Join cancer prevention experts as they discuss how environmental and behavioral factors can significantly increase cancer risk. You’ll follow the physiological pathways from aberrant cell formation that is normally detected and eliminated by the immune system to cancer formation. Examine how the environment and individual behaviors contribute to altering our endogenous protective mechanisms and explore strategies for cancer prevention based on these modifiable factors.

**Target Audience:** Registered Nurses, Advanced Practice Nurses

**Level of Content:** Advanced

**Speaker:**
Ernest T. Hawk, MD  
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**Full Disclosure:**  
Nothing to Disclose

**Speaker:**
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**Full Disclosure:**  
Nothing to Disclose

**Objectives:**
At the end of this session, participants will be able to:
1. Explain various germline, behavioral, and environmental factors that increase an individual’s risk for cancer.
2. Describe some of the key molecular, molecular pathway, and cellular aberrations that underlie cancer development and progression.
3. Illustrate the process of cancer development from germline, behavioral, and environmental perspectives to aid in the development, enhancement, or implementation of educational tools to benefit patients and families in clinical practice.
4. Discuss and apply current evidence-based guidelines applicable to patients and the general population that promote the adoption and maintenance of healthy lifestyles, the use of cancer-preventive vaccines and preventive agents, as well as screening services to reduce cancer risks.

**Content Outline:**

I. Many cancer diagnoses in western populations are preventable.
II. Environment and life-style contributions to cancer risk
III. Cancer biology and implications for management strategies
IV. Cancer risk and stem/progenitor cell divisions
V. Spotlight on obesity and physical activity mechanisms
VI. Cancer control
VII. Key parameters of implementation strategy for cancer control
VIII. The evidence base
   A. The Community Guide
   B. Research-Tested Intervention Programs (RTIPs) database
IX. MD Anderson institutional projects
   A. Internal actions
   B. Control projects
      1. Tanning bed legislation
      2. K–12 health promotion and cancer prevention program
      3. Coordinated Approach to Child Health (CATCH) program
      4. Cervical cancer screening and treatment in the underserved using Project ECHO
      5. Increasing uptake of antiestrogen preventive therapy for reduction of breast cancer incidence
X. ONS nurses advancing prevention and control
XI. Prevention as the optimal approach to cancer in 2015
   A. ACA and the transitioning of American medical care system
   B. Technological advances
XII. Adherence to cancer prevention recommendations reduces incidence and mortality.
XIII. Challenges to cancer prevention
   A. Discovery of molecular underpinnings
   B. Dissemination of evidence-based programs
XIV. Risk assessment
   A. Personal medical history and life-style habits
   B. Family cancer history
   C. Genetic testing
XV. Targeting various levels and key issues for implementation
   A. Tobacco
   B. Obesity
   C. Nutrition guidelines
   D. Alcohol consumption
   E. Fitness
   F. HPV vaccine
G. UV light reduction and tanning bed restrictions

XVI. Chemoprevention
A. Breast cancer
B. Colorectal cancer

XVII. Targeted screening
A. Cervical cancer
B. Colorectal cancer
C. Prostate cancer
D. Lung cancer

XVIII. Global view and practical considerations

Bibliography:
The Premise for Prevention
More than 50% of U.S. Cancer Cases Are Preventable Through Lifestyle Choices

Image from AACR Cancer Progress Report 2012.

Cancer Mechanisms
What turns a healthy cell into a cancerous cell?

*Non-modifiable* Risk Factors
- Major defects in cancer-promoting/inhibiting genes
- Subtle differences in genetic coding or expression

*Modifiable* Risk Factors
- Tobacco
- Poor diet
- Physical inactivity
- Viruses
- Occupational exposures

Modified from Hanahan & Weinberg, Cell 100:57, 2000 & 144:646-674, 2011; Science 2006

Cancer Risk & Stem Cell Divisions

- Compares no. of lifetime stem cell divisions across many tissues with lifetime cancer risk using a bioinformatics approach
- Suggests random mutations are “the major contributions to cancer overall, often more important than either hereditary or external environmental factors.”
- Some level of chance already known; this does not reflect level of risk in a population
- Contradicts:
  - Epidemiological findings of varying patterns of cancer incidence by country
  - Scientific evidence demonstrating reductions in cancer after preventive interventions
- Limitations:
  - Report emphasizes rare cancers & excludes most common cancers; focuses on U.S. population as measure of lifetime risk


Obesity

- Estimated to account for 20% of all cancers
- Associated with incidence, recurrence, mortality, & poor cancer-related outcomes


Pathways Linking Obesity & Breast Cancer

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Friday, April 24
Physical Activity

- Lack of physical activity estimated to account for 5% of cancers

- Physical Activity can reduce risk of:
  - Convincing: colon
  - Probable: postmenopausal breast, endometrial
  - Limited - Suggestive: lung, pancreas, premenopausal breast

