Cancer

Objectives:

1. Appreciate the Global impact of cancer.
2. Identify the most prevalent cancers worldwide, in the region and in KSA.
3. Identify the leading causes of cancer deaths.
4. Understand the cancer control continuum and explain its implication to public health.
5. Screening for cancer.
6. Understand and reflect the Kingdoms efforts to control the rising burden of Cancers in KSA.
7. Explain important factors and trends affecting cancer control and directions for future research.

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Important | Extra | Notes

Editing file

Brainstorming Questions

True or False?

A Large percentage of cancers are preventable

True or False?

Preventing cancer is easier than treating cancer

True or False?

Screening tests are recommended for most cancers

Global Impact of Cancer:

- The 2nd leading cause of death **globally**.
- In 2018, 18.1 million new cases and 9.6 million deaths.
- One in 5 men and one in 6 women develop cancer during their lifetime.
- One in 8 men and one in 11 women die from the cancer.
- The total annual economic cost of cancer in 2010 was estimated at approximately US$ 1.16 trillion.
- Late-stage presentation and inaccessible diagnosis and treatment are **common**.
- In 2017, only 26% of low-income countries reported having pathology services generally available in the public sector. Diagnosis and confirmation of the cancer is also an issue, especially in low income country and middle income country.
- More than 90% of high-income countries reported treatment services are available compared to less than 30% of low-income countries.

Most Preventable cancers:

This is from the world cancer report in 2017.
Most common cancer worldwide:

2nd cause for female is: lung

	In the World			
	Men		Women	
	Incidence	Mortality	Incidence	Mortality
1st cause	Lung		Breast	
2nd cause	Prostate	Liver	Colorectal	Lung
3rd cause	Colorectal	Somach	Lung	Colorectal
4th cause	Stomach	Colorectal	Cervical	
5th cause	Liver	Prostate	Stomach	

	In Middle East & North Africa			
	Men		Women	
	Incidence	Mortality	Incidence	Mortality
1st cause	Lung		Breast	
2nd cause	Prostate	Liver	Colorectal	
3rd cause	Bladder	Prostate	Thyroid	Lung
4th cause	Colorectal		Non-Hodgkins	Stomach
5th cause	Liver	Bladder	Ovarian	Liver

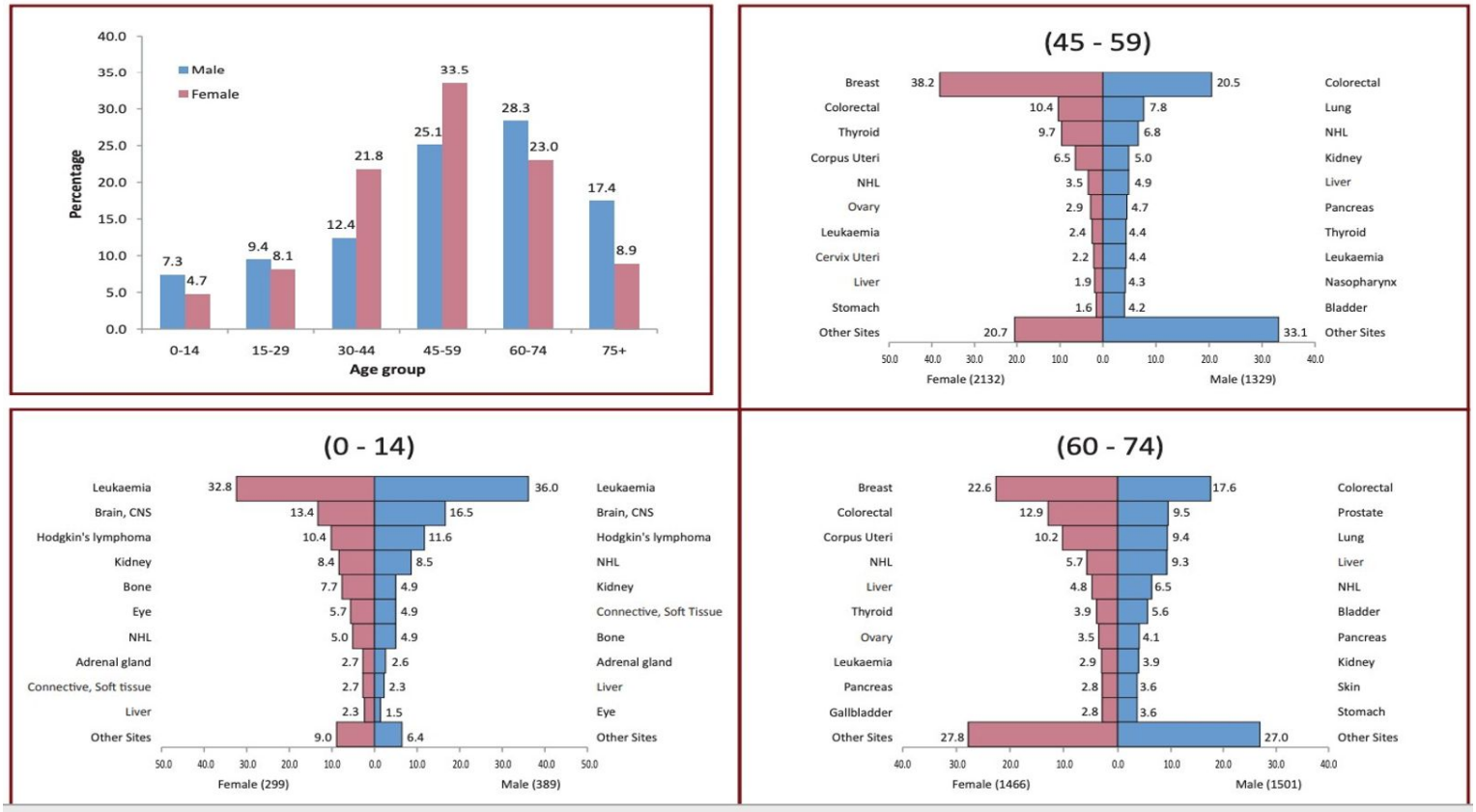
In middle east 1st cause is the same as the world.
2nd cause is colorectal in female.

