Sleep Disturbance and Chronic Pain: Interactions and Interventions

Michael V. Vitiello, PhD
Professor of Psychiatry & Behavioral Sciences, Gerontology & Geriatric Medicine, and Biobehavioral Nursing
Co-Director, Center for Research in Management of Sleep Disturbances
Co-Director, Northwest Geriatric Education Center
Editor-in-Chief (for the Americas), Sleep Medicine Reviews
University of Washington, Seattle WA

Presentation Objectives

• Describe the nature of sleep/pain relationships.
• Describe the evolving understanding of the impact of sleep on pain.
• Describe the results of Lifestyles, a RCT designed to examine whether improving sleep in a pain population (osteoarthritis) with co-morbid insomnia results in improved pain.

Sleep and Pain

• Chronic pain is associated with:
  – Increased nighttime sleep-related complaints
    » Vitiello et al., 2004
  – Increased daytime sleep-related complaints
    » Vitiello et al., 2004
  – Increased likelihood of napping
    » Foley et al., 2007
  – Increased nighttime awakenings from sleep
    » Ohayon and Roth, 2003
  – Increased difficulty returning to sleep after waking.
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Sleep and Pain: Questions of Directionality

- Historically it has been assumed that sleep disturbance was secondary to pain.
- The current view is that insomnia is typically co-morbid with pain.
- A growing body of data suggests that insomnia can lead to or worsen pain.
- Emerging data also suggest that improving sleep may improve co-morbid pain.

Sleep and Pain

- Disturbed sleep may maintain/exacerbate pain and related dysfunction.

Sleep and Pain

- Three recent studies have examined the day-to-day predictive relationships between sleep and pain in chronic pain populations:
  - Counter-intuitively, these studies report that, while measures of nighttime sleep quality predict next day pain, pre-sleep pain does not predict subsequent sleep quality.

Sleep and Pain

- A recent systematic review of sleep/pain interactions concluded that sleep disturbance is a stronger predictor for the development and maintenance of chronic pain, rather than vice versa.
- This suggests that improving sleep in chronic pain populations may improve pain outcomes.
Sleep and Pain

Several small intervention trials have evaluated CBT-I in diverse pain populations:

- Currie et al., 2000. CBT-I improved sleep but not pain compared to a waitlist at post-treatment and 3-mo among 60 chronic pain patients.
- Edinger et al., 2005. CBT-I improved sleep but not pain, and sleep hygiene improved pain but not sleep compared to usual care at post-treatment in a sample of 47 fibromyalgia patients.
- Jungquist et al., 2010. CBT-I improved sleep and pain relative to a contact control at post-treatment in 28 patients with mixed chronic neck and back pain.

CBT-I Improves both Sleep and Pain in Older Adults with Co-morbid Osteoarthritis and Insomnia


- CBT-I improved immediate and long-term sleep in OA patients with co-morbid insomnia.
- CBT-I reduced both immediate and long-term pain in these patients, without addressing pain.
- Improving sleep in OA patients with co-morbid insomnia may be “analgesic”.
- The likely reciprocal effects of pain dysfunction and sleep disturbance offer a compelling rationale for integrated management of these disorders.

Sleep as Analgesic: Possible Mechanisms

- Improved sleep quality reduces pain sensitivity.
- Improved sleep quality may result in improved daytime mood and function.
- Improved sleep quality reduces inflammatory risk/inflammation (CRP).

Lifestyles - Cognitive Behavioral Therapy for Arthritis Pain and Insomnia in Older Adults

M.V. Vitiello, S.M. McCurry and M. Von Korff, Co-PIs

- Specific Aim – Will a novel cognitive-behavioral intervention that targets both pain and sleep yield substantially improved sleep, pain, and functional outcomes versus a state-of-the-art cognitive-behavioral intervention that targets pain alone and an education only control in older adults with OA pain and co-morbid sleep disturbance.

Supported by AG031126
**Lifestyles - Cognitive Behavioral Therapy for Arthritis Pain and Insomnia in Older Adults**

- 367 older adults with co-morbid OA and insomnia.
- Randomized to three groups: Education Only Control (EOC), CBT-Pain (CBT-P), CBT-Pain/Insomnia (CBT-PI), each of six weekly 90-minute sessions.
- All treatments were group format led by a single pair of MH professionals.
- Sleep, pain, function, affect and cognition assessed at pre and post-treatment and 9 and 18 months.
- Subjects recruited from an HMO, allowing treatment delivery in primary care clinics and changes in health care utilization and costs to be assessed.

**Lifestyles Study Sample**

McCurry et al., Frequency of Co-morbid Insomnia, Pain, and Depression in Older Adults with Osteoarthritis: Predictors of Enrollment in a Randomized Treatment Trial. *Journal of Psychosomatic Research* 71(5):296-9, 2011.

