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Rating scales for low back pain

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Abstract

Introduction During the past decades several rating scales have been developed to assess the functional status of patients with low back pain.

Methods We performed a search using the keywords 'spine' in combination with 'scoring system', 'scale', 'scores', 'outcome assessment', 'low back pain' and 'clinical evaluation'.

Results Twenty-eight scoring systems are currently available for the evaluation of low back pain. Each of them evaluates low back pain using specific variables. All these scoring systems are presented.

Discussion Although many scoring systems have been used to evaluate the back function, we are still far from a single outcome evaluation system that is reliable, valid and sensitive to clinically relevant changes, taken into account both patients' and physicians' perspective and is short and practical to use.

Conclusion Further studies are required to evaluate the reliability, validity and sensitivity of the low back pain scoring systems used in the common clinical practice.

Key words low back pain rating scores assessment

Introduction

Low back pain (LBP) is a common symptom, affecting more than 80% of the general population in the industrialized world.[1] It is the most frequent cause of disability in people under 45 years of age.[2] It represents a relevant social and economic problem in developed countries, being the first reason for orthopaedic consultations.[3]

The development of instruments to measure the outcome of patient with LBP has been the subject of increasing interest. During the past decades, several score systems have been developed to assess the functional status of patients with LBP.[4–7] Many generic and disease-specific measures are available for orthopaedic clinical and research practice.[8] Self-report questionnaires of pain and functional status allow one to evaluate patients before and after a given treatment, and they can be used to detect short-term or long-term clinical changes of symptoms and disabilities.[9]

The aim of this review is to report all the available score systems for the evaluation of LBP and their use in the current orthopaedic practice.

Materials and methods

We performed a search using the keywords ‘spine’ in combination with ‘scoring system’, ‘scale’, ‘scores’, ‘outcome assessment’, ‘low back pain’ and ‘clinical evaluation’, with no limit regarding the year of publication. The following databases were accessed on 20 February 2009: PubMed (http://www.ncbi.nlm.nih.gov/sites/entrez/); Ovid (http://www.ovid.com); Cochrane Reviews (http://www.cochrane.org/reviews/). Given the linguistic capabilities of the research team, we considered publications in English, Spanish and Italian. Two authors (U.G.L. and M.L.) independently read the abstract of each publication identified (if an abstract was available). If no abstract was available, the publication was excluded. In addition, the references section of all the publications identified were studied to ascertain whether other relevant material could be found. The personal collection of scientific material of the senior authors (N.M. and V.D.) was consulted for the same purpose. If deemed relevant, all relevant publications were retrieved. The most relevant material was drawn between the years 1990 and 2007. A large number of publications focusing on surgical techniques of the lumbar spine, not including outcome scores, were not included. The publications thus selected were examined by all authors. After this further selection, 94 publications relevant to the topic at hand were included (Fig. 1).

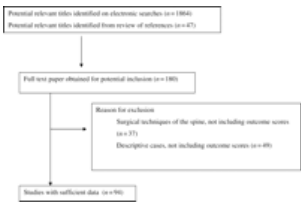

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Fig. 1
Details of the investigations excluded and included in the study.

Analytical description of LBP scoring systems

Roland–Morris disability questionnaire

The Roland–Morris disability questionnaire[10] is constructed by choosing statements from the sickness impact profile (SIP), which is a 136-item health status measure covering a range of aspects of daily living about physical and mental function.[11,12] The scale consists of 24 yes/no items related specifically to physical functions to specifically assess the disability from LBP (Table 1). The physical functions considered include walking, bending over, sitting, lying down, dressing, sleeping, self-care and daily activities. Patients are asked whether the statements apply to them that day (i.e. the last 24 h). In the scale, one point is given for each item. The RDQ score can be obtained by adding up the number of items checked. The final score ranges from 0 (no disability) to 24 (severe disability). The questionnaire is self-administered by the patient, it can be completed in a maximum of 5 min, and an un-weighted score can be calculated in less than 1 min.

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Table 1
The Roland–Morris disability questionnaire.

The original RDQ also contains a six-point pain rating scale in the form of a pain thermometer.[10] However, the authors prefer to use the pain scale of SF-36 instead of scale described in the original article.[13]

Variants of Roland–Morris disability questionnaire

The RDQ-23[7] (Table 2) is a modified 23-item version of Roland–Morris

disability scale. In this instrument five original items are deleted and replaced with other four items which the authors selected from the SIP. The five deleted items are 'Because of my back, I lie down to rest more often', 'Because of my back, I try to get other people to do things for me', 'My appetite is not very good because of my back', 'Because of my back pain, I get dressed with help from someone else' and 'I sit down for most of the day because of my back'. Each item is scored with 0 or 1 point and the final score is obtained by adding up item scores, ranging from 0 to 23.

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Table 2
The Roland–Morris disability questionnaire 23-item version.

The RDQ-18[14] (Table 3) is a shorter modified version of Roland–Morris disability scale, in which items 2, 15, 17, 19, 20 and 24 are deleted. The other questions are the same of original questions. Item reduction is obtained by measuring the frequency of item endorsement, calculating the inter-item correlations and determining the internal consistency of the questionnaire. The original version scoring scheme is maintained.

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Table 3
The Roland–Morris disability questionnaire 18-item version.

