The Bi-Directionality of Sleep and Co-morbid Conditions:
Why Should We Care

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Florida International Sleep School
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Agenda

- Chronic care principles
- Patient centered care
- The Big Five Co-Morbid Conditions
  - Bi-directionality of sleep and co-morbid conditions
Objectives

1. Apply principles of chronic care as they relate to the co-morbid condition and sleep disorder
2. Describe a patient-centered approach to patient with sleep disorders with co-morbid disease
3. Explain the impact of sleep deprivation on various body systems
4. Consider the increasing complexity a sleep disorder may contribute to a chronic illness
Chronic Care Facts

125 Million people have a chronic illness; 60 million have more than 1

Many people see more than 8 different doctors in one year; EMR systems have little to no interoperability

Chronic conditions can be reduced by closer management of common risk factors

http://www.jhsph.edu/lipitzcenter/Guided_Care/GC_Chronic_care_facts.html
Chronic Illness-Things to Think About

- Duration exceeds 3 months (National Center for Health Statistics)
- Paying for expensive treatment and tests
- Fear of the long-term
- Stress and anxiety
- Depression
- Diminished work performance and social engagement

Chronic Illness-The Big Five

Any condition that requires ongoing adjustments by the affected person and interactions with the health care system.
What is Chronic Care?

“necessary components for a delivery system that encourages and sustains productive interactions between patients and providers”
General Principles of Good Chronic Care

0 Develop a treatment partnership with your patient
0 Focus on the patients concerns and priorities
0 Support patient self management
0 Organize proactive follow-up
0 Involve peer support i.e. AWAKE meetings
0 Use written information:
   0 Treatment plan
   0 Reminder cards
0 Work as a “clinical team”
0 Assure continuity of care
0 Use the 5 A’s

WHO, 8, 2004 Interim guidelines for first-level facility health workers
Current Chronic Care Situation

Americans Believe That Access to Care and Coverage Is a Problem for People With Chronic Conditions

Percentage of Population Believing Factor Is a Problem

Access and Coverage Problems

Source: Chronic Illness and Caregiving, a survey conducted by Harris Interactive, Inc., 2000

RWJF: Chronic Care in America, 2010
What do Physicians Think?

Physicians Believe That People With Chronic Conditions Have Unmet Needs

Percentage of Physicians Who Believe Access Is Difficult or Very Difficult

- Mental health care: 84%
- Adequate health insurance: 80%
- Respite care for family: 78%
- Patient special education or training: 75%
- Prescription drugs: 65%
- Medical specialists: 56%
- Other health care professionals: 55%
- Primary care doctors: 53%
Patient Centered Care

0 What is it?

0 Why are the principles important in sleep medicine

0 Implications for the technologist/healthcare provider
Patient Centered Care

- **Dignity and Respect.** Health care practitioners listen to and honor patient and family perspectives and choices. Patient and family knowledge, values, beliefs and cultural backgrounds are incorporated into the planning and delivery of care.

- **Information Sharing.** Health care practitioners communicate and share complete and unbiased information with patients and families in ways that are affirming and useful. Patients and families receive timely, complete, and accurate information in order to effectively participate in care and decision-making.

- **Participation.** Patients and families are encouraged and supported in participating in care and decision-making at the level they choose.

- **Collaboration.** Patients and families are also included on an institution-wide basis. Health care leaders collaborate with patients and families in policy and program development, implementation, and evaluation; in health care facility design; and in professional education, as well as in the delivery of care.
People With Chronic Conditions Report Not Receiving Adequate Information

Percentage of Population With Chronic Conditions Reporting Problems

- Received different diagnoses from different providers: 1496
- Received information about drug interactions upon filling prescription: 1896
- Received conflicting information from providers: 1796
- Had duplicate tests or procedures: 1896

Source: Chronic Illness and Caregiving, a survey conducted by Harris Interactive, Inc., 2000.
# Medical vs. Patient Centered

