the results that were closer to 12 months. We reported the mean difference of the clinical effect observed in the experimental group and in the control group. When the difference was positive, the effect of the physical therapy intervention (physical therapy only or physical therapy added to usual care) was considered as superior compared with the effect of usual care only.

Two independent researchers assessed the methodological quality of all included articles with the Cochrane risk

of bias assessment tool.⁸ This checklist considers 6 items qualified as having a “low, unclear, or high risk of bias.” The items are: (1) sequence generation; (2) allocation concealment; (3) blinding of participants, personnel, and outcome assessors; (4) incomplete outcome data; (5) selective outcome reporting; and (6) other sources of bias.⁸ In a preliminary step, the assessors developed a guide on how they interpret each item based on the text in the Cochrane handbook.⁸ For the third item (blinding), we distinguished blinding of patients, therapists, and outcome assessors. Although blinding of patients and therapists is impossible for the majority of the interventions, we considered this item as having a high risk of bias if one of the involved people was not blinded or if the outcome was self-reported by the patient. For the last item (other sources of bias), we considered absence of ethical approval as having a high risk of bias. For the assessment of the 6 items, we considered the detailed description of the randomized controlled trial (RCT) if the authors of the economic analysis referred to it. The Cochrane Collaboration does not define a cutoff score for their risk of bias assessment.

The same 2 researchers (E.B. and D.M.) assessed methodological quality of the economic analyses with the Quality of Health Economic Studies (QHES) scale,⁹ which shows a good construct validity. This scale has previously been used to assess the quality of economic analyses of physical therapy interventions.⁶ The QHES assesses 3 types of economic analyses: cost-minimization, cost-effectiveness, and cost-utility. It comprises 16 items; each item is weighted according to its importance. The response to each item is binary. The final score represents the sum of the completed items. A score of 100 points indicates perfect quality. However, the scale does not indicate how scores should be interpreted. We considered a score of 70 as the cutoff for the classification of a “good-quality” study, as Peterson et al⁶ did. The QHES was used according to the guide of Pinto et al.¹⁰

For both quality assessments, both raters performed an evaluation of one article,

permitting them to clarify their comprehension of each item. Then, they independently evaluated 2 other articles. After that, they compared their results, which confirmed that they interpreted the items in a similar manner. Finally, they independently assessed the remaining articles and discussed the final quality score. They searched for a consensus for discordant evaluation.

Data Synthesis and Analysis

We synthesized the results of the economic analyses for each comparison: physical therapy only versus usual care only and physical therapy added to usual care versus usual care only. We further synthesized the results of the economic analyses for each group of health conditions: musculoskeletal (spine and joint problems) and other conditions (internal medicine and neurological). A descriptive analysis was performed for all data.

In a second step, we considered the cost-effectiveness of each intervention. First, the ICER, which is the standard tool used to evaluate the cost-effectiveness of an intervention, was reported. This ratio is computed as the cost difference between the intervention and the usual care divided by the difference in health outcome provided by the 2 treatments. Some included studies did not present ICERs. Moreover, different kinds of ICERs can be computed in function of different outcomes. Therefore, we proceeded as follows: (1) when the ICERs were reported in terms of QALYs, they are directly reported in Table 1; and (2) whenever possible, we computed at least one ICER based on an outcome variable such as visual analog scale or 36-Item Short-Form Health Survey (SF-36) score. This outcome determines whether the treatment provides equal or better benefit in terms of health.

Another point related to the computation of ICERs is the kind of costs that are included in the analysis. Some authors reported only costs that are directly related to treatments, whereas other authors included societal costs (eg, costs due to sick leave from their job). These differences made it difficult to compare the resulting ICERs. Therefore, we based our main computation on direct costs

Table 1.

Cost-Effectiveness Analysis: Number of Participants, Measure Used as Basis for ICER Calculations, ICER in 2014 Adjusted US Dollars, Cost-Effectiveness on the Basis of the ICER and the Definition Used in This Review, and Original Authors' Conclusion About Cost-Effectiveness^a