The RDQ-16[15,16] (Table 4) is a modified 16-item Roland–Morris disability scale designed to measure the limitations in daily living in the past 2 weeks due to back pain. Each item can be answered as follows: 'yes', 'no', 'don't know' or 'not applicable'. For scoring, the number of affirmative answers is divided by the number of questions answered. The final score is expressed by the percentage of items checked with higher scores representing greater limitations.

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Table 4
The modified 16-item Roland–Morris scale.

The RDQ-two time version (RDQ-two)[17] (Table 5) is a modified version of Roland–Morris disability scale produced to assess the LBP over the preceding 4 weeks. Patients have to mark how many days in the previous 4 weeks they had been affected by LBP. Each question has different possible answers and is scored with a 4-week time scale, ranging from 0 to 1 and according to how many days patient is affected: 'not at all' or 'not applicable' are scored with 0 points; '1–7 days' is scored with 0.2 points; '8–14 days' is scored with 0.4 points; '15–21 days' is scored with 0.6 points; '21–27 days' is scored with 0.8 points and 'every day' is scored with 1 point. The number of questions and the domains investigated are the same of the original version. The final score is calculated by dividing the patient total score by the maximum possible score (24) to express the result as a percentage.

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Table 5
The Roland–Morris disability questionnaire two.

The RDQ-7p[18] (Table 6) is a modified version of Roland–Morris disability scale in which a seven point Likert scale is used. This version consists of original wording and original scheme. For scoring, yes/no responses are

labelled as follows: 0 points means 'disagree totally', 3 points means 'not sure' and 6 means 'agree totally'. The final questionnaire score is expressed as percentages of the total possible score with higher scores representing greater disability.

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Table 6
The Roland–Morris disability questionnaire 7p.

The RDQ-12 (Table 7), also named the Maine–Seattle back questionnaire, is a 12-item version of Roland–Morris disability scale derived from the RDQ-23.[19] It is a short self-administered back-specific questionnaire. Like the original scale, the final score is obtained with an unweighted sum of each item score. Thus, the RDQ-12 score can range from 0 (no impairment) to 12 (severe impairment).

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Table 7
The Roland–Morris disability questionnaire 12-item version.

Oswestry disability index

The original Oswestry disability index (ODI) (version 1.0)[20] (Table 8) includes 10 sections of questions that evaluate the activities of daily living, which can be drastically influenced by LBP. The sections have been selected from experimental questionnaires that aimed to assess several aspects of daily living. The ODI domains are the following: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life and travelling. Each section contains six statements that are scored from 0 (minimum degree of difficulty in that activity) to 5 (maximum degree of difficulty). If more than one statement is marked in each section, the highest score should be taken. The total score is obtained by summing up the scores of all sections, giving a maximum of 50 points. The final score is expressed as a percentage with the following formula: (total score/(5 × number of questions answered) × 100%. For example, if all 10 sections are completed the score is calculated as follows: 16 (total scored)/50 (total possible score) × 100 = 32%. If one section is missed (or not applicable) the score is calculated as follows: 16 (total scored)/45 (total possible score) × 100 = 35.5%.[21]

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Table 8
The Oswestry disability index (version 1.0).

The authors suggest rounding the percentage to a whole number for convenience. The higher the percentage, the greater the perceived level of disability by the patient. The total score ranges from 0 to 100%, with 0 representing no disability and 100 representing maximum disability. A total score between 0 and 20% means minimal disability; between 20 and 40%, moderate disability; between 40 and 60%, severe disability; between 60 and 80%. crippled; between 80 and 100%, bed bound or symptom magnifier.[20]

The questionnaire is self-administered by the patient, it is usually completed in less than 5 min and scored in less than 1 min.

Versions of the ODI

Several versions of the ODI are available.[21] The original version 1.0[20] was published without section 8 (sex life) or section 9 (social life).[22] Moreover, there are two studies. in which the administration of the ODI by telephone

The Medical Research Council group produced a modified version of the ODI (version 2.0)[25] (Table 9), which has been proposed for general use.[26–28] It has been distributed by correspondence and is available as part of a computer interview in the UK (slightly modified)[25,29] or in the USA through MODEMS (PO Box 2354, Des Plaines, IL 60017–2354). In this version the following domains are included: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life (if applicable), social life and travelling. Each section contains six statements, ranging from 0 to 5, and patients should answer the questions in relation to that day ('today'). The standard scoring method can be used to obtain the final disability score.[20,21]

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Table 9
The Oswestry disability index (version 2.0).

A revised Oswestry Disability Questionnaire (Table 10) was published by a chiropractic study group in the UK.[30] This version consists of 10 sections: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling and changing degree of pain. Also in this version each section contains six statements, ranging from 0 to 5, and the final score is calculated with standard scoring method.

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Table 10
The revised Oswestry disability index.

A modified ODI published by Fritz and Irrgang[31] (Table 11) is similar to the modified ODI used by Hudson-Cook *et al.*[30] The questionnaire consists of 10 domains: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling and employment/homemaking. A section regarding employment and home-making ability is substituted for the section related to sex life. Each domain contains six statements, scored from 0 to 5, with higher values representing greater disability. The final score is obtained with standard scoring method.

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Table 11
The modified Oswestry disability index.

The American Academy of Orthopaedic Surgeons (AAOS) and other spine societies have modified version 1.0 to use it like their spine outcome instrument[32] (Table 12). This version includes seven sections: personal care, lifting, walking, sitting, standing, sleeping and travelling. The sections 1, 8 and 9 are omitted. Each section contains six statements, ranging from 0 to 5. and patients should answer the questions in relation to 'the past week'.[13] The standard scoring method can be also used for this versions of the ODI, but because it has only seven sections, corrections should be made to obtain the final score.[21]

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Table 12
AAOS/MODEMS.

