

Introducing The University of New Mexico 12-Level Functional Scale: A Novel Approach for Assessing Functional Recovery in Orthopaedic Trauma Patients

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ABSTRACT

The University of California at Los Angeles (UCLA) Activity Scale and other common activity scales are primarily used for patients undergoing joint reconstructive surgery. However, no such scale exists for musculoskeletal trauma patients. The authors propose The University of New Mexico (UNM) 12-Level Functional Activity Scale to address this gap in assessing functional activity and managing postoperative care for orthopaedic trauma patients. A comprehensive review of existing scales led to the development of the UNM Scale, emphasizing simplicity, objectivity, and potential benefits in patient education and interdisciplinary collaboration. The UNM Scale provides a structured approach to assess and monitor functional activity levels, relying less on subjective input and incorporating surgeon assessments. It enhances patient comprehension, facilitates surgeon-patient communication, and helps tailor rehabilitation protocols. The proposed UNM Scale may fill a critical gap in orthopaedic trauma care, potentially improving treatment outcomes and patient-provider communication. Further research is needed to validate its efficacy and feasibility in clinical practice.

Keywords: Orthopaedics; Orthopaedic Surgery; Patient Reported Outcomes; Trauma

INTRODUCTION

Quantifying patient baseline functional activity is important for orthopaedic trauma surgeons to define distinct treatment goals in the setting of traumatic musculoskeletal injury. Assessing subjective baseline function offers surgeons an insight into how well their patients recover postoperatively. One approach to evaluating this is by administering activity questionnaires, which evaluate the patient's ability to perform daily activities, satisfaction, and overall quality of life (QoL).¹ Patient-reported outcomes have become key clinical measuring tools in the field of orthopaedics.¹

Originally developed in the 1980s, the University of California at Los Angeles (UCLA) Activity Scale has become the most common measure for assessing physical activity in patients with significant osteoarthritis (OA) who underwent hip or knee arthroplasty (HA)/ (KA).² It is a questionnaire that relies on self-reported data to gauge individuals' engagement in diverse physical activities ranging from sedentary behaviors to vigorous exercise. Due to its widespread implementation, multiple activity scales have also been introduced in recent years aiming to expand upon and improve the foundations of the UCLA Activity Scale.

However, orthopaedic trauma patients present distinct challenges, due to the sudden nature of their injuries

and the diverse range of activities involved in their recovery. Therefore, a more specific functional activity scale may be a more appropriate tool tailored to their needs. This review proposes a unique activity scale, one which may prove beneficial in assessing the preoperative and postoperative function for patients sustaining musculoskeletal trauma requiring operative treatment.

OVERVIEW OF THE UCLA SCALE & OTHERS

Assessing activity levels for lower extremity joint reconstructive surgery has become important for evaluating patient outcomes and was initially proposed with the development of the UCLA Activity Scale.³ This scale was designed in 1984 by Amstutz et al² as a means of quantifying physical activity in patients with varying degrees of OA undergoing HA and KA. It is widely recognized that hip and knee OA can cause significant physical impairment to the individual, warranting joint replacement.⁴ It is beneficial to both the patient and their surgeon to establish objectivity when quantifying physical activity to set expectations as to what degree a major operation can improve the patient's QoL.⁵ The UCLA Activity Scale is a 10-level scale ranging from level 1 (wholly inactive) to level 10 (highly active) [Table 1], and has gained international attention as a clinically

Table 1. Study Patient Data

UCLA Physical Activity Scale [2]	
1	Wholly inactive, dependent on others
2	Mostly inactive, restricted to minimal activities of daily living.
3	Sometimes participates in mild activities such as walking, limited housework, shopping.
4	Regularly participated in mild activities.
5	Sometimes participates in moderate activities such as swimming, unlimited housework, shopping.
6	Regularly participated in moderate activities.
7	Regularly participates in active activities such as bicycling.
8	Regularly participates in very active activities such as bowling or golf.
9	Sometimes participates in impact sports such as swimming, unlimited housework, shopping.
10	Regularly participates in impact sports.*

**This table is the authors' original work using data from the cited source. The reference mentioned in the table is the source of the data.*

concise and convenient patient-reported outcome measure (PROM). However, the original scale's development and primary indications remain undocumented, as no true description of this has ever been formally published. To address its shortcomings, countless other modified scales have been proposed since the UCLA Activity Scale's inception.⁵