	In Saudi Arabia			
	Men		Women	
	Incidence	Mortality	Incidence	Mortality
1st cause	Colorectal		Breast	
2nd cause	Lymphoma, Multiple myeloma		Colorectal	
3rd cause	Prostate	Lung	Thyroid	Lymphoma, Multiple myeloma
4th cause	Lung	Liver	Lymphoma, Multiple myeloma	Leukemia
5th cause	Leukemia		Uterine	Liver

In saudi:
Male : 1st cause colorectal.
Female: 1st cause is breast cancer
2nd case: female: colorectal.

The previous tables indicates high burden of colorectal carcinoma in our population. It needs your attention, needs recommendations, need reinforcement of policies to screen and diagnose early and treatment of colorectal carcinoma in the region.

Figure 2.3: Distribution of Cancer Cases Among Saudi Nationals by Gender and Age Groups, 2014



The most affected age group by cancer is 45-59 years old (The life expectancy in SA is between 72-75, so people are dying early)

Distribution among males and females:
Male: Colorectal CA
In female: Breast CA.

In older age group it is the same colorectal and breast

In younger age groups below 14 it is leukemia, a blood borne cancer which is prevalent in both genders.

Causes of Cancer:

Cancer arises from the transformation of normal cells into tumour cells in a multistage process that generally progresses from a precancerous lesion to a malignant tumour. These changes are the result of the interaction between a person's genetic factors and 3 categories of external agents.

- **Personal factors:**
  - Genetic (Theoretically said: predisposing factors are genetics factors. So many cancers are hereditary and we are still looking for the gene and DNA identification.)
  - Age (in relation to the age, older ages are associated with colorectal CA and in early age it's hematologic CA)
  - Accumulation of external risk factors.
  - Tendency for cellular repair mechanisms to be less effective as a person grows older.
- **External factors:**
  - Physical carcinogens: such as ultraviolet and ionizing radiation. We are exposed to such radiation in the hospital where we work in a CT & x-ray department, in the scanning area. And what is going to help prevent this? A small gadget that is available now; a badge of how much radiation you have been exposed to (monitors the cumulative radiation).
  - Chemical carcinogens: such as asbestos, components of tobacco smoke, aflatoxin (a food contaminant), and arsenic (a drinking water contaminant).
  - Biological carcinogens: such as infections from certain viruses, bacteria, or parasites.