	Study	No. of Participants	Basis for ICER Calculation	ICER in 2014 Adjusted US Dollars ^b	Cost-Effectiveness on Basis of ICER ^c	Original Authors' Conclusion About Cost-Effectiveness
Physical Therapy Only Versus Usual Care Only						
MSC/Spine	Johnson et al, ²⁵ 2007	196	QALY	11,332 (direct)	–	The program of exercise and education has a small additional benefit in the reduction of LBP and disability; interventions are relatively inexpensive and prove to be cost-effective.
			VAS	17 (direct)		
			RMDQ	103 (direct)		
	Korthals-de Bos et al, ²⁶ 2003	183	VAS	EG1: 237 (direct), –153 (societal) EG2: 22,172 (direct), 173,640 (societal)	+ (EG2 only)	Manual therapy (spinal mobilization) (EG2) is more cost-effective than physical therapy (EG1) or care by a general practitioner in patients with neck pain.
			Functional disability	EG1: 108 (direct), –69 (societal) EG2: –158 (direct), –1,240 (societal)		
			Perceived recovery	EG1: 36 (direct), –24 (societal) EG2: –14 (direct), –113 (societal)		
	Moffett et al, ²⁷ 1999	187	RDQ	–42 (direct), –260 (societal)	+	Cognitive-behavioral approach was cost-effective for patients with chronic LBP.
			Aberdeen Back Pain Scale	–14 (direct), –83 (societal)		
			EQ-5D	–3,017 (direct), –18,461 (societal)		
MSC/Joint	Korthals-de Bos et al, ²⁹ 2004	185	VAS	66 (direct), 98 (societal)	–	The intervention was not found to be cost-effective. Wait-and-see policy was recommended for patients with epicondylitis.
			Elbow disability	92 (direct), 137 (societal)		
	Pinto et al, ³⁰ 2013	205	WOMAC (full score)	EG1: 81 (direct), –19 (societal) EG2: 41 (direct), 35 (societal) EG1 and EG2: 179 (direct), 129 (societal)	+ (EG1 only)	Manual therapy (EG1), exercise (EG2), and combined (EG1 and EG2) programs were cost-effective compared with usual care for treating patients with knee osteoarthritis.
			QALY	EG1: 67,778 (direct), –15,902 (societal) EG2: 15,113 (direct), 14,151 (societal) EG1 and EG2: 94,807 (direct), 98,445 (societal)		
	Tan et al, ³¹ 2010	131	EQ-5D	49,033 (direct), –56,297 (societal)	+	Exercise therapy (EG) was cost-effective compared with the conservative strategy in patients with patellofemoral pain syndrome.
			QALY	20,080 (direct), –23,055 (societal)		
Other Conditions	Glazener et al, ¹² 2011	411	EQ-5D	(*) –12,018 (direct), 39,043 (societal)	–	Individual physical therapy (EG) for men with urinary incontinence after prostate surgery was unlikely to be cost-effective compared with usual care (CG), which included information about pelvic-floor muscle training.
			QALY	(*) –180,276 (direct), 585,648 (societal)		

(Continued)

Physical Therapy Cost-Effectiveness

Table 1.
Continued

	Study	No. of Participants	Basis for ICER Calculation	ICER in 2014 Adjusted US Dollars ^b	Cost-Effectiveness on Basis of ICER ^c	Original Authors' Conclusion About Cost-Effectiveness	
Physical Therapy Only Versus Usual Care Only							
	Mazari et al, ¹³ 2013	178	QALY	−606,589 (direct)	+	Supervised exercise was more cost-effective than PTA only as treatment for patients with intermittent claudication.	
Physical Therapy Added to Usual Care vs Usual Care Only							
MSC/Spine	Luijsterburg et al, ⁴⁰ 2007	112	EQ-5D	6,279 (direct), 46,687 (societal)	−	The treatment of patients with lumbar radicular syndrome with physical therapy added to usual care (EG) was not more cost-effective than usual care only.	
			Global perceived effect	21 (direct), 156 (societal)			
			QALY	1,353 (direct), 10,062 (societal)			
	Niemistö et al, ²⁸ 2005	204	VAS	261 (societal)	−	Physician consultation only was more cost-effective for both health care use and work absenteeism and led to equal improvement in health-related quality of life.	
			ODI	1,366 (societal)			
	MSC/Joint	Bergman et al, ³⁴ 2010	150	Severity of main complaint	188 (societal)	−	Manual therapy accelerated recovery of patients with shoulder complaints on all outcome measures but was associated with higher costs.
Shoulder pain				322 (societal)			
Shoulder disability				18 (societal)			
EQ-5D				7,515 (societal)			
Buchbinder et al, ³⁵ 2007		156	SPADI	(*) −27 (direct), −16 (societal)	−	According to the performed cost-effectiveness analysis, physical therapy following arthrographic joint distension was not cost-effective.	
			Overall pain	(*) −423 (direct), −240 (societal)			
			AQOL	2,326 (direct), 1,319 (societal)			
			SF-36 mental function	233 (direct), 132 (societal)			
				SF-36 physical function	65 (direct), 37 (societal)		
Hurley et al, ³² 2012		418	WOMAC pain	−557 (societal)	+	Physical therapy added to usual care was cost-effective; resulted in better physical function and occasioned lower costs than usual care only.	
Juhakoski et al, ³⁶ 2011		120	WOMAC pain	−95 (direct)	+	No statistically significant differences in the total health care system costs between the groups.	
			WOMAC function	−66 (direct)			
Severens et al, ³³ 1999	135	ISS	218 (societal)	−	Physical therapy added to usual care was more effective and less costly than usual care only.		

