Insomnia Assessment, Diagnosis, and Current Treatments

S. Justin Thomas, PhD, FSBSM
Assistant Professor
Department of Psychiatry and Neurobiology
Objectives

1) Describe how insomnia is assessed and diagnosed
2) Understand important differential diagnoses
3) Describe current treatment approaches for insomnia
Insomnia diagnosis

• Chronic insomnia is defined by:
  • Difficulty initiating or maintaining sleep
    • Difficulty sleeping is present at least 3 times per week
    • Duration of at least 3 months
  • Adequate opportunity to sleep (rule out insufficient sleep)
  • Associated daytime consequences
• Short-term and “other” insomnia categories exist
• Rule out circadian rhythm disorder
  • R/O is critical because treatments differ!
Psychophysiological insomnia

• Defined in the ICSD-3 as “acquired sleep-preventing associations and increased arousal that results in difficulties falling asleep in the typical home sleep setting at the desired time”

• Perlis & Gehrman (UPenn) define it as a form of chronic insomnia that is perpetuated (see Spielman 3-P Model) by:
  • Psychological (behavioral and cognitive) factors
  • Physiological (hyperarousal) factors
Spielman’s 3-P Model of Insomnia

- **Pre-morbid Insomnia**:
  - Perpetuating factors: 20%
  - Precipitating factors: 20%
  - Predisposing factors: 50%

- **Acute Insomnia**:
  - Perpetuating factors: 100%

- **Early Insomnia**:
  - Perpetuating factors: 50%
  - Precipitating factors: 30%
  - Predisposing factors: 20%

- **Chronic Insomnia**:
  - Perpetuating factors: 20%
  - Precipitating factors: 30%
  - Predisposing factors: 50%
Insomnia assessment

- Clinical interview
  - Focus on frequency and severity of difficulties initiating/maintaining sleep
  - Consider assessing sleep hygiene
  - Rule out differential diagnoses (i.e., circadian phase disorders)

- Sleep diaries
  - AASM Sleep Diary
  - Consensus Sleep Diary

- Actigraphy
  - Validated device that records movement and correlates with sleep/wake activity

- Note: Overnight polysomnography is not necessary or even helpful
AASM Sleep Diary

**TWO WEEK SLEEP DIARY**

**INSTRUCTIONS:**
1. Write the date, day of the week, and type of day: Work, School, Day Off, or Vacation.
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**week 1**
The Consensus Sleep Diary: Standardizing Prospective Sleep Self-Monitoring

Colleen E. Carney, PhD; Daniel J. Buysse, MD; Sonia Ancoli-Israel, PhD; Jack D. Edinger, PhD; Andrew D. Krystal, MD; Kenneth L. Lichstein, PhD; Charles M. Morin, PhD

1Ryerson University, Toronto, Canada; 2University of Pittsburgh School of Medicine, Pittsburgh, PA; 3University of California San Diego, La Jolla, CA; 4Veterans’ Affairs and Duke University Medical Centers, Durham, NC; 5Duke University Medical Center, Durham, NC; 6The University of Alabama, Tuscaloosa, AL; 7Laval University, Quebec, Canada

Study Objectives: To present an expert consensus, standardized, patient-informed sleep diary.

Methods and Results: Sleep diaries from the original expert panel of 25 attendees of the Pittsburgh Assessment Conference were collected and reviewed. A smaller subset of experts formed a committee and reviewed the compiled diaries. Items deemed essential were included in a Core sleep diary, and those deemed optional were retained for an expanded diary. Secondly, optional items would be available in other versions. A draft of the Core and optional versions along with a feedback questionnaire were sent to members of the Pittsburgh Assessment Conference. The feedback from the group was integrated and the diary drafts were subjected to 6 focus groups composed of good sleepers, people with insomnia, and people with sleep apnea. The data were summarized into themes and changes to the drafts were made in response to the focus groups. The resultant draft was evaluated by another focus group and subjected to lexile analyses. The lexile analyses suggested that the Core diary instructions are at a sixth-grade reading level and the Core diary was written at a third-grade reading level.

