

Clinical evaluation of upper limb function: Patient's impairment, disability and health-related quality of life

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Musculoskeletal disorders substantially impacts physical activity, mental state, and quality of life (QOL). Generally, comprehensive assessment of upper limb function requires measures of impairment or disability as well as health-related quality of life. A growing number of outcome instrument have been introduced to evaluate upper limb function and disability, and these measures can be categorized as patient- or clinician-based, and as condition specific or general health-related QOL evaluations. The upper limb outcome instruments reviewed in this article assess different aspect of upper limb conditions, and the measures are affected by differences in cultural, psychological, and gender aspect of

illness perception and behavior. Therefore, physician should select/interpret the outcome instruments addressing their primary purpose of research. Information about regional instruments for upper limb condition and health-related QOL in upper limb disorder may help us in decision-making for treatment priority or in interpretation of the treatment outcomes.

Keywords: Upper limb, Outcome instrument, Impairment, Disability, Quality of life

INTRODUCTION

Musculoskeletal disorders are among the most frequently occurring chronic conditions that affect the general population and substantially impact physical activity, mental state, and quality of life (QOL) (Bingefors and Isacson, 2004; Lawrence et al., 1998). Musculoskeletal disorders become more prevalent with age, and they are the leading cause of disability (Lawrence et al., 2008; Pivcavet and Hazes, 2003). The management goals of patients with musculoskeletal disorders are no longer limited to reducing signs and symptoms but now includes increasing function (Dieppe, 2004). There is a current trend to enhance general well-being or QOL, which involves integrating patient-centric perspectives and comprehensive assessment of intervention outcomes (Furner et al., 2011; Gruber et al., 2010; Menz et al., 2010).

A growing number of outcome instruments have been introduced to evaluate upper limb function and disability (Oh et al., 2009; Romeo et al., 1996). These instruments range from objec-

tive measures, such as range of motion (ROM) (Constant and Murley, 1987) or muscle strength (Constant and Murley, 1987; Roh et al., 2012e), to more subjective measures, such as patient satisfaction (Monnin and Perneger, 2002) or quality of life (Goldhahn et al., 2008; van de Ven-Stevens et al., 2009). Impairments such as muscle weakness or limitation in range of motion may have a comprehensive impact on daily life. For instance, grip strength has a critical role during the performance of daily activities, and is considered an important measure of recovery after upper extremity injuries and for the evaluation of treatment outcomes. However, the degree of satisfaction regarding function or disability differs across patients, and this inter-patient variability in self-assessment is important to consider in the clinical evaluation of upper limb function. In clinical studies, recent trend has been to move toward patient-based (patient-centric) instruments and away from clinician-based (performance based) ones, the latter of which is more susceptible to observer bias and error and does not represent illness/disability experience of patients themselves (Harvie et al., 2005).

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Furthermore, outcome assessments include measures of impairment or disability as well as measures of general health-related QOL, in order to assess the full impact of problem related to a certain upper limb condition.

There are many outcome instruments available for assessment of upper limb functions. These are not standardized or unclear. The purpose of this paper is to review outcome measures of upper limb function, which can be categorized as patient- or clinician-based, and as condition specific or general health related QOL evaluations. In addition, we discuss clinical research considerations in selection/interpretation of instruments for upper limb functions. The upper limb outcome instruments reviewed in this article include the Michigan hand questionnaire (MHQ), the Patient-rated wrist evaluation score (PRWE), the Constant-Murley score, the simple shoulder test (SST) the Oxford shoulder score (OSS,) the disability of arm, shoulder and hand questionnaire (DASH), and the short form- 36 health survey (SF-36).

OUTCOME INSTRUMENTS IN PATIENT WITH UPPER LIMB CONDITION

On one hand, condition-specific instruments of musculoskeletal disorders measure symptoms and disabilities relevant to specific conditions and are useful for assessing responses to treatments. On the other hand, general health status instruments measure multiple aspects of health, including physical function, mental health, and social function. Although generic measures may not be as sensitive to the disability experienced by patients, general health status measurements generally correlate with condition-specific instruments that address musculoskeletal manifestation (Ostendorf et al., 2004; SooHoo et al., 2002). This implies that musculoskeletal complaints influence general health status and that a considerable proportion of variation in general health status can be attributed to regional musculoskeletal disability.

