# Tobacco Dependence as a Chronic Disease

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# Objectives

- Understand the rationale-Tobacco dependence – Chronic disease
- Review prevalence of tobacco use
- Smoking and Cardiovascular disease
- Smoking and Lung disease
- Smoking and Cancer
- Present USPHS Guidelines update--2008

# Rationale

- Tobacco Dependence should be considered a chronic disease similar to (USPHS guidelines 2000)
- Smoker goes through "process of quitting"
   Stages of pre contemplation, contemplation
- Associated with frequent lapses, relapses

# Rationale

- Clinicians should address this problem with each patient visit as with other medical problems
- Patients should be educated to understand smoking cessation is a process and the risk of relapse is lifelong
- May be similar to Alcoholic Anonymous framework.

# USPHS Clinical Practice Guideline-Tobacco dependence a Chronic disease

- Similar to diabetes, hypertension, and hyperlipidemia
- Clinicians provide counseling, advice, support, and appropriate pharmacotherapy
- Relapse is common (93% in 1 year for unassisted cessation)

www.ahrq.gov

# Prevalence Tobacco use-USA

- 1965 to 2009 Decline in adult cigarette smoking rate in USA, 41% to 20.6%
- 2005- Lowest consumption of cigarettes
- Recent plateau –decline is slowing
- Recent CDC (8/2/12)report sharp increase in other forms of tobacco use; pipes (482%) and large cigars (233%) from 2000 to 2011
- Decline in total tobacco consumption 27.5% from 2000 to 2011 (only 0.8% in 2010 to 2011)

# Per Capita Cigarette Consumption – USA



# Smoking Prevalence by state

- Which two US states have the highest smoking rate?
  - A. North Carolina
  - -B. West Virginia
  - C. Kentucky
  - D. Indiana

# Smoking prevalence by state

- Which US state has the lowest smoking rate?
- A. California
- B. Hawaii
- C. Utah
- D. New Jersey

# Smoking prevalence

- Overall 19.3% of US adults (2010)
- Highest --Kentucky and West Virginia 25.6%
- Lowest Utah—9.8%
- Highest prevalence in the Midwest and Southeast
- Lowest in the Western states (Utah and California lowest)

# Current Data 2009/2010

 Overall prevalence of cigarette smokers USA (> age 18) declined from 20.9% (2005) to 19.3% (2010)

– Men 21.5%; women 17.3%

- Kentucky and West Virginia –25.6%
- Utah 9.8% (2009)
- Midwest 21.8%, South 21% (2010)
- West 16.4% (2009)

# Prevalence by ethnic group

- 31.4% non-Hispanic American Indian/Alaska Native
- 21% Non-hispanic white
- 20.6% non-hispanic black
- 12.5% Hispanic
- 9.2% non Hispanic Asians

# Prevalence by education

- 25.1% if less than high school
- 45.2% GED
- 23.8% high scho graduate
- 23.2% some college
- 18.8% Associate degree
- 9.9% undergraduate degree
- 6.3% Postgraduate degree

# Prevalence by income status

- 28.9% persons below federal poverty level
- 18.3% at or above poverty Level

Ref. -CDC MMWR 9/6/11 vol. 60/no. 35

# The Toll of Cigarettes

- Deaths annually
  - World wide: >5 million
  - USA: 443,000
  - Canada 45,000
- Tobacco related disease (USA): 8,600,000
- Annual Costs (USA): \$167,000,000,000
   = \$3650/Smoker/year

# The Cigarette Death Epidemic in Perspective



# Tobacco Use worldwide

- As decline in Western developed countries (USA, UK, Europe, Australia and New Zealand)
- Increasing use in developing countries in Asia and Africa –especially China and India





443,000 Deaths Attributable to Cigarette Smoking United States



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# Smoking Effects on Cardiovascular System



### Cigarette Smoking & Vascular Events

- Hypercoagulability
- Increased myocardial work
- CO effects
- Catecholamine release
- Vasoconstriction
- Cigarette Smoking & Atherosclerosis
  - Lipids
  - Endothelial Function
  - Oxidant Injury
  - Thrombosis
  - Blood viscosity

# Cardiovascular Disease Related to Cigarette Smoking

- Coronary Artery Disease
- Sudden Death
- Stroke
- Atherosclerotic
   Vascular Disease
- Abdominal Aortic Aneurysms



# INTERHEART: Odds of MI according to number of cigarettes smoked



Lancet. 2004;364:937-52

# **Coronary Artery Disease**

- Leading cause of death in the USA
- Most of decline in incidence is because of ↓ smoking rate
- ~100,000 CVD deaths due to smoking and >35% occur before age 65
- In young smokers (age 35-39); 4.9 X risk of MI in men; and 5.3 X in women
- 2-6X ↑ risk of sudden death in smokers