Conclusions: The Consensus Sleep Diary was the result of collaborations with insomnia experts and potential users. The adoption of a standard sleep diary for insomnia will facilitate comparisons across studies and advance the field. The proposed diary is intended as a living document which still needs to be tested, refined, and validated.

Keywords: Sleep diary, insomnia, sleep assessment

Citation: Carney CE; Buysse DJ; Ancoli-Israel S; Edinger JD; Krystal AD; Lichstein KL; Morin CM. The consensus sleep diary: standardizing prospective sleep self-monitoring. SLEEP 2012;35(2):287-302.
Insomnia assessment

- Clinical interview
  - Focus on frequency and severity of difficulties initiating/maintaining sleep
  - Consider assessing sleep hygiene
  - Rule out differential diagnoses

- Sleep diaries
  - AASM Sleep Diary
  - Consensus Sleep Diary

- Actigraphy
  - Validated device that records movement and correlates with sleep/wake activity

- Note: Overnight polysomnography is not necessary or even helpful except to assess sleep state misperception
Differential Diagnoses

- Advanced/delayed sleep-wake phase disorder*
- Other sleep disorders that produce insomnia symptoms
  - Restless Legs Syndrome (sleep onset insomnia)
  - Obstructive Sleep Apnea (sleep onset and maintenance insomnia)
- Note: there is no primary versus secondary insomnia; insomnia can/often does persist after removing precipitating factor(s)
Insomnia Treatment Options

• Pharmacotherapy
  • Non-benzodiazepine hypnotics
  • Benzodiazepines
  • Belsomra/suvorexant (orexin receptor antagonist)
  • Rozerem/ramelteon (melatonin receptor agonist)
  • Trazodone
• Melatonin and other OTC products
• Sleep hygiene
• Cognitive Behavioral Therapy for Insomnia (CBT-I)
ACP Recommends Cognitive Behavioral Therapy as Initial Treatment for Chronic Insomnia

Philadelphia, May 3, 2016 -- Cognitive behavioral therapy for insomnia (CBT-I) should be the first-line treatment for adults with chronic insomnia, the American College of Physicians (ACP) recommends in a new evidence-based clinical practice guideline published today in Annals of Internal Medicine.

“Cognitive behavioral therapy for insomnia is an effective treatment and can be initiated in a primary care setting,” said ACP President Wayne J. Riley, MD, MPH, MBA, MACP. “Although we have insufficient evidence to directly compare CBT-I and drug treatment, CBT-I is likely to have fewer harms. Sleep medications can be associated with serious adverse effects.”
The Problem With Melatonin

- Erland & Saxena, JCSM, 2017
- 31 supplements tested
  - Melatonin content ranged from 83% less to 478% greater than the labeled content
  - Lot-to-lot variability was found to be as high as 465%
  - Serotonin was identified in 8 of the 31 supplements (26%) at levels of 1 to 75 micrograms
  - Melatonin did not meet labeled dose within a 10% margin in more than 71% of supplements
- Look for USP label
Sleep hygiene education

- Maintain a consistent sleep/wake schedule
- Avoid caffeine after noon
- Avoid napping/don’t take long naps
- Avoid bright light in the evenings
- Don’t eat heavy meals right before bedtime
- Don’t exercise right before bedtime
- Don’t go to bed until sleepy?? (stimulus control)
- Get out of bed when you can’t sleep?? (stimulus control)
Sleep hygiene is not a stand-alone treatment

- Sleep hygiene is employed in primary care and, unfortunately, many sleep clinics
- Evidence suggests sleep hygiene by itself does not necessarily improve sleep
- Sleep hygiene is often used as an active control in research studies
- Current AASM guidelines recommend against sleep hygiene as a stand-alone treatment (JCSM, 2021)!
What is Cognitive Behavioral Therapy?