<table>
<thead>
<tr>
<th>Medical Model</th>
<th>Patient-Centered Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient's role is passive</td>
<td>Patient's role is active</td>
</tr>
<tr>
<td><em>Patient is quiet</em></td>
<td><em>(Patient asks questions)</em></td>
</tr>
<tr>
<td></td>
<td><strong>Patient is a partner in the treatment plan</strong></td>
</tr>
<tr>
<td>Patient is the recipient of treatment</td>
<td><em>(Patient asks about options)</em></td>
</tr>
<tr>
<td><strong>Physician dominates the conversation</strong></td>
<td><strong>Physician collaborates with the patient</strong></td>
</tr>
<tr>
<td><em>(Does not offer options)</em></td>
<td><em>(Offers options, discusses pros &amp; cons)</em></td>
</tr>
<tr>
<td><strong>Care is disease-centered</strong></td>
<td><strong>Care is quality-of-life centered</strong></td>
</tr>
<tr>
<td><em>(Disease is the focus of daily activities)</em></td>
<td><em>(The patient focuses on family &amp; other activities)</em></td>
</tr>
<tr>
<td>Physician does most of the talking</td>
<td>Physician listens more &amp; talks less</td>
</tr>
<tr>
<td>Patient may or may not adhere to</td>
<td>Patient is more likely to adhere to treatment plan</td>
</tr>
<tr>
<td>treatment plan</td>
<td><em>(Treatment accommodates patient's cultures &amp; values)</em></td>
</tr>
</tbody>
</table>

Adverse Outcomes of Sleep Loss

- Physiological
  - Altered Immune response, metabolic/endocrine

- Social
  - Impaired social interaction, family, work

- Cognitive-Behavioral
  - Fatigue, risk for accidents, executive function dysfunction

- Emotional
  - Altered Mood, low motivation

Sleep Deprivation
Depression, A Common Factor

- Heart attack: 40%-65%
- Coronary artery disease (without heart attack): 18%-20%
- Parkinson's disease: 40%
- Multiple sclerosis: 40%
- Stroke: 10%-27%
- Cancer: 25%
- Diabetes: 25%
- Chronic pain syndrome: 30%-54%
Co-Morbidity and Sleep

- Association between number of comorbid conditions, depression, and sleep quality using the Pittsburgh Sleep Quality Index: results from a population-based survey (Hayashino, 2010)
  - The number of comorbid conditions correlated positively with poor sleep quality, and as the number of comorbid conditions increased, the proportion of those also suffering from depression increased.
  - Recognizing the signs of depression in patients with multiple comorbid conditions is important because of its exacerbation of poor sleep quality.
Cardiovascular Consequences of OSA- General

- Independent role in cardiovascular mortality and morbidity exists
**Figure Legend:**

Schematic outlining proposed pathophysiological components of OSA, activation of cardiovascular disease mechanisms, and consequent development of established cardiovascular disease.
OSA and Hypertension

0 Hypertension
0 Sympathetic over activity
   0 Persists after hypoxic related arousal
   0 Exerts systemic changes; promotes persistent, elevated BP; augments subsequent response to sympathetic stimuli
   0 Sympathetic interaction with the renin-angiotensin system
      0 Angiotension II potentiates the vaso-constrictor effects
   0 Resetting of the baroreflex
      0 Adaptation to higher blood pressure set point
      0 Reactive oxygen species = oxidative stress
   0 Vasoconstriction may induce long lasting changes in the resistance vessels; structural and functional changes

Khayat, 2009 Heart Failure Rev
When do Cardiovascular abnormalities begin?

- Prospective, non-randomized study to ascertain the degree in which OSA/AHI contributes to cardiovascular abnormalities in newly dx OSA pts
  - Without clinically diagnosed cardiovascular disease
  - N=130 (84% male); 49±10 years; 48% RDI 30-50/hour; BMI 26.5±3 (56% overweight, 16 obese)

- Methods
  - Blood pressure/ APBM (X3), Full PSG, Echocardiography, Carotid Ultrasonography, Aortic Pulse Wave Velocity, Biological parameters such as cholesterol, lipids and glucose

Baguet, 2009, Vascular Health and Risk Management
Results

0 Patients categorized as group A RDI<37 or group B RDI>37(>BMI)
0 BP, ABP and HR did not vary from group to group
   0 75% were hypertensive (not previously known)
   0 42% had non-dipping BP (but more severe OSA were higher non-dippers 52 vs. 34%)
0 Arterial parameters did not vary between groups
   0 Carotid IMT/PWV positively correlated with age
   0 Carotid IMT correlated with mean SaO2
   0 Pulse pressure positively correlated with age
   0 LVH was present in 5-9%
0 Patients with highest RDI had significantly higher LV wall thickness
0 Patients with a higher SaO2 were older and worse hypertension
So, what does it mean?

