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Measuring Recovery After Ankle Fractures: A Systematic Review of the Psychometric Properties of Scoring Systems

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ABSTRACT

Recovery after ankle fractures places a considerable burden on patients both short and long term. Numerous tools called patient-reported outcome measures (PROMs) have been developed to measure the outcome of ankle fractures. They can assist clinicians to measure the effect, guide intervention, and assess the rate of recovery. We identified and evaluated the psychometric properties of PROMs used in the assessment of ankle fractures. In a systematic search, we examined 4 databases from inception to December 4, 2016. Search terms included ankle fracture, ankle pain, disability, gait, questionnaire, and PROMs. Reference lists were also examined. The inclusion criteria were English studies and adult populations. The psychometric properties of the identified PROMs were examined, including internal consistency, test–retest reliability, validity, floor–ceiling effects, and minimally important clinical differences. We identified 22 PROMs relating to ankle pain and disability. Only 5 were specifically used for ankle fractures. The 36-item short-form health survey and short musculoskeletal functional assessment reported floor–ceiling effects, and the lower extremity functional scale reported good responsiveness and content validity, although these are not tools specifically related to ankle fractures. The ankle-fracture outcome of rehabilitation measure (A-FORM) and the Olerud and Molander questionnaire were ankle fracture specific and assessed for internal consistency and validity. Clinicians should use the most appropriate PROM to evaluate patients' recovery from ankle fractures. The A-FORM currently has the most appropriate evidence supporting its use as a PROM for ankle fracture management and rehabilitation.

Ankle fractures are relatively common and account for 9% of all fracture presentations (1). The estimated incidence of ankle fractures has been reported to be 122 per 100,000 person-years from Edinburgh (2), 187 from Rochester, New York (3), and 147 from Geelong in Victoria, Australia (4). This equates, for example, in Geelong, to 1 of every 700 adults sustaining an ankle fracture annually (4). The most commonly affected people are active young men due to high-energy trauma (5) and older women due to low-energy trauma (6). The Australian Institute of Health and Welfare's National Hospital Morbidity Database documented that >16,500 admissions for ankle fractures to Australian hospitals occurred in 2013 to 2014 (7). Whether ankle fractures are treated with a cast or operatively, this type of fracture generally requires treatment for ≥6 weeks. The most recent Cochrane review supports rehabilitation beginning as soon as the fracture has been appropriately treated (8). During the period of immobilization and rehabilitation, a patient's daily function is greatly impaired (9). Returning to normal activities after treatment varies considerably and can place a considerable burden on patients in terms of their day to day activities (4), including their ability to return to work (10). Complications can also occur during recovery, including infections (11), posttraumatic osteoarthritis (12), and delayed union or nonunion (13,14). Ankle fractures can result in chronic functional impairment and mechanical instability (15) and can require long-term rehabilitation to reverse the effects of muscle atrophy (16).

Numerous tools have been developed to measure the outcomes of health conditions from the patient's perspective. Such tools are referred to as patient-reported outcome measures (PROMs). These allow

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Table 1
Databases searched and search terms

Database	Ankle	Ankle Fracture*	Pain*	Quality of Life	Walk*	Range of Motion	Joint Instability	Questionnaire*	Treatment Outcome or Outcome Assessment
OVID Medline	8628	689	128,437	155,806	84,145	16,707	18,175	391,311	817,549
CINAHL	3741	847	54,807	69,291	15,422	19,082	6128	279,202	220,213
Embase	38,831	9984	374,176	368,981	62,626	34,076	9577	570,393	365,951
Cochrane Library	5105	255	93,082	45,702	5670	6150	754	55,980	135,263

* Denotes truncation for variations in search terms.

clinicians to quantify patients' activities of daily living, pain, and other functional outcomes (17), as prioritized by the patient. PROMs assist clinicians in documenting the outcomes of treatment and can be used to determine the need for intervention. PROMs are typically condition specific, and many have been developed to assess foot and ankle pathology, including foot and ankle instability (18), the effect of osteoarthritis of the ankle (19) and its treatment, and more general outcomes of foot function (20). The aim of the present systematic review was to identify the PROMs used to evaluate foot and ankle function after ankle fractures and to determine the quality of these questionnaires according to their psychometric properties to guide clinicians in the most appropriate tool for future use.

