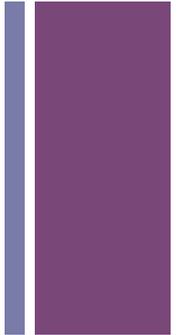


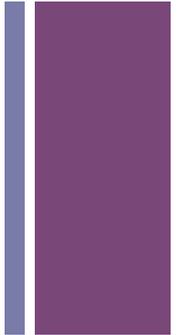
**Sleep and Hospitalization:
Effect on Outcomes**
Vineet Arora MD MAPP
Sleep, Health, and Metabolism Center
University of Chicago

+ Disclosures

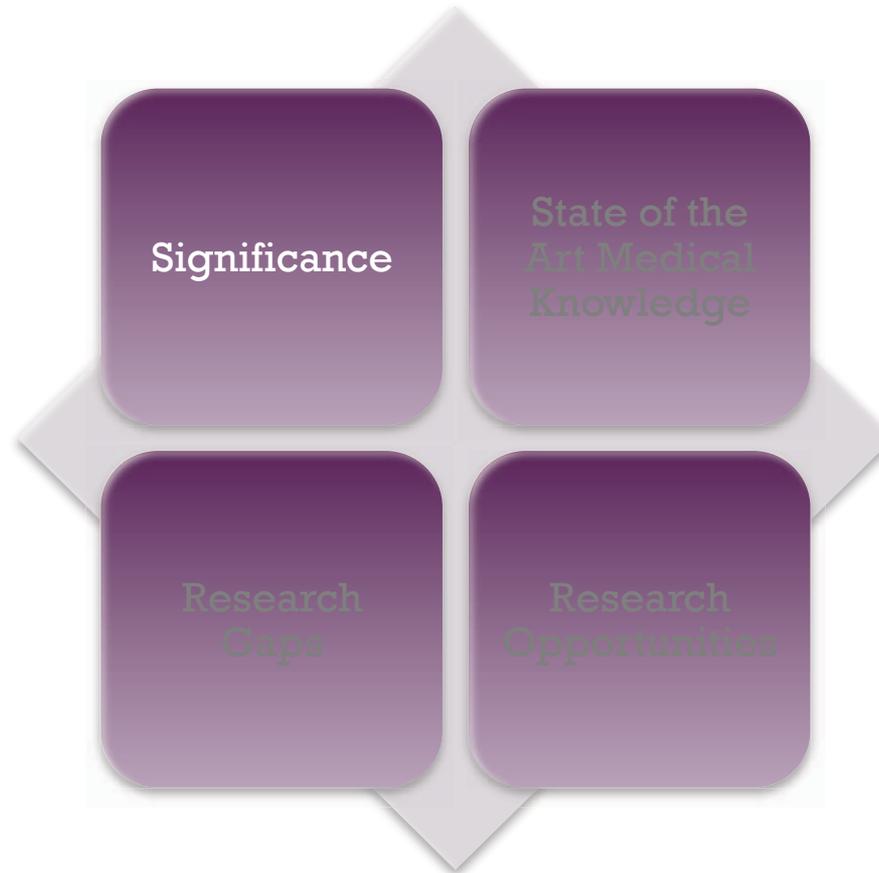


- Current funding:
 - NHLBI R25 SIESTA Sleep for Inpatients Empowering Staff to Act
- Past funding
 - NIA K23 Understanding Sleep Loss in Hospitalized Patients
 - American Sleep Medicine Foundation
- Other financial relationships:
 - American Board of Internal Medicine Board Member
- Conflicts of interest: none

+ 4 Questions



+ Why is Sleep in the Hospital Important?





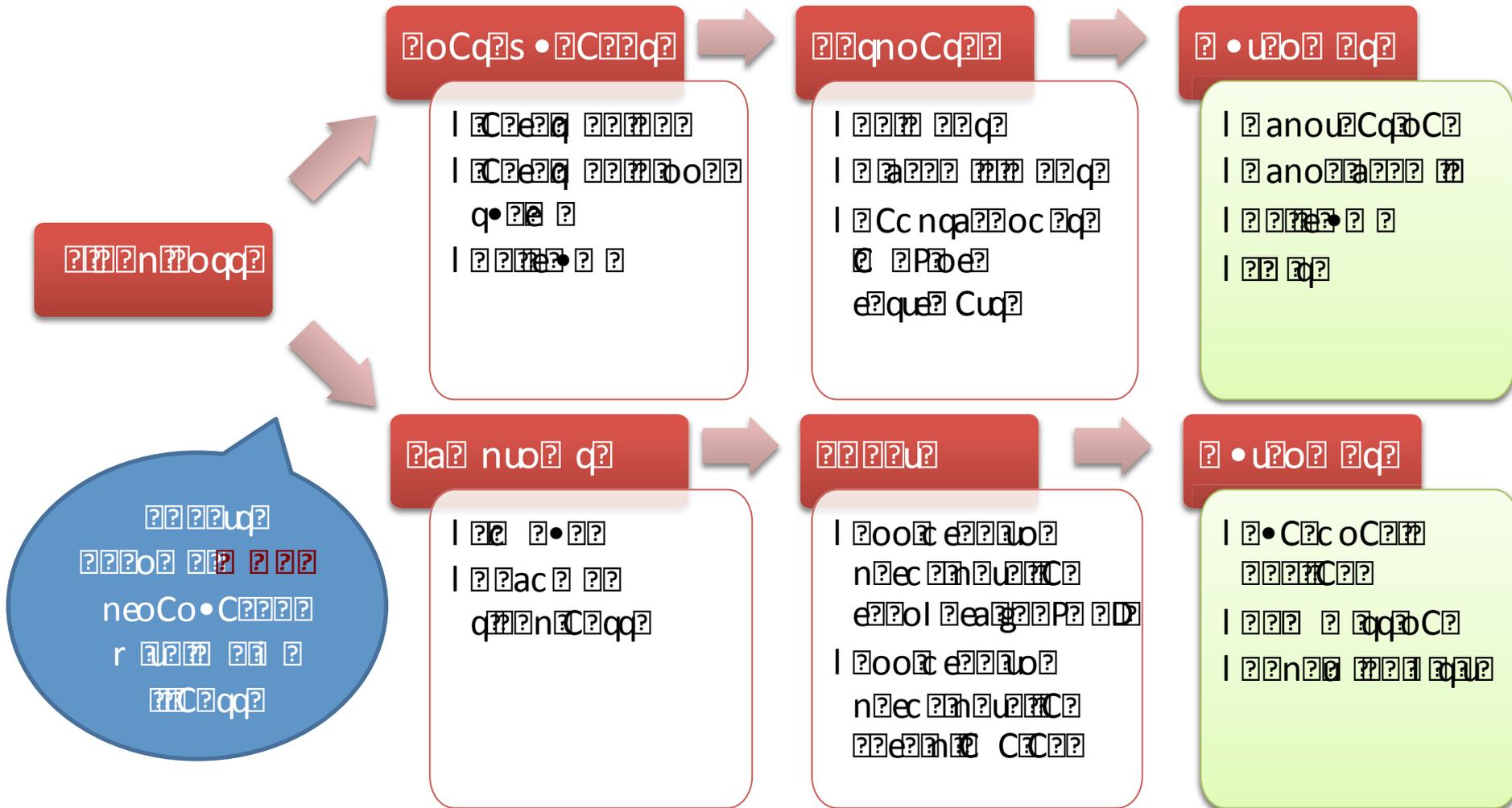
Significance

- 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



The Atlantic

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TOPICS > HEALTH

Why won't hospitals let patients sleep?

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



12798



253



+1



EMAIL



HEALTH

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.