Hand & Wrist

The Michigan hand questionnaire (MHQ) is a hand specific and patient-based subjective assessment (Chung et al., 1998). The questionnaire assesses a patient's perception to function, pain, satisfaction, and aesthetic appearance. The original MHQ has been used with almost all types of hand disorders, and its reliability, validity, and responsiveness has been validated for a range of upper extremity conditions, such as carpal tunnel syndrome, distal radius fractures, and rheumatoid arthritis (Chatterjee and Price, 2009; Kotsis et al., 2007; Roh et al., 2011; Waljee et al., 2010). The questionnaire

itself consists of 57 items, and distinguishes between left and right hands over six domains, including overall hand function, activities of daily living, pain, work performance, aesthetics, and patient satisfaction with function. Each domain is scored from 0 to 100, by which a lower score denotes worse disability save except for the pain domain for which the opposite holds true. The final score is obtained by averaging the six scores after reversing the pain score.

Patient-rated wrist evaluation score (PRWE) is a reliable and valid tool for quantifying patient-rated wrist pain and disability in the setting of distal radius fractures treatment (MacDermid et al., 1998). The questionnaire is completed by the patient themselves and consists of two domains, pain and function. There are five items in the pain domain and ten items in the function domain. The response to each item is scored on a scale of 0-10. The pain score is the sum of five items, with the worst possible score of 50, and the disability (function) score is the sum of ten items divided by 2.

Shoulder

The Constant-Murley questionnaire is a shoulder specific and clinician-based assessment with acceptable reliability and validity (Gilbart and Gerber, 2007), and is the most widely used questionnaire in Europe (Kirkley et al., 2003). This instrument consists of 4 function items and 5 physical examination items. As the measurements are fundamentally different, the functional and physical examinations are scored separately, as opposed to being combined for a total score.

The simple shoulder test (SST) is a patient-based measure (Lippitt, 1993). It is a quick, subjective questionnaire composed of 12 questions with yes or no response. It was reported to be reliable, valid, and responsive (Godfrey et al., 2007). For each question, a patient indicates whether he or she is able to perform the indicated activity or not. The sum total score ranges from 0 (worst) to 12 (best) for shoulder function.

Oxford shoulder score (OSS) (Dawson et al., 1996) is a shoulder-specific, patient-based questionnaire composed of 12 questions for assessing pain perception and quality of life in patients with symptomatic pathologies of the shoulder. Each question on the questionnaire is scored 0-4, with four representing the best. Thus, it produces overall scores that range from 0 to 48, with 48 being the best outcome. The Oxford shoulder score is easy to complete, imposes very little burden to the patient, and provides reliable, valid,

and responsive data about patient perceptions of shoulder problems (Christie et al., 2009; Kirkley et al., 2003). It is an internationally recognized orthopedic assessment instrument, is available in certain European languages. Its validity has been demonstrated through cross-cultural adaptation processes. (Berendes et al., 2010, Huber et al., 2004; Murena et al., 2010; Roh et al., 2012c)

Whole upper extremity

The disability of arm, shoulder and hand (DASH) is a self-administered, upper-extremity specific questionnaire that consists of 30 questions (Hudak et al., 1996). It includes physical functions, symptoms, and social function, work, sleep, and confidence items. Five responses are provided per question and are scored from 1 (without difficulty or no symptom) to 5 (unable to engage in activity or very severe symptom). Thus, the DASH provides the best possible score of 0 and the worst possible score of 100. The DASH evaluation is user-friendly, reliable, and valid for a range of upper-extremity disorders (Gummesson et al., 2003; Szabo, 2001), and is the best instrument for evaluating patients with disorders involving multiple upper limb joints.