- Hypertension is highly prevalent in OSA patients (75%)
  - Predominately nocturnal, diastolic, associated with non dipping
    - The value of ABPM
  - ~25% presented with carotid hypertrophy
    - More common in older, severe OSA with a mean of SaO2 of > 95.3%
    - For this low risk population, was elevated
  - Link between left ventricular mass and OSA severity
    - LVH was moderate
Take Home Message

OSA in newly diagnosed patients, in the absence of other cardiovascular diagnosis show early signs of cardiovascular disease
Coronary Artery Disease

Coronary heart disease (CHD) is a narrowing of the small blood vessels that supply blood and oxygen to the heart. CHD is also called coronary artery disease.

Fatty material and other substances form a plaque build-up on the walls of your coronary arteries. This buildup causes the arteries to narrow.
Sleep Deprivation Linked to Coronary Artery Calcification

Figure 2: Coronary Calcification Incidence by Mean Sleep Duration

Error bars indicate 95% confidence intervals, which are 95% binomial intervals. Three self-reports were missing. $P < .001$ for trend for actigraphy and $P = .12$ for trend for self-report.

King, et al, 2008 JAMA (CARDIA Study)
# SHHS and Incident CHD

Table 3. Relation of OSA to Incident CHD*

<table>
<thead>
<tr>
<th></th>
<th>AHI (Events per Hour)</th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5.0</td>
<td>5.0 to 14.9</td>
<td>15.0 to 29.9</td>
<td>≥30.0</td>
<td>χ²</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of subjects</td>
<td>829</td>
<td>644</td>
<td>282</td>
<td>172</td>
<td></td>
</tr>
<tr>
<td>No. of CHD events</td>
<td>114</td>
<td>96</td>
<td>47</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Covariates in model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, race, BMI, smoking</td>
<td>1.00 (Referent)</td>
<td>0.94 (0.71, 1.24)</td>
<td>1.07 (0.75, 1.52)</td>
<td>1.45 (0.30, 2.13)</td>
<td>0.46</td>
</tr>
<tr>
<td>Plus total and HDL cholesterol, lipid-lowering medications, diabetes mellitus</td>
<td>1.00 (Referent)</td>
<td>0.93 (0.70, 1.23)</td>
<td>1.04 (0.73, 1.40)</td>
<td>1.41 (0.36, 2.07)</td>
<td>0.68</td>
</tr>
<tr>
<td>Plus SBP, DBP, use of antihypertensive medications</td>
<td>1.00 (Referent)</td>
<td>0.91 (0.69, 1.20)</td>
<td>1.07 (0.75, 1.52)</td>
<td>1.33 (0.91, 1.95)</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of subjects</td>
<td>1605</td>
<td>610</td>
<td>196</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>No. of CHD events</td>
<td>103</td>
<td>54</td>
<td>17</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Covariates in model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, race, BMI, smoking</td>
<td>1.00 (Referent)</td>
<td>1.01 (0.73, 1.45)</td>
<td>0.92 (0.54, 1.55)</td>
<td>0.35 (0.11, 1.16)</td>
<td>0.10</td>
</tr>
<tr>
<td>Plus total and HDL cholesterol, lipid-lowering medications, diabetes mellitus</td>
<td>1.00 (Referent)</td>
<td>0.99 (0.71, 1.40)</td>
<td>0.89 (0.52, 1.51)</td>
<td>0.37 (0.12, 1.19)</td>
<td>0.09</td>
</tr>
<tr>
<td>Plus SBP, DBP, use of antihypertensive medications</td>
<td>1.00 (Referent)</td>
<td>0.98 (0.69, 1.36)</td>
<td>0.87 (0.51, 1.49)</td>
<td>0.40 (0.12, 1.27)</td>
<td>0.10</td>
</tr>
</tbody>
</table>

*Results are adjusted hazard ratio (95% confidence interval).

χ² for the overall effect of AHI modeled as a continuous variable.