Thoughts

“I am socially awkward”

Behaviors

Seclusion

Mood

Anxious
Depressed
What is CBT-I?

- CBT-I is a cognitive and *behavioral* intervention for insomnia that includes:
  - Sleep hygiene education
  - Sleep compression/restriction
  - Stimulus control
  - Relaxation techniques
  - Cognitive therapy
- CBT-I is tailored to the patient and can be modified (e.g., CBT-I for peri-menopausal women)
Sleep compression/restriction

- Match time in bed to estimated total sleep time
  - Sleep compression is gradual
  - Sleep restriction is quick
- Takes advantage of homeostatic sleep drive
- May be used as a stand-alone treatment for insomnia
## Sleep compression/restriction

### TWO WEEK SLEEP DIARY

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**TST = 5.4 hours**
Stimulus control

• Developed from classical learning therapy
• In general, don’t associate the bed/bedroom with activities other than sleep or sex
• When you can’t sleep...
  1) Get out of bed and bedroom
  2) Perform a relaxing activity
  3) Return to bed when sleepy
• Most difficult and possibly effective component
Stimulus Control

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|--------------|----------------|-------------|------|-----|---|---|---|---|-----|---|---|---|----|------|-----|----|---|---|---|----|---|---|---|---|-----|
| sample       | Mon.           | Work        | E    |     |   |   |   |   |     |   |   |   |    |      |     |    |   |   |   |    |   |   |   |   |     |     |     |     |    |     |     |
| Tues         | C              |             |      |     | C |   |   |   |     |   |   |   |    |      |     |    | C |   |   |   |    |   |   |   |   |     |     |     |     |    |     |     |
| Wed          | C              | C           |      |     |   | C |   |   |     |   |   |   |    |      |     |    | C |   |   |   |    |   |   |   |   |     |     |     |     |    |     |     |
| Thur         | C              |             |      |     | C |   |   |   |     |   |   |   |    |      |     |    | C |   |   |   |    |   |   |   |   |     |     |     |     |    |     |     |
| Fri          |                |             |      |     |   |   | M | L |     |   |   |   |    |      |     |    | C | M | L |   |    |   |   | C | M |     |     |     |     |    |     |     |
| Sat          |                |             |      |     | M |   |   |   |     |   |   |   |    |      |     |    | C | M | L |   |    |   |   | C | M |     |     |     |     |    |     |     |
| Sun          |                |             |      |     | M |   |   |   |     |   |   |   |    |      |     |    | C | M | L |   |    |   |   | C | M |     |     |     |     |    |     |     |
| Mon          |                |             |      |     | M |   |   |   |     |   |   |   |    |      |     |    | C | M | L |   |    |   |   | C | M |     |     |     |     |    |     |     |
Sleep “forbidden zone”

DLMO

CBT_{min}

Relaxation techniques

- Relaxation techniques come in a variety of shapes and sizes but generally include:
  - Deep/diaphragmatic breathing
  - Progressive/passive muscle relaxation
  - Autogenic phrases (“I am calm, I am relaxed”)
  - Imagery
- Not included in brief behavioral therapy for insomnia (BBT-I)
Cognitive therapy

• Identification of maladaptive thought patterns (e.g., “If I don’t fall asleep soon,...)
• Gently challenge these thoughts
• Modify maladaptive thoughts to more realistic and, sometimes, helpful thoughts
• Most commonly slighted component; also not included in BBT-I
## Cognitive therapy for insomnia

<table>
<thead>
<tr>
<th>Situation</th>
<th>Automatic Thought</th>
<th>Mood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedtime</td>
<td>“I won’t fall asleep”</td>
<td>Anxious</td>
</tr>
<tr>
<td>Lying in bed awake</td>
<td>“If I don’t fall asleep quickly, I…”</td>
<td>Anxious</td>
</tr>
<tr>
<td>Daytime fatigue</td>
<td>“If I could sleep more/better, I wouldn’t feel so tired”</td>
<td>Frustrated</td>
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<td>Angry</td>
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</table>
Why use CBT-I?