(Continued)

Table 1.

Continued

	Study	No. of Participants	Basis for ICER Calculation	ICER in 2014 Adjusted US Dollars ^b	Cost-Effectiveness on Basis of ICER ^c	Original Authors' Conclusion About Cost-Effectiveness
Physical Therapy Added to Usual Care vs Usual Care Only						
Other Conditions	Fletcher et al, ³⁷ 2012	130	QALY	−8,499 (direct), −2,324 (societal)	+	The cost-effectiveness analysis showed that there was more than 80% probability that physical therapy added to usual care was a cost-effective strategy compared with usual care only.
			EQ-5D	−3,187 (direct), −872 (societal)		
	Mazari et al, ¹³ 2013	178	QALY	−21,375 (direct)	+	Standardized exercise combined with PTA is more cost-effective than PTA alone.
	Robertson et al, ³⁹ 2001	133	SF-36 physical functioning	37 (direct)	−	Despite a reduction in falls as a result of this home exercise program, there was no significant reduction in health care costs.
	Underwood et al, ³⁸ 2013	798	QALY	(*) −490,388 (direct)	−	Usual care was more effective and less costly compared with the exercise program.

^a ICER=incremental cost-effectiveness ratio; EG=experimental group; VAS=visual analog scale; RMDQ=Roland-Morris Disability Questionnaire; RDQ=Roland Disability Questionnaire; ODI=Oswestry Disability Index; ISS=impairment-level sum score; EQ-5D=European Quality of Life–5 Dimensions, a health-related quality-of-life measure; SPADI=Shoulder Pain and Disability Index; SF-36=36-Item Short-Form Health Survey; AQOL=assessment of quality of life; QALY=quality-adjusted life year; WOMAC=Western Ontario and McMaster Universities Osteoarthritis Index; LBP=low back pain; PTA=percutaneous transluminal angioplasty; MSC=musculoskeletal condition.

^b A negative value for ICER indicates a result in favor of the intervention program, except when usual care was more effective on health than the intervention. In this case, a negative value of the ICER indicates a result in disfavor of the intervention program. These cases are marked with the symbol (*). "Direct" indicates that only costs directly imputable to health treatments were included in the computation, whereas "societal" means that other elements (eg, sick leave from paid work) are taken into account.

^c Plus sign (+) indicates a cost-effective intervention using the definition of the present review, and minus sign (−) indicates a non-cost-effective intervention.

(available in all studies), and, whenever possible, we added an ICER for societal costs. We defined societal costs as the total costs, including both direct and additional costs. All results are reported in Table 1.

No absolute agreement exists on the definition of cost-effectiveness and the interpretation of ICERs. Cost-effectiveness is generally related to the willingness to pay for an additional unit of health,¹¹ but no universal guidelines exist regarding the threshold to use. For instance, Glazener et al¹² used 2 thresholds (£20,000 and £30,000) for cost-effectiveness in terms of additional costs for the intervention per QALY, but without justification. Mazari et al¹³ used a threshold of €25,000 to €35,000, as recommended by the

National Institute for Health and Care Excellence. Another option is to consider cost-effectiveness as an allocation of a fixed health budget between different treatments maximizing the overall level of health of the society.¹¹

The data published in the 19 studies included in our review made it impossible to aggregate all results on a unique scale. Therefore, we chose to report both the conclusion of the original authors and our own judgment (Tab. 1). Our judgment is based on the simplest possible definition of ICER, which describes that an intervention is cost-effective if it costs less than the usual care for an equal or better benefit in terms of health. Our conclusion was then based on the point estimate of ICERs

evaluated for societal cost (or direct cost when societal costs were not available). In case of discrepancies among the different health outcomes, we relied on (1) QALY (when available) and (2) the majority of measures.

Results

Article Selection

We identified 367 references; 291 articles remained after elimination of doubles (n=72) and exclusion of articles that were not written in English, French, Italian, or German (n=4). We identified 13 systematic reviews. One of the 13 systematic reviews was the review by Peterson et al,⁶ which responded precisely to our research question. We checked the 95 references included in the review by Peterson et al⁶; 8 articles met our inclu-

