Appropriate screening in oncology

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Outline

- Definition of cancer screening
- Principle of cancer screening
- Bias of screening test
- Recommendation of cancer screening
- Conclusion
Quiz

Which cancer does not have recommendation in screening in terms of disease-specific mortality?

A. Colon cancer
B. Prostate cancer
C. Breast cancer
D. Lung cancer
E. Cervical cancer
Definition of cancer screening

- To screen an **asymptomatic** population to identify cancer at an **earlier stage**
- Lead to a **reduction in mortality** from the disease
Screening is generally not a diagnostic test.

- Screening test

  If positive

  Diagnostic test
Levels of Cancer Prevention

- **No disease**
  - Primary: Remove risk factors
- **Asymptomatic disease**
  - Secondary: Early detection and treatment
- **Clinical course**
  - Tertiary: Reduce complications
Principle of Cancer Screening

- Important public health problem in terms of its frequency and/or severity
- Opportunity for early detection $\rightarrow$ detectable preclinical phase
- Effective treatment can alter the natural history of the disease (cause specific mortality)
- Easy, safe and cheap
Bias of Screening Test

- Factors may cause survival times to look like they are getting better when they are not
  - Lead-time bias
  - Length-time bias
  - Overdiagnosis
  - Selection Bias
Lead-time bias

- Onset
- Early diagnosis
- Symptom
- Death
Variability in cancer progression rates

Greater probability of detecting a slower growing cancer

Slower growing cancers have better prognosis

Screening will identify cases at a lower risk of death
Overdiagnosis

- Detection of a cancer not have progressed to become symptomatic in the person's lifetime
- eg. PSA screening in prostate cancer
Selection Bias

- Participants in cancer screening are usually different from those who are not.
- High risk for disease, more health conscious, have access to better health care
The Most Common Cancer: Males

1. Mouth 4.5%
2. Nasopharynx 6.6%
3. Trachea, bronchus, and lung 23.6%
4. Tongue 4.8%
5. Esophagus 8.2%
6. Stomach 3.6%
7. Colon and Rectum 21.5%
8. Liver and bile ducts 17.3%
9. Non-Hodgkin lymphoma 6.4%

The Most Common Cancer: Females

1. Breast 47.8%
2. Trachea, bronchus, and lung 7.1%
3. Colon and Rectum 10.4%
4. Liver and bile ducts 3.5%
5. Cervix uteri 16.2%
6. Ovary 4.0%
7. Corpus uteri 4.0%
8. Stomach 2.0%
9. Thyroid 2.6%
10. Non-Hodgkin lymphoma 2.4%

NCI of Thailand 2011
Common Cancers

- Colorectal cancer
- Breast cancer
- Lung cancer
- Cervical cancer
- Hepatobiliary cancer
- Prostate cancer
Common Cancers

- Colorectal cancer
- Breast cancer
- Lung cancer
- Cervical cancer
- Hepatobiliary cancer
- Prostate cancer

Screening reduces mortality
Quiz

A mature woman aged 52 years, non-smoker, no personal history of cancer, no family history of cancer, 10 pack-year of smoking for the last 5 years. She seeks advice on cancer screening. What screening test is not necessary in this case?

A. Colon cancer
B. Breast cancer
C. Lung cancer
D. Cervical cancer
Reference

- National Comprehensive Cancer Network (NCCN)
- The U.S. Preventive Services Task Force (USPSTF)
- American Cancer Society (ACS)
Colorectal Cancer Screening
Modalities

• **Fecal-based screening tests**
  • Fecal tests
    • Fecal occult blood test (FOBT): Guaiac test, immunochemical test
    • Fecal DNA test: not recommended by FDA

• **Structural screening tests**
  Endoscopic procedures
  • Flexible sigmoidoscopy
  • Colonoscopy
  Radiographic procedures
  • Double-contrast barium enema
  • Virtual colonoscopy or CT colonography
Recommendations for CRC screening

Individual at average risk for CRC

Age > 50 years

No Hx of adenoma

No Hx of inflammatory bowel disease

Negative family Hx
# Recommendations for CRC screening

<table>
<thead>
<tr>
<th>Population</th>
<th>Screening tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS 2012</td>
<td>Age &gt; 50 yrs                       Annual FOBT or Sigmoidoscopy or CT colonography q 5 yrs or DCBE q 5 yrs or Colonoscopy q 10 yrs</td>
</tr>
<tr>
<td>NCCN 2012</td>
<td>Age &gt; 50 yrs                       Annual FOBT or Sigmoidoscopy or CT colonography q 5 yrs or Annual FOBT + sigmoidoscopy q 5 yrs or Colonoscopy q 10 yrs</td>
</tr>
<tr>
<td>USPSTF 2008</td>
<td>Age &gt;50 yrs                        Annual FOBT or Sigmoidoscopy or CT colonography q 5 yrs or DCBE q 5 yrs or Colonoscopy q 10 yrs</td>
</tr>
</tbody>
</table>
Breast Cancer Screening
Modalities

- Breast Self Examination (BSE)
- Clinical breast examination (CBE)
- Mammography
- Breast MRI
## Recommendations for Breast Cancer Screening

<table>
<thead>
<tr>
<th>Source</th>
<th>Population</th>
<th>Screening test</th>
</tr>
</thead>
</table>
| **ACS 2012**  | Age ≥ 20 yrs  
Age 20-39 yrs  
Age ≥ 40 yrs | CBE q 3 yrs, Monthly BSE (option)  
CBE q 3 yrs  
Annual mammography and annual CBE |
| **NCCN 2011** | Age 20-39 yrs  
Age ≥ 40 yrs | CBE q 1-3 yrs and breast awareness by BSE  
Annual CBE and annual mammography and breast awareness |
| **USPSTF 2009** | Age 50-74 yrs | Mammography q 2 yrs |
Lung Cancer Screening
Modalities

- Sputum cytological examination
- Chest x-ray
- Low-dose CT scan

- no benefit in reduction of cancer mortality
What’s the LDCT Scan?