**Conclusions**—Obstructive sleep apnea is associated with an increased risk of incident heart failure in community-dwelling middle-aged and older men; its association with incident coronary heart disease in this sample is equivocal. (*Circulation*. 2010;122:352-360.)
OSA and the Heart

0 Mechanical
  0 Thought to play a role in existing cardiac dysfunction
  0 Negative pressure increases the gradient between the intraventricular pressure = increase work load of the left ventricle
  0 Contribute to pulmonary edema
  0 Increase in pre-load
OSA and the Heart

0 Endothelial
   0 Endothelial dysfunction precedes clinical manifestations of cardiovascular consequences
   0 Promotes atherosclerotic changes; oxidative stress
   0 Impaired endothelial mediated vasodilation
      0 AHI/ODI and impairment of flow mediated dilation

0 Inflammation
   0 Systemic inflammation = ROS
   0 Elevated levels of tumor necrosis factor

Khayat, 2009 Heart Failure Rev
Congestive Heart Failure

0 Systolic Heart Failure
   0 The heart muscle cannot pump (eject) the blood out of the heart very well.

0 Diastolic Heart Failure
   0 heart muscles are stiff and do not fill up with blood easily.

0 Fluid builds up in the lungs, liver, gastrointestinal tract, and the arms and legs.
Signs and Symptoms-CHF

- Cough
- Fatigue, weakness, faintness
- Loss of appetite
- Need to urinate at night
- Pulse that feels fast or irregular, or a sensation of feeling the heart beat (palpitations)
- Shortness of breath when active or lying down
- Swollen (enlarged) liver or abdomen
- Swollen feet and ankles
- Waking up from sleep after a couple of hours due to shortness of breath
- Weight gain
CHF and Sleep Problems

- Dyspnea
- Symptoms of RLS
- OSA/CSA
- Insomnia
  - Impacts daytime functional performance
- Short sleep duration

CHF Common Medications

0 Drugs
   0 Diuretics
      0 Nocturia; leg cramps
   0 Beta Blockers
      0 Insomnia, nighttime awakenings
   0 antiarrhythmic
      0 Sleep difficulties, daytime fatigue
   0 Ace Inhibitors
      0 Fatigue, sleep problems
**SDB and CHF Management**

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Fig 3.
A suggested algorithm for management of sleep-disordered breathing in congestive heart failure.
2013 ACCF/AHA Guideline for the Management of Heart Failure

Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

New!

7.3.1.4. Treatment of Sleep Disorders: Recommendation

Class IIa

1. Continuous positive airway pressure (CPAP) can be beneficial to increase LVEF and improve functional status in patients with HF and sleep apnea (393-396) (Level of Evidence: B)

Sleep disorders are common in patients with HF. A study of adults with chronic HF treated with evidence-based therapies found that 61% had either central or obstructive sleep apnea (397). Despite having less sleep time and sleep efficiency compared with those without HF, patients with HF, including those with documented sleep disorders, rarely report excessive daytime sleepiness (398). Thus, a high degree of suspicion for sleep disorders should be maintained for these patients. The decision to refer a patient to a sleep study should be based on clinical judgment.
Diabetes

0 Diabetes affects the body's ability to use blood sugar for energy.
0 Type 1 diabetes, Type 2 diabetes, and gestational diabetes.
Diabetes

- Type 1 Diabetes
  - In type 1 diabetes, previously known as juvenile diabetes, the body’s immune system destroys insulin-producing cells in the pancreas.

- Type 2 diabetes
  - Type 2 diabetes is the most common type of diabetes accounting for 90%-95% of people with diabetes.

- Pre-diabetes and insulin resistance

- Gestational
  - Occurs during pregnancy; glucose intolerance linked to short sleep duration and snoring (Qui, et al., 2010)
Potential Mechanisms Linking OSA to Alterations in Glucose Metabolism

- High sympathetic nervous system activity
- Intermittent hypoxia
- Sleep fragmentation and sleep loss
- Dysregulation of the hypothalamic pituitary axis
- Endothelial dysfunction
- Alterations in cytokine and adipokine release

Tasali, Mokhlesi, & Van Cauter, 2008 CHEST
Change in Glucose Values with CPAP
(Babu Arch Intern Med 2005)

No. of Glucose Values > 200 mg/dL

Before CPAP

After CPAP

P = .003

P = .003

All Patients

Patients With HbA1c > 7
Sleep Loss → Diabetes

- Altered Glucose Metabolism
- Reduced Leptin (Increased Ghrelin)
- Up regulation of appetite, more time to eat
- Lower Energy Expenditure?

???