217



SHEFALI LUTHRA | AUG 19, 2015

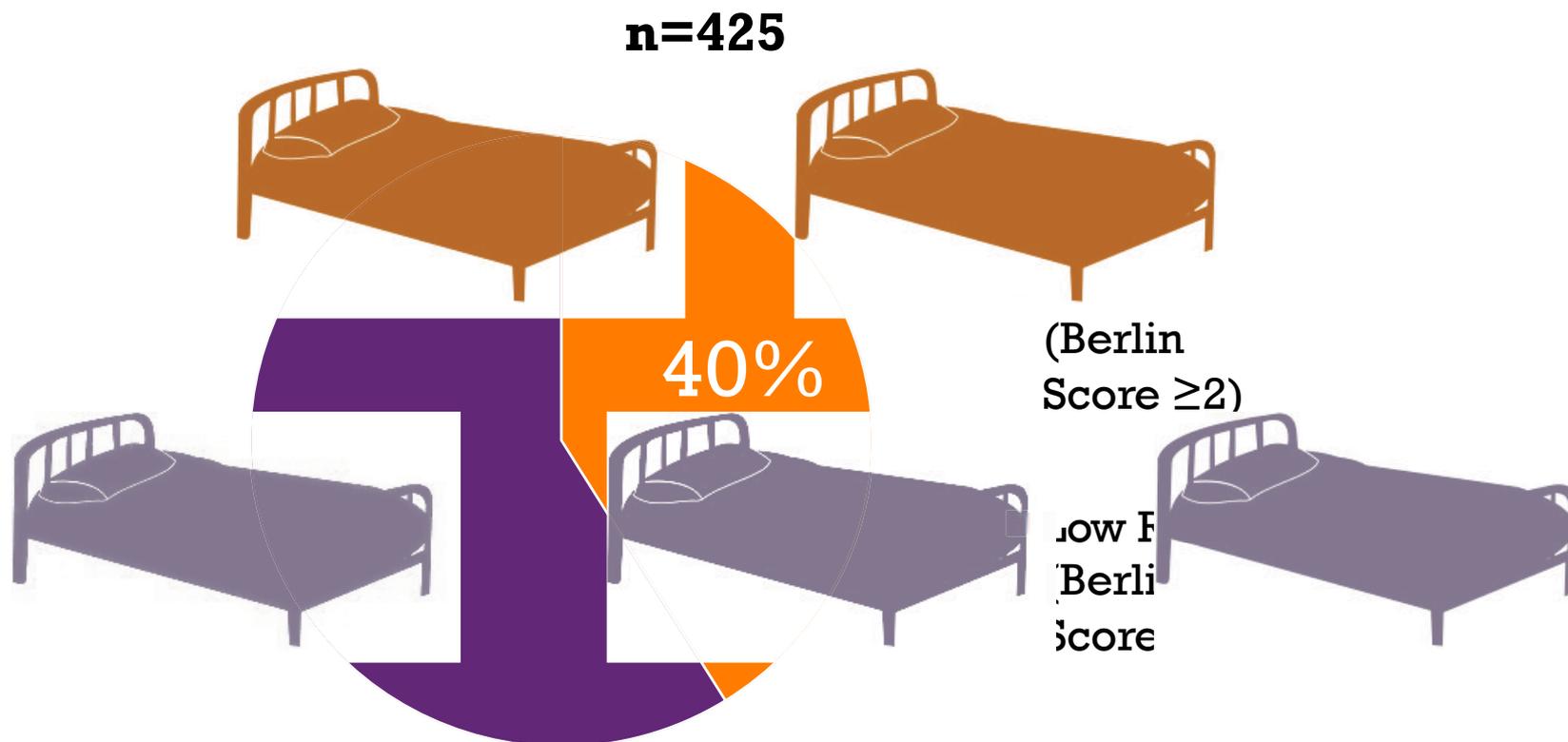


THE UNIVERSITY OF CHICAGO MEDICINE



Inpatients at Risk for Sleep Disorders

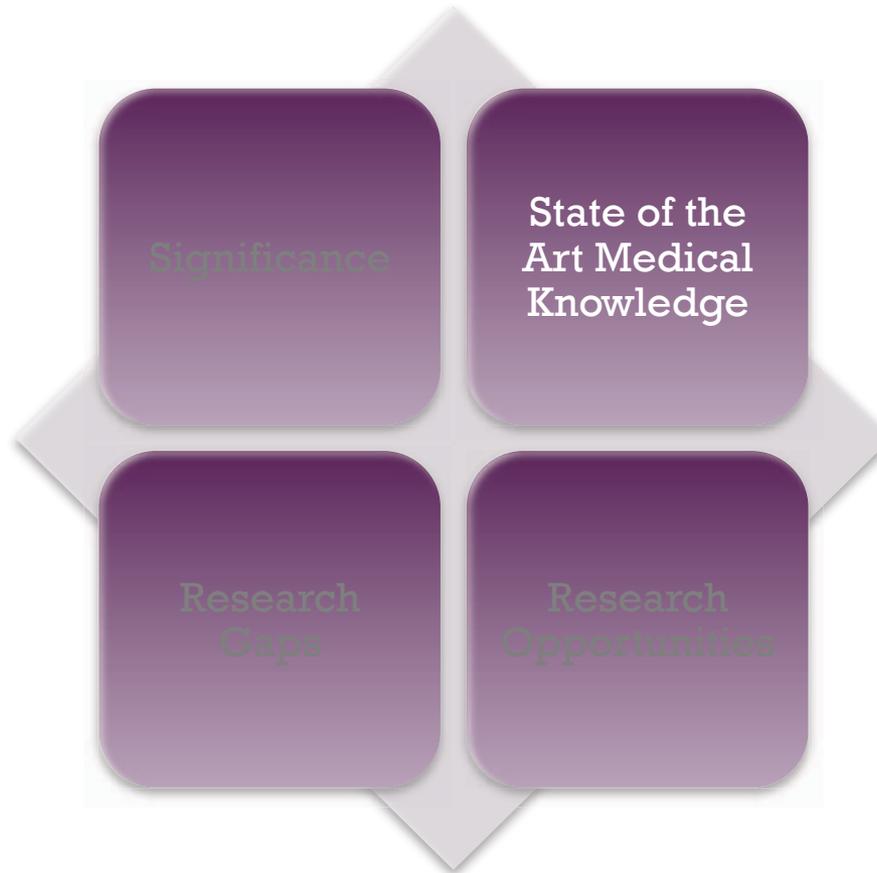
% of Hospitalized Patients Screened at High Risk for OSA



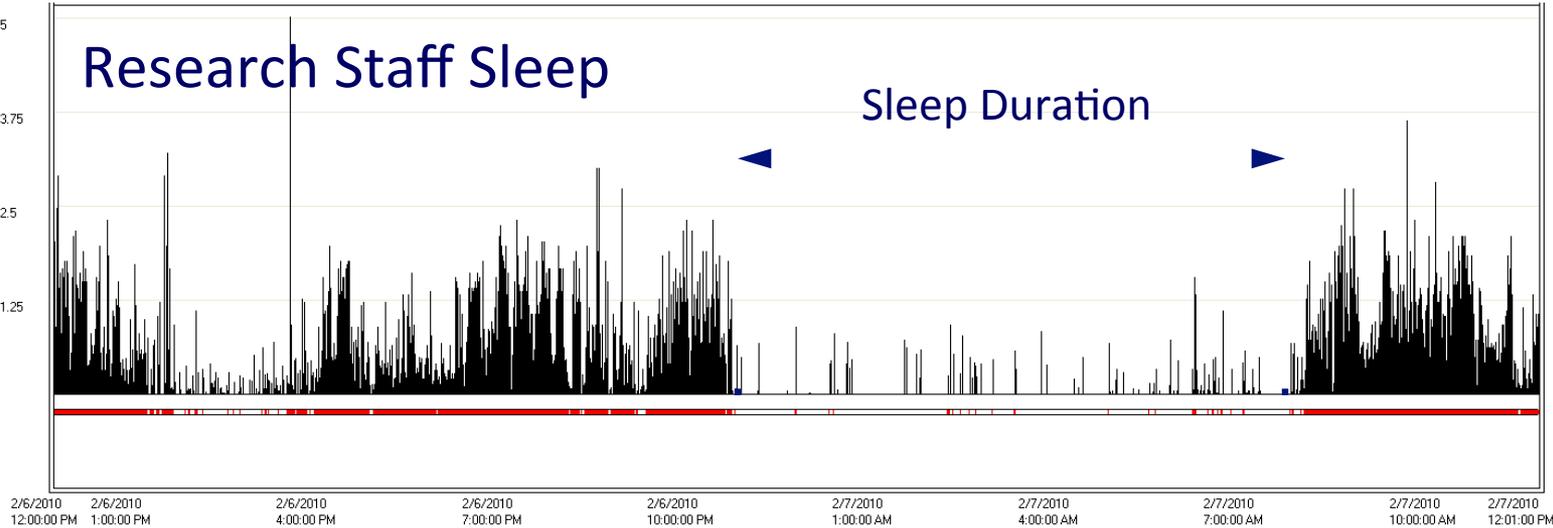
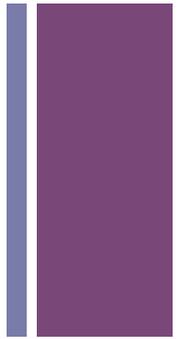
2 out of every 5 inpatients screened as high risk for OSA