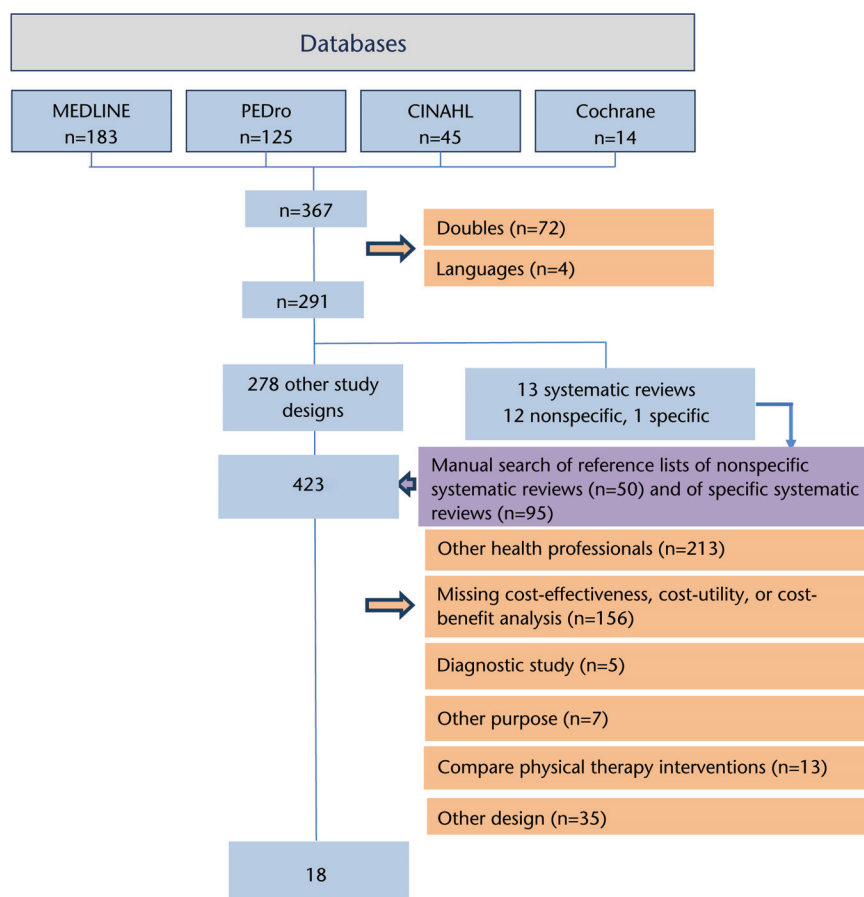


Figure.

Results of the search strategy according to inclusion and exclusion criteria applied to the reading of titles and abstracts. One article could have been excluded due to more than one exclusion criterion. In that case, we added it behind all concerned exclusion criteria.

sion criteria. We checked the reference lists of the other 12 reviews about cost-effectiveness of interventions applied by different health professionals, which we, therefore, called “nonspecific systematic reviews.” The manual search of the reference lists of these 12 nonspecific systematic reviews (Pinto et al,¹⁰ Driessen et al,¹⁴ Indrakanti et al,¹⁵ Maund et al,¹⁶ Furlan et al,¹⁷ Michaleff et al,¹⁸ Lauche et al,¹⁹ Bermingham et al,²⁰ Armstrong et al,²¹ Boyers et al,²² O’Doherty et al,²³ and Boland et al²⁴) yielded 40 references; 1 article met the selection criteria. At the end of the selection process, 18 references met the selection criteria (Figure) and were included in the analyses.

Quality of the Articles

Randomized controlled trial methodological quality was assessed with the Cochrane criteria permitting us to high-

light methodological strengths and weaknesses of the included trials (Tab. 2). Blinding of participants and therapists was unfeasible; therefore, these items were assessed in all studies as being “at high risk of bias” or “unclear.” Item 4 (incomplete outcome data) was identified as an item at high risk in 7 studies and was unclear in 2 studies, most frequently because the reasons for which the patients dropped out were not specified. The interrater agreement was high; only one item out of the 108 ratings (18 studies \times 6 items) was discordant.

Methodological quality of the economic analyses was high; out of the 18 studies, 17 (94%) had a QHES score between 70 and 100 points, which is considered a good to excellent score; 1 study had a score below 70 points (Tab. 3). The interrater agreement was high; out of the

288 ratings (18 studies \times 16 items), only 2 items were rated discordantly.