Another version of the ODI has been published by the North American Spine Society (NASS).[33] This version includes a pain diagram, questions from the SF-36 health questionnaire, questions on neurological symptoms and on the LBP, and a modification of the original ODI.[13]

The Quebec back pain disability scale (QBPDS) (Table 13) is a 20-item condition-specific questionnaire to assess the degree of disability in patient with back pain.[34] Item selection was performed from 46 disability items by examining the test-retest reliability and responsiveness of individual items, by using techniques of factor analysis and by application of item response theory.[35] The QBPDS assess disability by evaluating the following daily tasks: self-care, sleeping, walking, climbing stairs, sitting, standing, lifting large or heavy objects, bending and stooping, physical activities and houseworks. Social life, sex life and pain intensity are omitted; so pain should be evaluated with other scoring system. Each one of 20 daily activities is scored with a six-point difficult scale ranging from 0 ('not difficult at all') to 5 ('unable to do'). The item scores are added up in order to obtain the disability score, which ranges between 0 and 100. The higher values represent greater disability, and sub-scores are not reported.[34]

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Table 13
The Quebec back pain disability scale.

The questionnaire is self-administered by the patient, it can be easily completed in about 5–10 min, and scored in less than 2 min.

The Waddell disability index

The Waddell disability index (WDI) (Table 14)[36] is nine-item scale which assesses disability by evaluating daily living activities commonly restricted by LBP. The items included are: lifting, sitting, standing, travelling, walking, sleeping, social life, sex life and putting on footwear. Items about work, self-care and sports are not included. Questions are not related to a specific time period and are selected from a previous questionnaire[37] and pilot interviews. Patients answer to questions only with positive or negative statement (yes/no). The final score is calculated by adding up positive items, and ranges from 0 to 9.[36]

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Table 14
The Waddell disability index.

The questionnaire is easy to administer; it can be filled out in about 5 min and scored in less than 1 min. It was validated on a chronic LBP population.

The Million visual analogue scale

The Million visual analogue scale (MVAS) (Table 15) is a 15-item questionnaire about disability and pain intensity in patients with LBP.[38] The 15 questions investigate the body functions (pain, sleep, stiffness and twisting), daily activities (walking, sitting, standing and work) and social life. Information about item selection process is not available. Score is given on a 100 mm visual analogue scale(VAS). For example, if patients are asked to quantify the severity of his pain (like the first question), they mark a point on a 100-mm line in which the end points are labelled as 'no pain' and 'intolerable'. In each question, it is possible to obtain an index of severity of symptoms in a patient-specific fashion measuring the distance of the marked point from the origin of the line. The final score is calculated by adding up the equally weighted scores.

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Table 15
The Million visual analogue scale.

about 2–3 min.

The low back outcome score

The low back outcome score (LBOS)[39] (Table 16) is designed as a self-reported measure to assess the patients with LBP. It is a 13-item questionnaire, and it includes weighted questions about current pain, employment, domestic chores, sport activities, resting, medical treatments or consultations, drug use, sex life and daily activities (such as sleeping, walking, sitting, travelling, dressing).

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Table 16
The low back outcome score.

The pain question is answered with an 11-point VAS ranging from 'no pain' to 'maximum pain possible'. However, for scoring, the 11 answer possibilities are reduced to four categories (0–2, 3–4, 5–6, 7–10). All the other questions offer an answer for different possibilities, except the sport activities and resting questions, which provide three different answers.

The answering possibilities of each item are scored with a four-point scale, but questions are differently weighted. Three different groups of questions can be identified. Items with a nine-point scoring system (pain, employment, domestic and sport activities) in which the score can be 0, 3, 6 or 9 points. Items with a six-points scoring system (resting, treatment or consultation, analgesia and sex life) in which the score can be 0, 2, 4 or 6 points. Items with a three-points scoring system (sleeping, walking, sitting, travelling, dressing) in which the score can be 0, 1, 2 or 3 points. The final score is obtained by summing the score of each item and it ranges from 0 to 75, with lower values representing greater disability.

The questionnaire can be completed in about 5 min and scored in less than 1 min.

The low back pain rating scale

The low back pain rating scale (LBPRS)[40] (Table 17) is a rating system designed to evaluate the clinical outcome of LBP patients. This instrument includes three different components: pain, disability and physical impairment. The pain component consists of six questions divided into two groups: three questions about back pain and three questions about leg pain. Each item is scored with the VAS. Items are the following: LBP/leg pain at the time of examination (0–10 points), the worst LBP/leg pain within the last 2 weeks (0–10 points) and the average level of the back pain/leg pain during the same period (0–10 points). The final score ranges from 0 to 30 for both low back/leg pain. Therefore, the pain component in total gives 0–60 points. The disability component consists of 15 questions evaluating the patient's ability to perform daily activities, such as sleeping, ability to perform houseworks, walking, sitting, lifting, working, dressing, driving, running, getting up from a chair, climbing stairs, contact with people and expectations of future pain. Each question can be answered with three different possible answers and is scored with a three-point Likert scale. Answers are the following: 'yes' (0 points), 'can be a problem' (1 point) or 'no' (2 points). The disability component gives a total score of 0–30 points. The physical impairment component is evaluated by measuring the back muscle endurance, spinal mobility, patient mobility and use of analgesics. Muscle endurance and spinal/patient mobility are recorded with specific physical test, and each is scored on a scale ranging from 0 to 10. Use of analgesics/NSAID is scored as follows: 'no use during a week' (0 points); 'use of NSAID/non-narcotic analgesics up to 4 times a week' (2 points); 'use of NSAID/non-narcotic analgesics more than 4 times a week' (4 points); 'use of morphine/ analogues up to 4 times a week' (8 points) and 'use of morphine/analogues more than 4 times a week' (10

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Table 17
The Low back pain rating scale.