Generic health status measure

The short form - 36 (SF-36) health survey is the most widely used, patient-reported generic health status measure (Ware and Sherbourne, 1992). The 36 items in the questionnaire are grouped by eight health subscales which are designed to represent the World Health Organization definition of health: physical function (PF), role limitations due to physical problems (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), role limitations due to emotional problems (RE), and mental health (MH). These eight scales can be combined into two summary measures that provide overall estimates of physical health (physical component summary [PCS]) and mental health (mental component summary [MCS]). The SF36V2 uses norm-based scores, and the its summary scores use the sum of eight subscale z-scores weighted by factor score coefficients (Ware, 2000). The SF-36 is commonly used to represent broad aspects of health for questionnaire validation and reportedly is more responsive than other general health instruments for musculoskeletal disorders (Beaton et al., 1996).

CONSIDERATIONS IN THE SELECTION/ INTERPRETATION OF INSTRUMENTS

To evaluate upper limb impairment or disability, reliable and validated outcome measures should take into account all aspects

of a patient's life that may be affected by the presence of the disability or impairment. Most investigators support the use of condition specific measures along with generic measures. The former include items relevant and sensitive to the disorder being studied, and the latter allow for comparisons between conditions and may be sensitive to unexpected consequences of a disorder. Investigators should select a proper instrument with established validity and reliability. All things being equal, the most responsive instrument available should be used in order to minimize the sample size for the proposed study. Therefore, additional information is required to understand how sensitive these instruments are to clinical change in function experienced by patients who have problems over time.

Psychologic distress, such as pain-induced anxiety or depression, is increasingly recognized as contributing to pain and disability perception in several musculoskeletal disorders (Kim et al., 2011; Roh et al., 2012d). Depression has been reported to be highly prevalent in the elderly and consistently contributes to symptom severity in some musculoskeletal disorders (Roh et al., 2012b; Rosemann et al., 2007; Salaffi et al., 1991). Furthermore, subjective factors, such as pain and depression, have been reported to have greater influences when disability is measured with respect to functions related to the entire upper extremity, i.e. DASH scores, rather than with respect to a more specific regional site (Lindhovius et al., 2008). A large variability in DASH scores in upper-extremity disorders was found to arise from psychosocial rather than physical factors (Ring et al., 2006).

Female subjects are known to report higher level of musculoskeletal pain and disability, although objective findings, such as range of motion and abduction strength, did not differ between the genders (Roh et al., 2012a; Roh et al., 2012d). Musculoskeletal pain or disability has been reported to be both more prevalent (Leveille et al., 2005) and worse in women (Bingefors and Isacson, 2004), which could be due to a higher physical vulnerability (Wijnhoven et al., 2006) or sensitivity to pain (Wolfe et al., 1995) in the gender. This gender-specific effect was reported not to be confined to a specific physical subscale but rather involved all physical components of SF-36 and DASH.

Functional assessment is also influenced by the prevalence of degenerative musculoskeletal disorders such as osteoarthritis and rotator cuff disease. In individuals older than 65 yr, osteoarthritis of the knees and hands and rotator cuff diseases are the most prevalent causes of musculoskeletal pain. A high prevalence of these degenerative musculoskeletal diseases has been previously demonstrated (Picavet and Hazes, 2003), and prevalence of concurrent

upper and lower extremity pain in those older than 65 yr is estimated to be greater than 40% (Scudds and Robertson, 2000).

CONCLUSIONS

Much progress has been made in validation of functional assessment of upper limb conditions, and currently there is a growing number of instruments for each of the main groups of upper limb conditions. The upper limb instruments reviewed in this article allow for assessments of various aspects of functional problems related to upper limb conditions. Furthermore, functional outcome measures of upper limb are affected by differences in cultural, psychological, and gender aspects of illness perception and behavior. Therefore, comprehensive assessment of upper limb function requires measures of impairment or disability as well as generic measures of health-related QOL. Standardized assessments of regional musculoskeletal disabilities and general health status may help clinician in treatment decision-making and in interpretation of treatment outcomes of upper limb conditions. Clinicians and researchers should be aware of the characteristics of each outcome instrument and select the upper limb outcome instruments which most appropriately address the primary purpose of a given research.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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