Physical Activity: Mechanisms

- Increased physical activity may reduce the risk of:
  - Development of cancer
  - Mortality from cancer

Cancer Control

Policy, Education, Services

- **Policies**
  - Inform, impact & implement worksite, government & public policies & related activities

- **Education** – public & professional
  - Develop & deliver school-based programs, media campaigns & counter-marketing programs. Improve health professional knowledge through CME programs & telemedicine activities

- **Services beyond MD Anderson’s walls**
  - Improve professional practice & delivery of community-based screening & early detection, counseling, immunization, & prevention services

Key Parameters of an Implementation Strategy for Cancer Control

- Control actions/intensity (PES)
  - Protocols
  - Active
  - Dominant risk factors
  - Levels of intervention/cohorts
  - Geopolitical
  - Risk-based target subgroups
  - Moonshot-oriented cancer sites/organ systems

The Evidence Base for Cancer Control
Friday, April 24

The Cancer Control Evidence Base

The Community Guide

Cancer Prevention and Control
- Cancer is the second leading cause of death in the United States, responsible for an estimated 5.7% of all deaths each year.
- In 2014, the cost of medical care for cancer was estimated at $275 billion in the United States.

Community Guide Systematic Reviews
The Community Guide includes systematic reviews of interventions in the following areas:
- Increasing Breast, Cervical, and Colorectal Cancer Screening
- Research-Informed Intervention Programs (RTIPs) Database

Promoting Informed Decision Making for Cancer Screening
Interventions that help patients make informed decisions about cancer screening.

The Cancer Control Evidence Base

The Community Guide

Task Force Recommendations and Findings
Preventing Skin Cancer
- Education and Outreach (e.g., free skin cancer screenings, educational materials)
- Interactions with Patients (e.g., sun safety, sunscreens)

The Cancer Control Evidence Base

The Community Guide

RTIPs Database

Research-Informed Intervention Programs (RTIPs)
- Treatment programs that help patients understand the risks and benefits of different interventions for skin cancer.
- Preventing Skin Cancer: Education and Outreach
- Interactions with Patients: Sun Safety and Sunscreen Information

Promoting Informed Decision Making for Cancer Screening
- Interventions that help patients make informed decisions about cancer screening.

The Cancer Control Evidence Base

The Community Guide

RTIPs Database

Search

- Advanced Cancer Screening
- Breast Cancer Screening
- Colorectal Cancer Screening
- Cervical Cancer Screening
- Prostate Cancer Screening
- Tobacco Control
- Tobacco Cessation
- Tobacco Use
- Tobacco Use Reduction
- Tobacco Use Screening

The Cancer Control Evidence Base

The Community Guide

RTIPs Database

Intervention Programs

- Prevention and Control of Gynecologic Cancers
- Research-Informed Intervention Programs (RTIPs)
- Preventing Skin Cancer
- Research-Informed Intervention Programs (RTIPs)
- Preventing Skin Cancer
- Research-Informed Intervention Programs (RTIPs)
- Preventing Skin Cancer
- Research-Informed Intervention Programs (RTIPs)
**MD Anderson Institutional Projects**

*Self-examination & Internal Actions that Inform, Transform, & Establish Credibility*

- **Leadership**
  - Strategic Framework
  - Comp. Cancer Control (CCC) Program
  - Inter-departmental communication
  - BoV/Cancer Control Adv. Group
- **Nutrition**
  - Healthier food options in cafés (P,S)
  - Calorie guides on menus (E)
  - "Healthy Bites" employee educational program (E)
- **Physical activity**
  - Employee fitness facility (S)
  - Employee educational program (E)
- **Tobacco control**
  - Tobacco-free campus (P)
  - Tobacco Treatment Program (S)
  - Health insurance surcharge (P)
  - Tobacco-free hiring policies (P)
  - EndTobacco plan (P,E,S)
- **UV exposure**
  - Sun umbrellas (S)
  - Employee messaging (E)
  - Screening / preventive services
  - CPC employee outreach (E,S)
  - Expansion of MD Anderson guidelines (E,S)
  - Employee health survey/incentive (S)
  - Insurance coverage (P,S)

**Comprehensive Early Childhood & Youth (K-12) Health Promotion & Cancer Prevention Program**

- **Premise**
  - Cancer risk behaviors are developed early in life
  - Instigators of adult cancer are known to operate during childhood
- **Goal**
  - Leverage expertise in tobacco use prevention/cessation & ultraviolet radiation (UVR) protection in youth to develop, implement & disseminate an age-appropriate, educational program to promote critical thinking & understanding
  - Tobacco prevention
  - UV protection
  - Energy balance – healthy diets & physical activity
  - Cancer preventive vaccinations
  - Cancer development & evidence-based screening
- **Approach**