The three different components are weighted: 60 points for pain scoring, 30 points for disability and 40 points for physical impairment. Therefore, combining them, the final LBPRS score ranges from 0 (in patient without back problems) to 130 (in disabled patient). The questionnaire can be filled out in about 15 min and scored in about 3–5 min.

The NASS lumbar spine outcome assessment instrument

The NASS lumbar spine outcome assessment instrument (NASS LSO) was first published by Daltroy *et al.*,[33] and is derived from a consensus of the NASS. It consists of 62 main question obtained from three different existing questionnaires: the SF36, a modified ODI and a modified employment assessment published by Bigos.[41]

The NASS data are grouped into five categories. The first group consists of demographic data (age, sex, race, education and insurance information). The second group consists of the medical history (diagnosis, past surgeries, comorbidities, etc.). The third group includes: pain, neurogenic symptoms and function. These domains are measured by a modified ODI version. The fourth group is represented by employment history, evaluated by a score system published by Bigos *et al.*[41] The fifth group consists of data about outcomes of treatment, but it is included only in the follow-up module.

The scoring is complex and subscores are extractable (modified ODI, SF36, pain and disability scale, neurogenic symptoms scale, job exertion scale, expectation and satisfaction scale).[42] The questionnaire is long and it takes 20 min to be filled out.

The clinical back pain questionnaire

The clinical back pain questionnaire (CBPQ) (Table 18), also known as the Aberdeen LBP scale, is a 19-items questionnaire, consisting of questions commonly used in the clinical assessment of patients with LBP.[43] It includes questions about body functions (pain, sleep, bending, loss of feeling and leg weakness) and questions about daily activities (self-care, walking, sitting, standing, sport, housework and resting). There are 6 multiple choice questions and 13 single choice questions. Answering possibilities for each question can vary between three and six items. The answer categories to each single choice question are scored in an ordinal manner (e.g. 0, 1, 2, 3 points, etc.), while multiple choice questions' responses are assigned a score of one point. The 'back pain severity score' is calculated by summing the score of the responses' to each question, and then it is converted to percentages. The final score ranges between 0 and 100 with the higher values representing greater disability.

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Table 18
The clinical back pain questionnaire.

The questionnaire is easy to administer, can be completed within 5–10 min, and scored within 3 min.

The resumption of activities of daily living scale

The resumption of activities of daily living scale (RADL) (Table 19) scale is designed to assess broad areas often affected by back injury.[44] The scale measures the extent of resumption of a person's 'usual' activities since the time of injury. The final 12-item RADL includes the following areas: sleeping patterns, sexual activity, self-care, light and heavy household

recreational activities and paid employment. Each item is scored with a graphic scale ranging from 0 (not at all) to 100% (complete resumption). The total RADL score can vary from 0 to 100; it is obtained by summing across the items and dividing by the number of items. At least 9 items of the 12 questions have to be completed to calculate a total score for each patient.

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Table 19
The resumption of activities of daily living scale.

The functional rating index

The functional rating index (FRI) (Table 20) is a 10-item scoring system designed to measure both patient's perception of function and pain of the spinal musculoskeletal system.[45] The instrument includes: eight items focus on daily activities (sleeping, self-care, travel, work, recreation, lifting, walking and standing) that can be affected by a spinal disease and two items focus on two different aspects of pain (intensity and frequency). Each item is scored with a five-point scale ranging from 0 (no pain or full ability to function) to 4 (worst possible pain or unable to perform a specific function at all). The index score is achieved by adding up the equally weighted scores, dividing by the maximum possible score, and multiplying by 100%. When all 10 items are answered, the formula is the following: (total score/40) $\times$ 100%. The final score ranges from 0 (representing absence of disability) to 100% (representing severe disability). Therefore, the higher the score the higher the perception of dysfunction and pain.

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Table 20
The functional rating index.

The back pain functional scale

The back pain functional scale (BPFS) (Table 21) is a self-report measure evaluating patient's functional status in clinical and researching settings.[46] Item selection was from existing questionnaires (such as SIP,[47] OLBPD,[20] QBPD,[34] Dallas pain questionnaire(DPQ),[48] RMQ,[10] MOS-36,[49] PSFS[50]) and interviews with physical therapists. Items reduction was performed by examining the test-retest reliability, internal consistency, content and construct validity. The final version of the BPFS consists of 12 items, investigating work, hobbies, home activities, bending or stooping, dressing shoes or socks, lifting, sleeping, standing, walking, climbing stairs, sitting and driving. Each item is scored with a six-point scale, in which 0 means unable to perform activity, 1 extreme difficulty, 2 quite a bit of difficulty, 3 moderate difficulty, 4 a little bit of difficulty and 5 no difficulty. The total BPFS score can vary from 0, representing the lowest functional level, to 60, representing the highest functional level.

