

**A systematic review of interventions to increase the use of standardized outcome measures by rehabilitation professionals**

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Keywords:	Outcome Assessment (Health Care), Occupational therapy, Physiotherapy, Measurement
Abstract:	<p>Objective: To determine the types and effectiveness of interventions to increase the knowledge about, attitudes towards, and use of standardized outcome measures in rehabilitation professionals. Data Sources: An electronic search using Medline, EMBASE, PsycINFO, CINAHL, Ergonomics Abstracts, Sports Discus. The search is current to February 2016. Study Selection: All study designs testing interventions were included as were all provider and patient types. Two reviewers independently conducted a title and abstract review, followed by a full-text review. Data extraction: Two reviewers independently extracted a priori variables and used consensus for disagreements. Quality assessment was conducted using the Assessment of Quantitative Studies published by the Effective Public Health Practice Group. Data Synthesis: We identified 11 studies involving at least 1200 providers. Nine of the studies showed improvements in outcome measure use rates but only three of these studies used an experimental or quasi-experimental design. Eight of the studies used an educational approach in the intervention and three used audit and feedback. Poor intervention description and quality of studies limited recommendations. Conclusions: Increased attention to testing interventions focused on known barriers, matched to behavior change techniques, and with stronger designs is warranted.</p>

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12 **A systematic review of interventions to increase the use of standardized outcome measures**  
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14 **by rehabilitation professionals**  
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19 Running Title: Systematic review of outcome measures  
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## Abstract

**Objective:** To determine the types and effectiveness of interventions to increase the knowledge about, attitudes towards, and use of standardized outcome measures in rehabilitation professionals. **Data Sources:** An electronic search using Medline, EMBASE, PsycINFO, CINAHL, Ergonomics Abstracts, Sports Discus. The search is current to February 2016. **Study Selection:** All study designs testing interventions were included as were all provider and patient types. Two reviewers independently conducted a title and abstract review, followed by a full-text review. **Data extraction:** Two reviewers independently extracted a priori variables and used consensus for disagreements. Quality assessment was conducted using the Assessment of Quantitative Studies published by the Effective Public Health Practice Group. **Data Synthesis:** We identified 11 studies involving at least 1200 providers. Nine of the studies showed improvements in outcome measure use rates but only three of these studies used an experimental or quasi-experimental design. Eight of the studies used an educational approach in the intervention and three used audit and feedback. Poor intervention description and quality of studies limited recommendations. **Conclusions:** Increased attention to testing interventions focused on known barriers, matched to behavior change techniques, and with stronger designs is warranted.

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Key words: Allied health professional, Routine outcome measurement, Use of measures, Occupational therapy, Physical therapy, Physiotherapy, Speech and language therapy

For Peer Review

## Introduction

Using standardized outcome measures as an integral component of health care practice is believed to improve clinical decision-making, care, and patient outcomes (1, 2). Yet, despite decades of encouragement (2), an apparent consensus on the need to use outcome measures (2, 3), and favorable clinicians' attitudes towards them (4), the use of outcome measures in health care practice including rehabilitation has not become routine practice (4-6). Surveys on the use of outcome measures by rehabilitation professionals consistently report low use rates and inconsistent application of measures across similar patient groups (4, 7-9).

The flaws associated with subjective judgement of patient improvement have been well documented (10). Clinicians tend to believe in the effectiveness of the treatment they administer and are, therefore, likely to be biased towards positively rating client improvement (11). If subjective judgment is the only method used to assess progress, clinician bias is increased. This supports the notion that the use of outcome assessment from sources other than clinician subjective judgement alone should lead to more accurate and realistic information on client progress, and subsequently, improved clinical decision-making, care and patient outcomes. Empirical support for the benefits of routine outcome measurement on occupational therapy practice (12), client outcomes (13, 14), processes of care (15), and communication (16, 17) exists.