Shear et al. J Clin Sleep Med. 2014

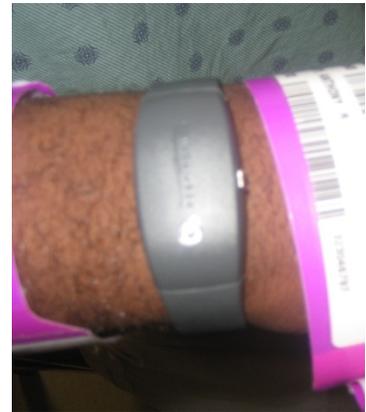
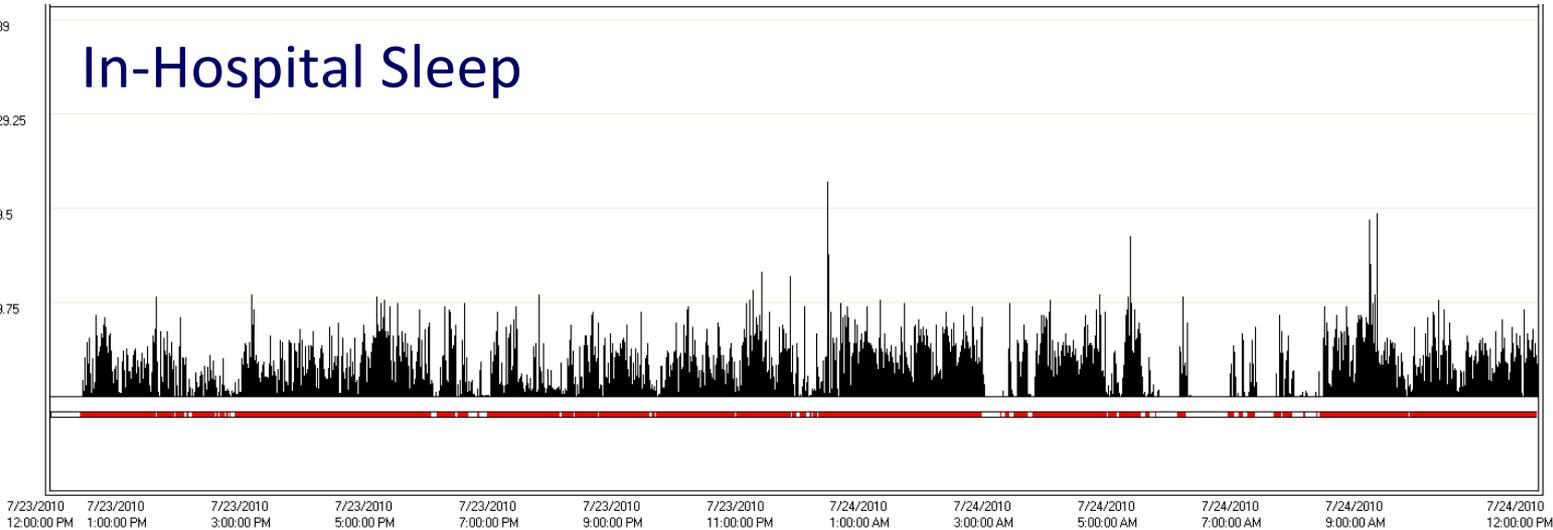
+ What do we know about inpatient sleep duration & quality?



+ Data Collection: Actigraphy

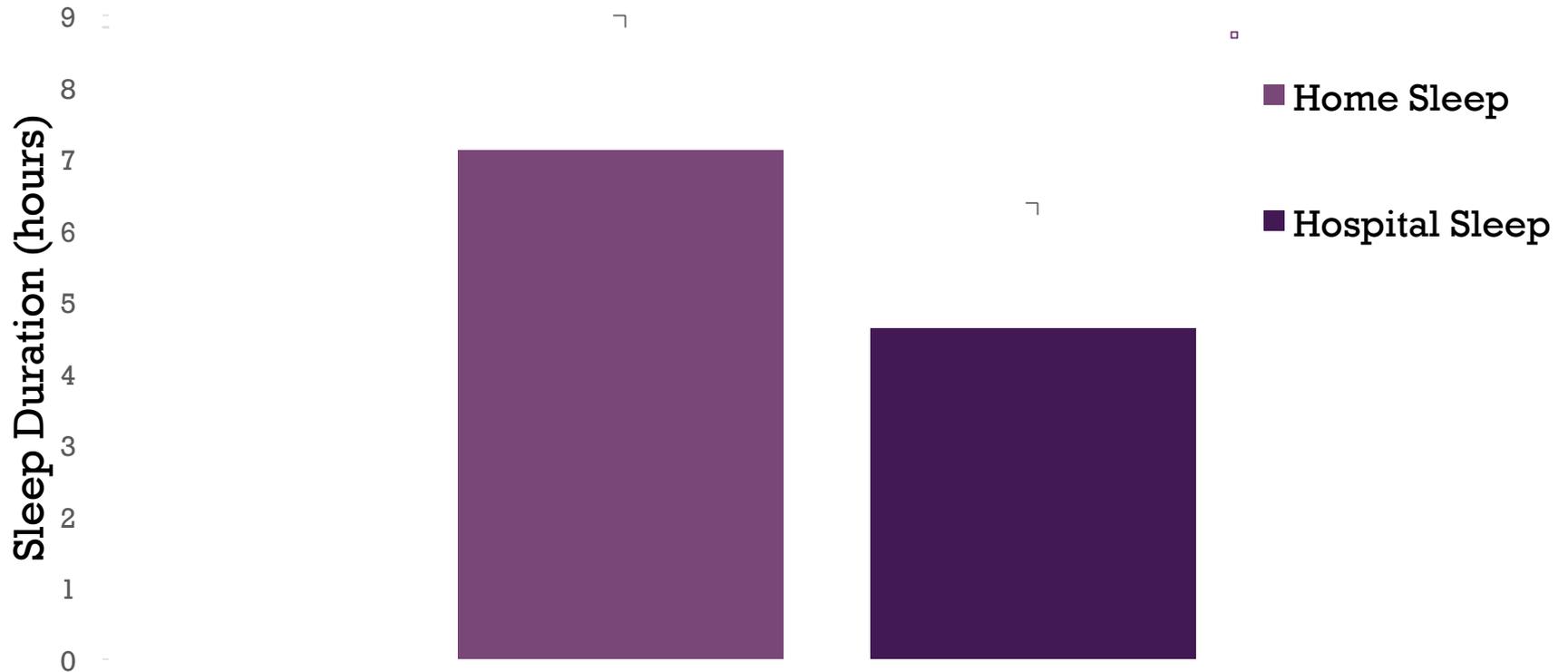


Actiwatch 2
(Respironics, Inc.,
Murrysville, PA)



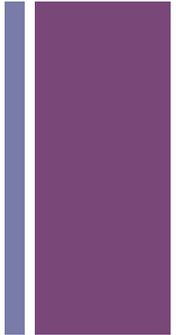
The Scope of The Problem

Patients Sleep 2 Hours LESS In The Hospital Compared To Home

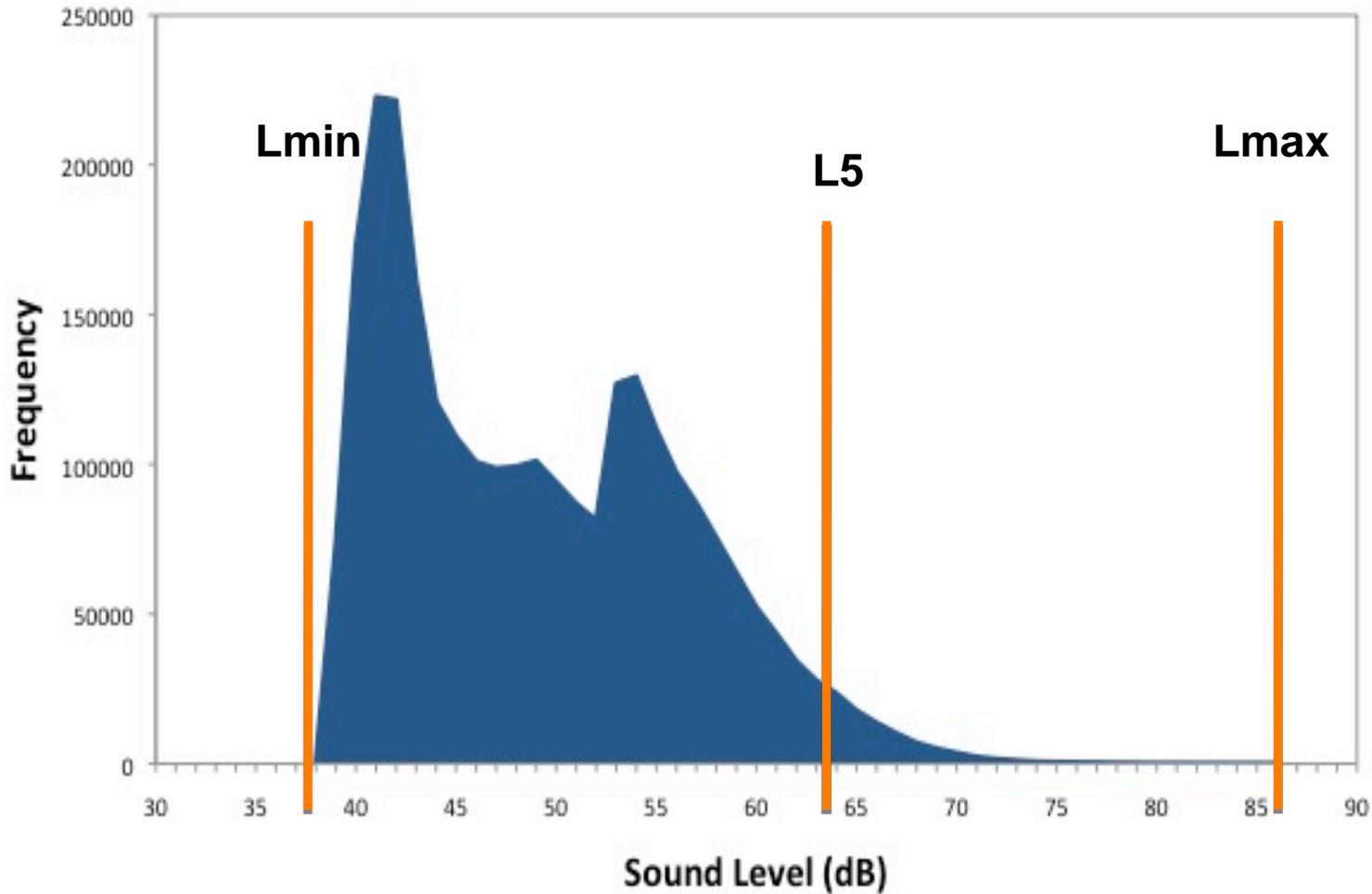


Arora VM et al. J Am Ger Soc. 2011.