# How are we doing?

- Smoking status not even documented in 25% of CVD patients
- Only 14% of post MI patients received a prescription for smoking cessation (TRIUMPH study)
- We are much better at treating hypertension, Diabetes, and hyperlipidemia

# Respiratory Diseases Related to • COPD Cigarette Smoking

- Acute respiratory
   disease
- Reduced lung function infants
- Cough, phlegm, wheezing, dyspnea
- Poor asthma control
- Premature onset and accelerated age-related decline in lung function

Emphysema

Normal

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# COPD Chronic Obstructive Pulmonary Disease

- 3rd leading cause of death in USA
  - 80% of COPD deaths due to smoking
  - Death rate for COPD 10 times higher among current smokers
- 3 types:

### Chronic bronchitis, Emphysema, Asthma

- Decreased airflow
- Reduced ability to bring oxygen to the body
- Shortness of breath
- Can lead to disability and death

## Leading Causes of Death in USA 1970-2002

**Figure 1.** Trends in Age-Standardized Death Rates for the 6 Leading Causes of Death in the United States, 1970-2002



Jemal, A et al, JAMA 294:1255, 2005

# Leading Causes of Death in USA 1970-2002

- ↓↓ Death rates from heart disease (52%), stroke (63%), accidents (41%)
- ↓ Death rates from all types of cancer (2.7%)
- ↑ in deaths from diabetes (45%)

# Smoking: Asthma Severity

ttacks of

- Compared with Never Smokers and Ex-smokers, Current Smokers reported
  - Significantly more attacks of breathlessness
  - Significantly higher severity scores



<sup>a</sup>At rest in the last 12 months. <sup>b</sup>Relationship between attacks of breathlessness and smoking.

<sup>c</sup>Severity score for asthma was established using an a priori decisional tree.<sup>d</sup>Strength of the relationship between severity score and smoking. The 3 classes were coded 1, 2, and 3 for quantitative analysis. Severity score was adjusted for age, sex, and educational level.

Siroux et al. Eur Respir J. 2000;15(3):470-477.

# **Smoking and Tuberculosis**

# Smoking and Pulmonary TB

 Smoking is a risk factor for the development of pulmonary TB





<sup>a</sup>The ratio of the odds of development of disease in exposed persons to the odds of development of disease in nonexposed persons. Crude OR was adjusted for age. To minimize the effect of other confounders the study population was restricted to men aged 20 to 50 years only.

TB=tuberculosis.

Kolappan et al. *Thorax*. 2002;57(11):964-966; www.medscape.com/viewarticle/452428\_2. Accessed May 13, 2007. © 2012 MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED

# Tobacco Smoke: Role in Carcinogenesis

# Carcinogenicity of Tobacco Smoke

- Tobacco smoke contains more than 4000 chemicals
- More than 60 carcinogens are in cigarette smoke



Hecht. Nat Rev Cancer. 2003;3(10):733-743; Freiman. J Cutan Med Surg. 2004;8(6):415-423; US Surgeon General's Report 1989. http://profiles.nlm.nih.gov/NN/B/B/X/S/\_/nnbbxs.pdf. Accessed September 20, 2007; http://www.istockphoto.com/file\_closeup/health\_and\_beauty/medical\_concepts/addiction/3311496\_burning\_cig arette.php?id=3311496. Accessed October 19, 2007. © 2012 MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED

# **Tobacco Smoke Constituents**

- Arsenic
- Benzene
- Benzo[a]pyrene
- Cadmium
- Chromium VI
- Cresol
- Formaldehyde

- Lead
- Nitrosamines
- Phenol
- Polonium 210
- Polycyclic aromatic hydrocarbons
- Vinyl chloride

# Summary: Smoking and Cancer Smoking is associated with an increased risk of

- Smoking is associated with an increased risk of the following cancers:
  - Lung Gastric

- Gynecologic

– Renal

- Head-and-neck Esophageal
- Pancreatic Lymphoma
- Bladder Leukemia
- The risk of some cancers may be related to the duration or amount smoked:
  - Lung Laryngeal
    - Esophageal
- Gynecologic

- Renal –
- Pancreatic Lymphoma
- Gastric

# **Smoking and Lung Cancer**

# Cigarette smoking and Lung cancer

- 1941 Thoracic surgeons Ochsner and DeBakey –"it is our definite conviction that the increase in incidence of pulmonary carcinoma is due largely to the increase in smoking"
- 1950 Doll/Hill UK case/control study note association
  - Wynder and Graham in the USA note 96% of lung cancer case in one series were moderate or heavy smokers