Diethylstilbestrol (DES) hormone is associated with vaginal adenocarcinoma

Table 4 Cancer-causing Pathogens

Bacteria

Infectious Agent	Cancer	% of global cancer cases attributable to infection*
Helicobacter pylori	Stomach cancers	32.5

Parasites

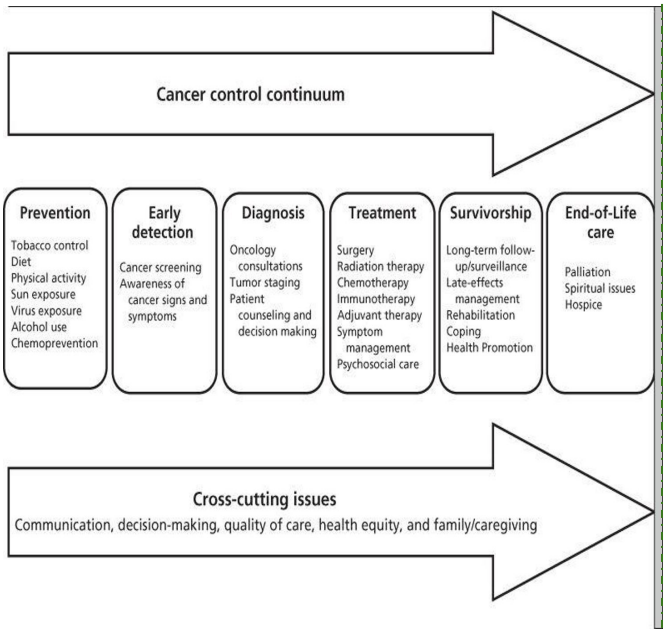
Infectious Agent	Cancer	% of global cancer cases attributable to infection*
Clonorchis sinensis	Biliary, gallbladder, and pancreatic cancers	0.1
Opisthorchis viverrini	Biliary, gallbladder, and pancreatic cancers	
Schistosoma haematobium	Bladder cancer	0.3

Viruses

Infectious Agent	Cancer	% of global cancer cases attributable to infection*
Epstein-Barr virus (EBV)	Hodgkin and certain non-Hodgkin lymphomas, and stomach and nasopharyngeal cancers	5.4
Hepatitis B/C viruses (HBV and HCV)	Hepatocellular carcinoma	29.5
Human herpes virus type-8 (HHV-8; also known as Kaposi sarcoma herpes virus)	Kaposi sarcoma and certain form of lymphoma	2.1
Human immunodeficiency virus (HIV)	Kaposi sarcoma and non-Hodgkin lymphoma	
Human papillomavirus (HPV)	Anal, cervical, head and neck, oral, penile, vaginal, and vulvar cancers	30
Human T-cell lymphotrophic virus, type-1 (HTLV-1)	T-cell leukemia and lymphoma	0.1
Merkel cell polyomavirus (MCV)	Merkel cell carcinoma	

* where known

data from Ref 76



What does cancer control continuum mean? You start from prevention and you go up and treat the person till the end of life. Prevention is done to the risk factors that have been identified for cancer which are: **Tobacco** consumption leading to lung CA. **Diet & physical inactivity** leading to colorectal CA. **Sun exposure** leading to skin CA. **Viral exposure** leading to hepatitis which then leads to hepatocellular CA. **Alcohol** consumption leading to liver CA. **Chemoprevention** leads to leukemia, lymphoma, bone marrow depletion CA. Sun Exposure can be limited by sunscreen, you also have Hep. A and B vaccination, early treatment & immunoglobulin. Early detection by screening. Most cancers do not have screening, but the ones who have screening are the ones considered a high burden CA

Screening for Cancers:

The Wilson-Jungner Criteria for Screening:

1. The condition being screened for should be an **important health problem.**
2. The **natural history** of the condition should be well understood.
3. There should be a detectable **early stage.**
4. **Treatment** at an early stage should be of more benefit than at a later stage.
5. A suitable **test** should be devised for the early stage.
6. The test should be **acceptable**.
7. **Intervals** for repeating the test should be determined.
8. Adequate **health service** provision should be made for the extra clinical workload resulting from screening.
9. The **risks**, both physical and psychological, should be **less than** the benefits.
10. The **costs** should be **balanced** against the benefits.