+ Data Collection: Noise (dB)

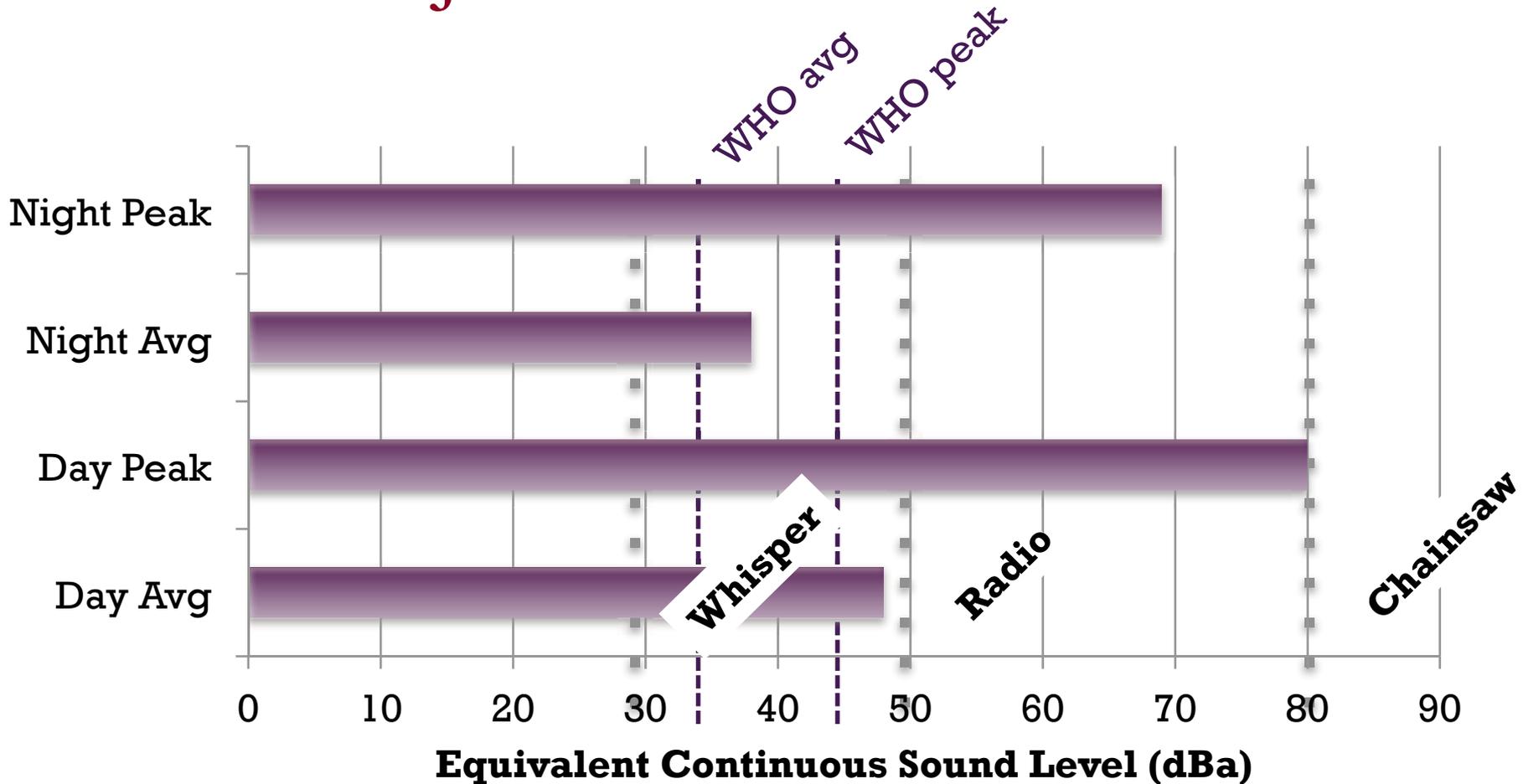


Typical Sound Level Distribution



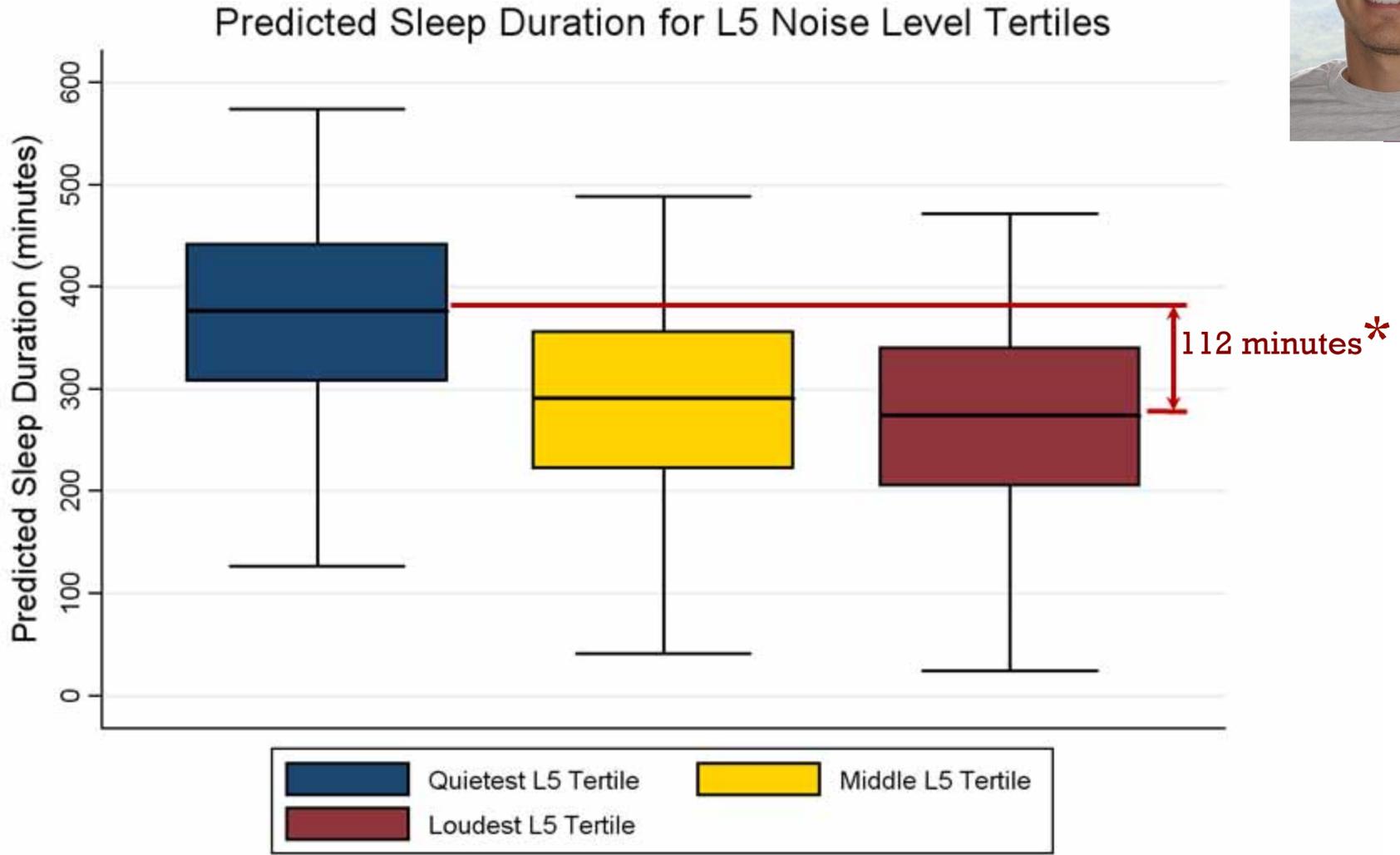
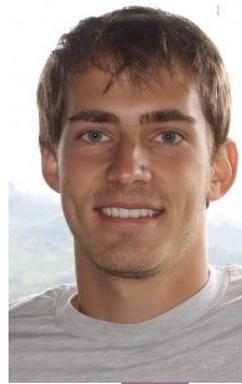
?? opC?? ? ?? yp??
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?????? ?? ???? ??
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Noise- A Major Environmental Factor



Yoder JC et al. *Arch Int Med* 2012.