Summary of the Included Articles

Table 4 presents the authors and year of publication, the country, health conditions, the experimental and control interventions, and the average number of treatment sessions across study sites. We grouped the results according to the health condition of the participants of each study for each comparison: physical therapy only versus usual care only or physical therapy added to usual care versus usual care only. Thirteen studies concerned musculoskeletal conditions: back pain for the comparison of physical therapy only versus usual care only (n=3)²⁵⁻²⁷ and for the comparison of physical therapy added to usual care versus usual care only (n=2)^{25,28} and joint problems for the comparison of physical therapy only versus usual care only (n=3)²⁹⁻³¹ and for the comparison of physical therapy added to usual care versus usual care only (n=5).³²⁻³⁶ Two comparisons of physical therapy only with usual care only concerned patients with internal conditions (urinary incontinence, intermittent claudication). Two comparisons of physical therapy added to usual care with usual care only concerned neurological conditions (Parkinson disease,³⁷ depression³⁸), and 2 comparisons concerned internal medicine conditions (fall prevention for elderly people,³⁹ intermittent claudication¹³). The study that included participants with intermittent claudication was incorporated in both comparisons.¹³

Most studies were conducted in Great Britain (n=7; 39%) or the Netherlands (n=6; 33%). The smallest study had 112 participants,⁴⁰ and the largest study had 798 participants.³⁸ Health-related quality of life and disability were the most frequently mentioned clinical outcomes. A detailed description of study characteristics is provided in eTable 1 (available at journal.apta.org).

Table 1 reports both the original authors’ conclusions about cost-effectiveness and our own conclusions based on the computation of different ICERs. Original data used for these computations are reported in eTable 2 (available at

Table 2.

Cochrane Risk of Bias Assessment of the 18 Included Randomized Controlled Trials^a

Comparison	Physical Therapy Only vs Usual Care Only						Physical Therapy Added to Usual Care vs Usual Care Only											
Health Conditions	MSC/Spine			MSC/Joint			Other Conditions	MSC/Spine	MSC/Joint					Other Conditions				
Item	Johnson et al, ²⁵ 2007	Korthals-de Bos et al, ²⁶ 2003	Moffet et al, ²⁷ 1999	Korthals-de Bos et al, ²⁹ 2004	Pinto et al, ³⁰ 2013	Tan et al, ³¹ 2010	Glazener et al, ¹² 2011	Luijsterburg et al, ⁴⁰ 2007	Niemistö et al, ²⁸ 2005	Bergman et al, ³⁴ 2010	Buchbinder et al, ³⁵ 2007	Hurley et al, ³² 2012	Juhakoski et al, ³⁶ 2011	Severens et al, ³³ 1999	Fletcher et al, ³⁷ 2012	Mazari et al, ¹³ 2013	Robertson et al, ³⁹ 2001	Underwood et al, ³⁸ 2013
Sequence generation	✓	✓	✓	✓	✓	✓	✓	✓	?	✓	✓	✓	✓	?	✓	?	✓	✓
Allocation concealment	?	✓	✓	✓	✓	?	✓	?	✓	✓	✓	?	✓	?	?	✓	?	✓
Blinding of participants	x	x	x	x	x	?	x	x	x	X	x	x	x	x	x	?	x	x
Blinding of therapists	x	x	x	x	x	?	x	x	x	X	x	x	x	x	x	?	x	x
Blinding of outcome assessors	x	✓	?	✓	✓	?	✓	x	✓	X	✓	✓	✓	?	x	?	?	✓
Incomplete outcome data	x	✓	x	✓	x	✓	x	x	✓	X	✓	x	?	?	✓	✓	✓	✓
Selective outcome reporting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other sources of bias	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

^a ✓=low risk of bias, ?=unclear risk of bias (light gray cells), x=high risk of bias (dark gray cells), MSC=musculoskeletal condition.

ptjournal.apta.org). Based on the authors' conclusions, physical therapy only compared with usual care only was cost-effective in 6 out of the 8 comparisons^{13,25-27,30,31}; physical therapy added to usual care compared with usual care only was cost-effective in 4 out of the 11 comparisons.^{13,32,33,37} According to our judgment of cost-effectiveness, we found 5 out of 8 comparisons^{13,26,27,30,31} between physical therapy only and usual care to be cost-effective and 4 out of 11 comparisons^{13,32,36,37} between physical therapy added to usual care and usual care only to be cost-effective. The number of study participants indicates study size.

Discussion

The results presented in Table 1 show that our own conclusion about cost-effectiveness differed in 3 articles from that of the original authors. This difference is a direct consequence of our choice of relying on a very strict definition of cost-effectiveness. To be cost-effective, an intervention has to be

cheaper than the standard treatment. Usually, a more expensive intervention is accepted if additional costs are not too high. However, there is no clear defined cutoff above which costs should be considered as too high, hence our choice. Johnson et al²⁵ concluded that physical therapy was cost-effective even if the cost associated with this treatment was higher than the cost of usual care. Juhakoski et al³⁶ rejected the cost-effectiveness of physical therapy added to usual care because the difference with usual care only was not statistically significant. However, according to our definition and considering only the point estimate, the treatment had to be considered as cost-effective. Severens et al³³ accepted the cost-effectiveness of physical therapy added to usual care, but their published results indicate a higher cost for the intervention compared with usual care only, so we chose to reject cost-effectiveness in this case. The discrepancies between our judgments and the authors' judgments reflect only the methodological differences between studies;

they are not challenging the quality of these studies.

