

# Utilizing Care Management Platforms to Improve Range of Motion Management & Collection

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## **Abstract**

The active range of motion (ROM), or mobility, of a joint is a fundamental characteristic of optimal musculoskeletal function, and its improvement has been correlated positively with patient satisfaction and outcomes.<sup>1</sup> For this reason, ROM assessments are administered to orthopedic patients to: assess outcomes of procedures, determine the progress of rehabilitation, tailor rehabilitation plans and assist clinicians in managing patient expectations for their recovery. Joint ROM is traditionally assessed during in-person health care provider (HCP) visits throughout the episode of care. While critical to tracking recovery, the current standard of care in orthopedics lacks both volume and objectivity of ROM data points.

The value of ROM may be best described as:

- An objective metric for setting post-treatment patient-expectations
- A motivational tool for demonstrating patient progress to encourage engagement in the care plan
- Providing objective measures of progress to a payor in justifying payment for orthopedic procedures
- Objectively tracking progress toward functional activities correlated with improved joint mobility

Improving access to ROM data has the potential to enhance patient management through recovery by identifying those patients whose recovery is lagging behind expectations. In an attempt to improve access to clinically-relevant data for managing patient recovery, companies such as Zimmer Biomet are innovating with digital tools that allow for more frequent measurement and reporting of ROM by patients from the comfort of home. Such solutions may enable HCPs to accurately manage patient expectations, determine when and why patients lag in their recovery, and intervene when necessary, all while linking surgical endpoints to patient outcomes.

All parties seem to benefit from patient engagement. Studies and literature reviews report that patients with higher Patient Activation Measurement (PAM) scores before surgery, experienced greater satisfaction associated

with improved experience self-efficacy, leading to enhanced motivation for physical therapy, decreased pain scores, and improved mental health.<sup>2,3,4\*</sup> HCPs and health care systems can also appreciate the efficient nature of digital tools with regard to demand and cost resources.

The design of digital tools used in the management of post-operative recovery is aimed at improving the trifecta of innovation success: improved patient outcomes, improved provider efficiency and reducing the burden of resource-demand on health care.

## **Problem Statement**

From the inception of orthopedic medicine, one of the primary objective clinical measures of value has been the active range of movement, or ROM, a joint can comfortably achieve. This freedom of motion is closely tied to human function, surgical outcomes and patient satisfaction<sup>5</sup> and therefore is often identified as one of the goals of orthopedic interventions.

ROM progression can also provide prognostic value for patients which is valuable in both post-operative education and communication for recovery expectations. Moreover, there is a growing interest in connecting the objectives of surgical endpoints with patient outcomes to optimize a plan for each patient.

However, as common as ROM is to orthopedic goals, many health care practitioners do not use goniometers or other devices to accurately measure these movements, preferring to “eyeball” the ROM to validate the progression and success of their procedures. One could speculate that this is because the appropriate framework for setting ROM expectations has not been established in many orthopedic procedures. Recovery curves showing the normative return to mobility following many orthopedic procedures have not been established and the return to functional ROM not well-understood for a given procedure at a population-level.

In addition to the lack of normative data, traditional methods of measuring ROM in-person have multiple constraints including:

- Limited and time-consuming touch points in which to measure ROM
- Medical tourism which can limit the follow-up information a surgeon receives
- Patient access to care, requiring time and personal expense
- Challenge to office visit assessment efficiencies

Given the ubiquity of this measure of orthopedic success and its contributions to functional performance and the advancement of technology making this data collection simple, remote and objective, the addition of ROM collection to care management platforms is an obvious one. Companies such as Zimmer Biomet have innovated in this important area of post-operative management to provide new digital management solutions to maximize care and outcomes.