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10         Studies that develop and test interventions to increase the use of standardized outcome  
11 measures are needed. To date, bridging this practice gap has focused on cross-sectional surveys  
12 identifying barriers to outcome measure use (7-9), including a systematic review of barriers and  
13 facilitators to the use of outcome measures (18) . A key finding from the systematic review was  
14 that interventions to improve the use of outcome measurement in practice need to address  
15 barriers not only at the level of individual clinicians, but also at team and organizational levels.  
16 To our knowledge there are no reviews of interventions to increase the use of outcome measures  
17 in practice.  
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28         Consequently we conducted a systematic review to investigate the types and  
29 effectiveness of interventions studied that are aimed at increasing knowledge about, attitudes  
30 towards, and use of standardized outcome measures in the core (19) rehabilitation professionals;  
31 Occupational Therapy, Physiotherapy, Speech Language Pathology. A standardized outcome  
32 measure was defined as an instrument designed to describe, evaluate and/or predict an attribute  
33 (20, 21).  
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## 45         **Methods**

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10 We undertook this review using Cochrane best practice methods in systematic reviews. Studies  
11 evaluating any intervention to improve knowledge about and/or change attitudes towards and/or  
12 increase the use of outcome measures in rehabilitation professionals (i.e., Occupational Therapy,  
13 Physiotherapy, Speech Language Pathology) focusing on any patient type were included. All  
14 quantitative study designs were included. We accepted any comparator (e.g. no intervention or  
15 other intervention). The systematic review is primarily aimed at rehabilitation but as limited  
16 intervention testing was anticipated, the search was extended to include interventions tested that  
17 targeted other health professionals (i.e., medicine, nursing, social work, dietetics and  
18 psychology) to determine if other areas have evaluated interventions to increase the use of  
19 measures in contexts that are relevant to rehabilitation.  
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33 Studies were excluded if the intervention was not evaluated, if the study was qualitative,  
34 if the study only investigated barriers and facilitators to outcome measure use, if the effect of  
35 using an outcome measure on care or patient outcomes was studied (as opposed to increasing  
36 use), and if conducted outside health care contexts, e.g. education. Studies that involved  
37 interventions applied to other health professionals were included if both reviewers agreed that  
38 the context was relevant to rehabilitation.  
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47 Search strategies were designed and run by an information specialist (MF). Strategies  
48 combined controlled vocabulary, when available, and keywords. Terms included, but were not  
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10 limited to, outcome assessment health care, outcome and process assessment, psychiatric rating  
11 scales, health surveys. The following databases were initially searched in December 2013:  
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13 Medline, EMBASE, PsycINFO (OVID); CINAHL, Ergonomics Abstracts, Sports Discus  
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15 (Ebsco) and citation indexes and conference proceedings via Web of Knowledge. Neither date  
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17 nor language limits were applied. We scanned reference lists of studies selected for inclusion.  
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19 Full search strategies are available in Appendix A. An updated search, current to February 2016,  
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21 was conducted to identify papers published since the initial search.  
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26 Study selection followed a two-step process. In the first, abstracts and titles were  
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28 independently reviewed by two individuals (HC, MEL), followed by a consensus exercise to  
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30 resolve discrepancies and arrive at a list of articles for a full text review. In the second step, full  
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32 text articles were separately reviewed by the same two individuals followed by a consensus  
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34 process to determine articles for inclusion in the review. For both steps, an interrater reliability  
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36 analysis using the Kappa statistic was performed to determine rater consistency. Ordered  
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38 categories were assumed (i.e. include, potentially include, do not include) and thus, weighted  
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40 Kappa values were calculated (22).  
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45 Data extraction of the included articles was completed independently by two reviewers  
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47 (HC, MEL) with discrepancies resolved using discussion. The data extraction forms and  
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49 procedures were pilot tested in two studies to ensure clarity of items, interpretation of  
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10 instructions, coding, and uniformity between data abstractors. The extraction was completed  
11 using an Excel spreadsheet. The following variables were collected: *study descriptors* (i.e.,  
12 author, year, country in which data collection occurred, clinical setting, provider type, provider  
13 characteristics reported, patient characteristics reported, the types of outcome measures being  
14 promoted); *study quality* (i.e., study design, quality assessment data); *intervention descriptors*  
15 (i.e., if and how a theory was used for intervention design, a description of the intervention being  
16 used, whether any efforts were undertaken to sustain the use of the measures after the study was  
17 over), and *study results* (i.e., study result, sample size of provider and patients, statistical  
18 technique used).  
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31 Quality assessment was achieved using the quality assessment tool for Quantitative  
32 Studies published by the Effective Public Health Practice Group (23). This approach was chosen  
33 as it includes multiple quantitative study designs similar to the range of designs anticipated in  
34 this review, has an accompanying dictionary of definitions and instructions, and has been used in  
35 previous systematic reviews that have focused on rehabilitation (24). The tool involves a global  
36 rating of quality based on eight sources of bias: selection bias, study design, confounders,  
37 blinding, data collection methods, withdrawals and dropouts. Two independent raters (HC,  
38 MEL) completed the tool and final scores were determined based on consensus.  
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10 A narrative and descriptive summary of all of the descriptors was undertaken. Statistical  
11 analysis of the data was planned if results permitted (mean differences and confidence intervals  
12 for continuous data; odds ratio's and confidence intervals for dichotomous data).  
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## 18 19 **Results**