According to our judgment, physical therapy only was cost-effective in 5 out of the 8 comparisons^{13,27,30,31} with usual care only. Out of these studies, 4 concerned patients with musculoskeletal conditions.^{27,30,31} This is a relevant result, as the prevalence of musculoskeletal conditions is high.⁴¹ In addition, musculoskeletal conditions frequently include long-term pain and disability and, therefore, are particularly expensive for the health care system and society.^{42,43}

In contrast to our study, one review concluded that general practitioners' care for low back was not cost-effective.⁴⁴ In our review, 1 of the 2 studies that included patients with low back pain showed that physical therapy only is cost-effective. The active and educative physical therapy approach could explain the positive trend of our results.

Table 3.

Methodological Quality Assessment of the 18 Economic Analyses With the QHES^a

No.	Comparison	Physical Therapy Only vs Usual Care Only						Physical Therapy Added to Usual Care vs Usual Care Only												
	Health Conditions	MSC/Spine		MSC/Joint		Other Conditions	MSC/Spine	MSC/Joint				Other Conditions								
		Johnson et al, ²⁵ 2007	Korthals-de Bos et al, ²⁶ 2003	Moffet et al, ²⁷ 1999	Korthals-de Bos et al, ²⁹ 2004			Pinto et al, ³⁰ 2013	Tan et al, ³¹ 2010	Glazener et al, ¹² 2011	Luijsterburg et al, ⁴⁰ 2007	Niemistö et al, ²⁸ 2005	Bergman et al, ³⁴ 2010	Buchbinder et al, ³⁵ 2007	Hurley et al, ³² 2012	Juhakoski et al, ³⁶ 2011	Severens et al, ³³ 1999	Fletcher et al, ³⁷ 2012	Mazari et al, ¹³ 2013	Robertson et al, ³⁹ 2001
QHES Item																				
1	Was the study objective presented in a clear, specific, and measurable manner?	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
2	Were the perspective of the analysis (eg, societal, third-party payer) and reasons for its selection stated?	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
3	Were variable estimates used in the analysis from the best available source (ie, randomized controlled trial=best, expert opinion=worst)?	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
4	If estimates came from a subgroup analysis, were the groups prespecified at the beginning of the study?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Was uncertainty handled by (1) statistical analysis to address random events or (2) sensitivity analysis to cover a range of assumptions?	0	9	0	0	9	9	9	9	0	0	0	9	9	0	9	9	9	9	9
6	Was incremental analysis performed between alternatives for resources and costs?	6	6	0	6	6	6	6	6	6	6	6	6	6	0	6	6	6	6	6
7	Was the methodology for data abstraction stated?	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
8	Did the analytic horizon allow time for all relevant and important outcomes? Were benefits and costs that went beyond 1 year discounted (3%–5%) and justification given for the discount rate?	0	7	7	7	7	7	7	0	7	0	7	0	7	7	7	0	7	0	7
9	Was the measurement of costs appropriate and the methodology for the estimation of quantities and unit costs clearly described?	8	8	8	8	8	8	8	8	8	8	8	0	8	8	8	8	8	8	8
10	Were the primary outcome measures for the economic evaluation clearly stated, and did they include the major short-term justification given for the measures/scales used?	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11	Were the health outcomes measures/scales valid and reliable? If previously tested valid and reliable measures were not available, was justification given for the measures/scales used?	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
12	Were the economic model (including structure), study methods and analysis, and components of the numerator and denominator displayed in a clear, transparent manner?	8	8	8	8	8	8	8	8	8	8	8	0	8	8	8	8	8	8	0
13	Were the choice of economic model, main assumptions, and limitations of the study stated and justified?	0	0	0	7	7	7	7	7	7	7	7	0	7	7	7	7	7	0	0
14	Did the authors explicitly discuss direction and magnitude of potential biases?	0	0	0	0	0	6	0	0	0	0	0	0	6	0	0	0	0	0	0
15	Were the conclusions/recommendations of the study justified and based on the study results?	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
16	Was there a statement disclosing the source of funding for the study?	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0	3	3
	Total	71	87	72	85	94	100	87	85	78	85	64	100	79	94	87	91	80	79	79

^a QHES=Quality of Health Economic Studies scale, MSC=musculoskeletal condition.