## Background

### ROM Measurements

Active ROM, simply defined, is the measured degree of movement a joint moves in three dimensional space. Often, motions are categorized into Cardinal planes of motion: Sagittal (flexion/extension), Frontal (abduction/adduction), and Transverse (internal/external rotations). Because it is measured physically in three-dimensional space by a goniometer (a handheld device with two arms – a bit like a protractor) it is commonly measured in-person during a physical therapy evaluation or other treatment.<sup>6\*\*</sup> As 3-D camera technology in smartphones has advanced however, software algorithms have made it possible to capture and interpret previously two-dimensional data. As mentioned earlier, the practice of assessing 3-D ROM during in-person visits is prohibitive for collecting continuous data points which would enable more immediate response and customization of post-operative care. Moreover, there is always the challenge of missed appointments, access to medical care or medical tourism.

While ROM outcomes and recovery curves vary by orthopedic procedure and surgeon's precautions for progression, nearly all procedures measure their success by the patient's return to motion, strength and comfort in functional movements. For example, in primary Total Knee Arthroplasty (TKA), ROM is an important outcome to achieve a comfortable gait pattern, requiring at least 67° of knee flexion to comfortably swing the affected limb from push off to initial heel contact. Climbing

stairs requires a minimum of 83° of knee flexion while descending stairs requires 90° or more. How quickly and comfortably a patient regains this ROM will often dictate their satisfaction with the surgery and success in patient reported outcome measures.<sup>7</sup>

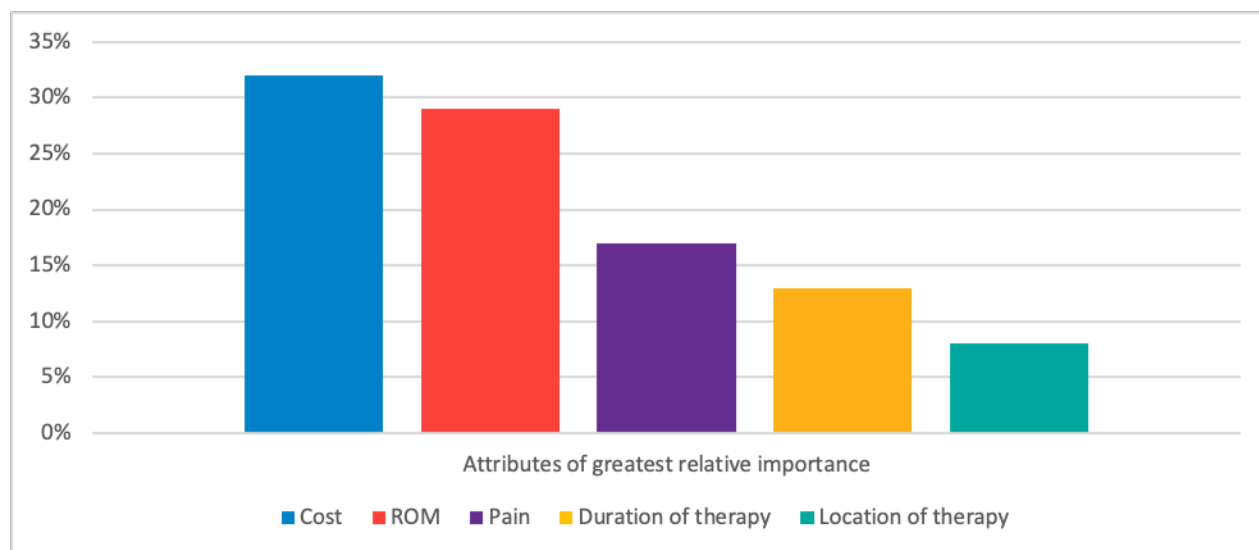
While early initiation of ROM exercises for TKA has been shown to be superior in a clinical trial in yielding better outcomes when started within 24 hours of surgery<sup>8</sup>, it is not clear how optimal ROM can be achieved within each unique patient and surgical procedure. Achieving this optimal ROM remains a mysterious combination of the biology, psychology, physiology and care pathway prescription of each case. While the guidelines are quite clear on the initiation, type of exercises and measurements to be taken, there is not a guideline for the standard frequency or duration of supervised physical therapy post orthopedic surgery.<sup>9</sup> Most treatments aimed at achieving optimal ROM use some combination of stretching (Bonutti, Windau, Ables, & Miller, 1994), manual techniques, and strengthening (Kelley, McClure, & Leggin, 2009).<sup>10</sup>