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21 Searching yielded 3,907 records in the initial search and an additional 2083 records as part of the  
22 updated search for a total of 5,990 records that underwent title and abstract screening. Fifty  
23 articles were selected for full-text review. Thirty-nine articles were excluded in the full-text  
24 review resulting in the final inclusion of eleven studies. Reasons for exclusion based on full text  
25 review included not involving an intervention to increase measure use, not being relevant to  
26 rehabilitation (i.e. the use of pain scales by nurses in intensive care units), not including an  
27 evaluation of the intervention, commentaries, and studies pertaining to barriers assessment. Two  
28 studies could not be located. For the title and abstract review, the weighted Kappa statistic was >  
29 .4 (moderate agreement), and for the full text review, the Kappa statistic was > .7 (good  
30 agreement) (22). A PRIMSA flow diagram, documenting all stages of study selection is in Figure  
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47 All included studies specifically targeted the intervention to at least one of the three core  
48 rehabilitation providers with two exceptions. Kisely and colleagues stated the target for the  
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10 intervention as ‘outpatient mental health professionals’ (25). Since occupational therapy can be  
11 considered a core team member for outpatient mental health (26), we chose to include this  
12 article. The second study directed the intervention at prosthetists (27). Since the outcome  
13 measures used were focused on functional mobility and for the purposes of measuring changes in  
14 functional mobility due to prosthetist treatment, we determined that this study was relevant to  
15 rehabilitation.  
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### 26 *Study descriptors*

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28 The studies were published between 2000 to 2016. The year with the greatest number of  
29 studies, n=3 (27-29), was 2015. There were a range of clinical study settings. For example, one  
30 was in outpatient mental health (25), one in both private practices and nursing homes (29), and  
31 one in the area of chronic pain (30). Three of the studies covered both acute and community  
32 contexts: stroke (31), brain injury (32) and non-specified (33) (i.e. any area of practice in which a  
33 measure was used). Two of the studies were in an outpatient pediatric setting (28, 34). Seven of  
34 the studies targeted physiotherapists only (1, 28, 29, 31, 33-35) , one study occurred with  
35 community mental health professions (unspecified but occupational therapy assumed) (25), one  
36 study each targeted occupational therapists only (30) and prosthetists only (27), and one study  
37 involved physiotherapists, occupational therapists and speech-language pathologists (32). While  
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10 nine studies reported various provider characteristics such as age, gender, years of experience,  
11 work location, and caseload levels, one study reported only the professional discipline of the  
12 providers (33), and one study reported only ‘mental health providers’ without specifying any  
13 further provider characteristics (25). Four of the studies included some characteristics of the  
14 patients in whom the outcome measure was being applied to (25, 28, 32, 34). Most often, these  
15 characteristics included age and diagnosis. An additional three (29, 30, 35) provided a general  
16 description of the patients (i.e., patients with low back pain), and the remaining four (1, 27, 31,  
17 33) did not include any information on patients.  
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28 The types of outcome measures used ranged in number and type. Ten of the eleven  
29 studies used sets of multiple individual measures, with the eleventh study not specifying exact  
30 measures administered but rather that at least one of any type of measure should be used (33).  
31 For a summary of key variables for each study, see Table I.  
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#### 40 *Study Quality*