# Lung cancer relation to tobacco use

- 1964 First US Surgeon General report
  - Cigarette smoking caused lung cancer in men
  - Risk increased with the number of cpd and duration
  - Average male smoke had 10 X risk of nonsmoker
  - Heavy smoker had 20X risk

# Lung Cancer

- Leading cause of cancer death in men and women in USA. About 15% of smokers will develop lung cancer
- 2008 215,000 new cases and 161,800 deaths
- Smoking causes 90% of lung cancers and increases risks of all four major cell types.
- Cigar and pipe smoking associated with increased risk
- 5-year survival for non-SCLC is 15%. Varies with race and gender.
- Reduced risk with stopping smoking

# Lung cancer prognosis

- 5 year survival rate in the USA is 15.6%
- In Europe and China 5 year survival estimated to be only 8.9%
- In the USA smoking rates peaked in US women 2 decades later than in men
- And lung cancer rates have declined in both men and women, but the decline in women occurred later. (10-20 year lag)

### Lung Cancer is the Leading Cause of Cancer Death in Women



### Risk of Lung Cancer Current smokers have a higher risk of developing lung cancer than ex-

 Current smokers have a higher risk of developing lung cancer than exsmokers or nonsmokers



<sup>a</sup>The relative likelihood of experiencing a particular event or the effect of an explanatory variable on the hazard or risk of an event.

Mannino et al. Arch Intern Med. 2003;163:1475-1480.

# **Risk of Lung Cancer**

 The risk of developing lung cancer is directly related to the amount smoked



Current Smokers Pack/year was calculated by multiplying the average number of cigarettes smoked daily by the number of years smoked and dividing the product by 20.

<sup>a</sup>The relative likelihood of experiencing a particular event or the effect of an explanatory variable on the hazard or risk of an event.

Mannino et al. Arch Intern Med. 2003;163:1475-1480.

# Lung cancer types

- Small Cell lung cancer –15%
- Non-small cell lung cancer—85%
  - Adenocarcinoma-38.5%
  - Squamous cell carcinoma-20%
  - Large cell carcinoma—3%
- Tobacco use related to all types
  - More common SCLC and Squamous cell
  - Adenocarcinoma more common in nonsmokers

# **COPD:** Risk for Lung Cancer

 When evaluated long-term, diagnosis of COPD is<sub>1</sub>a\_predictor of lung cancer development



Kaplan-Meier curves for incident lung cancer.

Adjusted for age, race, sex, education, smoking status, pack-years, and years since regular smoking. Mannino et al. Arch Intern Med. 2003;163(12):1475-1480. © 2012 MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED

# Lung cancer screening

- National Lung Screening Trial →53,000 patients (current or ex-smokers)
  - Age 55-74
  - Smoking history of at least 30 pack-years
  - Former smokers quit within 15 years.
  - Two arms -low dose CT vs. Chest x-ray
  - 3 annual screenings



# Screening for Lung Cancer

- Screening for lung cancer with low-dose spiral CT resulted in a reduced lung cancer mortality. –20% reduction
  - National Lung Screening Trial Research team study (NEJM 2011:365:395-409)
- Problems
  - False positives (20-50% resected nodules bg)
  - Over diagnosis (slow growing indolent tumors)

# Lung Cancer screening guidelines

- American Lung Association-recommends
  - Lung cancer screening with low-dose CT scans for:
    - Current or former smokers
    - Age 55-74
    - 30 pk/yr. hx. Of smoking
  - Chest x-ray should NOT be used for lung cancer screening
  - Insurance coverage is an issue

# Summary: Smoking and Lung Cancer

- Risk of lung cancer increases with
  - Quantity and duration of smoking
  - Diagnosis and severity of COPD
  - Severity of lung function
  - Quantity and duration of environmental tobacco smoke exposure
- Risk of lung cancer and lung cancer death decreases with
  - Duration of abstinence
  - Age at cessation

# reference

Lung cancer, Clinics in Chest medicine

 Guest editor Lynn T. Tanoue, MD
 Richard A. Matthay, MD
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# **Other Health Effects**

- Periodontal Disease
- Adverse Surgical Outcomes
  - Poor Wound Healing
  - Respiratory complications
- Cataracts
- Hip Fractures
- Low Bone Density
- Peptic Ulcer Disease



### Periodontal Disease and Gum Recession

# **Reproductive Effects** of Cigarette Smoking

- Decreased fertility
- Low birth weights
- Premature rupture of membranes
- Placenta praevia
- Placenta abruption
- Preterm delivery
- SIDS