Similar to TKA, ROM is also measured for shoulder procedures, such as Total Shoulder Arthroplasty (TSA). Similar to studies for TKA, greater postoperative ROM in TSA was significantly influenced by greater preoperative ROM.<sup>11</sup> Further proving the value of capturing ROM throughout the episode of care, up to 13% of primary TSA, patients reported lower satisfaction due to not achieving expected pain and ROM improvements; therefore, it is important to pre-operatively identify patients who are at risk of less improvement, to match patient expectations with anticipated ROM and pain outcomes.<sup>12</sup>

Clearly, ROM is critical for patient satisfaction and for returning to normal activities and measuring ROM is critical in understanding patient progress and success. The path to advancing personalized care begins with tracking episode of care data including outcomes and clinical achievement metrics like ROM.

### ROM and Willingness to Pay

Research has demonstrated that cost and improving ROM are the most important factors to orthopedic patients with pain reported as the third most-important reason to have surgery. In an interesting study by Napora J.K. et. al. the authors conducted a discreet choice experiment (DCE) with upper extremity surgical patients to understand the willingness to pay for various conditions of therapy and outcomes.<sup>13</sup> The study concluded the importance of factors depicted in Figure 1.



Cost was directly correlated to outcomes which demonstrated that patients were willing to spend more money to achieve their desired results with ROM. Specifically, “[P]atients were willing to pay \$85 more per therapy session for a 40% improvement in their range of motion. Patients were willing to pay \$43 more per therapy session to improve from severe pain to mild pain.”<sup>14</sup>

While this study was conducted on upper extremity patients only, and extrapolating the results should be taken with caution, it does reveal important attitudes of orthopedic patients as it relates to the monetary value of achieving certain outcomes related to ROM and pain.

Moreover, the study elucidated that patients are indifferent to the location that the therapy takes place. This is important because it creates the possibility for physical therapy to occur outside the historical context of an office visit. In theory, it allows for digital care management solutions to provide self-directed rehabilitation as an alternative to traditional care.

## ROM and Increase Patient Activation

On a related note, research has demonstrated that shared decision making and higher patient activation (or engagement in their peri-operative surgical planning and recovery) can result in increased post-operative patient satisfaction, decreased pain, better adherence to physical therapy visits and improved mental health.<sup>14,15</sup> When the research is viewed in totality, it underscores the criticality of engaging patients in their post-operative care to optimize outcomes. Digital patient engagement platforms are an effective, low cost solution to achieve greater engagement, while collecting valuable data with the goal of personalizing and optimizing care for future patients.

Thus, ROM data collection through remote, convenient technology is a logical conclusion that involves patients in measuring their ROM at regular and frequent intervals as a part of their continuum of care management.

## Solution

Digital tools are intended to improve the patient experience and improve the ability of the surgeon to adequately measure and assess range of motion. An ideal digital care management platform solution should be able to efficiently collect range of motion measurements and pain scores remotely to track patient outcomes. Patients should be able to track their progress with ROM and other relevant metrics to stay engaged and informed. Additionally, surgeons should be able to easily access specific outcomes and benchmarking to demonstrate results to patients and set expectations. Ideally, this should all be achieved with readily available consumer technology, making collection convenient, easy and impactful to the management of the patient’s condition.

## Conclusion

The integration of digital tools into the post-operative care aims to be able to enhance the patient’s experience and outcomes through a tighter clinical connection with their surgeon and care team. The ease of collecting frequent data aims to provide for a more sensitive customization of rehabilitation plans, helping to over-deliver on patient value drivers for balancing cost containment with clinical improvements. An additional benefit is that robust datasets will provide the entire industry of orthopedics with new information that can aid in understanding the recovery process that further drives innovation and personalization in the field of post-operative care.

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\*mymobility was not used in these studies

\*\*The mymobility app does not capture measurements for internal/external rotation.

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