A similar, subjective and rather popular, scale is the Lower Extremity Activity Scale (LEAS). Originally developed in 2005, the LEAS focuses on arthroplasty patients and further expands upon the UCLA Activity Scale by providing a total of 18 questions ranging from "I am confined to bed all day" to "I am up and about at will in my house and outside. I also participate in vigorous physical activity, such as competitive level sports daily."⁶ The LEAS and UCLA Activity Scale have both been widely recognized as the two most rigorously developed and validated scales in orthopaedics to date.⁶

The subjective 42-question comprehensive knee injury and osteoarthritis outcome score (KOOS) and condensed 12-question KOOS-12 are other examples. Both are widely used PROMs that provide overall scores for pain, function, symptomatology, QoL, and an overall knee impact score.¹ Given the sheer number of individual questions, the KOOS is cumbersome to complete in a busy orthopaedic trauma clinic. But unlike the UCLA Activity Scale, which primarily measures a patient's overall physical activity on a wide spectrum, the KOOS-12 assesses the impact of knee OA on the patient's pain, function, and QoL.¹

Another widely used activity scale is the Western Ontario and McMaster Universities osteoarthritis index,

which also serves as a PROM in assessing lower limb OA.⁷ This scale has been widely implemented since its original publication in 1988 and has since been utilized as one of the highest-performing outcome measures for patients with knee and hip OA.^{7,8} This scale is a 24-item subjective-based questionnaire that assesses patients' functional status based on three primary categories: pain, stiffness, and physical function.⁷ Much like the UCLA Activity Scale, it relies on distinct input from patients, which leaves it prone to several forms of bias, including recall bias. Nevertheless, it is widely used in clinical practice today and remains extremely relevant in the field of orthopaedic joint surgery.

Other notable examples include the Short Musculoskeletal Function Assessment, Visual Analogue Scale, Short-Form-36, and Physical Activity Scale for the Elderly.⁹⁻¹³ These tools are commonly employed for various orthopaedic conditions, each demonstrating high reliability and validity as outcome measures, effectively gathering subjective patient data such as pain levels and general physical function.

Due to the widespread implementation of the UCLA Activity Scale and subsequent development of similar scales, scale validation should be mentioned. Validation of functional activity is crucial for ensuring their reliability and sustained relevance in clinical practice. Validity ensures that the scale accurately measures what it intends to, while reliability ensures consistent and reproducible measurements. For orthopaedic clinicians, validated scales provide accurate assessment of patients' functional status, guiding treatment decisions effectively. Without validation, there remains a risk of misinterpretation and suboptimal patient care; several studies examining the validity of activity scales are routinely performed to address these issues.^{14,15} Ongoing validation efforts are essential in upholding the integrity and utility of these scales in orthopaedic practice.

THE NEED FOR A TRAUMA-FOCUSED OUTCOME MEASURE

The original UCLA Activity Scale and many of its later counterparts have proven useful in the field of arthroplasty, specifically in patients with significant OA that warrants surgical intervention. The purpose of these scales is to provide orthopaedic surgeons a means of objectively assessing their patients' activity levels postoperatively. However, to the authors' knowledge, no such scale exists for the orthopaedic trauma population. Traumatic orthopaedic injuries often lead to significant long-term musculoskeletal impairments. Therefore, establishing a trauma patient's functional activity levels and tracking them over the course of the postoperative period may prove beneficial in quantifying patient recovery while managing long-term treatment algorithms and rehabilitation programs.

Table 2. Proposed UNM 12-Level Function Scale, designed to assess preoperative function and postoperative functional recovery specifically in patients sustaining traumatic orthopaedic injuries, ranging from fully non-ambulatory to increasing degrees of impact activities.