Number one is breast cancer screening.
Early detection decreases the burden of CA. Awareness of signs & symptoms in schools/colleges and self (breast) examination (although sensitivity is questionable) are helpful. However, you do the idea and can approach a physician if you need further investigation. A low sensitivity but preferred way to teach your population, self examine their breast and seek for help if they feel something abnormal. Diagnosis, of course you have to diagnose, you want to have a pathology lab and all the equipment for diagnosing to reach a decision on whether it is benign vs malignant. There is a high incidence of cancer and treatment is different when it is uncontrolled. You will need every sort of facility in the hospital including surgeons, surgical instruments, chemotherapy, immunotherapy, adjuvant therapy, psychosocial help/support and national support. The cost is huge. Remember once breast CA happens there is a high probability no matter what you do or how much you do chemotherapy/radiation, the end result will be bone marrow metastasis and secondaries from bone metastasis is very bad, it'll cause paralysis & an inability to walk so they become bedridden and develop sores. End of life in the hospital/palliative care, the pain is severe and a long-term follow up will be needed, which will cause an increase in the costs. Also, regular screening & tests will be needed. The people after a while are not coping and there are psychosocial issues, there are depressive & suicidal candidates in CA patients .

USPSTF Recommendation Grades:

Screening for cancer: criteria we usually follow in screening program (You should know it from previous lectures). The most important thing in screening program is how sensitive and specific that program is? and do you have treatment that is available? If you diagnosed people early in life, will you provide them the treatment if you have the? There is categorization in the screening programs. There is grade A, B, C, D and I which is unknown.

Grade	Recommended / against	Evidence	Benefits
A	Recommended	High	Substantial
B	Recommended	High	Moderate
		Moderate	Moderate to Substantial
C	Recommended selectively based on: 1. Professional judgment. 2. Patient preferences.	Moderate	Small
D	Against	Moderate to high	No benefit or harm > benefit
I	Unknown	Lacking, or poor quality, or conflicting	Benefit? Harm?

Breast Cancers Screening:

What does “C” mean in the population between 40- 49 years? The decision to start screening in women prior to the age of 50 this is category “C”. That means that it is recommended selectively based on professional judgment and the patients preference. Women who are at higher risk and have a family history of females with breast CA, you’ll most definitely start screening at the age of 40-49 this is what we mean by Grade C. The evidence to put them in a screening program or mammogram (40-49) is having a sibling, daughter, mother, or an aunt which has had breast CA.

Population	Recommendations	Grade
40 to 49 yrs	- The decision to start screening **mammography** in women prior to age 50 years should be an individual one. - Women with a parent, sibling, or child with breast cancer are at higher risk for breast cancer and thus may benefit more than average-risk women from beginning screening in their 40s.	C
50 to 74 yrs	The USPSTF recommends biennial screening **mammography** for women aged 50 to 74 years.	B
75 yrs or older	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening mammography in women aged 75 years or older.	I

Colorectal cancer screening

Adults **50-75**. Are you going to put them for **screening**? **"A"** means **yes**. The risk and benefit of different screening methods vary.
Starting at the age of 50 and continue until the age of 75, hence this shows that colorectal CA if diagnosed early is a preventable carcinoma. Otherwise, they would not have put "A" category as screening category.
"**C**" means **clinical consideration**, and its recommend screening for colorectal CA.

Population	Recommendations	Grade
Adults aged 50 to 75 yrs	- The USPSTF recommends screening for colorectal cancer starting at age 50 years and continuing until age 75 years. - The risks and benefits of different screening methods **vary**.	A
Adults aged 76 to 85 yrs	The decision to screen for colorectal cancer in adults aged 76 to 85 years should be an individual one, taking into account the patient's overall health and prior screening history. ● Adults in this age group who have never been screened for colorectal cancer are more likely to benefit. ● Screening would be most appropriate among adults who: ○ Are healthy enough to undergo treatment if colorectal cancer is detected. ○ Do not have comorbid conditions that would significantly limit their life expectancy.	C
In Saudi Arabia there is no countrywide policy for colorectal screening despite the increasing incidence of the disease.		