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Table 21
The back pain functional scale.

The questionnaire takes less than 5 min to complete and about 30 s to score.

The general function score

The general function score (GFS) (Table 22) is a disease-specific instrument consisting of nine items, created to measure physical disability in patients with LBP.[51] The original version consists of 17 items concerning physical activities of daily living. The final GFS includes just 9

of the 17 original items, showing high individual correlations, validity, reliability, responsiveness and feasibility. The final items are walking a flight of stairs; sitting more than 30 min; standing more than 30 min; walking more than 30 min; lifting more than 10 kg; lean over a basin; carry a bag of groceries; make the bed and dressing. Each item can be answered with three possible response alternatives: 'can perform', 'can perform with difficulty' or 'cannot perform'. These responses are respectively scored as 0, 1 and 2 points. The total score is obtained by summing each item's score, but it is represented as a percentage: 0% means no physical disability and 100% means maximal physical disability.

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Table 22
The general function score.

The questionnaire is filled out in about 2 min and scored in less than 1 min.

The patient-specific functional scale

The patient-specific functional scale (PSFS) (Table 23)[50] is a patient self-defined instrument, designed to record and measure a list of disabilities specific for each patient. The questionnaire has three separate sections: pain question set, pain limitation section and pain intensity section. The first section includes a list of activities chosen by the patient. Patients are asked to identify the five most affected activities in their daily living, because of the low back pain. A slightly different version has been also described in a population with neck dysfunction,[52] in which the list of activities includes only three items plus the space for additional activities. To quantify the level of disability, each item is scored with an 11-point scale, ranging from 0 ('unable to perform activity') to 10 ('able to perform activity at pre-injury status level'). The second section assesses the functional limitation from pain during the previous 24 h. Pain limitation is also scored with an 11-point scale, ranging from 0 ('activities have been severely limited') to 10 ('activities have not been limited'). The third section measures pain intensity during the previous 24 h. Scoring is performed using an 11-point scale, in which the orientation is reversed, because 0 means 'no pain' and 10 means 'pain as bad as it can be'.

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Table 23
The patient-specific functional scale.

The PSFS can be administered and recorded in about 4 min. It should be administered during history taking and prior to physical examination. The clinician should read the instructions to the patient and record the activities, the corresponding score and the assessment date. At subsequent reassessments, the clinician reads the follow-up instructions. and records the score of the previously identified activities and the date.[53]

The outcome measure in lumbar spinal stenosis

The outcome measure in lumbar spinal stenosis (OMLSS) (Table 24) is a short self-administered questionnaire for the assessment of patients with lumbar spinal stenosis.[54] The questionnaire includes three sections: symptom severity, physical function and patient satisfaction. The items for each section were selected from a literature consultation and interviews with rheumatologists and orthopaedic surgeons specialized in spine surgery.

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Table 24
The outcome measure in lumbar spinal stenosis.

The symptom severity scale includes seven items: pain severity, pain frequency, pain in the back, pain in the leg, weakness, numbness and balance disturbance. Questions 1, 3, 4, 5 and 6 can be answered as follows: none, mild, moderate, severe and very severe. These responses are respectively scored with 1, 2, 3, 4 and 5 points. Also, question 2 has five possible responses scored with a five-point scale: less than once a week (1 point); at least once a week (2 points); everyday, for at least a few minutes (3 points); everyday, for most of the day (4 points) and every minute of the day (5 points). However, balance disturbance has only three answers: none (1 point), sometimes (3 points) and often (5 points). The symptom severity scale score is calculated by summing score of each answered item and dividing for the number of answered questions. The score can range from 1 to 5. If more than two items are missing, the scale score cannot be obtained.

The physical function scale consists of five questions about walking distance, ability to walk for pleasure, for shopping, for getting around the house and from bathroom to bedroom. All questions are scored with a four-point scale. Questions 2, 3, 4 and 5 can be answered as follows: yes, comfortably (1 point); yes, but sometimes with pain (2 points); yes, but always with pain (3 points) and no, could not perform (4 points). Question 1 can be answered as follows: more than 2 miles (1 point), more than 2 blocks but less than 2 miles (2 points), more than 50 feet but less than 2 blocks (3 points) and less than 50 feet (4 points). The physical function scale score is obtained by adding up score of each answered item and dividing by the number of answered questions. The score can range from 1 to 4. If more than two items are missing, the scale score cannot be calculated.

The patient satisfaction scale includes six questions about satisfaction with the overall result of the back operation, pain relief after the operation, walking ability after the operation, ability to do housework or job after the operation, strength in the thighs, legs or feet and balance or steadiness on feet. All questions are scored with a four-point scale and can be answered as follows: very satisfied (1 point), somewhat satisfied (2 points), somewhat dissatisfied (3 points) and very dissatisfied (4 points). The satisfaction scale score is obtained by summing the score of each answered item and dividing for the number of answered questions. The score can range from 1 to 4. If the number of responses exceed fours, the scale score can be calculated. The questionnaire is very easy to compile and to score.