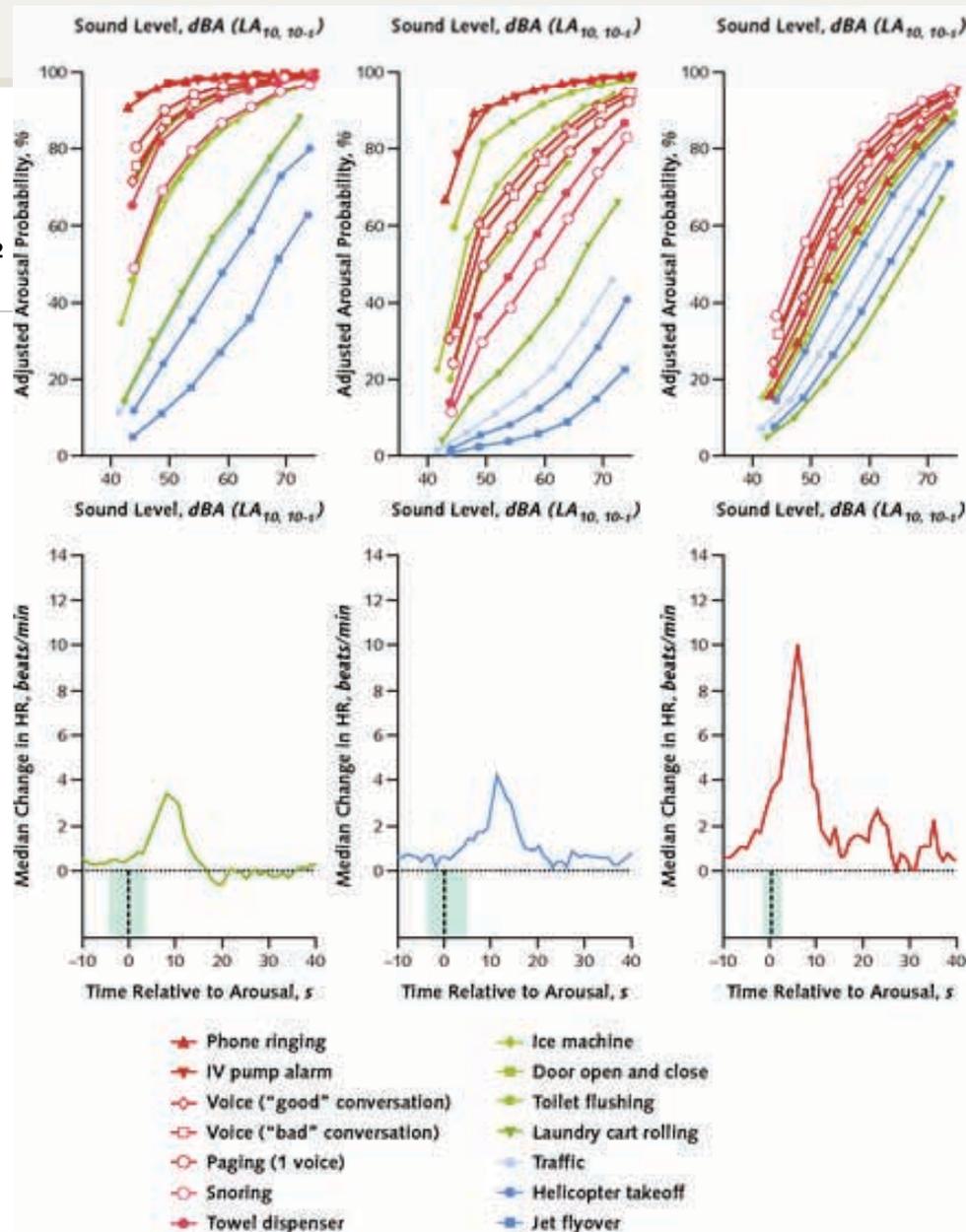
+Noise and Inpatient Sleep



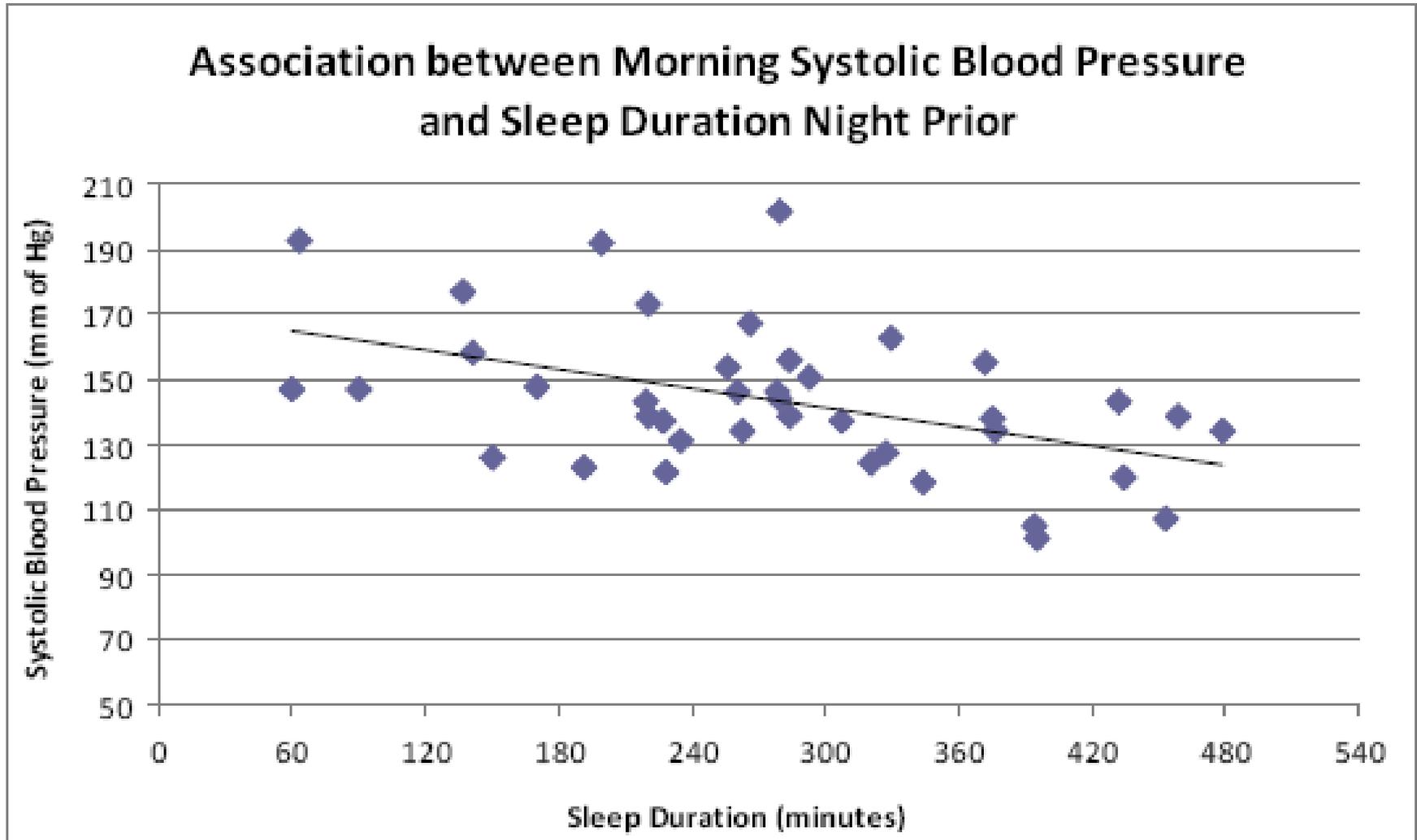
From: Sleep Disruption due to Hospital Noises: A Prospective Evaluation

Ann Intern Med. 2012;157(3):170-179. doi:10.7326/0003-4819-156-12-201208070-00472