UNM 12-Level Functional Activity Scale (Trauma-Focused)	
1	Nonambulatory: full assist for transfers (dead lift).
2	Nonambulatory: able to bear weight (upper +/- lower) to assist transfer, needs human assist to complete transfer.
3	Nonambulatory: able to self-transfer with assistive device (eg, walker/cane).
4	Minimal ambulation with walker (takes a few steps).
5	Household ambulation with walker or bilateral devices.
6	Community ambulation with two canes or bilateral devices.
7	Community ambulation with one cane or simple device.
8	Community ambulation with no assist, level surfaces only.
9	Minimal impact: ambulatory on irregular surfaces, stairs with rail, able to lift/carry up to 5 lbs, sedentary work.
10	Light impact: hiking with day pack, stairs without rail, occasional lift/carry up to 20 lbs, light duty.
11	Moderate impact: jogging, backpacking, frequent lift/carry up to 50 lbs, medium duty.
12	High impact: sprinting, jumping, continual lifting up to 100 lbs, heavy labor.

On that account, the authors propose The University of New Mexico (UNM) 12-Level Function Scale, which provides an objective means of monitoring postoperative recovery and is practical for use in high-volume clinic settings (Table 2). This scale is designed to be level-based, with each level encompassing a patient's maximum ambulation. Ideally, the treating surgeon would document a patient's pre-injury function level based on subjective input gathered from the patient and/or their friends/family to establish a functional postoperative goal and gauge recovery. Functional recovery can then be objectively assessed by the surgeon and physical therapists at the bedside, during clinic visits, or throughout rehabilitation sessions during the postoperative period. Using the UNM Scale as a means of objective evaluation would serve two purposes: 1) to quantify the current degree of impairment, and 2) to track progress toward baseline function during the early postoperative recovery period. Special focus on each subsequent level is directed to varying degrees of ambulation and impact activities (eg, non-ambulatory,

community ambulation, minimal/light/moderate/high impact). This scale is designed to be both effective and easy to use, aiming to provide orthopaedic trauma surgeons with a framework to objectively assess and measure their patients' activity levels postoperatively.

DISCUSSION

The UCLA Activity Scale and its counterparts have proven to be beneficial in the arthroplasty field. The goal of these scales remains to provide orthopaedic surgeons an avenue to categorize their patients' activity levels postoperatively. However, to the authors' knowledge, no such scale exists for the orthopaedic trauma population. Traumatic orthopaedic injuries can often lead to significant long-term musculoskeletal disabilities. The number of patients surviving major musculoskeletal trauma has doubled in recent years, further necessitating the need for improving QoL in the immediate and late postoperative periods.¹⁶ Given this, a trauma-focused activity scale that quantifies outcome measures and establishes treatment goals and timelines for a reasonable return to baseline function seems to be a suitable approach.

The UNM Scale provides a unique tool for implementation for several important reasons. Similar to previous scales, the UNM Scale will somewhat rely on subjective input from the patients and their friends/family to define baseline function. But more importantly, it will rely heavily on assessment from the treating surgeon and physical therapist throughout the postoperative period. As previously stated, many of the prior activity scales being used today, specifically the UCLA Activity Scale, utilize self-reported questionnaires filled out by the patients to arrive at an overall score. Such subjective input can be limited by the complexity of the questions themselves and self-reporting information bias.^{17,18} Therefore, a scale with a more objective aspect may be appropriate when evaluating orthopaedic trauma patients. Although assessing pre-injury function would still require subjective reporting either directly from the patient or their friends/family, careful clinical examination by orthopaedic surgeons and physical therapists will provide a new level of detailed assessment of their patients' functional status. Their assessment can therefore be correlated to the corresponding UNM score and tracked over time to monitor improvements or setbacks in functional status.

Next, the UNM Scale is designed to focus on simplicity, aiming to underscore its practicality while promoting patient education and understanding. It seeks to streamline the evaluation process, particularly in the setting of a high-volume orthopaedic trauma clinic, by avoiding the cumbersome nature of a multitude of subjective-based questions utilized by many of its predecessors. The ease of use encourages patients to express their concerns and perspectives with their

providers, while also ensuring the highest standards of care are maintained throughout the surgical treatment and rehabilitation periods.¹⁶ Integrating feasibility considerations with proper communication and transparent expectations can be initiated from the start of treatment, enhancing patient education and comprehension. Moreover, using a common reference system may help articulate patient preferences with their surgeons, and can be further supplemented by interactive visual aids or charts in a hospital or clinic setting. Such practices have been shown to strengthen the patient-provider relationship and lead to improved overall health outcomes.¹⁷