The back illness pain and disability nine-item scale

The back illness pain and disability nine-item scale (BACKILL)[55] (Table 25) aims to detect disability and response to treatment in chronic low-back pain affected patients. Items are selected from three pre-existing validated instruments: the PAIN-FREE8, which is an 8-item version of McGill Pain Questionnaire;[56] the Functional Assessment Screening Questionnaire with five items,[57,58] which is derived from the original 15-item FASQ;[59] the Oswestry low back pain disability questionnaire with eight items, which is a shorter version of the original OSW.[20] The BACKILL includes two items for pain (aching and tiring), and seven items for mobility (lifting, sitting for 30 min, standing for 30 min, travelling, getting up from a low seat, walking and personal care). Items about pain are scored with a four-point scale: none (4 points), mild (3 points), moderate (2 points) and severe (1 points). Three items about mobility (standing, sitting and getting up from a low seat) are also scored with a four-point scale: easy (4 points), a little difficulty (3 points), a lot of difficulty (2 points) and unable to do without help (1 points). Resting mobility items are scored with a six-point scale in which possible answers are specific for each question. Moreover two additional items can be included (fearful and punishing-cruel). They are scored separately from BACKILL items, with a

four-point scale. The questionnaire is self-administered and it is easy to complete and to score.

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Table 25
The back illness pain and disability nine-item scale.

The Bournemouth questionnaire

The Bournemouth questionnaire (BQ)[60] (Table 26) is a short-form multidimensional questionnaire designed to measure the outcomes in back pain patients. The items included in the questionnaire were obtained by reviewing the literature. Seven aspects of the back pain experience were selected. These aspects were the most commonly measured, and showed significant responsiveness to clinical change. Domains are the following: pain intensity; ability to perform daily activities and social activities; anxiety status; depression status; pain interference with work activities and pain locus control. Each item is scored with an 11-point numerical rating scale from 0 to 10. A total score can be obtained by summing result of each item, although the authors recommend to express the total score of the BQ as a percentage. The questionnaire can be completed and scored quickly.

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Table 26
The Bournemouth questionnaire.

The Dallas pain questionnaire

The DPQ[48] (Table 27) is a 16-item instrument to assess the four aspects of daily living affected by chronic back pain: day-to-day activities, such as pain and intensity, personal care, lifting, standing, sitting, walking and sleeping; work and leisure activities, such as social life, travelling and vocational; anxiety-depression status, including anxiety and mood, emotional control and depression; and social interest, such as interpersonal relationship, social support and punishing responses. Each item is scored with a VAS, divided into five, six, seven or eight small segments (it depends on the question). Scale extremities are labelled with specific words (e.g. 'no pain'/'all the time') and with percentage (0%/100%). For every specific question, the patient marks the point on the scale which represents his/her condition.

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Table 27
The Dallas pain questionnaire.

For scoring, 0 points are assigned to the left-hand segment, 1 point to the next segment, 2 points to the next segment and so on to the last segment. Item scores are added and multiplied by a constant to obtain the percentage of pain interference with each of four daily living aspects evaluated by DPQ. The constant used for daily activities section is 3, while the constant used for work/leisure activities, anxiety/depression and social interest section is 5. The DPQ can be answered in 3–5 min and scored in less than 1 min.

The disability rating index

The disability rating index (DRI)[61] (Table 28) is a 12-item questionnaire that allows to evaluate the physical function. The DRI includes the following activities: dressing; outdoor walks; climbing stairs; sitting for a longer time; standing bent over a sink; carrying a bag; making a bed; running; light work; heavy work; lifting heavy objects; participating in exercise/sports. The 12 items are divided into three categories: basic daily

life activities (questions 1–4); physical activities (questions 5–8); work-related/vigorous activities (questions 9–12).

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Table 28
The disability rating index.

Each item is scored with a 100 mm VAS. Extremities of the scale are labelled with 'without difficulty' (0 points) and 'not at all' (100 points). Patients mark a point on the line, representing their ability to perform the daily activities included in the question list. For scoring, in each item the distance in mm on the VAS between the zero points and the point marked from the patient is measured. The mean of these measurements is calculated, and the DRI score is expressed as percentage. The DRI is a very quick self-administered questionnaire, and can be scored in less than 2 min.

Jan van Breemen functional scale

Jan van Breemen functional scale (JVB)[62] (Table 29) quantifies back pain. It consists of three different domains: pain, functional capacity and spinal mobility. The pain component includes six questions about back pain in the past week: 'in general', 'at night', 'during the first hour in the morning', 'during sitting', 'during walking' and 'during standing'. Each item is scored with an 11-point scale, ranging from 0 to 10. The functional capacity component includes eight questions about the ability to perform the following tasks during the past week: carrying, walking, standing, sitting, lifting, going outdoors, sleeping and performing household/hobby activities. Each item is also scored with a 0–10 scale. The lumbar spine mobility component is measured with the following tests: lumbar flexion index; lumbar flexion/extension index; lateral bending, fingertips to fibular head (right/left); lateral bending to the right/left, contraction; lateral bending to the right/left, distraction; active straight leg raising (right/left).

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Table 29
The Jan van Breemen functional scale.

The complete JVB (questionnaire and physical test) requires about 20 min.

The occupational role questionnaire

The occupational role questionnaire[63] (Table 30) is a short eight-item instrument to assess the impact of back pain in workers. It consists of two sections: productivity and satisfaction. The productivity component includes four questions about extra work, ability to work quickly, productivity/efficiency and quality of work. The satisfaction component includes four questions about opportunities to improve one's skills, job security, job satisfaction and relations with co-workers. Each of eight item is answered with four possible responses: 'a lot' (scored with 3 points); 'somewhat' (scored with 2 points); 'a little' (scored with 1 point) or 'not at all' (scored with 0 points). The final score is calculated adding up item scores and it is converted to a 0–100 scale. It is also possible to obtain two subscores, one for productivity section and one for satisfaction section. Each of them is calculated with the same format of the final ODQ score.