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42 There was one randomized controlled trial (31), two controlled before and after studies  
43 (29, 35), seven before and after studies (1, 25, 27, 28, 30, 33, 34), and one retrospective cohort  
44 study (32). Nine of the eleven studies had an overall quality rating of weak. Two studies had an  
45 overall rating of moderate (31, 35). Only one of the studies had strong ratings for any of the six  
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10 components that made up the overall quality rating (31). Of the nine studies that were rated as  
11 weak, one was weak in all categories (30) and the other eight were weak in either four or five of  
12 the six categories (1, 25, 27-29, 32-34). One of the studies that had an overall rating of moderate  
13 (31) used an experimental design with randomization but was limited by a small sample size, i.e.  
14 15 experimental and 15 control professionals. See Table II for a summary of the quality  
15 assessment.  
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### 23 24 25 26 *Intervention descriptors*

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28 Five studies were informed by a theory or knowledge translation framework. Two studies  
29 (28, 34) applied the Knowledge to Action Framework (36) to guide the steps they undertook to  
30 change practice. Two other studies (29, 35) also used a framework to provide guidance but chose  
31 Grol and Wensing's Five-step Implementation Model (37). The fifth study (31) used theories by  
32 Grol (38) and Ajzen (39) to gain insights into how education can change behavior and to identify  
33 barriers and facilitators to behavior change.  
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42 The interventions to increase knowledge of, attitudes towards and the use of outcome  
43 measures, ranged in content and intensity. Nine of the eleven studies applied educational  
44 strategies in the form of workshops or seminars (1, 27-32, 34, 35). The two that did not do this  
45 (25, 33) applied indirect education through the dissemination of materials. One of the studies that  
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10 employed direct educational strategies tested two different types of strategies head-to-head:  
11 education delivered by experts versus non experts (31). Three of the studies applied audit and  
12 feedback in combination with either education (32) or dissemination of materials (25, 33). About  
13 half, five of the eleven, used greater than 3 strategies (1, 28, 30, 34, 35). Four studies reported a  
14 dose for all elements of the intervention. Specifically, these were reported as: audit and feedback  
15 plus education for 25 weekly session (32); audit and feedback plus education on one occasion  
16 (33); four interactive half-day sessions over 4-5 months and provision of a toolkit on one  
17 occasion (29); five two-hour evening education sessions over 14 weeks (31). Of the remaining  
18 seven that did not provide full information on the dose of the intervention, four (28, 30, 34, 35)  
19 provided some but not all information (ie. the length of time of the workshop but not how many  
20 reminders were provided) (35), and three studies reported no details on the dose of the  
21 intervention (1, 25, 27). Only one of the studies did not measure use rates, measuring confidence  
22 in using measures (27). Of the other ten studies that measured use rates, three also measured  
23 attitudes towards measures (1, 29, 35) and two also measured knowledge of measures (28, 34).  
24 Only two of the eleven studies included efforts to sustain the use of the measures after the study  
25 had completed; one study measuring at 12 and 18 months after the intervention (34) and one at 8  
26 months after the intervention (29).  
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### *Study Results*

Of the eight studies that employed educational strategies and measured the use rates of outcome measures, seven found improvements (1, 28-31, 34, 35). The two studies that employed indirect educational strategies (i.e., dissemination of guidelines) also reported improvements in use rates (25, 33). Both of these studies used audit and feedback in combination with the indirect educational strategies. The one study that used educational strategies but did not show an effect was the study that used audit and feedback in combination with education (32). The two studies with the highest quality ratings found improvements in use rates. The first of these studies evaluated a 10-hour educational strategy (31) and the other study evaluated an intervention with five strategies that included dissemination of guidance, a 3-hour educational workshop, a website of guideline and measures, email reminders, and email and telephone support (35). Of the two studies that attempted to measure if effects were sustained over time, one found effects that were maintained at 18 months (34), the other did not (29).

Three studies included secondary measurement of attitudes. One found that attitudes became less positive after the intervention (1), the other two found no change in attitudes (29, 35). The two studies that measured knowledge found improvements (28, 34). Two studies used both actual and self-report rates of measure use: one found consistent and positive results for

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9 both self-report and actual use rates (28), while the other found that the physiotherapists  
10 overestimated their use of outcome measures on self-report (31).  
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## 16 **Discussion**

