Editorial

The Value of Measuring Variability in Osteoarthritis Pain

The topic of pain variability has been of interest for decades within the context of rheumatological diseases. Research on short-term pain variability has primarily involved patients with rheumatoid arthritis. In contrast, research on osteoarthritis (OA)-related pain, which is generally considered to be more slowly evolving and somewhat less variable on a day-to-day basis, has primarily focused on longterm changes.

It is certainly important to understand longterm changes in pain and other outcomes in OA, as this provides some clues regarding a likely clinical course, which can vary based on patient characteristics[1]. Yet there is also significant value, from both clinical and scientific perspectives, to describing shorter-term changes in OA-related pain.

In this issue of *The Journal*, Hutchings, *et al* describe results of the Longitudinal Examination of Arthritis Pain (LEAP), one of few studies to explore relatively short-term changes in OA-related pain[2]. Specifically, the authors describe within-week and between-week pain fluctuations in patient-reported pain over a 12-week period, as well as the association of pain variations with changes in other health outcomes. One particularly interesting finding of this study is that the mean within-week pain fluctuation (i.e., difference between lowest and highest pain scores) was 3.9 points (SD 1.9), on a 10-point scale. This variation in pain of about 40% is comparable or larger than changes seen in response to treatment in many OA clinical trials. Similarly, about half of participants reported at least one between-week difference of 2 points or more on a modified 11-point Western Ontario and McMaster Universities (WOMAC) pain subscale, which is arguably a change of clinical importance[3]. Taken together, these findings add to previous evidence that there is important variability in OA-related pain that occurs within months[4], weeks[5], and even days[6-8].

Not surprisingly, changes in pain among the LEAP participants were associated with substantial changes in other common OA-related outcomes, including activity limitation, sleep, mood, and quality of life. Perhaps more interestingly, changes in pain were most strongly associated with productivity, defined as days of missed activity for non-workers and missed work for workers. Productivity is not routinely assessed or reported within the context of OA studies, although it is more commonly described in studies of some other rheumatological diseases. These results argue that productivity may be one of the more important constructs to assess among patients with OA because of its close association with pain in this patient group. Particularly among workers, decreased productivity may have significant personal economic consequences. In addition, this study showed that among workers, productivity decreased when an individual experienced an increase in pain, but productivity was not associated with absolute level of pain. This highlights the importance of measuring pain variations, which can affect other key outcomes in a manner different from patients' average or baseline pain scores.

What are the implications of this and other studies that document substantial variability in OA-related pain? First, there are clinical implications. Understanding patients' patterns of OA-related pain can help with recommendations for timing of medication use or other treatments. Also, helping patients to recognize their own pain patterns can assist with behavioral strategies, such as employing coping techniques or scheduling activity during periods of the day when pain is typically less severe. Second, there are implications for research methodology. Given that OA-related pain can vary considerably with the day or week, the timing of administering baseline or followup questionnaires in clinical trials may be affected by these variations, in addition to any treatment effects. This is less problematic with outcome measures that ask participants to assess their average pain over a specific prior period of time, such as the past week or month. However, even these recall-based measures can be influenced by patients' pain levels at the

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time of outcome assessment[9]. In other words, if a participant is experiencing a high level of pain during survey completion, this could bias their pain recall toward greater levels. There are several measurement strategies that can be utilized within clinical trials, as well as observational or epidemiological studies, to account for pain variability. Studies can attempt to assess repeated pain measures (i.e., pre- and post-treatment in a clinical trial) at the same time of day. Another strategy is to ask participants to report their highest, lowest, and average pain levels during a prior period of time. Although this may still be somewhat affected by recall bias, assessing a range of pain captures patients' experiences more broadly than an average rating alone. Optimally, if resources allow, collecting daily pain diaries can provide a rich source of information regarding patients' pain levels and patterns.

What do we still have to learn about variability in OA-related pain? Since there have been relatively few studies on short-term (i.e., daily or weekly) changes, there is still a need for additional descriptive studies that characterize OA pain variability among different patient samples, including racial and ethnic minorities. There has also been very little work describing factors associated with pain variability. Some research has shown that psychological factors and coping are associated with changes in OA-related pain[6,8], and further exploration of these relationships is warranted as this represents a potential avenue for interventions aimed at pain reduction. In addition, research is needed to understand associations of demographic characteristics, joint sites, treatment factors, physical activity, and clinical and biological factors (such as known OA biomarkers) with OA pain variability.

There are a number of practical challenges to measuring short-term pain variations. Key issues involve participant retention and accuracy and completion rates of pain diary data. In earlier research, the proportion of incomplete or inaccurate pain diary entries was typically very high[10]. However, technological advances have provided improved options for data collection. For example, handheld computers have been shown to dramatically improve compliance and accuracy of pain recording in comparison to paper diaries. One study reported 94% pain diary completion using a handheld computer[11]. Although somewhat costly for large studies, handheld computers are an excellent tool for measuring pain variability. One caveat is that data entry needs to be very simple, particularly to accommodate older adults or other individuals who have little or no experience with these types of devices. In order to achieve reasonable rates of retention and pain diary completion, use of financial compensation, motivational strategies, and/or regular reminders is needed, particularly when participants are asked to record pain multiple times per day for several days. The LEAP study participants were compensated well (maximum of $325 for 13 completed questionnaires), and completion rates were relatively high.

In summary, the study by Hutchings, *et al* in this issue provides useful and interesting information regarding OA-related pain, showing that clinically relevant changes commonly occur on a short-term (weekly) basis as part of the normal course of this disease. Further, these changes have a notable influence on other health outcomes. Although measuring pain variations via real-time diaries is certainly more cumbersome than recall-based or averaged pain assessments, the value of the resulting data makes this effort worthwhile. This kind of assessment provides a richer picture of the influence of pain on patients' daily lives and can enhance both clinical care and research methodology.

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