• CBT-I is safe, relatively inexpensive, highly effective, and durable

• CBT-I skills may generalize to other mental/physical health conditions
  • Decreased anxiety
  • Decreased chronic pain

• American College of Physicians recommends CBT-I as the first line treatment for insomnia
CBT-I Efficacy Research

• Meta-analysis by Wu et al., 2015 reported
  • 36.0% of patients who received CBT-I were in remission from insomnia compared with 16.9% of those in control or comparison conditions
  • Pre-treatment and post-treatment effect sizes were medium to large for most sleep parameters
  • Improvements were greater in psychiatric than in medical populations
  • These findings are consistent with other meta-analyses
### Medical

<table>
<thead>
<tr>
<th>Source by Comorbid Diagnosis Type</th>
<th>Measure</th>
<th>Hedges g</th>
<th>Standard Error</th>
<th>Variance</th>
<th>95% CI</th>
<th>z Value</th>
<th>p Value</th>
<th>Favors Control/Comparison</th>
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<tr>
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<td>POMS-F</td>
<td>0.61</td>
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<tr>
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<td>Combined</td>
<td>0.39</td>
<td>0.51</td>
<td>0.26</td>
<td>-0.62 to 1.39</td>
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<td>PFS</td>
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<td>0.26</td>
<td>0.07</td>
<td>-0.39 to 0.65</td>
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<td>0.07</td>
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<td>-0.03</td>
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<td>0.48</td>
<td>0.23</td>
<td>-0.69 to 1.19</td>
<td>0.52</td>
<td>.61</td>
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<tr>
<td>Fibromyalgia: Edinger et al, 2005</td>
<td>Combined</td>
<td>0.04</td>
<td>0.35</td>
<td>0.12</td>
<td>-0.65 to 0.73</td>
<td>0.11</td>
<td>.91</td>
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<tr>
<td>Fibromyalgia: Martinez et al, 2014</td>
<td>Combined</td>
<td>0.23</td>
<td>0.26</td>
<td>0.07</td>
<td>-0.28 to 0.75</td>
<td>0.89</td>
<td>.38</td>
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<tr>
<td>Fibromyalgia: Miro et al, 2011</td>
<td>MPQ</td>
<td>0.25</td>
<td>0.31</td>
<td>0.10</td>
<td>-0.36 to 0.86</td>
<td>0.81</td>
<td>.42</td>
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<tr>
<td>Hearing impairment: Jansson-Frajmark, 2012</td>
<td>Combined</td>
<td>0.70</td>
<td>0.36</td>
<td>0.13</td>
<td>0.00 to 1.40</td>
<td>1.97</td>
<td>.05</td>
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<tr>
<td>Mixed chronic diseases: Morgan et al, 2012</td>
<td>FSS</td>
<td>-0.14</td>
<td>0.17</td>
<td>0.03</td>
<td>-0.47 to 0.19</td>
<td>-0.83</td>
<td>.41</td>
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<tr>
<td>Mixed medical: Rybczynk et al, 2005</td>
<td>Combined</td>
<td>0.21</td>
<td>0.21</td>
<td>0.05</td>
<td>-0.20 to 0.63</td>
<td>1.00</td>
<td>.32</td>
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</tr>
<tr>
<td>OSA: Guitton et al, 2008</td>
<td>Combined</td>
<td>0.31</td>
<td>0.51</td>
<td>0.26</td>
<td>-0.70 to 1.31</td>
<td>0.60</td>
<td>.55</td>
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</tr>
<tr>
<td>Osteoarthritis: Vitiello et al, 2013</td>
<td>CPS</td>
<td>0.04</td>
<td>0.10</td>
<td>0.01</td>
<td>-0.15 to 0.23</td>
<td>0.41</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>PLMD: Edinger et al, 1996</td>
<td>Combined</td>
<td>0.07</td>
<td>0.50</td>
<td>0.25</td>
<td>-0.91 to 1.05</td>
<td>0.14</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Renal disease: Chen et al, 2011</td>
<td>Combined</td>
<td>0.40</td>
<td>0.24</td>
<td>0.06</td>
<td>-0.07 to 0.86</td>
<td>1.68</td>
<td>.09</td>
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</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td>0.19</td>
<td>0.06</td>
<td>0.00</td>
<td>0.09 to 0.30</td>
<td>3.53</td>
<td>&lt;.001</td>
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</tr>
</tbody>
</table>