- **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



Arora, et. al. JAGS 2011



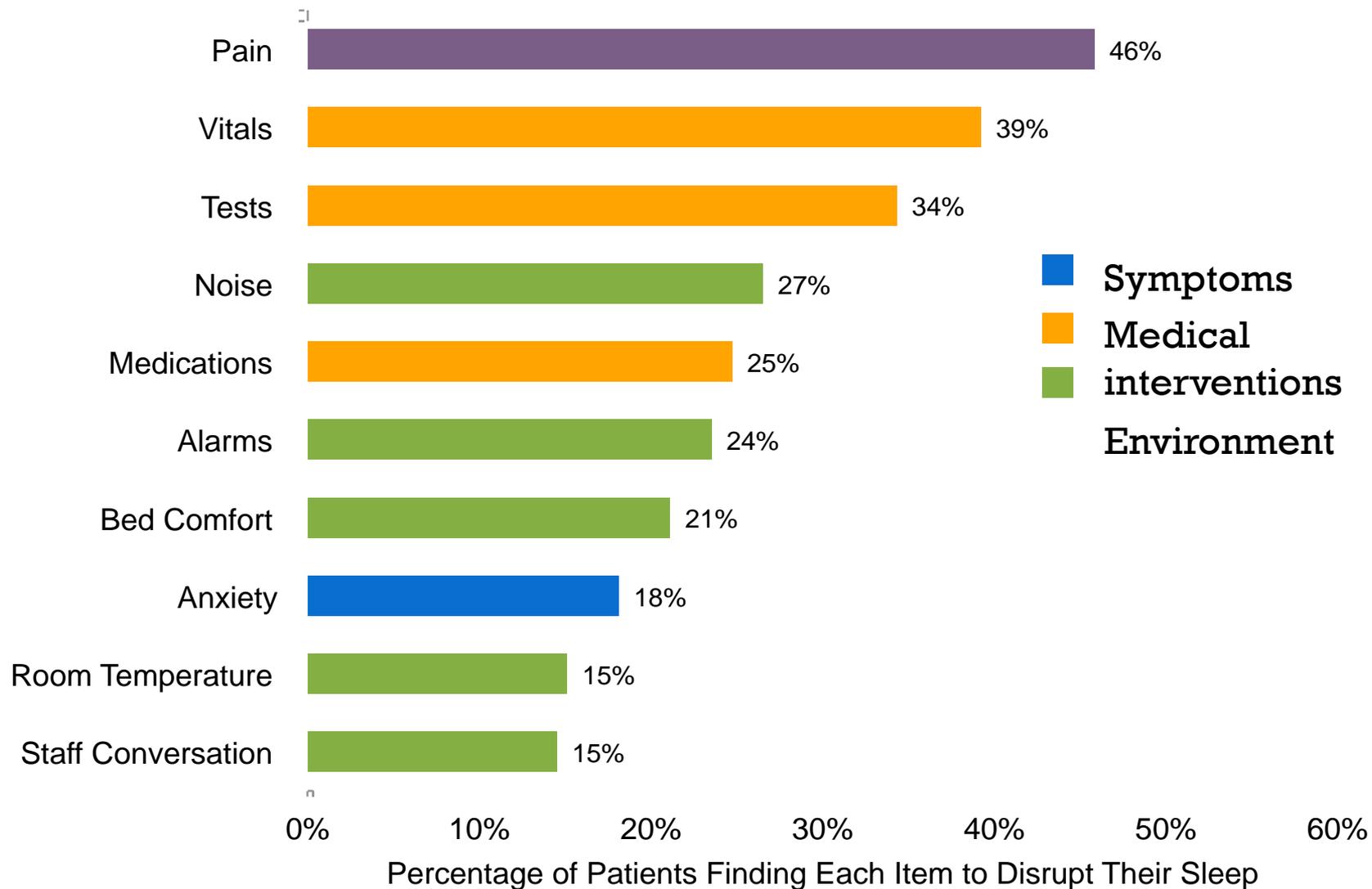
Symptoms

Background: Is it just noise?

Medical Interventions

Environmental Factors

Patient Reported In-Hospital Sleep Disruptions (n=166)



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

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

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

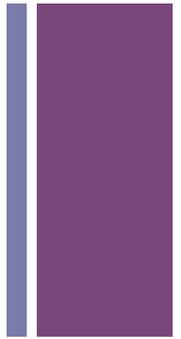
Could inpatient sleep loss be a novel risk for hyperglycemia of hospitalization?

+ What do we need to know?