**2014 Tanning Bed Restriction Legislation Across U.S.**

MD Anderson has reached out directly to assist efforts in CO, KS, WA, IA, and MD

**CATCH School Health Promotion Program**

*(Coordinated Approach to Child Health)*

- Evidence-based with population impact
- Proven dissemination methods into public schools
- Established reach in >50% of Texas schools & ~9,000 schools nationwide
- Adaptable with ability to easily incorporate new elements, such as tobacco control or UV protection

**Cervical Cancer Screening & Treatment Along the Texas-Mexico Border**

- **Problem:** Cervical cancer incidence 31% higher; advanced stage cancers far too common
- **Causes:** High rates of poverty, lack of insurance, health care shortages (40-50% fewer MDs & NPs/100K population)
- **Opportunity:** Bolster local providers’ access, skills, & confidence to perform GYN procedures needed to optimally screen, diagnose, & treat cervical dysplasia
- **Actions:**
  - Train & support local MDs & providers to perform evidence-based SOA cervical care including:
    - Screening guidelines
    - Decision-making
    - Colposcopic exams & interpretation
    - LEEP/ligation services
  - Promote CHW-based outreach & public education re:
    - HPV vaccination
    - Cervical screening
- **Progress**
  - Established relationships & provided enabling technologies
  - Invite participation by UT-MDACC, UT-Health, UTMB, & Baylor College of Med
  - 9 teleECHO sessions with average attendance of 15-20
  - PCPs, gynecologists, mid-level providers, and nurses in FQHCs (+Promotoras soon)
- **Early Results**
  - Boost in local providers’ sense of support
  - Empowerment & enthusiasm to take on other prevention challenges (e.g., HPV vaccination, screening, tobacco cessation)
Increasing Uptake of Anti-Estrogen Preventive Therapy to Reduce Incidence of Breast Cancer

Dissemination of a Performance Improvement Project

All Women

Uptake of interferon = 0.21%
Uptake of tamoxifen = 0.03%
Uptake of raloxifene = 0.21%


ONS Nurses Advancing Cancer Prevention & Control

• Personal
  – Awareness

• Patient Interactions
  – Family history - genetics
  – Advise on tobacco cessation, SHS avoidance
  – Counseling to minimize UV exposure
  – Recommend vaccines / screenings

• PES Actions
  – Advocate for evidence-based policies & actions
  – Engage social media

Novel Population-Based Approaches to Prevention

• Affordable Care Act & Transitioning of the American Medical Care System
  – Guidelines
  – Checklists
  – Health care systems

• Rapid & Profound Technological Advances
  – Project ECHO Replications
  – Social media & mobile apps facilitating novel connections & communications
  – EMRs & electronic referrals
  – Ask-Advise-Connect

Optimal Approaches to Cancer in 2015

• Prevention-based
  – Adoption of healthy lifestyles + vaccinations + risk assessment + evidence-based screenings +/- preventive interventions*

• Treatment-based
  – Early detection** + surgical excision and/or radiotherapy ablation + lifestyle alteration +/- adjuvant intervention

Adherence to Prevention Recommendations Reduces Cancer Incidence & Mortality

• 2 large prospective cohorts demonstrate significant benefits for adherence to ACS cancer prevention guidelines
  – Cancer Prevention Study-II (N=111,966; 14-yr. f/u)
  – NIH-AARP Diet & Health Study (N=566,401; 10-13-yr. f/u)
  – Each computed scores to reflect adherence to ACS guidelines based on BMI, physical activity, diet, alcohol intake
  – Significant reductions in cancer incidence, cancer mortality & all-cause mortality were observed in each cohort
  – Cancer mortality reductions consistent in each cohort
  – 24% in women, 25-30% in men
  – All-cause mortality reduced by 26-42% across cohorts

Challenges to Cancer Prevention in 2015

- **New Discoveries Regarding the Molecular Underpinnings of Cancer Development**
  - Enhanced preclinical systems with greater relevance to prevention cohorts & the population
  - Characterization of pre-malignant lesions/pre-malignant genome
  - Integrative, cumulative risk assessment
  - Priorities in molecular prevention to better define meaningful responses, targets, & promising strategies (e.g., SITEP, combos)

- **Dissemination of Evidence-Based Programs**
  - Enhanced control programs & infrastructures
  - “Functional whole”: comprehensive cancer centers uniting in prioritization, implementation, monitoring, & adapting “PES” activities
  - Actions to realize the transformative promise of the ACA to advance health, wellness & prevention

Resources to learn more

- Oncology Nursing Society
  https://www.ons.org/

- MD Anderson Cancer Center
  http://www.mdanderson.org/prevention-and-screening/

- American Institute for Cancer Research
  http://www.aicr.org/

- Centers for Disease Control & Prevention
  http://www.cdc.gov/cancer/

- American Cancer Society
  http://www.cancer.org/

- Prevent Cancer Foundation
  http://preventcancer.org/prevention/