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Table 30
The occupational role questionnaire.

The spinal pain independence measure[64] (Table 31) is designed to assess the chronic LBP. It consists of three sections: activities related to mobility, activities performed in sitting and standing and activities performed in the room and bathroom. The mobility section includes five items: mobility for short distances, mobility for moderate distances, mobility for long distances, stair management and maximal walking speed. The activity in sitting and standing section includes three items: carrying loads, activity in the sitting position and activity in the standing position. The activity indoors section includes four items: mobility in bed, transfers, washing lower body and dressing lower body.

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Table 31
The spinal pain independence measure.

The physical impairment scale

The physical impairment scale (PIS)[65] (Table 32) is designed to measure the physical impairment in patients with LBP. It includes seven item selected from a pool of 27 physical tests by investigating reliability, ability to discriminate patients and normal subjects, and ability to express the disability. Physical tests included in the final version of PIS are the following: total flexion, total extension, average lateral flexion, average straight leg raising (SLR), spinal tenderness, bilateral active SLR and sit-up. For each item a cut-off value is established to differentiate illness subjects from normal subjects. Each item is scored with 0 points if the test value is normal, or with 1 point if the test value is pathologic. The final score of PIS ranges from 0 to 7 and it can be expressed as percentage.

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Table 32
The physical impairment scale.

The functional outcomes questionnaire for spinal disorders

The functional outcomes questionnaire for spinal disorders (FOQSD)[66] includes the following items: ability to perform heavy activities (such as active sports, heavy housecleaning, gardening, etc.), ability to perform light/moderate activities (such as washing, cooking, light cleaning, etc.), ability to perform activities (such as visiting friends, eating out, etc.), sitting, walking, sleeping, duration of symptoms, depression, level of pain, pain medication usage and overall satisfaction with results.

The pain response to activity and position questionnaire

The pain response to activity and position questionnaire (PRAP)[67] is a 30-item questionnaire consisting of two sections of 15 questions. One section is related to LBP and the other section is related to leg pain. In both groups of questions, for each item the patient describes his/her pain as follows: 'no pain', 'better', 'same' or 'worse'. The PRAP is a patient self-report instrument.

The back pain interference scale

The back pain interference scale[68] is an 18-item questionnaire to measure the restrictions in daily activities due to the back pain. Each question is scored with a 10-cm line scale ranging from 0 (no pain/symptoms at all) to 10 (the worst pain/symptoms). Final score vary from 0 to 180.

An analytic description for every score is presented in Table 33.

View this table:
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Table 33
Analytic description for every score.

Discussion

A wide variety of rating systems to measure functional outcomes in patients with LBP have been described in the past decades. Each of them evaluates low back performance using specific variables, including both objective and subjective criteria. Also, when the same variables are evaluated, different weight is attributed to the single domain. Interpreting these domains becomes difficult, because, even though they can be common to more than one scoring system, each stresses them in a different way. Functional status measures are usually classified as generic or disease specific.[69] Generic measures allow one to evaluate symptoms, functions or organ systems, which are not necessarily spine related; moreover they can be used in all kind of patients. Disease-specific measures assess symptoms and functional limitations related to a specific disease/condition, so in the back pain patient back-related problems are focused.[5] Usually, physicians and researchers use both functional status measures.

Although many back pain score systems are available, the most used in clinical and research settings are: RDQ, ODI, QBPDS, WDI, MVAS, LBOS, LBPRS, NASS and CBPQ.

The RDQ is a health status measure created to assess physical disability from LBP and it is one of the most used in research or clinical settings for monitoring patients.

The RDQ is validated in English,[10] French,[70] German,[71] Greek,[72] Portuguese.[73] Spanish,[74] Swedish,[75] Turkish,[76] Norwegian,[77] Iranian,[78] Moroccan.[79]

The questionnaire is simple to complete and easily understood by patients. Patients completing the RDQ have to mark statements which describe themselves that day. The RDQ score correlate well with the data obtained from other physical function score systems, such as the QBPDS[34] and the ODI.[20] The RDQ has good construct validity, internal consistency, responsiveness and reliability.[13] The test-retest reliability when the test-retest interval is short (24 h) is better than when the test-retest interval is long.

On the basis of the validation study conducted by Roland and Morris, the RDQ should be applied for disability assessment when there is the need to detect short-term changes in back pain or short-term changes in response to treatment. On the contrary, because of the absence of specific domains in the scale, the RDQ is inadequate when the clinicians want to assess the psychological or social problems related to the patient's LBP.[10] For these reason, the RDQ should be integrated with other appropriate outcome measures when this kind of evaluation is required.

The ODI is a functional status outcome measure widely used in the clinical management of spinal disorders. It is validated in English,[20] Finnish,[80,81] French,[82] German,[83] Greek,[72] Norwegian,[77] Iranian.[78] The questionnaire is quick to complete and has good construct validity, pointed out by internal consistency, responsiveness and reliability. The ODI and RDQ scores are highly correlated, with similar test-retest reliability and internal consistency.[25]

In a recent review by Fairbank and Pynsent[21], the authors recommend the use of ODI version 2.0 to detect meaningful changes in disability status in every day life, as when using the RDQ. However, the RDQ is recommended in patients with mild/moderate disability, whereas the ODI is recommended in patients with persistent severe disability.[13] Moreover, unlike the RDQ, the ODI allows one to investigate the patient's social problems and sexual life.