Table 4.
Description of the Study Characteristics^a

	Study	Country	Health Condition	Intervention and Control Intervention	Average No. of Sessions
MSC/Spine	Johnson et al, ²⁵ 2007	Great Britain	Chronic LBP	EG: program of exercise and education using a CBT approach CG: GP care	8
	Korthals-de Bos et al, ²⁶ 2003	The Netherlands	Neck pain for at least 2 wk	EG1: manual therapy (spinal mobilization) EG2: physical therapy (exercise) CG: GP care	7 (EG1), 14 (EG2)
	Moffett et al, ²⁷ 1999	United States	Chronic LBP	EG: strengthening exercises for all main muscle groups, stretching exercises, relaxation session, and brief education on back care (CBT approach) in groups CG: medical treatment + eventually usual physical therapy interventions (total of 146 sessions)	8
MSC/Joint	Korthals-de Bos et al, ²⁹ 2004	The Netherlands	Lateral epicondylitis	EG: physical therapy CG1: corticosteroid injections CG2: a wait-and-see policy	12
	Pinto et al, ³⁰ 2013	New Zealand	Knee osteoarthritis	EG1: manual therapy EG2: exercise therapy EG3: manual therapy + exercise therapy CG: usual care (GP + health professional care, if necessary)	9
	Tan et al, ³¹ 2010	The Netherlands	Patellofemoral pain syndrome	EG: exercise therapy CG: usual care	9
Other Conditions	Glazener et al, ¹² 2011	Great Britain	Men after prostate surgery (acute)	EG: PFMT CG: standard management	4
	Mazari et al, ¹³ 2013	Great Britain	Intermittent claudication	EG1: SEP CG: PTA	36
MSC/Spine	Luijsterburg et al, ⁴⁰ 2007	The Netherlands	Acute LRS	EG: GP care + physical therapy CG: GP care	9
	Niemistö et al, ²⁸ 2005	Finland	Chronic LBP	EG: physician consultation group + manipulative treatment, exercise CG: physician consultation group	4
MSC/Joint	Bergman et al, ³⁴ 2010	The Netherlands	Shoulder complaints	EG: usual medical care + manipulative therapy of the cervicothoracic spine and the adjacent ribs CG: usual medical care	6
	Buchbinder et al, ³⁵ 2007	Australia	Adhesive capsulitis (shoulder) for >3 mo	EG: usual care + active physical therapy program following arthrographic joint distension CG: usual care	8
	Hurley et al, ³² 2012	Great Britain	Knee osteoarthritis	EG: usual care + ESCAPE-knee pain CG: usual care	12
	Juhakoski et al, ³⁶ 2011	Finland	Hip osteoarthritis	EG: GP care + exercise CG: GP care + usual physical therapy (mean: 2 sessions)	16
	Severens et al, ³³ 1999	The Netherlands	Upper extremity, reflex dystrophy	EG: usual care + physical therapy CG: usual care + control treatment (social worker)	Not reported
Other Conditions	Fletcher et al, ³⁷ 2012	Great Britain	Parkinson disease	EG: usual care + exercise intervention in a group CG: usual care (GP and physical therapy, occupational therapy, and speech therapy, if necessary)	10
	Mazari et al, ¹³ 2013	Great Britain	Intermittent claudication	EG2: PTA + SEP CG: PTA	36
	Robertson et al, ³⁹ 2001	New Zealand	Fall prevention, women >80 y old	EG: usual care + home-based muscle strengthening and balance retraining program CG: usual care and social visits	4
	Underwood et al, ³⁸ 2013	Great Britain	Depression	EG: usual care + physical therapist-led exercise class CG: usual care	8

^a Synthesis of the 18 included publications performing 19 comparisons. EG=experimental group that received either physical therapy only or physical therapy added to usual care, CG=control group that received usual care only, GP=general practitioner, LBP=low back pain, CBT=cognitive-behavioral therapy, PFMT=pelvic-floor muscle training, SEP=supervised exercise, PTA=percutaneous transluminal angioplasty, LRS=lumbosacral radicular syndrome, ESCAPE=Enabling Self-Management and Coping of Arthritic Knee Pain Through Exercise.

Physical therapy costs are particularly related to the number of treatment sessions and whether the sessions are delivered in groups or individually. However, these factors do not seem to be relevant to the cost-effectiveness of results. A relatively high number of sessions does not impede a cost-effective result. For example, for patients with Parkinson disease, 10 physical therapy sessions in groups added to usual care per year were sufficient for a cost-effective result in favor of physical therapy.³⁷ On the other hand, 36 standardized exercise sessions in groups for patients with intermittent claudication also gave a cost-effective result in favor of physical therapy added to usual care.¹³ A possible explanation could be that almost all physical interventions added to usual care in the included trials were active interventions (exercise). An active approach could indeed enable patients to better perceive their physical abilities and to use strategies helping them to overcome limitations compared with patients who receive usual care only. This approach could promote patients' autonomy and permit them to return sooner to their prior activities and avoid loss of productivity.