<table>
<thead>
<tr>
<th></th>
<th>EOC</th>
<th>CBT-P</th>
<th>CBT-PI</th>
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<tbody>
<tr>
<td>N</td>
<td>123</td>
<td>122</td>
<td>122</td>
</tr>
<tr>
<td>Age</td>
<td>73.1 (8.0)</td>
<td>73.0 (8.4)</td>
<td>73.2 (8.1)</td>
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<tr>
<td>% Women</td>
<td>75.6</td>
<td>80.3</td>
<td>79.5</td>
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<tr>
<td>3MSE</td>
<td>93.1 (5.4)</td>
<td>94.0 (4.8)</td>
<td>93.3 (4.4)</td>
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<td>GDS</td>
<td>7.0 (5.6)</td>
<td>6.6 (4.5)</td>
<td>6.5 (5.1)</td>
</tr>
<tr>
<td>% Chronic Illness</td>
<td>49.6</td>
<td>49.2</td>
<td>59.8</td>
</tr>
<tr>
<td>Insomnia Severity</td>
<td>11.5 (5.1)</td>
<td>11.8 (4.7)</td>
<td>11.2 (5.2)</td>
</tr>
<tr>
<td>Pain Severity</td>
<td>4.1 (1.5)</td>
<td>4.3 (1.6)</td>
<td>4.6 (1.5)</td>
</tr>
</tbody>
</table>

**Lifestyles Conclusions**

- Lifestyles interventions, including EOC, were all perceived as comparably credible.
- Subject retention was high: post-treatment = 96.7%, 9-mo = 92.9%, 18-mo = 88.9%.
- CBT-PI significantly improved ISI and SE relative to EOC over 9-mo.
- CBT-PI significantly improved ISI relative to CBT-P, while both improved SE relative to EOC, over 9 mo.

**Lifestyles Conclusions**

- Pain Severity and AIMS were not significantly reduced by any Lifestyles intervention over 9 mo.
- An a-priori planned subgroup analysis of subjects with higher baseline pain (PS > 5), revealed a similar pattern of results.
- At 18 months no outcome measure differed significantly from baseline in any of the three treatment arms, even among persons with severe baseline pain.
**Lifestyles Conclusions**

- **Lifestyles results support the durability of an integrated CBT-PI intervention for reduction of insomnia symptoms through 9 months among individuals with co-morbid OA pain, regardless of severity.**
  

- **Sustained (18 month) treatment effects for any outcome were not statistically significant and did not support the benefits of an integrated sleep and pain intervention over sleep-focused treatment.**
  

**Lifestyles Strengths and Caveats**

- **Strengths:**
  - A large population-based study sample with frequent and multiple co-morbidities beyond insomnia and OA.
  - Treatment delivered at patients’ primary care clinics.
  - A highly credible attention control condition.
  - Excellent subject retention.
  - Moving from testing efficacy to effectiveness.

- **Limitations:**
  - Regression to the mean from screen to pre-treatment.
  - Higher than expected ICCs which limited analytic power.
  - CBT-PI may have diluted CBT efficacy to improve sleep?

**Lifestyles – Lessons Learned**


- **Inspection of effect sizes of the primary outcomes for the full study sample, as well as two sub-samples (high baseline pain severity, high baseline pain and insomnia severity), raise questions about the true nature of the study outcome:**
  - CBT-P vs EOC revealed little or no effects.
  - CBT-PI vs EOC revealed moderate ISI effects which increased with severity and attenuated over time, and small to moderate Pain Severity effects which increased with both severity and time.
Lifestyles – Sleep Improvers Analysis

• We compared Lifestyles subjects whose sleep improved (a baseline to post-treatment ≥30% decrease in ISI, N=131) regardless of treatment versus those who did not (N=223).
• Sleep improvers showed significant, sustained improvements in ISI (P<.001), PSQI (P<.001), Flinders Fatigue Scale (P<.001).
• Sleep improvers also showed significant, sustained improvements in Pain Severity (P<.001), and Arthritis Symptoms (P<.001), but not in catastrophizing or depression.

Lifestyles Final Conclusions
• The overall pattern of Lifestyles findings suggests that successful treatment of sleep disturbance in OA with co-morbid insomnia may yield benefits for reduced pain over the long-term, contingent on achieving robust and sustained improvements in sleep.
  • However, the jury is still out on the impact of improved sleep on chronic pain in older OA patients in particular and pain populations in general.
  • Appropriately powered RCTs to definitively test this sleep/pain relationship remain to be done.
Lifestyles Collaborators

- Susan M. McCurry, PhD – Co-PI
- Michael Von Korff, ScD – Co-PI
- Susan M. Shortreed, PhD – Co-I
- Laura D. Baker, PhD – Co-I (Lifestyles 1)
- Benjamin Balderson, PhD – Co-I (Lifestyles 1)
- Bruce D. Rybarczyk, PhD – Consultant (Lifestyles 1)
- Francis J. Keefe, PhD – Consultant (Lifestyles 1)
- Charles M. Morin, PhD – Consultant (Lifestyles 2)
- Research staffs of the NW Research Group on Aging (NWRGA), University of Washington and the Group Health Research Institute (GHRI), Seattle, WA.
- Supported by the NIA (AG031126)