Colorectal Cancers Modalities & Frequency:

This table shows colorectal modalities and frequencies. What modalities do we have & how frequently we should be proceed with them.
- **Colonoscopy** for a person who is suspected of colorectal CA should be done **every 10 years**.
- An easier and much frequent test should be done on outpatients, which is **fecal occult blood testing**. Where you take the sample of the feces and you send it to the laboratory and you ask them how many red cells are there. If the criteria is more then, you have to see that patient more, if not it is fine. You repeat the test **every year**.

Test	Frequency (years)
Guaiac-based Fecal Occult Blood Test (gFOBT)	**1**
Fecal immunochemical test (FIT)	1
FIT-DNA	1-3
Colonoscopy	**10**
CT-colonography	5
Flexible sigmoidoscopy	5
Flexible sigmoidoscopy +FIT	10

Cervical cancers: Incidence In KSA (estimates in 2012)

Indicators	KSA	Western Asia	World
Annual number of new cancer cases	241	4,455	527,624
Crude incidence rate	1.9	3.8	15.1
Age-standardized	2.7	4.4	14
Cumulative risk (%) at 75 yrs old	0.3	0.5	1.4

Cervical Cancers Screening:

Cervical cancer screening modality: Pap smear (most sensitive screening is pap smear) when greater than 65 years of age. Class "A" recommendation is anybody after the reproductive age). Here, for every year after marriage you have to have a pap smear, if 3 consecutive pap smears are negative. You don't have to repeat it.

Age Group	Pap smear (cytology)	HPV testing	Grade
< 21 years	Against screening	-	D
21-30 years	-	Against	D
	Recommended every 3 years	-	A
30-65 years	Recommended every 3 years	Recommended every 5 years	A
	Or recommend pap + HPV every 5 years		
>65 years	against screening if they have had adequate prior screening and are not otherwise at high risk for cervical cancer.		A
Had Hysterectomy + removal of cervix + no prior high-grade precancerous lesion (CIN grade 2 or 3) or cervical cancer.: Against			D

Primary prevention of cervical cancer ➡ pap smear every 3 years

Definition of **Adequate Cervical Cancers Screening:**

- **3 consecutive negative cytology** (Pap smear) results.
- **or 2 consecutive negative HPV results** within 10 years before cessation of screening, with the most recent test occurring within 5 years.
- Screening may be clinically indicated in > 65 years for whom the adequacy of prior screening cannot be accurately assessed or documented. Or does not recall previous test or you don't have her previous profile.

Screening for Hematologic Malignancies (Lymphoma, Leukemia..etc):

Below 14 years of age 1st in both males and females. How to suspect such cancer? By family history and age group and **a routine blood test**

- There are **no routine screening tests** for hematologic malignancies.
- It is typical for a patient to seek medical treatment when symptoms appear.
- Incidental finding when a blood test is ordered for another reason.

Screening For Lung Cancers:

We **don't have a screening program**, but we know that **smokers** are more prone to it and it is preventable.

- Age 55–77 years.
- Smoking history >30 Pack Years.
- Active smoker or quit smoking less than 15 years ago.
- Did not have chest CT scan the last year.
- Screening patients for smoking:
    - Ask all your patients systematically if they smoke or not. Make it a part of their vital signs.
    - If a smoker is identified, implement smoking cessation guidelines.
- Screening modality: Low dose chest CT scan.

In western region (international recommendations): anybody who is a smoker and smokes more than 30 packs/year (age 65-77), you do a CT scan of the chest. However, in our setting this is not done.

Screening For Prostate Cancers:

It is screenable. We have modalities. Mean age between 55-69 years should be provided with a PSA screening for prostate CA. The progression and mortality is not high.

Population	Recommendations	Grade
Men aged 55 to 69 yrs	- The decision to undergo periodic prostate-specific antigen (PSA)–based screening for prostate cancer should be an individual one. - Screening offers a small potential benefit of reducing the chance of death from prostate cancer in some men. - Many men will experience potential harms of screening, including false-positive results that require additional testing and possible prostate biopsy; overdiagnosis and overtreatment; and treatment complications, such as incontinence and erectile dysfunction. - Patients and clinicians should consider the balance of benefits and harms on the basis of family history, comorbid medical conditions. - Clinicians should not screen men who do not express a preference for screening.	C
Men 70 yrs & older	The USPSTF recommends against PSA-based screening for prostate cancer in men 70 years and older.	D

Screening For Thyroid Cancers:

Population	Recommendations	Grade
Adults	The USPSTF recommends against screening for thyroid cancer in asymptomatic adults.	D

Screening For Liver Cancers:

- Patients with cirrhosis of any etiology, but especially cirrhosis caused by hepatitis B or C, are at high risk for the development of HCC and these patients should be the targets for a screening program.
- The best screening modality is ultrasound of the liver. Hepatitis B, C, and hepatocellular caricnoma are good candidates for this, but because liver cancer does not have a high burden of mortality it is not a recommendation.