Discussing cost-effectiveness relates to 3 aspects: health care costs, societal costs and total costs, the sum of health care and societal costs. Physical therapy sessions added to usual care increases health care costs. However, when the analysis includes societal costs, such as costs related to absence from work, the total costs are not higher for the group receiving physical therapy added to usual care than for the group receiving usual care only. Therefore, cost-effectiveness analyses should not remain limited to health care costs; total costs that consider both aspects are more relevant. For instance, out of the 5 studies on cost-effectiveness of conservative treatment for neck pain included in the review by Driessen et al,¹⁴ none analyzed exclusively health care costs. Three studies considered societal costs, and 2 studies considered total costs.

The calculation of health care costs only is also a relevant issue. In our review, a standardized exercise program added to

medical care for patients with intermittent claudication was cost-effective,¹³ whereas medical treatment only was not cost-effective. This result is confirmed by the review by Bermingham et al,²⁰ who concluded that a standardized exercise program was cost-effective compared with medical treatment only in these patients; an exercise program is the recommended approach for intermittent claudication. The study by Mazari et al¹³ and the review by Bermingham et al²⁰ analyzed health care costs. Both groups of authors underscored that program modalities (frequency and number of sessions needed for good short- and long-term effects) should be better defined. Indeed, an appropriate definition of these modalities optimizes the use of health care services and consequently contributes to minimize health care costs.

Clinical Implications

With regard to implications for the clinical practice, it is likely that the active and educative nature of physical therapy interventions contributes to the cost-effectiveness. Group sessions are less expensive than individual sessions and favor learning from other patients with similar health conditions. Such group sessions also appear to be an advantage. The number of sessions does not appear to influence costs. However, regular assessments of the effect of the treatment (eg, after 6–9 sessions) are recommended to avoid unnecessary expenses.

Strengths and Weaknesses of This Review

Quality assessment and study quality are important strengths of this review, which benefited from past use of the QHES for economic analyses in health care. Peterson et al⁶ compared the QHES with other assessment tools for economic analyses; they confirmed its appropriateness for economic studies on physical therapy interventions.¹⁰ A further strength is that the quality of the studies included in the review of Peterson et al⁶ was high: 85% of the 95 included studies were of good to excellent quality, with a total score between 70 and 100 points. We found a similar result in our review, which reinforces the relevance of the overall positive eco-

nomic results of physical therapy interventions found in both reviews.

A further strength is the generalizability of the results. Seven of the 18 studies chose a pragmatic design that should increase external validity; this was also the case in similar reviews.^{10,16} Thereby, results from pragmatic RCTs favor generalizability because their research question is as similar as possible to questions of clinical decision makers.⁴⁵

This review also has several weaknesses: The number of studies meeting our inclusion criteria is small, and these studies are heterogeneous regarding their size, the considered health conditions, and the health care costs. It also should be noted that the different studies included in our review did not always use the same definition of cost-effectiveness or the same method for their evaluation. These limitations make the interpretation of the results difficult. Therefore, the results should be considered cautiously, and their generalization remains limited. Larger high-quality studies are needed to confirm our recommendations.

Robustness of the estimated costs is a further methodological criterion that should be taken into account when economic results are to be integrated into clinical decisions. The quality assessment of the included studies shows that these elements are not systematically considered.

The majority of the studies stem from Great Britain or the Netherlands, but some of them were completed in other European countries, in New Zealand, in Australia, and in the United States. As health care systems vary in the different countries, economic results may not be directly generalizable to other countries.

A last limitation is that usual care did not systematically exclude any physical therapy intervention. Authors of 4 studies^{10,27,36,37} left open the possibility that patients of the control group could have usual physical therapy, even if in practice the patients rarely chose this opportunity (mean of 2 sessions per participant in the studies by Moffett et al²⁷ and Juha-

koski et al³⁶). Most likely, the authors made this choice to respond to ethical requirements, but the differences between groups then would possibly be attenuated.

In conclusion, physical therapy only or physical therapy added to usual care implies improved health in almost all studies. The cost-effectiveness of such interventions is demonstrated in half of the studies. This result might have been influenced by the fact that different definitions of the notion of “cost-effectiveness” exist.

Cost-effectiveness of physical therapy has been shown for several musculoskeletal conditions, such as neck pain, chronic low back pain, knee osteoarthritis, hip osteoarthritis, and patellofemoral pain syndrome. This is a relevant result, as the prevalence of musculoskeletal conditions is high. In addition, cost-effectiveness for physical therapy could be identified for patients with Parkinson disease and intermittent claudication.

Future RCTs investigating efficacy of physical therapy should include an economic societal perspective. When an approach is cost-effective, the optimal modalities of physical therapy as a single intervention or of the added physical therapy should be defined.

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