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18 Eleven studies were identified that met the inclusion criteria; all but one pertained to  
19 rehabilitation and/or outpatient mental health services (providers unspecified). Seven of the  
20 eleven studies used physiotherapists as the target for the intervention. One study had prosthetists  
21 as the target for the intervention (27). Overall, improvements in use rates of outcome measures  
22 occurred in nine of the ten studies that measured use rates (1, 25, 28-31, 33-35) although five of  
23 these ten stated effects as changes in percent adherence without any statistical testing (1, 25, 29,  
24 30, 33). Whilst the studies in this review do appear to have had some effect, strong conclusions  
25 cannot be made due to weak study designs, poor intervention descriptions, and a limited number  
26 of studies.  
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43 Despite the importance of routine outcome measurement being recognized for over 20  
44 years (18), the quantity and quality of research conducted to date to improve routine use of  
45 outcome measurement is poor. Only one study in this review used an experimental design with  
46 randomization and most interventions would be difficult to replicate given the quality of  
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10 reporting. Consequently this review is unable to draw any definitive conclusions. Focused  
11 studies in key clinical areas, with stronger causal designs and more detailed intervention  
12 descriptions are therefore urgently required. Consideration of additional improvements to  
13 intervention design and evaluation such as process evaluations (40), design based on known  
14 barriers (41), and deliberate stakeholder engagement (42) should also be considered.

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21 The majority of interventions included in this review adopted education approaches. This  
22 was the same finding as a systematic review of knowledge translation interventions, designed to  
23 translate research into allied health professional practice (24). The over-reliance of education as a  
24 strategy to bring about behavior change is widespread, and has been described as an ‘education  
25 reflex’(43) by Pailey and colleagues. While systematic reviews of continuing education (44) do  
26 show that educational activities can lead to improvements in practice, they typically only address  
27 knowledge barriers, and do not necessarily target other, and sometimes more important barriers  
28 such as skills or professional role. Whilst the education studies in this review do appear to have  
29 had some effect, a reliance on education is unlikely to optimize use of routine outcome measures.

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42 Three studies in this review used audit and feedback to improve routine outcome  
43 measurement use (25, 32, 33). Audit and feedback shows promise as an intervention to change  
44 people’s behavior (45). It can take many forms (e.g. verbal or written), have differing sources  
45 (e.g. colleague, or manager) and can contain information on varied content (e.g. processes of  
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10 care or patient outcomes) (45). Using audit and feedback to improve routine outcome  
11 measurement is one approach among others that merits rigorous evaluation.  
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14 Education and audit and feedback mechanisms, however, are only one of a series of  
15 evidence-based behavior change techniques (46). A variety of other strategies exist, and have  
16 potential to make a greater difference to outcome measurement usage in practice. In particular,  
17 tools like the Theoretical Domains Framework (47) and the Behaviour Change Technique matrix  
18 (46), a theory-based process of matching known barriers to behavior change techniques could be  
19 useful to the uptake of outcome measures. In addition, these approaches allow for the  
20 specification of the relationship between the barriers to be addressed and the intervention  
21 components.  
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33 The focus of each of the interventions included in this study was targeted at the  
34 individual clinician level. This is likely to be insufficient, as evidence from a previous review of  
35 routine outcome measurement literature suggests that the reasons for failure to routinely  
36 implement outcome measurement are multi-factorial, and occur at different levels in an  
37 organization: individual, team, and organization (18). Future studies should, therefore, evaluate  
38 behavioural change interventions that address each of these levels to maximize their potential  
39 effectiveness. This could include even broader levels such as the socio-political context (37).  
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As with all reviews, this study has limitations. In order to locate all possible studies, the search strategy was kept broad and a significant number of abstracts were screened. However, it is still possible that papers were missed, particularly in a field as broad as ‘outcome measurement’. Also, rehabilitation is a large domain that is encompassed in many settings and difficult to objectively delimit. It is also possible that many outcome measure efforts occur as local quality improvement efforts that may or may not be in peer-reviewed literature. A search of grey literature might have addressed this although it is not clear that study quality would have been high given what was found in the peer-reviewed literature. In addition, there could be other evidence outside of the domain of rehabilitation and health (e.g. education) that could yield additional insights but were not necessarily the focus of this review.

In conclusion, our systematic review of interventions to increase outcome measure use in the field of rehabilitation yielded only eleven studies. Study designs were weak and interventions descriptions were poor. Understanding how to improve the use of outcome measures in rehabilitation will require stronger study designs and improvements to the design and reporting of interventions. Careful consideration of potentially useful intervention components outside of education is warranted, as is testing audit and feedback, and the selection of interventions components in keeping with known barriers to outcome measure use.