Finally, the degree of scale specificity can prove beneficial when surgeons collaborate with their physical therapy colleagues to provide postoperative treatment recommendations. The nature and location(s) of traumatic injury plays a large role in patient outcomes, with high-energy pelvic and lower limb injuries most likely to cause long-term functional impairments after operative intervention.¹⁹ As such, a large portion of orthopaedic trauma patients require prolonged rehabilitation. For example, it is estimated that 90.0% of patients experiencing acute hip fractures require discharge to a post-acute care facility where they can receive the necessary vigorous physical therapy care they need.²⁰ Therefore, a standardized scale may mitigate communication challenges between the surgeon and the physical therapist by providing objective function assessments, allowing both care teams to arrive at a reasonable, yet quantifiable recovery goal for their patients. In this manner, the UNM Scale could 1) be used to develop rehabilitation protocols based on fracture type, treatment, and elapsed time from injury, and 2) establish an obtainable postoperative goal by estimating the patient's pre-injury level.

To demonstrate how the UNM Scale might be used to achieve these goals, let us consider a 70-year-old man with a UNM preoperative score of 8 who undergoes routine intramedullary (IM) nailing for a femoral shaft fracture. Assuming a relatively uncomplicated postoperative course, a hypothetical improvement in functional status would be expected per the UNM Scale as demonstrated in Table 3. The ultimate treatment goal for this patient would be to eventually achieve a postoperative score of 8, matching the previously established preoperative score. By utilizing the UNM Scale, this postoperative goal can not only be explicitly defined at the time of surgery, but improvements (or setbacks) in function may be tracked over the course of the recovery period as well.

Overall, the key goal of this scale is to establish objectivity in a patient's functional activity levels, particularly in the early postoperative period. This may prove

Table 3. Rehabilitation protocols and corresponding UNM score, which illustrates the expected functional status at different postoperative intervals based on fracture type in a hypothetical patient scenario. In this example, a femoral shaft fracture treated with intramedullary nailing is illustrated.

IM Nail for Femoral Shaft Fractures	Corresponding UNM Score
Postoperative day 1 – 7	4
Postoperative week 2 – 6	4
Postoperative week 6 – 12	6
Postoperative week 12 – 18	7
Postoperative week 18 – 36	8
Postoperative week 36 – 54	8

beneficial in managing long-term treatment algorithms and rehabilitation programs to track improvements of physical function, with the ideal goal of returning patients to their pre-injury baseline. Given this, and the apparent absence of a trauma-focused scale in the current literature, the authors believe this innovative concept is worth proposing at this time.

Further research and extensive testing are necessary to evaluate the practicality and validity of the UNM 12-Level Scale in quantifying patient recovery for orthopaedic trauma patients undergoing operative management. This institution is currently conducting a pilot study aimed at validating this scale through a prospective cohort study. The study focuses on a small group of patients with lower extremity fractures who underwent standardized operative treatment per institutional protocols. Adopting an interdisciplinary approach to define the patient's baseline function and subsequent postoperative activity levels may yield the most comprehensive results. One proposed approach involves blinding all parties involved – including the patient, surgeon, patient's spouse/close family members, and a certified physical therapist – at defined intervals throughout the recovery period and collecting their individual assessments. Consistency across multiple blinded observers would greatly contribute to the overall validity of the UNM Scale. Future research with larger study groups and diverse traumatic fracture patterns are essential. The authors anticipate that these studies will demonstrate significant correlations between UNM scores and clinical outcomes, as well as favorable feedback regarding practicality and utility of integrating the scale into modern clinical practice. Only with time will it become clear whether a simplistic 12-level functional activity scale specifically designed for orthopaedic trauma patients will prove beneficial in today's world of musculoskeletal trauma.

CONCLUSION

A trauma-focused functional activity scale may prove beneficial in quantifying recovery and guiding treatment recommendations for patients suffering from acute musculoskeletal injuries. To the authors' knowledge, no such scale currently exists in practice. Previous activity scales, such as the UCLA Activity Scale, have been implemented and modified over many years to guide such recommendations and provide objective baselines to orthopaedic surgeons evaluating their patients, particularly in the arthroplasty field. Such a novel idea may prove substantially beneficial in the trauma population to achieve similar results. The authors propose a 12-level maximum function scale to fill this gap in literature with the goal of implementation into modern clinical practice as a convenient and practical option for future orthopaedic trauma surgeons, physical therapists, and their patients alike.

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