Insulin Resistance → Weight Gain

Diabetes Risk

Short (≤ 5 hrs) and long (≥ 9 hrs) sleep contributes to the development of diabetes (Nurses Health Study)

Adapted from Parker, K.P. (2011) Sleep disorders and Sleep Promotion in Nursing Practice; p. 180
How does diabetes contribute to poor sleep?

- Anxiety
- Depression
- Painful neuropathy
- Going to the bathroom
- Restless Legs
Chronic Obstructive Pulmonary Disease

- Emphysema
- Chronic Bronchitis
COPD

- Disrupted and fragmented sleep
  - Prolonged sleep latency, decreased efficiency; TST; REM and SWS.
- Coughing and shortness of breath
- OSA Overlap

Diagram:

- Genetic factors
  - Lung hyperinflation
  - Skeletal muscles
- Hypoxia
- Inflammation (Pulmonary/ Systemic)
- Oxidative stress
- Sympathetic activation
- Connective tissue degradation
- Arterial stiffness

Cardiovascular diseases
- Coronary Artery Disease
- Congestive Heart Failure
- Arrhythmias

COPD

1 elastolytic activity
Disturbed sleep among COPD patients is longitudinally associated with mortality and adverse COPD outcomes (Omachi, et al., 2012, Sleep Medicine)

Fig. 1. The study addressed questions of cross-sectional associations (Pathways #1 and #2), questions of longitudinal associations (Pathway #3), and questions of cognitive deficits or psychological factors as potential mediators in longitudinal associations (Pathway #4).
Asthma

Pathophysiology of Nocturnal Asthma

**Hormonal**
- \( \uparrow \) Cholinergic tone
- \( \uparrow \) Melatonin
- \( \downarrow \) Cortisol
- \( \downarrow \) Epinephrine

**Mechanical**
- Supine posture
- \( \downarrow \) Lung volumes
- \( \uparrow \) Intrathoracic blood volume

**Cellular**
- \( \uparrow \) Macrophages
- \( \uparrow \) Eosinophils
- \( \uparrow \) CD4
- \( \uparrow \) LTE4

**Response to treatment**
- \( \beta \) receptor polymorphisms
- Glucocorticoid receptor variations

**Consequences**
- Disrupted sleep
- \( \uparrow \) Sleep latency
- \( \uparrow \) Daytime cognitive performance
- \( \downarrow \) Daytime hypersomnia

\( \downarrow \) FEV1/PEFR
\( \uparrow \) Airway resistance
\( \uparrow \) Airway hyperactivity
\( \uparrow \) Airway inflammation
Asthma

- Disrupted and fragmented sleep
  - Dyspnea, cough or wheeze
- Lowest peak flow during night hours
  - Increased parasympathetic activity; increased airway inflammation, increased levels of proinflammatory leukotriens
- Treatment with inhaled corticosteroids may help to improve sleep
Sleep disturbances in a Canadian population with asthma or chronic obstructive pulmonary disease (COPD)

A Des Comiers, LP Boulet

From AlleGen NCE Inc.’s Fifth Annual Research Conference: Innovation from Cell to Society
Québec City, QC, Canada. 7-9 February 2010

Objective/purpose
To compare the self-reported prevalence of sleep duration and quality in patients with asthma, chronic bronchitis (CB), or undefined COPD in the Canadian population.

Methods
This cross-sectional survey was done using the Public Use Microdata File Canadian Community Health Survey (CCHS) Questionnaire for Cycles 1.1 (2000-2001). Ninety-eight percent of the Canadian population was represented by a sample of 136,000 persons, aged 12 or older.

Findings
A higher frequency of difficulty falling or staying asleep most of the time was observed in people with asthma (19.1%), chronic bronchitis (29.7%), or COPD (50.9%) compared to the general population (GP: 12.8%). Fewer patients with these conditions reported finding their sleep "refreshing" most of the time (A: 50.7%; CB: 42.1%; COPD: 45.1%) compared to those without these ailments (62.3%). A difference was also observed in regard to difficulty in staying awake most of the time during the day (A: 8.5%; CB: 10.5%; COPD: 11.0%; GP: 5.7%) and in the degree to which chronic fatigue was reported (A: 1.7%; BC: 3.2%; COPD: 5.2%; GP: 6.8%). Canadians with asthma and COPD report more sleep disturbance and chronic fatigue than healthy people.