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For Peer Review

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10 Clinical Messages

- 11 • Minimal testing of interventions to increase the use of outcome measures in rehabilitation  
12 has been undertaken
- 13 • Increased attention to testing interventions focused on known barriers, matched to  
14 behavior change techniques, and with stronger designs is needed  
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29 acquisition, analysis and interpretation of data, and drafted the manuscript. MEL and CC  
30 contributed to the acquisition, analysis and interpretation of data in this study. ED contributed to  
31 the design of this study as well as the interpretation of the data. MF contributed to the design  
32 and conduct of the search strategy. JG contributed to the conception and design of the study as  
33 well as the interpretation of the data. All author's contributed edits to, read and approved the  
34 final version of the manuscript.  
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Figure 1 –PRISMA diagram

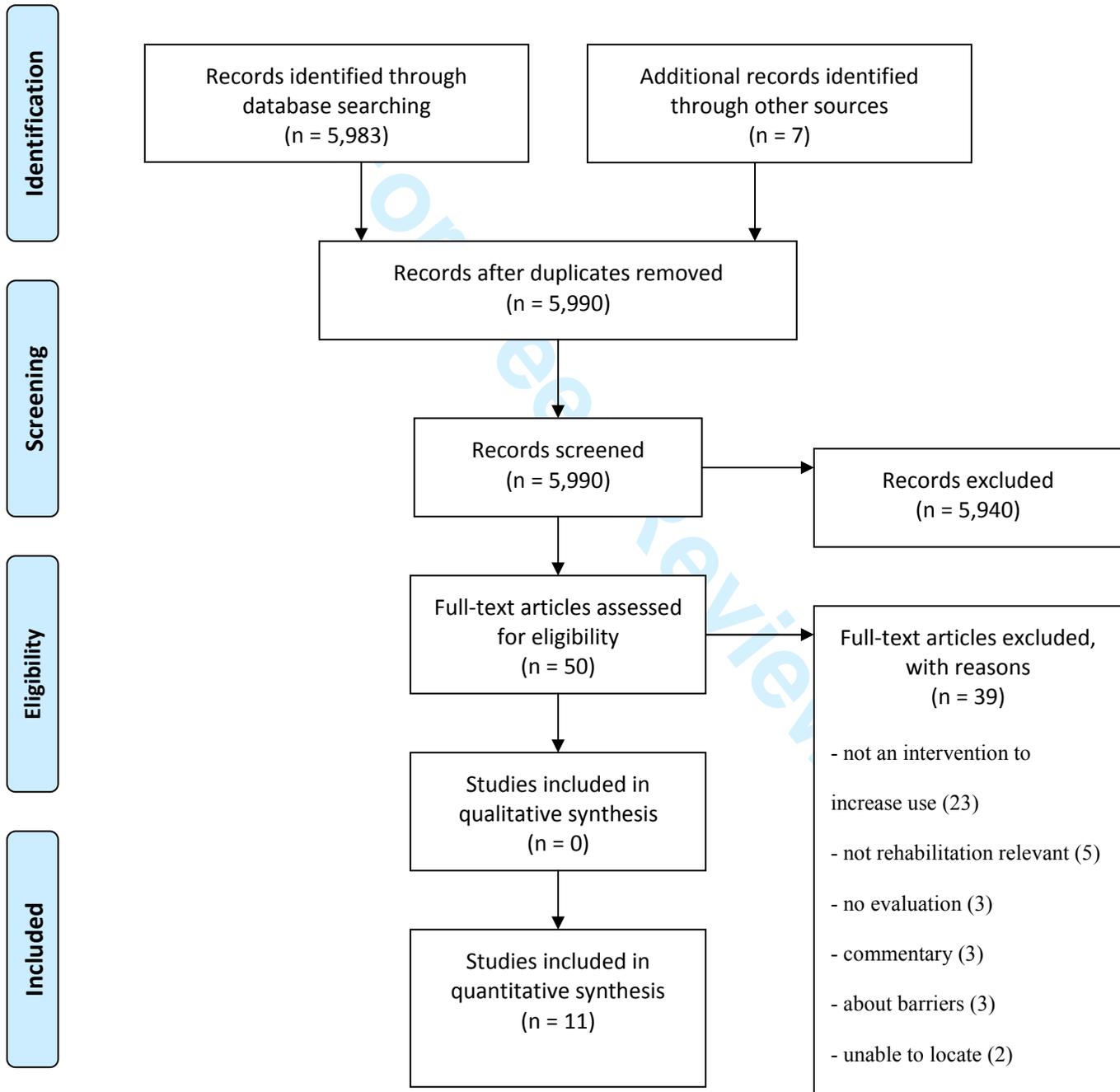


Table I Summary of included studies, n=11

Author, year, country	Provider, provider sample size	Study design	Setting	Outcome measure being used in practice	Intervention	Results
Abrams, 2006 (1) Australia	PT n = 154	Before and after study	Community, outpatient	Multiple, n = 9 (e.g. Oswestry, Quebec)	Education, dissemination of guidance, mandated processes of care, resources, peer support Dose: not reported	<u>Use</u> : Percent difference was positive for seven of nine tests (self-report) <u>Attitude</u> : Total attitude score show less positive attitudes, p=.02, 27.1 (SD 4.8) to 25.8 (SD 1.1)
Bland, 2013 (32) United States	OT, PT SLP n = 118	Retrospective cohort study	Acquired brain injury Acute care, inpatient, outpatient	Multiple, n = 39 (Brain Recovery Core assessments)	A&F + educational staff meetings Dose: 25 meetings over 17 months	<u>Use</u> : No effect (actual use)
Cook, 2007 (30) Australia	OT n=36	Before and after study	Chronic pain, setting unspecified	Multiple, n=9 (e.g., Visual Analogue Scale, Goal Attainment Scale)	Educational workshop + resource package of measures + follow-up support Dose: 1 day	<u>Use</u> : Increased from 66% to 91% (p=0.012) (self-report)

					workshop + 4 months of follow-up	
Gaunaurd, 2015(27) United States	Prosthetists n=79	Before and after study	Prosthetic clinics	Multiple, n=2 (i.e., Timed Up and Go, Amputee Mobility Predictor)	Educational workshop Dose not reported	<u>Confidence</u> : improved confidence for administering both measures p<.0001 (self-report)