### Psychiatric

<table>
<thead>
<tr>
<th>Source by Comorbid Diagnosis Type</th>
<th>Measure</th>
<th>Hedges g</th>
<th>Standard Error</th>
<th>Variance</th>
<th>95% CI</th>
<th>z Value</th>
<th>p Value</th>
<th>Favors CBT-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol dependence: Arnedt et al, 2011</td>
<td>Combined</td>
<td>2.48</td>
<td>0.85</td>
<td>0.72</td>
<td>0.82 to 4.15</td>
<td>2.92</td>
<td>.003</td>
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<tr>
<td>Alcohol dependence: Currie et al, 2004</td>
<td>BDI</td>
<td>0.66</td>
<td>0.35</td>
<td>0.12</td>
<td>-0.03 to 1.34</td>
<td>1.88</td>
<td>.06</td>
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<tr>
<td>Depression: Manber et al, 2008</td>
<td>HRSD</td>
<td>0.29</td>
<td>0.38</td>
<td>0.14</td>
<td>-0.45 to 1.02</td>
<td>0.77</td>
<td>.44</td>
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<tr>
<td>Depression: Wogley et al, 2013</td>
<td>PHQ-9</td>
<td>0.76</td>
<td>0.39</td>
<td>0.15</td>
<td>-0.00 to 1.52</td>
<td>1.95</td>
<td>.05</td>
<td></td>
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<tr>
<td>Depression: Watanabe et al, 2011</td>
<td>HRSD</td>
<td>0.83</td>
<td>0.34</td>
<td>0.11</td>
<td>0.17 to 1.49</td>
<td>2.46</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Hypnotic dependence: Morgan et al, 2004</td>
<td>Abstinent d/wk</td>
<td>0.69</td>
<td>0.17</td>
<td>0.03</td>
<td>0.35 to 1.03</td>
<td>4.02</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>PTSD: Margolies et al, 2013</td>
<td>Combined</td>
<td>0.96</td>
<td>0.40</td>
<td>0.16</td>
<td>0.18 to 1.74</td>
<td>2.40</td>
<td>.02</td>
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<tr>
<td>PTSD: Talbot et al, 2014</td>
<td>Combined</td>
<td>0.26</td>
<td>0.31</td>
<td>0.09</td>
<td>-0.34 to 0.86</td>
<td>0.85</td>
<td>.40</td>
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<tr>
<td>PTSD: Ulmer et al, 2011</td>
<td>PCL-M</td>
<td>1.89</td>
<td>0.56</td>
<td>0.32</td>
<td>0.79 to 3.00</td>
<td>3.36</td>
<td>.001</td>
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<tr>
<td>Subtotal</td>
<td></td>
<td>0.76</td>
<td>0.15</td>
<td>0.02</td>
<td>0.46 to 1.05</td>
<td>5.03</td>
<td>&lt;.001</td>
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</tr>
</tbody>
</table>

### Mixed

<table>
<thead>
<tr>
<th>Source by Comorbid Diagnosis Type</th>
<th>Measure</th>
<th>Hedges g</th>
<th>Standard Error</th>
<th>Variance</th>
<th>95% CI</th>
<th>z Value</th>
<th>p Value</th>
<th>Favors CBT-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed psych and medical: Lichstein et al, 2000</td>
<td>Combined</td>
<td>0.25</td>
<td>0.30</td>
<td>0.09</td>
<td>-0.33 to 0.84</td>
<td>0.84</td>
<td>.40</td>
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</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td>0.25</td>
<td>0.30</td>
<td>0.09</td>
<td>-0.33 to 0.84</td>
<td>0.84</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>0.26</td>
<td>0.05</td>
<td>0.00</td>
<td>0.16 to 0.36</td>
<td>3.12</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>
CBT-I Comparative Effectiveness Research