Screening For Uterine Cancers:

- No evidence that screening reduces mortality from uterine (endometrial) cancer. And we don't have screening test for uterine cancer
- Most cases of endometrial cancer (85%) are diagnosed at low stage because of symptoms, and survival rates are high.

Screening For Ovarian Cancers:

Population	Recommendations	Grade
Asymptomatic women	- The USPSTF recommends against screening for ovarian cancer in asymptomatic women. - This recommendation applies to asymptomatic women who are not known to have a high-risk hereditary cancer syndrome.	D
Example of a high-risk hereditary cancer syndrome, women with BRCA1 or BRCA2 genetic mutations associated with hereditary breast and ovarian cancer.		

Understand & Reflect The Kingdoms Efforts To Control The Rising Burden Of Cancers In Ksa:

What is the kingdom doing in regards to cancer? You have cancer registry, and it has been present for 50 years. It collects data from main hospitals and mortuary and aggregates data. Detecting the cause of death related to CA. It is located in the head office in King Faisal Specialist Hospital and it provides reports every 3-4 years.

- Cancer Control Program Ministry of Health
- Saudi Cancer society.
- National program for early detection of breast cancer.
- King Fahad National Centre for Children's Cancer
- Sanad Children’s Cancer Support Association

Factors And Trends Affecting Cancer Control And Directions For Future Research:

1. Tobacco:

- Raise tobacco taxes.
- Tax all tobacco products to maintain a comparable price to prevent consumers switching from highly taxed products to less taxed ones.
- Require by law and enforce 100% smoke-free environments in all indoor workplaces and public places.
- Ban all advertising, promotion and sponsorship of tobacco products, brands and related trade.
- Put health warnings on all tobacco packaging.
- Build media awareness of both the addictive nature of tobacco use and treatment options.

2. Alcohol:

Raise public awareness, especially among young people, about alcohol-related health risks, including cancer.

3. Unhealthy Diet, Physical Inactivity, Overweight And Obesity:

- Develop and implement national dietary guidelines and nutrition policies. For e.g. restaurants should put calories.
- Promote educational and information campaigns about reducing salt, sugar and fat consumption.
- Develop and implement national guidelines on physical activity.
- Implement community-wide campaigns to promote the benefits of physical activity.
- Promote physical activity in workplaces.

4. Hepatitis B Virus (HBV):

Implement universal infant immunization using one of the recommended immunization schedules.

جدول التطعيمات الوطني

الزيارة Visit	التطعيم Vaccine	
عند الولادة At Birth	• BCG	• درن
	• Hepatitis B	• التهاب كبدي (ب)
عمر شهرين 2 months	• IPV	• شلل أطفال معطل
	• DTaP	• الثلاثي البكتيري
	• Hepatitis B	• الالتهاب الكبدي (ب)
	• Hib	• المستدمية النزلية
	• Pneumococcal Conjugate (PCV)*	• البكتيريا العقدية الرئوية*
	• Rota**	• فيروس الروتا**
عمر ٤ شهور 4 months	• IPV	• شلل أطفال معطل
	• DTaP	• الثلاثي البكتيري
	• Hepatitis B	• الالتهاب الكبدي (ب)
	• Hib	• المستدمية النزلية
	• Pneumococcal Conjugate (PCV)*	• البكتيريا العقدية الرئوية*
	• Rota**	• فيروس الروتا**
عمر ٦ شهور 6 months	• OPV	• شلل الأطفال الفموي
	• IPV	• شلل أطفال معطل
	• DTaP	• الثلاثي البكتيري
	• Hepatitis B	• الالتهاب الكبدي (ب)
	• Hib	• المستدمية النزلية
	• Pneumococcal Conjugate (PCV)*	• البكتيريا العقدية الرئوية*

5. Environmental Exposure to Carcinogens:

- Stop using all forms of asbestos.
- Provide safe drinking water.
- Reduce the use of biomass and coal for heating and cooking at home, and promote use of clean burning and efficient stoves.
- Implement food safety systems (i.e. legislation and monitoring) focusing on key contaminants.