Käll, 2016(35) Sweden	PT n=425 ( 256 intervention and 163 control)	Controlled before and after study	Low back pain, setting unspecified	Multiple, n=4 (e.g., Neck Disability Index, Disabilities of the Arm, Shoulder and Hand)	Dissemination of guidance + educational workshop + website of guideline and measures + email reminders + email and telephone support Dose: 3-hour workshop	<u>Use</u> : 55% in intervention group report use of measures frequently versus 36% in control group (95% CI 6.2% to 31%) (self-report) <u>Attitudes</u> : No effect, p=0.857
Kisely, 2008 (25) Canada	Providers providing 'mental health services'	Before and after study	Community outpatient (mental health services)	Multiple, n = not specified (Health of the Nation Outcome Scales [HoNOS])	A&F + dissemination of educational materials Dose: not reported	<u>Use</u> : Completion rate went from 61% to 86% (actual use)

Russell, 2010(34) Canada	PT n=122	Before and after study	Pediatric outpatient	Multiple, n=4. (i.e., GMFCS, GMFM-88 and GMFM-66, MGC)	Knowledge Broker (multiple activities including education) Dose: 6 months	<u>Use</u> : Significantly improved for 3 of 4 measures. <u>Knowledge</u> : Significantly improved for all measures. (self-report)
Schreiber, 2015(28) United States	PT n=17	Before and after study	Pediatric outpatient	n=7; GMFM-88/GMFM-66, MGC, GMFCS, PEDI, TUG, TUDS, 30 second walk test)	Educational workshop + resource materials + video demonstration + on-line discussion Dose: 2 hour workshop	<u>Use (self-report)</u> : mean change of 11.6 (SD 5.9), p<.001. <u>Use (actual)</u> : increase in frequency counts of measures. <u>Knowledge (self-report)</u> : 54.1(SD13.5) at baseline and 81.8 (SD12.7) at follow-up
Sumner, 2000 (33) United Kingdom	PT n = not specified	Before and after study	8 settings across multiple sectors (e.g. acute, community, private practices)	Not specified (could be any measure)	A&F + dissemination of education materials Dose: frequency of one	<u>Use</u> : Documented outcome measure use increased from 44% to 79%. (actual use)
Swinkels, 2015(29) Netherlands	PT n=261 (175 for Intervention and 86 for control)	Controlled before and after study	Private Practice or Nursing Homes	Not specified. Private practice (19 suggested tools); Nursing	Educational workshop + toolkit of measures Dose: 4	<u>Use</u> : Improved from 26% to 41% use in intervention, and 45% to 48% in control. <u>Attitudes</u> : No effect