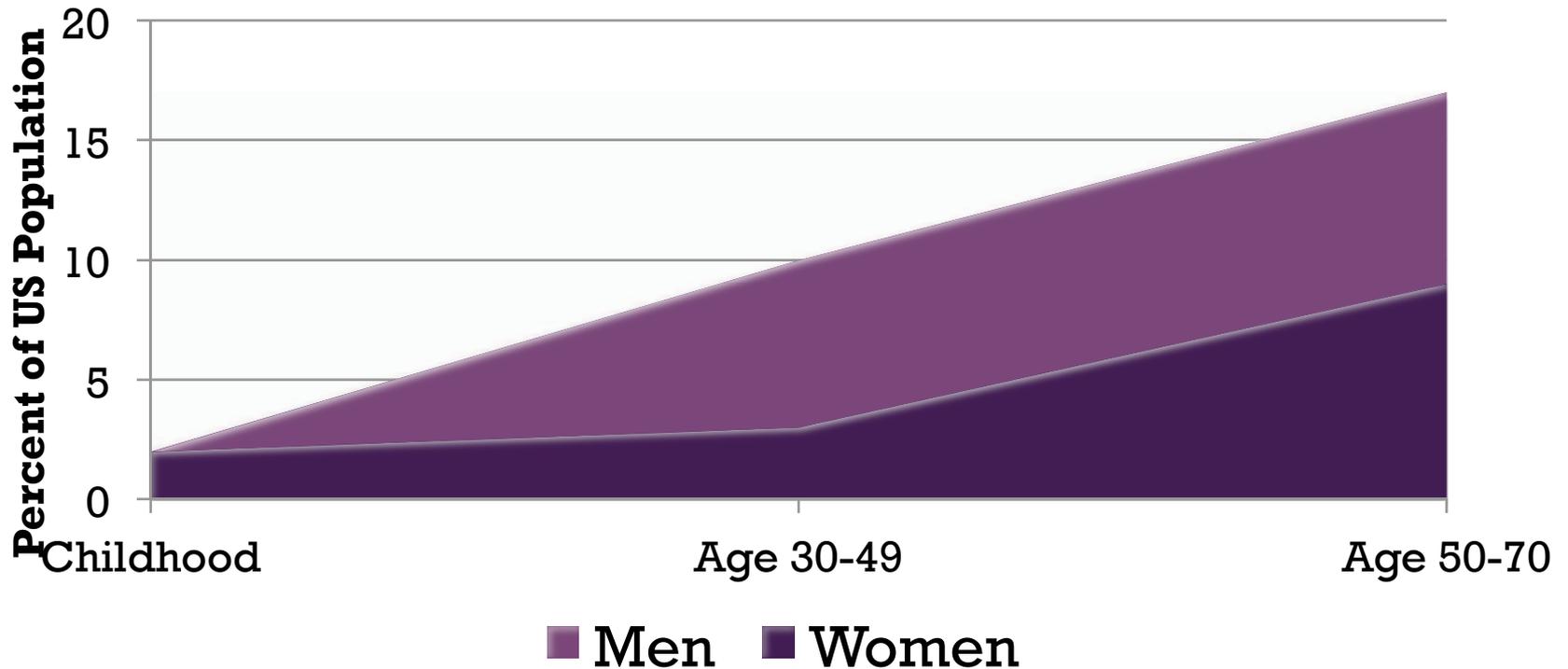




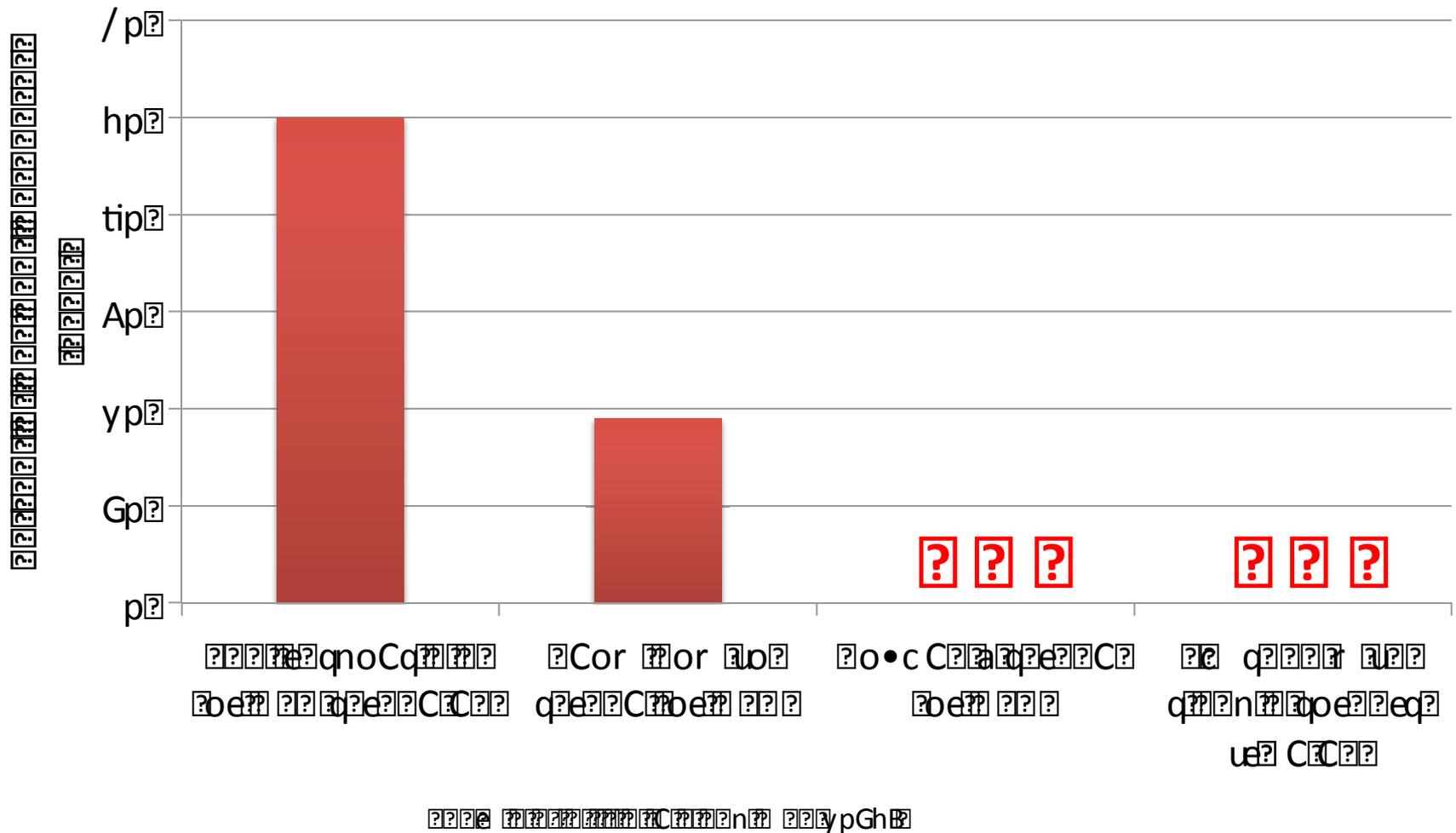
OSA Is More Prevalent As We Age



Prevalence of Mod-Severe Obstructive Sleep Apnea

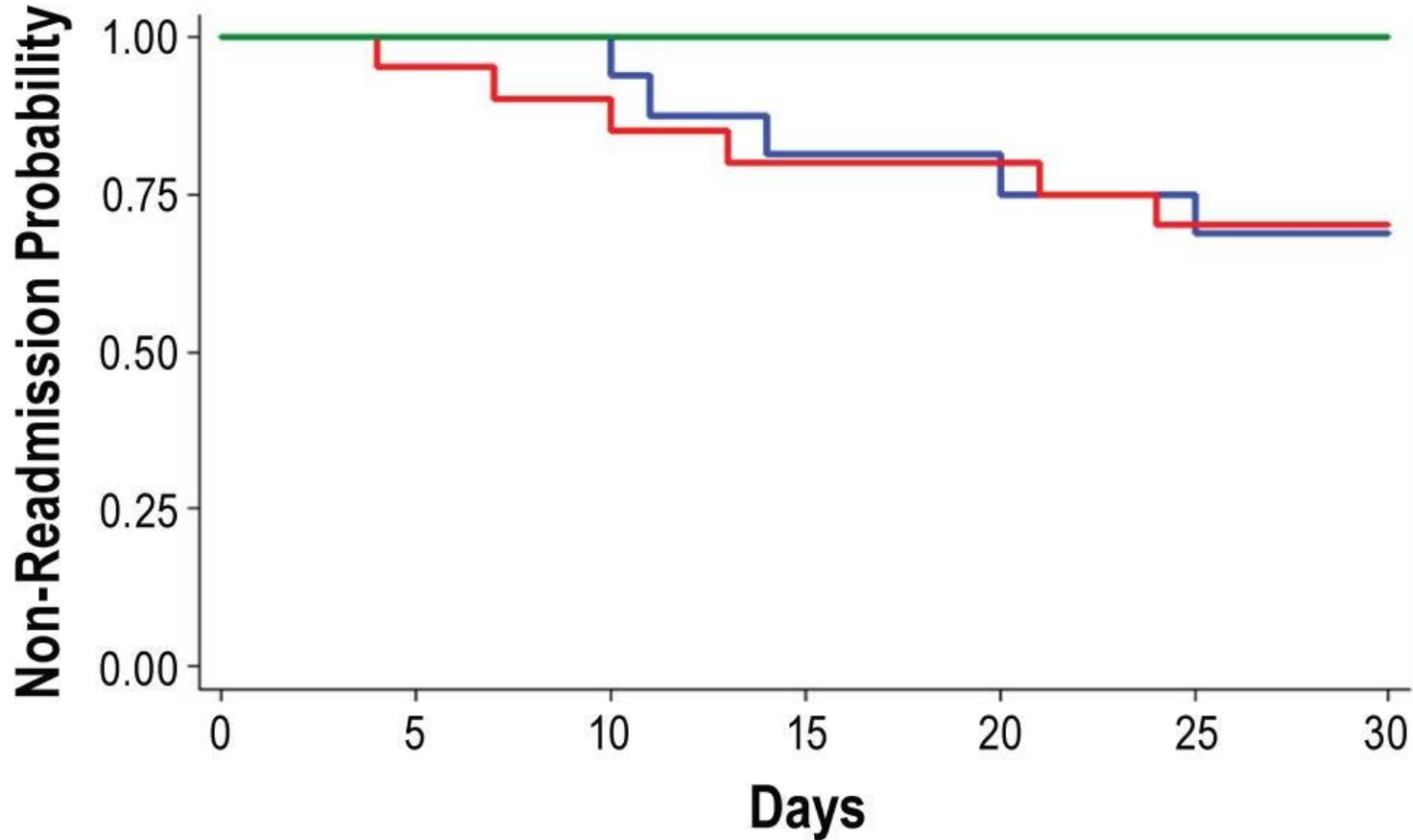


UC Resident Perspective of OSA Screening





Readmission Kaplan-Meier Analysis

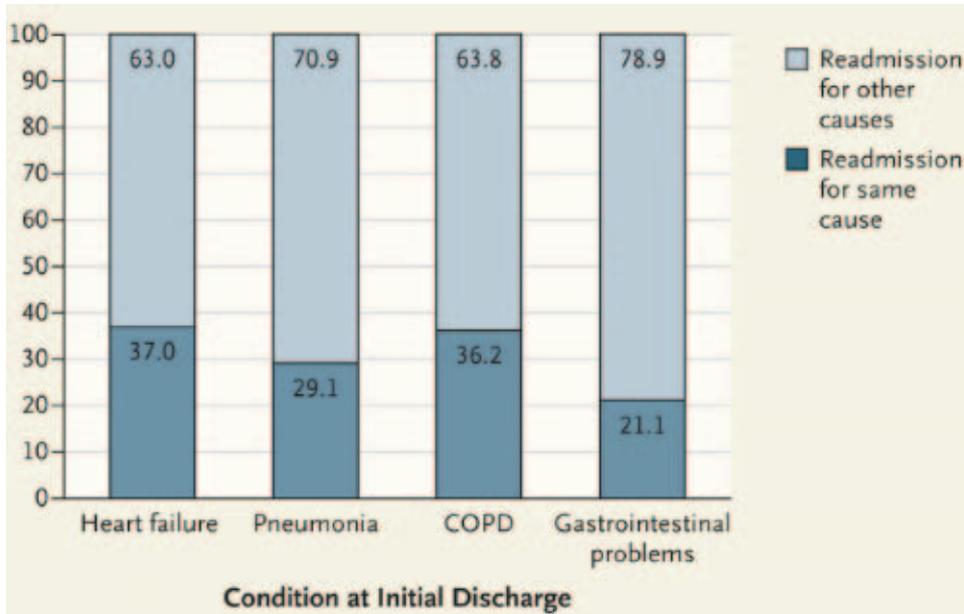


Kauta SR, Keenan BT, Goldberg L, Schwab RJ. Diagnosis and treatment of sleep disordered breathing in hospitalized cardiac patients: a reduction in 30-day hospital readmission rates. *J Clin Sleep Med* 2014;10(10):1051-1059.



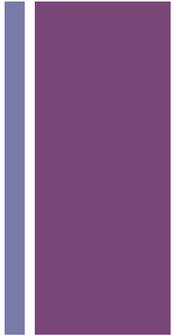
What Happens After Discharge?

- **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

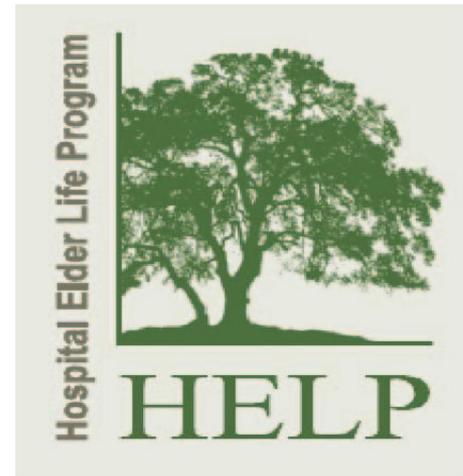




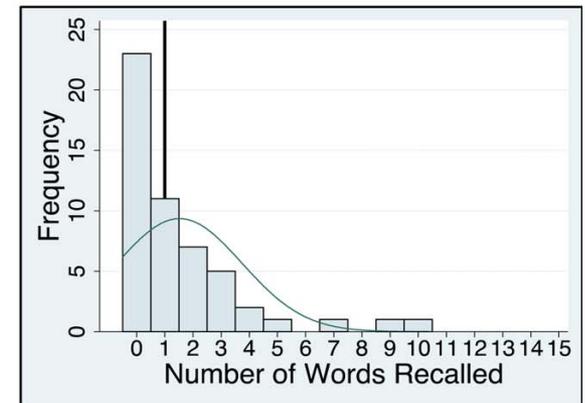
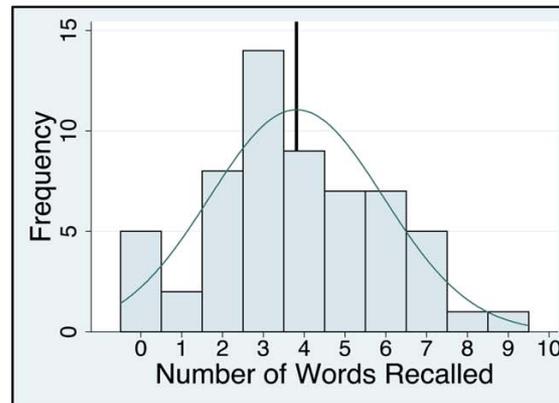
Inpatient Sleep Loss & Delirium/ Memory