Materials and Methods

The present review was performed and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (21). The population, intervention, comparison, and outcomes model was used (22) to develop the search terms using the Boolean operators "AND" and "OR" to combine each domain. Search terms relating to comparison interventions were not used and truncation (asterisk) was used for variations of search terms. The keyword search terms used to identify the studies using PROMs or tools that elicited the patient's view in the evaluation of recovery after ankle fracture are listed in Table 1. Four electronic databases were searched (OVID Medline, Embase, Cochrane Library, and CINAHL Plus) from inception to December 4, 2016.

Search Strategy

The titles and abstracts of 2166 reports (Fig.) were screened by the 3 of us (R.N., N.B., C.W.) against the inclusion criteria listed in Table 2. Studies were included for full-text review if 2 of us independently agreed on inclusion. Two of us (R.N., N.B.) reviewed these studies; if the full text was not available or the report did not describe the psychometric properties of an ankle fracture-specific PROM, the study was excluded. A total of 59 full-text reports were reviewed against the inclusion criteria. Disagreements were resolved by discussion among all 3 of us (R.N., N.B., C.W.). The reference lists of the included studies were searched using the OVID Medline database to identify additional studies. If a PROM specific to ankle fracture had been discussed within a study without the psychometric properties, the name of the PROM was searched using OVID Medline to determine how the tool was developed. A forward search strategy was also used to determine whether any studies had investigated the psychometric properties of each PROM after development. The review team was not kept unaware of the authorship, date of publication, or journal of publication.

Data Extraction and Quality Appraisal

One investigator (R.N.) extracted the data relating to the descriptors and quality assessment of the PROMs. A second investigator (C.W.) supported this extraction if clar-

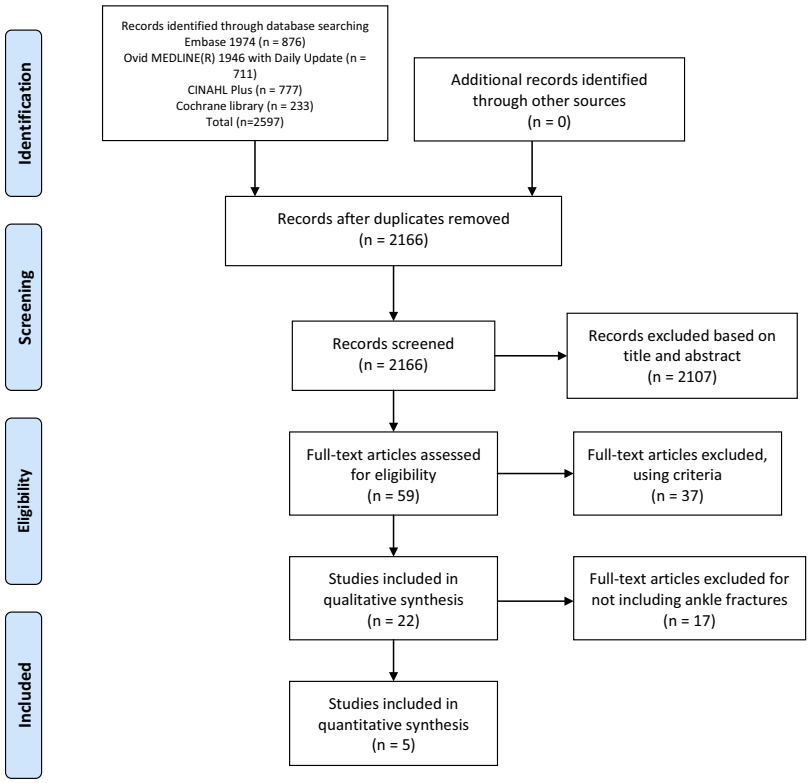

Fig. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.