				homes (14 suggested tools)	interactive half-day sessions over 4-5 months	
van Peppen, 2009 (31) Netherlands	PT n = 30 (15 experimental and 15 control)	Pilot randomized controlled trial	Stroke Acute, rehabilitation, community	Multiple, n=7 (e.g., Berg Balance Scale, Barthel Index)	Educational program by non-expert (control); education by expert (intervention) Dose: 10 hours	<u>Use</u> : Median (number of outcome measures used) in experimental group (6) higher than in control group (4), p=.07 (actual use)

Notes: Occupational Therapists (OT), Physiotherapists (PT), Speech Language Pathologists (SLP), audit and feedback (A&F); Gross Motor Function Classification System (GMFCS); Gross Motor Function Measure (GMFM-88 and GMFM-66); Motor Growth Curves (MGCs); Pediatric Evaluation of Disability Inventory (PEDI), Timed 'Up and Go' Test (TUG), Timed Up and Down Stairs Test (TUDS)

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Table II Summary of quality assessment

<b>First author, date</b>	<b>Selection Bias</b>	<b>Study Design</b>	<b>Confounders</b>	<b>Blinding</b>	<b>Data Collection Method</b>	<b>Withdrawals and Dropouts</b>	<b>Overall rating</b>
Abrams, 2006 (1)	Moderate	Weak	Weak	Weak	Weak	Weak	Weak
Bland, 2013 (32)	Moderate	Weak	Weak	Moderate	Weak	N/A	Weak
Cook, 2007(30)	Weak	Weak	Weak	Weak	Weak	Weak	Weak
Gaunaurd, 2015 (27)	Moderate	Weak	Weak	Weak	Weak	Weak	Weak
Käll, 2016 (35)	Moderate	Moderate	Moderate	Weak	Moderate	Moderate	Moderate
Kisely, 2008 (25)	Moderate	Weak	Weak	Weak	Weak	Weak	Weak
Russell, 2010 (34)	Moderate	Weak	Weak	Weak	Weak	Weak	Weak
Schreiber, 2015 (28)	Moderate	Weak	Weak	Weak	Weak	Weak	Weak
Sumner, 2000 (33)	Weak	Moderate	Weak	Weak	Weak	Weak	Weak
Swinkels, 2015 (29)	Weak	Moderate	Weak	Weak	Weak	Weak	Weak

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Van Peppen, 2009 (31)	Moderate	Strong	Strong	Moderate	Weak	Strong	Moderate
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For Peer Review

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3 **Objective:** To determine the types and effectiveness of interventions to increase the knowledge  
4 about, attitudes towards, and use of standardized outcome measures in rehabilitation  
5  
6 professionals. **Data Sources:** An electronic search using Medline, EMBASE, PsycINFO,  
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8 CINAHL, Ergonomics Abstracts, Sports Discus. The search is current to February 2016. **Study**  
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10 **Selection:** All study designs testing interventions were included as were all provider and patient  
11 types. Two reviewers independently conducted a title and abstract review, followed by a full-text  
12 review. **Data extraction:** Two reviewers independently extracted a priori variables and used  
13 consensus for disagreements. Quality assessment was conducted using the Assessment of  
14 Quantitative Studies published by the Effective Public Health Practice Group. **Data Synthesis:**  
15 We identified 11 studies involving at least 1200 providers. Nine of the studies showed  
16 improvements in outcome measure use rates but only three of these studies used an experimental  
17 or quasi-experimental design. Eight of the studies used an educational approach in the  
18 intervention and three used audit and feedback. Poor intervention description and quality of  
19 studies limited recommendations. **Conclusions:** Increased attention to testing interventions  
20 focused on known barriers, matched to behavior change techniques, and with stronger designs is  
21 warranted.  
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