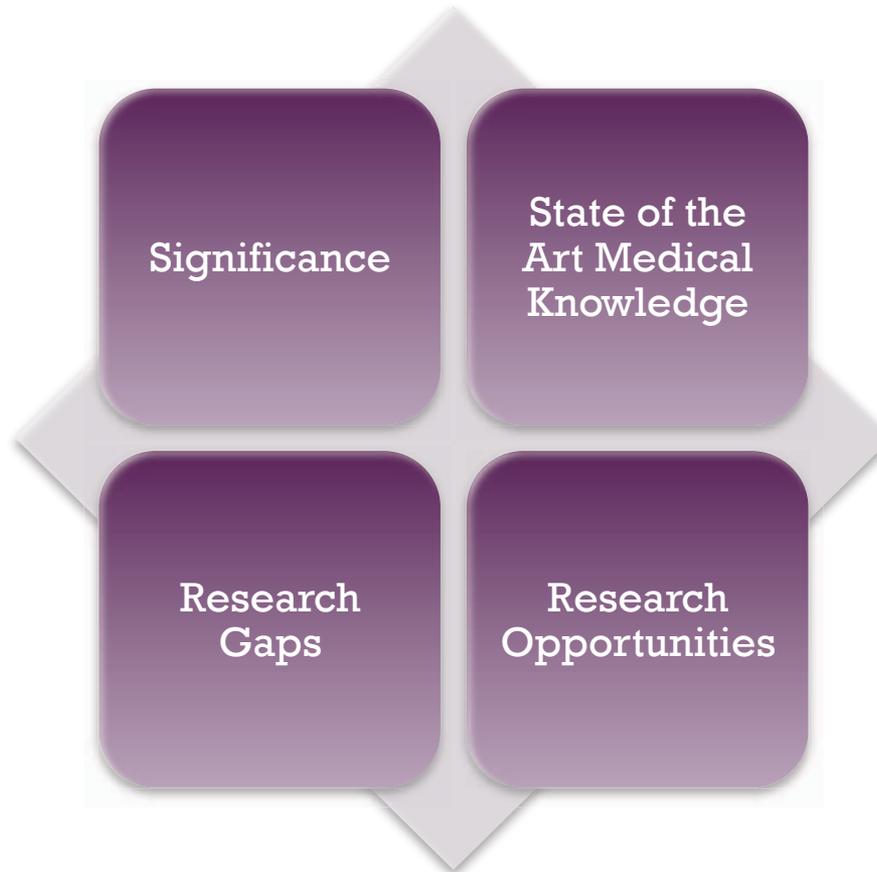
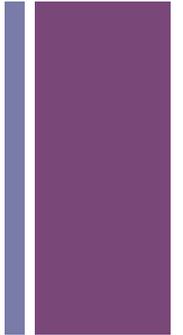
- HELP Trial for delirium
 - Only 10% adherence to sleep protocol (Inouye et al Arch Int Med 2003)
 - Can adherence to better sleep reduce delirium?
- 50% have poor memory!
 - No relationship between sleep and memory all patients were likely sleep deprived



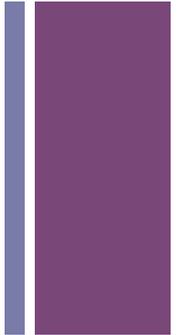
Calev et al. JHM 2015



+ 4 Questions



+ 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?

Risk of Sleep Apnea in Hospitalized Older Patients

Talia C. Shear, B.A.¹; Jay S. Balachandran, M.D.^{2,3}; Babak Mokhlesi, M.D., M.Sc., F.A.A.S.M.^{2,3}; Lisa M. Spampinato, B.S.²; Kristen L. Knutson, Ph.D.^{2,3}; David O. Meltzer, M.D., Ph.D.²; Vineet M. Arora, M.D., M.A.P.P.^{2,3}

¹Pritzker School of Medicine, University of Chicago, Chicago, IL; ²Department of Medicine, University of Chicago, Chicago, IL; ³Sleep, Metabolism and Health Center, University of Chicago, Chicago, IL

Background/Objectives: 1 undiagnosed obstructive sleep apnea in hospitalized medical inpatients and to identify risk factors associated with in-hospital sleep apnea.
Design: Prospective cohort study.
Setting: General medicine ward.
Participants: 424 hospitalized patients without a sleep disorder diagnosis, 72% African American.
Main Measures: The Berlin Questionnaire for determining risk of OSA, sleep duration via wrist actigraphy. Self-reported sleep quality using Karolinska Sleep Quality Scale.
Key Results: Two of every 5 hospitalized patients (n = 168) were found to be at high risk for sleep apnea. Sleep duration was ~ 5 h and sleep quality was poor. Using random effects linear regression, we found that patients who screened at high risk for sleep apnea had a 1.5-fold increased risk of postoperative complications and a 1.5-fold increased risk of hospital readmission.

Hospital Sleep Medicine: The Elephant in the Room?

Commentary on Kautz et al. Diagnosis and treatment of sleep disordered breathing in hospitalized cardiac patients: a reduction in 30-day hospital readmission rates. *J Clin Sleep Med* 2014;10:1051-1059 and Shear et al. Risk of sleep apnea in hospitalized older patients. *J Clin Sleep Med* 2014;10:1061-1066.

Sunil Sharma, M.D., F.A.A.S.M.

Jefferson Sleep Disorders Center, Thomas Jefferson University and Hospitals, Philadelphia, PA

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?

have an increased risk of postoperative complications and a 1.5-fold increased risk of hospital readmission. This finding has been characterized as a period of high risk for sleep apnea.

(HTN), atrial fibrillation and obesity hypoventilation syndrome (OHS) among others, makes the hospital a happy play ground for sleep disordered breathing in particular, and other sleep

may significantly influence re-admissions. Nonetheless, these findings, if confirmed with a randomized control trial, will have significant implications on the role of hospital sleep medicine



SIESTA



American Sleep Medicine Foundation
Funding Research and Promoting Education

- Bite-sized chunks of information
 1. Improving hospital sleep
 2. Screening for sleep disorders
- Can be delivered online “Flipped classroom”



The Doctor's Channel
short vids for doctors

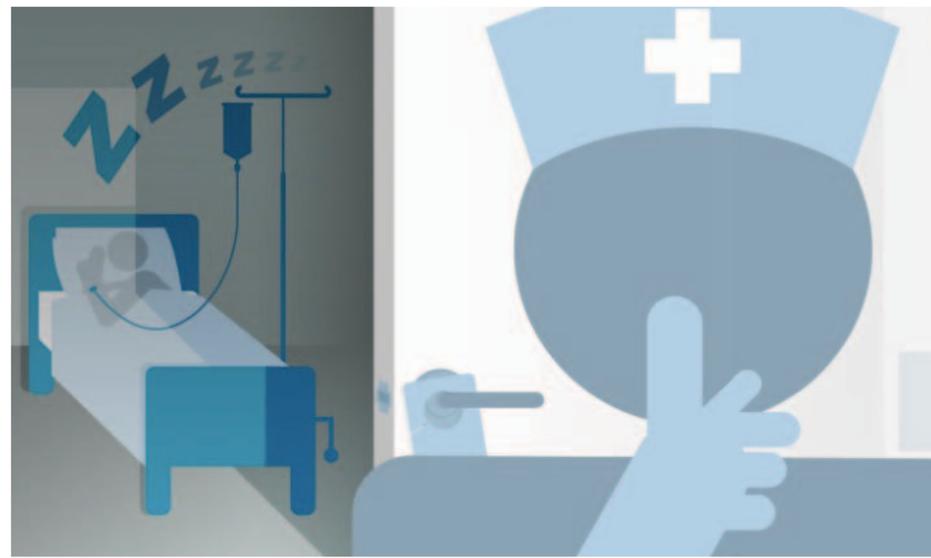


SIESTA Educational Module Advisors:
Babak Mokhlesi & Jay Balachandran



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- MERITS – Drs. Jeanne Farnan, Barrett Fromme, Holly Humphrey
- Project Managers – Paul Staisiunas, Lisa Spampinato, Sam Anderson & Sam Ngooi
- Dr. David Meltzer & Hospitalist Study Staff
 - Andrea Flores, Ainoa Mayo



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- NIA UL1 RR024999 Clinical Translational Sciences Award
- American Sleep Medicine Foundation
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