<sup>a</sup>The probability of an event (developing a disease) occurring in exposed people compared with the probability of the event in nonexposed people. Compared with current smokers. Data for relative risk given as median (range). Ebbert et al. *J Clin Oncol.* 2003;21(5);921-926. © 2012 MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED

### Smoking Cessation: Lung Cancer Risk Reduction Lung cancer risk declines with increased duration of abstinence and approaches that of nonsmokers



Adjusted for age, physical activity, education, body mass index, waist circumference, alcohol use, and fruit consumption. <sup>a</sup>The probability of an event (developing a disease) occurring in exposed people compared with the probability of the event in nonexposed people. <sup>b</sup>Recent ex-smoker (quit  $\leq$ 5 years at baseline). <sup>c</sup>Distant ex-smoker (quit >5 years at baseline). Ebbert et al. *J Clin Oncol.* 2003;21(5);921-926.



**Causes of Death** 

CHD=coronary heart disease; CVD=cardiovascular disease. Athonisen et al. Ann Intern Med. 2005;142(4):233-239. © 2012 MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED

# Impact of Smoking Cessation on Mortality: Men

 Risk of death from lung cancer progressively decreases with increased duration of abstinence



<sup>a</sup>The combined risks from aggregate exposures to multiple agents or stressors. US Environmental Protection Agency National Center for Environmental Assessment. http://cfpub.epa.gov /ncea/cfm/recordisplay.cfm?deid=54944. Accessed May 7, 2007; Peto et al. *BMJ.* 2000;321(7257);323-329. © 2012 MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED

- Prevalence of tobacco use is about 21% which is half what it was in the 1960's.
- Rate of quitting has outstripped initiation so that today there are more former smokers than current smokers.
- Percent of health plans that cover any tobacco dependence treatment has grown from 25 % in 1995 to 90% in 2003.
- Medicaid provides coverage of at least 1 Guideline recommended treatment in 72% of the states.

- JCAHO requires intervention for smokers with diagnosis of MI, pneumonia, and CHF.
- Telephone quit lines now provide wide access to treatment.
- 7 First-line medications are now available.

- Tobacco dependence is a chronic disease that often requires repeated interventions.
- Clinicians and healthcare systems must consistently identify and document tobacco use status and treat every tobacco user.
- Every patient willing to make a quit attempt should be offered counseling and medication.
- Brief tobacco dependence treatment is effective. Every tobacco using patient should be offered at least brief treatment.

- Combination of counseling and medication is more effective than either alone. Both should be routinely offered.
- Telephone quit line counseling is effective and has broad reach. Clinicians and healthcare systems should ensure patient access and promote their use.
- Motivational treatments increase future quit attempts among some smokers unwilling to make a quit attempt.
- Tobacco dependence treatments are clinically effective and highly cost effective. Insurers and health plans should include counseling and medications identified by the Guideline as effective

# USPHS Clinical Practice Guidelinechanges --2008

- Stronger evidence that counseling is an effective tobacco use treatment strategy.
- Counseling adds significantly to the approved medications.
- Telephone quit line counseling is an effective intervention with broad reach.
- Counseling increases tobacco abstinence in adolescent smokers.

- 5 A's (Ask, Advise, Assess, Assist, Arrange)
- 5 R's =??
- Vital sign

# USPHS Clinical Practice Guideline-Motivational interviewing

- Principles spelled out in Guideline:
  - Express empathy
  - Roll with resistance
  - Support self-efficacy

### First line

- nicotine gum
- nicotine patch
- nicotine lozenge
- nicotine nasal spray
- nicotine inhaler
- bupropion
- varenicline
- combination of medications
- Second line
  - clonidine, nortriptyline

- All smokers trying to quit should be encouraged to use effective pharmacotherapies except:
  - Presence of contraindications.
  - Populations where there is insufficient evidence of efficacypregnant smokers, ST users, light smokers(<10 CPD), and adolescents.
- Choice of 1<sup>st</sup> line medication guided by:
  - Clinician familiarity with medications
  - Patient preference/previous experience
  - Patient characteristics
  - Withdrawal symptom relief

- Tobacco-user identification system in every clinic.
- Education, resources and feedback to promote provider intervention.
- Dedicated staff to provide tobacco dependence treatment.
- Hospital policies that support and provide inpatient tobacco dependence treatment services.
- Include tobacco dependence treatment as a paid or covered service for all subscribers.

# Summary

- Tobacco-related diseases are the most important preventable cause of death worldwide
- Tobacco dependence should be viewed as a chronic disease
- Most smokers want to quit
- New treatments -- counseling techniques and new medications are available