• Pharmacotherapy results in rapid improvements that are not maintained at follow-up
• CBT-I results in slower improvements that are more durable
• Morin et al., 2009 compared CBT-I versus CBT-I/Ambien and reported
  • Similar response (60%) and remission (40%) at post-treatment
  • At 6-months, combined treatment (56%) had a higher remission rate than CBT-I alone (43%)
  • At 6-months, remission was best for those who tapered off Ambien (68%) compared with continuation (42%)
Cognitive Behavioral Therapy and Zolpidem/Trazodone for Insomnia

Supported by Contract # CER-2018C2-13262

From the Patient-Centered Outcomes Research Institute (PCORI)
*Medication = Provider/patient choice of either zolpidem or trazodone

Rural primary care

Recruitment

Online Screening, e-Consent

Randomize n = 1200

Online Baseline Data Collection

Medication* (zolpidem/trazodone) n = 400

CBT-I N = 400

Medication* (zolpidem/trazodone) + CBT-I n = 400

Online Outcome Evaluations: 9 weeks, 6 months, 12 months
  • Patient-reported **efficacy** and **safety** outcomes
  • Sleep-wake diary
  • Medication use (patient report, EHR)

Completers offered CBT-I at study conclusion
- Individualized, self-guided, self-contained
- Internet access required
- Computer preferred; smart phone possible
COZI Trial

• Eight-site comparative effectiveness trial funded by PCORI
• Comparing online CBT-I versus pharmacotherapy in rural primary care clinics
• Three arms:
  • Online CBT-I via SHUTi
  • Pharmacotherapy (i.e., zolpidem or trazodone)
  • Combined online CBT-I and pharmacotherapy
• Largest insomnia treatment study to date; enrollment began in April 2022
Newer/Cutting-Edge Treatments

- Ebb cooling cap
  - [https://ebbsleep.com](https://ebbsleep.com)
  - ChiliSleep merged with Ebb Therapeutics
  - Launched Sleepme website and products
- Intensive sleep retraining (ISR)
- Quviviq (daridorexant)
  - Dual orexin receptor antagonist (inhibits binding of orexins to reduce excessive wakefulness)
  - Indicated for both sleep onset and maintenance insomnia
  - 25 and 50 mg doses
Intensive Sleep Retraining (ISR)

- ISR is the MSLT from hell
  - Twenty to twenty-five-minute sleep opportunity every 30 minutes across 24 hours
  - Patient is woken up after 2-3 minutes of sleep
- Sleep pressure (homeostatic pressure) increases during the trial
- Also takes advantage of circadian sleep drive
- Reverses conditioned arousal and improves self-efficacy for sleep
Sleep Latencies During Intensive Sleep Retraining

Average time taken to fall asleep over 24 hours of intensive sleep re-training (ISR) during a pilot study (n=17; left) and during a randomized control trial (n=39; right); taken from Lack L et al., Brain Sci, 2017
Limitations to ISR

- Laboratory-based ISR requires PSG and sleep tech
  - Expensive intervention
  - May not generalize to home environment (conditioning occurs at home, not the lab)
  - Patient acceptability unknown
- IRS appears to be effective for sleep onset insomnia but not sleep maintenance insomnia
THIM Wearable Device

• Instead of PSG-measured sleep onset, THIM uses a behavioral response to a faint tone emitted every 30 seconds from a wearable device
• Individual has to respond to the tone or an alarm will sound
• Similar to Dr. Nathaniel Kleitman’s “Spoon Test”
• THIM received an AASM 2021 Strategic Research Grant (PI: Dr. Hanna Scott)
  • May be more effective than traditional ISR because of increased generalizability
Questions/Discussion