Sleep and Hospitalization: Effect on Outcomes

Vineet Arora MD MAPP
Sleep, Health, and Metabolism Center
University of Chicago
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4 Questions

- Significance
- State of the Art Medical Knowledge
- Research Gaps
- Research Opportunities
Why is Sleep in the Hospital Important?

- Significance
- State of the Art Medical Knowledge
- Research Gaps
- Research Opportunities
Significance

- Sleep critical for recovery from acute illness

- Hospitalization is a time of acute vulnerability
  - "Hazards of hospitalization"
    - Delirium
    - Cardiometabolic derangements, i.e. hyperglycemia
    - Hospital-acquired conditions (HACs)
      - Falls
    - Hospital acquired infections (HAI)
      - CAUTI, CLABSI

No Sleep in the Hospital
Mechanisms for How Inpatient Sleep Loss Affects Health
Why won’t hospitals let patients sleep?

BY SHEFALI LUTHRA, KAISER HEALTH NEWS August 17, 2015 at 12:34 PM EDT

When Hospitals Don't Let Their Patients Sleep

Constant monitoring, noise, and other interruptions can keep people awake through the night—and their health can suffer as a result.
Why is sleep in the hospital important?

Pathophysiological Effects

HCHAPS & Value Based Purchasing
Patients who reported that the area around their room was "Always" quiet at night…

The Patient Experience

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Pain Management</th>
<th>Discharge Instructions</th>
<th>Discharge Phonecalls</th>
<th>Nurse Communication</th>
<th>Bedside Shift Report</th>
<th>Discharge Process</th>
<th>Rounding</th>
<th>Quiet Ab Nigh</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>The University of Chicago Medical Center</td>
<td>64.0%</td>
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<td>Northwestern Memorial Hospital</td>
<td>65.0%</td>
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<td>Rush University Medical Center</td>
<td>69.0%</td>
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</table>
Inpatients at Risk for Sleep Disorders

% of Hospitalized Patients Screened at High Risk for OSA

n=425

40%

(Berlin Score ≥2)

Low Risk

2 out of every 5 inpatients screened as high risk for OSA

What do we know about inpatient sleep duration & quality?

- Significance
- State of the Art Medical Knowledge
- Research Gaps
- Research Opportunities
Data Collection: Actigraphy

Research Staff Sleep

Sleep Duration

In-Hospital Sleep

Actiwatch 2
(Respironics, Inc., Murraysville, PA)
The Scope of The Problem

Patients Sleep 2 Hours LESS In The Hospital Compared To Home

Data Collection: Noise (dB)
Noise - A Major Environmental Factor

Noise and Inpatient Sleep

*Loudest tertile L5 associated with 112 min less in sleep time (95% CI [6-218], p=0.039)

112 minutes*
Changes in the median HR during noise-induced arousals aligned with time of peak HR response

Expressed relative to average HR in 10 sec preceding arousals in sleep stages N2, N3, and REM

Vertical lines represent the median times of arousal onset (with CIs) before that peak.
Blood Pressure and Sleep

One hour of sleep loss associated with 2.28 mmHg increase in blood pressure (p=0.13)

Arora, et. al. JAGS 2011
Medical Interventions

Environmental Factors

Background: Is it just noise?
Patient Reported In-Hospital Sleep Disruptions (n=166)

- Pain: 46%
- Vitals: 39%
- Tests: 34%
- Noise: 27%
- Medications: 25%
- Alarms: 24%
- Bed Comfort: 21%
- Anxiety: 18%
- Room Temperature: 15%
- Staff Conversation: 15%

Percentage of Patients Finding Each Item to Disrupt Their Sleep

- Symptoms
- Medical Interventions
- Environment
Results: Disruptions and Objective Sleep
Output of Five Individual Regression Models
(n=645 nights from 379 patients)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minutes [95% CI]</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tests</td>
<td>-19.9 [-41.6, 1.9]</td>
<td>0.07</td>
</tr>
<tr>
<td>2. Vitals</td>
<td>-1.8 [-23.1, 19.6]</td>
<td>0.9</td>
</tr>
<tr>
<td>3. Pain</td>
<td>-43.4 [-66.7, -20.1]</td>
<td>0.001*</td>
</tr>
<tr>
<td>4. Medications</td>
<td>-23.1 [-45.9, -0.34]</td>
<td>0.047*</td>
</tr>
<tr>
<td>5. Noise</td>
<td>-33.7 [-58.1, -9.3]</td>
<td>0.007*</td>
</tr>
</tbody>
</table>

Pain, medications and noise were associated with significantly less in-hospital objective sleep time.
Hyperglycemia of Hospitalization & Sleep

• Hyperglycemia of hospitalization
  – Associated with adverse outcomes & longer lengths of stay (Magaji and Johnston 2011)
  – ~1/3 of all hospitalized patients (Levetan et al. 1998)
  – Blood glucose >126mg/dL
  – Mechanism unclear but thought to be due to stress of illness

Could inpatient sleep loss be a novel risk for hyperglycemia of hospitalization?
What do we need to know?

- Significance
- State of the Art Medical Knowledge
- Research Gaps
- Research Opportunities
OSA Is More Prevalent As We Age

Prevalence of Mod-Severe Obstructive Sleep Apnea

UC Resident Perspective of OSA Screening
Readmission Kaplan-Meier Analysis

Non-Readmission Probability

Days

What Happens After Discharge?

- **Post-hospital syndrome** *(Krumholz, NEJM 2013)*
  - Acquired, transient period of generalized vulnerability
  - Cause is multifactorial
    - Sleep deprivation, inactivity
    - Risk factors for functional decline post-discharge
Inpatient Sleep Loss & Delirium/ Memory

- HELP Trial for delirium
  - Only 10% adherence to sleep protocol (Inouye et al Arch Int Med 2003)
  - Can adherence to better sleep reduce delirium?

- 50% have poor memory!
  - No relationship between sleep and memory all patients were likely sleep deprived

Calev et al. JHM 2015
4 Questions

Significance

State of the Art Medical Knowledge

Research Gaps

Research Opportunities
Research Opportunities

- Can empowering patients directly to get better sleep in the hospital improve their sleep and health outcomes?

- Can training hospital staff to screen inpatients for OSA improve health and lower future costs of care?

- Is sleep loss from hospitalization associated with a chronic sleep disorder?
Confirmation of short and long term benefits of hospital sleep medicine in conjunction to a cost effective screening strategy could lead to a paradigm change on how we practice and view sleep medicine in hospitalized patients. ...With such potentially profound implications we cannot continue to ignore the elephant in the room...can we?
Bite-sized chunks of information
1. Improving hospital sleep
2. Screening for sleep disorders

Can be delivered online “Flipped classroom”

SIESTA Educational Module Advisors: Babak Mokhlesi & Jay Balachandran
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