The QBPDS is a condition-specific instrument[34] which assesses only

functional disability and sleep. while it does not evaluate pain. The QBPDS is validated in English, Dutch,[84] French[35] and Iranian.[78] Because of a few validated translations to other languages, it is not as often used as the RDQ or the ODI. Internal consistency, test–retest reliability and responsiveness are satisfactory.[34]

In the validation study by Kopec *et al.*,[34] the QBPDS is recommended both as outcome measurement in clinical trials and as a monitor for the patients' progresses during treatment and rehabilitation programs. Furthermore, it resulted more reliable and at least as sensitive to change when compared with the ODI and RDQ, although some authors found that the test–retest reliability and responsiveness are better for the modified ODI than the QBPDS.[31] However, in the assessment of patients affected by LBP, the QBPDS needs to be associated with an independent pain assessment tool.[85] Moreover, it does not allow to investigate patient's social and sex life, as these items are not included in the score.

The WDI is a short nine-item score system consisting of questions about daily activities. It is validated in English,[36] Spanish and is also available in an unvalidated French version.[86] Internal consistency is higher in the WDI than in the RDQ, but it is lower than in the ODI.[87] Responsiveness is good: the questionnaire is sensible for clinical change 4 weeks after surgery.[43] Following the indications given in the validation study by Waddell and Main[36], in clinical settings, the WDI should be associated with other functional scoring systems to obtain a more complete assessment of disability by evaluating daily living activities commonly restricted by LBP.

The MVAS is a 15-item questionnaire evaluating disability and pain intensity in patients affected by LBP. The main advantage of MVAS scale is that it is easy to use. Despite its good reliability and internal consistency, it should be applied only when previous score are not available because it has received limited validation, and some of its questions could lead to inaccurate answers. As reported in the validation study by Million *et al.*,[38] the correlation between results by different observers is not always satisfactory.

The LBOS is a self-reporting measure for both assessment and outcome in patients with LBP. The LBOS should be applied when physicians need a short general assessment of current or previous back pain, medical treatments, employment, daily activities, sport activities, sex life, etc. Moreover, it is helpful in clinical settings because it is easy to administer and clearly discriminates between pain and disability.[88] Test–retest reliability is high, the internal consistency is good[89] and it correlates well with the ODI and the WDI.[90] Nevertheless, in the LBOS score pain is assessed independently and other items are scored with different scale.[5] In this way, there is an item-weighting bias, because the total score gives different weight to questions.[84] Moreover, the LBOS is validated in English.[39]

The LBPRS is a rating system evaluating the clinical outcome of LBP patients in clinical settings. It assesses pain, disability and physical impairment with a good internal consistency.[42] It is available in English and validated in Danish.[40] The score is influenced by a weighting bias due to the difference in the scoring of pain (obtained with 11-point VAS scale) and scoring of all other items (obtained with a three-point Likert scale).[88] Despite its limitations, including the small number of patients recruited for the validation study, the LBPRS score is recommended in the evaluation of functional pain.[42]

The NASS LSO is another questionnaire designed for the assessment and outcome measurements of patients with LBP. It is validated in English,[33] German[91] and Italian.[92] It represents a complete outcome assessment in which pain is a very dominant factor assessed with several measurements.

indicated clearly by using a pain locator (picture where patient has to mark the location of pain).[84] In the validation study, the authors clearly pointed out how the NASS LSO does not claim to contain the best scales at all but, given its good reliability, validity and easiness in the administration, it should be taken in consideration whenever the clinicians need to monitor patients' progress during treatment. Moreover, it allows pooling of data and it could result useful in clinical trials on LBP treatments.[33]

The CBPQ, also known as the Aberdeen LBP scale, is a clinical assessment questionnaire consisting of questions about body functions and questions about daily activities. It is validated in English[43] and Chinese.[93] Internal consistency, test–retest correlation and responsiveness are acceptable.[43] However, the CBPQ gives different weights to the questions, pointed out by the various answering scales. In the validation study by Ruta *et al.*[88], the CBPQ scale is meant to be used in association with a general evaluation of the patient (such as the one given by SF-36) to identify health gain that enable those who treat back pain to justify their claims on scarce resources. Nevertheless, given the structural problems previously reported, the questionnaire is of limited value.

Grotle *et al.*,[9] according to the three ICF perspectives of health (bodily, personal and social perspective), proposed a division of LBP rating systems into four group: (i) questionnaires mainly assessing activity limitations; (ii) questionnaires mainly assessing activity limitations and few social functions; (iii) questionnaires assessing a mix of activity limitations and impairments; and (iv) questionnaires assessing items derived from all domain of functioning.

Most scores do not appear to have been constructed in a systematic fashion using recommended methodology. There is an increasing need for orthopaedic surgeons both to be familiar with and to routinely use objective measures of outcome for their procedures.[94] There is a trend towards the increased use of validated patient-based scores, but many have not been properly tested for validity, repeatability and sensitivity to change. Scores are not valid when used in a modified form and their use should be discouraged. One of the further areas of study is to compare and contrast two or more scoring scale, to ascertain whether they address the same category of low back function. In conclusion, although many scoring systems have been used to evaluate the low back function, we are still far from a single outcome evaluation system, which is reliable, valid and sensitive to clinically relevant changes, which takes into account both patients' and physicians perspective, and which is short and practical to use.

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