Deliverables
Eventually, this study will be published in a journal and will be presented at both national and international conferences.

Relevance
This study will help optimize treatment in respiratory diseases. A better knowledge base will result in better treatment. Asking questions about quality of sleep will provide physicians with a better understanding of their patient. This type of question will indicate to them how the disease impacts patient's lives.

Published: 25 November 2010

Cite this article as: Comiers and Boulet: Sleep disturbances in a Canadian population with asthma or chronic obstructive pulmonary disease (COPD).ergy, Asthma & Clinical Immunol 2010;Suppl 3:

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Sleep-related problems and urologic symptoms: Testing the hypothesis of bi-directionality in a longitudinal, population-based study.
Araujo AB, Yaggi HK, Yang M, McVary KT, Fang SC, Bliwise DL.

PURPOSE:
To evaluate the bi-directional association between urologic symptoms (urinary incontinence (UI), lower urinary tract symptoms (LUTS), and nocturia) and sleep-related variables.

MATERIALS AND METHODS:
Data were obtained from a prospective cohort study of 1,610 men and 2,535 women who completed baseline (2002-05) and follow-up (2006-10) phases of the Boston Area Community Health (BACH) survey, a population-based random sample survey. Sleep restriction (≤5 hours/night), restless sleep, sleep medication use, and urologic symptoms were assessed by self-report. UI was defined as weekly leakage or moderate/severe leakage, LUTS (overall, obstructive, irritative) was defined by American Urological Association Symptom Index, and nocturia was defined as urinary frequency ≥2 times/night.

RESULTS:
At the 5 year follow-up, 10.0%, 8.5% and 16.0% of subjects newly reported LUTS, UI and nocturia, respectively, and 24.2%, 13.3%, 11.6% newly reported poor sleep quality, sleep restriction and use of sleep medication, respectively. Controlling for confounders, the odds of developing urologic symptoms was consistently increased for subjects who reported poor sleep quality and sleep restriction at baseline, but only baseline nocturia was positively associated with incident sleep-related problems at follow-up. Body mass index, a potential mediator, reduced selected associations between sleep and incident UI and irritative symptoms, but C-reactive protein did not.

CONCLUSIONS:
These data suggest that self-reported sleep-related problems and urologic symptoms are linked bi-directionally, and BMI may be a factor in the relationship between sleep and development of urologic symptoms.
What are our goals?

- Reduce the impact of chronic illness
- Help the patient become successful
- Reduce healthcare costs
- Improve the care of the patient by incorporating patient centered ness
- Improve quality of life
Maslow Hierarchy of Needs

- Self-Actualization
- Esteem Needs
- Social Needs
- Safety Needs
- Physiological Needs
Information to Consider: It is not just about the condition!

- Patients ideas, preferences, values, living condition, economics
- Build upon past experiences
- Culture, skills and health literacy
- Risks, benefits and costs
- System for feedback; care strategy changes

IOM, 2011
What is Concept Mapping?

- Introduce and stimulate critical thinking as a multidimensional, integrative process.
- Enhance understanding of the numerous, interrelated influences on their client.
- Identify and clarify all concepts (with supportive data) and the health or situational influences.
- Visually and logically link the concepts by drawing lines that illustrate an understanding of the relationships.


Kathleen Huun, PhD; Concept Mapping, a Preview for Preceptors
Concept Map - Diabetes

- Neuropathy Pain
- Insomnia/sleep deprivation
- Wt Gain
- 65 yo, female, Diabetes
- Depression
- Lack of Exercise
- Poor Daytime Functioning

Interconnections:
- Neuropathy Pain to Insomnia/sleep deprivation to Wt Gain
- Wt Gain to Depression
- Depression to Lack of Exercise
- Lack of Exercise to Poor Daytime Functioning
- Poor Daytime Functioning to Neuropathy Pain
Take Away: Why Should We Care?

- Sleep disturbances may contribute to the development of co-morbid conditions
- Medical conditions can contribute to poor sleep
- Care of patients with chronic conditions must always include adequate investigation of sleep related issues
- Sleep professionals can be instrumental in improving the health and well-being of patients, outside of the realm of sleep medicine
Guiding Principle

Knowing is not enough; we must apply.
Willing is not enough; we must do.

Johann Wolfgang von Goethe
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