- Non contrast CT scan
- Lower radiation exposure when compare with conventional CT scan
National Lung Screening Trial

- Large randomized, multicenter trial of current and former heavy smokers

Current and former heavy smokers,* 55-74 yrs of age (N = > 53,000)

- Primary endpoint: lung cancer mortality
- Secondary endpoints: overall mortality, lung cancer incidence, screening- and treatment-related morbidities

Baseline screening

Low-dose CT scan

26,722 persons

Chest x-ray

26,732 persons

2 annual follow-up scans

*≥ 30 pack-yrs; former smokers quit within last 15 yrs.
## Results

<table>
<thead>
<tr>
<th></th>
<th>LD CT</th>
<th>CXR</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adherence</strong></td>
<td>95%</td>
<td>93%</td>
<td></td>
</tr>
<tr>
<td><strong>Positive screening test</strong></td>
<td>24.2%</td>
<td>6.9%</td>
<td></td>
</tr>
<tr>
<td><strong>False positive</strong></td>
<td>96.4%</td>
<td>94.5%</td>
<td></td>
</tr>
<tr>
<td><strong>Incidence</strong> (cases per 100,000 person-years)</td>
<td>645</td>
<td>572</td>
<td></td>
</tr>
<tr>
<td><strong>Deaths from lung cancer per 100,000 person-yrs</strong></td>
<td>247</td>
<td>309</td>
<td>RRR = 20.0% (95% CI, 6.8 to 26.7) P = 0.004</td>
</tr>
<tr>
<td><strong>Overall mortality</strong></td>
<td>1877</td>
<td>2000</td>
<td>RRR = 6.7% (95% CI, 1.2 to 13.6) P = 0.02</td>
</tr>
</tbody>
</table>

## Recommendations for lung cancer screening

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<tr>
<td><strong>NCCN 2013</strong></td>
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<tr>
<td><strong>ACS 2012</strong></td>
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</table>
Cervical Cancer Screening
Modalities

- PAP smear
- HPV DNA testing
## Cervical Cancer Screening Guidelines

<table>
<thead>
<tr>
<th></th>
<th><strong>USPSTF 2012</strong></th>
<th><strong>ACS 2012</strong></th>
<th><strong>NCCN 2012</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start screening</strong></td>
<td>Within 3 yrs after sexual activity, ≥21 yrs</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td><strong>Interval</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age ≤ 30 yrs</td>
<td>Pap tests q 3 yrs</td>
<td>Pap tests q 3 yrs</td>
<td>Pap tests q 3 yrs</td>
</tr>
<tr>
<td>Age &gt;30 yrs</td>
<td>Pap tests q 3 yrs (acceptable)</td>
<td>Pap tests q 3 yrs (acceptable)</td>
<td>Pap tests q 3 yrs (acceptable)</td>
</tr>
<tr>
<td><strong>HPV DNA testing</strong></td>
<td>age &gt; 30 yrs* q 5 yrs with Pap (prefer)</td>
<td>age &gt; 30 yrs* q 5 yrs with Pap (prefer)</td>
<td>30 yrs* q 5 yrs with Pap (prefer)</td>
</tr>
<tr>
<td><strong>Stop screening</strong></td>
<td>Age 65 after regular normal Pap</td>
<td>Age 65 after regular normal Pap</td>
<td>Age 65 after regular normal Pap</td>
</tr>
</tbody>
</table>
Prostate Cancer Screening
## Prostate Cancer Screening

<table>
<thead>
<tr>
<th>ASCO, NCCN 2012, USPSTF 2012</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Not recommend for PSA testing</td>
<td></td>
</tr>
<tr>
<td>- Against recommend in life expectancy &lt;10 yrs</td>
<td></td>
</tr>
<tr>
<td>: Not clear benefit and associated with subsequent unnecessary treatment</td>
<td></td>
</tr>
<tr>
<td>: Informed and shared decision-making with the patients</td>
<td></td>
</tr>
</tbody>
</table>
Serum tumor markers especially mucin-associated cancer antigens (CEA, CA19-9, CA125, CA15-3) have no clinical utility as screening tests for any cancer.
<table>
<thead>
<tr>
<th>Who</th>
<th>All with &gt;50 yrs</th>
<th>Woman &gt; 40 yrs</th>
<th>High risk 55-74 yrs</th>
<th>Women with sexually active or age &gt;21 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>How</td>
<td>colonoscopy</td>
<td>mammogram</td>
<td>LDCT</td>
<td>PV+PAP HPV DNA</td>
</tr>
<tr>
<td>How often</td>
<td>every 10 yr</td>
<td>yearly</td>
<td>yearly for 3 yrs</td>
<td>every 3-5 yrs</td>
</tr>
<tr>
<td>Stop screening</td>
<td>No data</td>
<td>As long as good health</td>
<td>&gt; 74 yrs</td>
<td>Age 65-70 after regular normal Pap</td>
</tr>
</tbody>
</table>
ผู้หญิงคู่อายุ 52 ปี ไม่มีโรคประจำตัว ไม่มีประวัติมะเร็งในครอบครัว สูบบุหรี่ 10 pack-year เลิกมา 5 ปี มาขอคำแนะนำตรวจคัดกรองมะเร็ง ท่านคิดว่าการตรวจมะเร็งชนิดใดไม่จำเป็นต้องทำในรายนี้

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Question & Answer