6. Occupational Exposure to Carcinogens:

- Develop regulatory standards and enforce control of the use of known carcinogens in the workplace.
- Include occupational cancer in the national list of occupational diseases.
- Identify workers, workplaces and worksites with exposure to carcinogens.

7. Radiation:

- Provide information about sources and effects of all types of radiation. Include occupational cancer in the national list of occupational diseases.
- Establish national radiation protection standards (using internationally available guidelines).
- Ensure regular safety training of radiation workers.
- Promote UV risk awareness and UV protection action.
- For example Dose limits for Ionizing radiation are:
    - For the public, 1 mSv/year.
    - For occupationally exposed persons, 20 mSv/year.

How are people exposed to UV radiation?

- Sunlight: the main source of UV radiation.
- Sunlamps and sunbeds (tanning beds and booths).
- Phototherapy (UV therapy): UVA (320 to 400 nm) OR UVB

Summary

- The 2nd leading cause of death **globally**.

Most preventable cancers:

	In the World & Middle East			
	Men		Women	
	Incidence	Mortality	Incidence	Mortality
1st cause	Lung		Breast	
2nd cause	Prostate	Liver	Colorectal	

	In Saudi Arabia			
	Men		Women	
	Incidence	Mortality	Incidence	Mortality
1st cause	Colorectal		Breast	
2nd cause	Lymphoma, Multiple myeloma		Colorectal	

External factors causing cancer:

- Physical carcinogens - Chemical carcinogens- Biological carcinogens

Diethylstilbestrol (DES) hormone is associated with vaginal adenocarcinoma

Cancer causing pathogens:

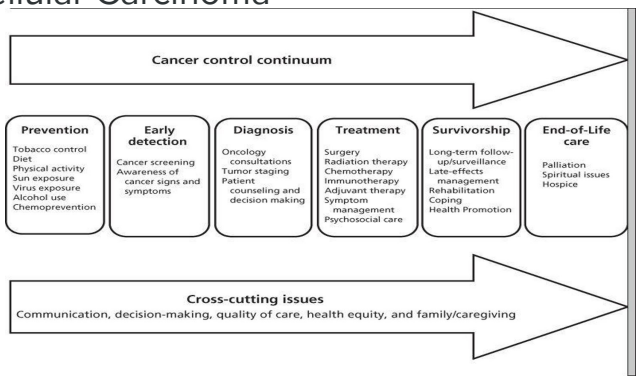
H.pylori ➔ Stomach CA

C. Sinensis & O. Viverrini ➔ Biliary, gallbladder, & Pancreatic CA

Schistosoma haematobium ➔ Bladder CA

EBV ➔ Hodgkin and non-Hodgkin lymphomas, stomach & nasopharyngeal CA

HBV & HCV ➔ Hepatocellular Carcinoma



Screening for Cancers:

The Wilson-Jungner Criteria for Screening:

1. Important health problem
2. Well understood natural history
3. Detectable early stage
4. More benefit in early treatment
5. Suitable early stage test
6. Acceptable test
7. Determined intervals for repeating test
8. Adequate health service provision
9. Benefits outweigh the risks
10. Cost balanced against benefit

USPSTF Recommendation Grades:

Grade	Recommended / against
A	Recommended
B	Recommended
C	Recommended selectively based on: 1. Professional judgment. 2. Patient preferences.
D	Against
I	Unknown

Breast Cancer Screening:

Population	Grade
40 to 49 yrs	C
50 to 74 yrs	B
75 yrs or older	I

Colorectal Cancer Screening:

Population	Grade
Adults aged 50 to 75 yrs	A
Adults aged 76 to 85 yrs	C

Guaiac-based Fecal Occult Blood Test (gFOBT): every year
Colonoscopy: every 10 years

Cervical Cancer Screening:

Age Group	Pap smear (cytology)	HPV testing	Grade
< 21 years	Against screening	-	D
21-30 years	-	Against	D
	Recommended every 3 years	-	A
30-65 years	Recommended every 3 years	Recommended every 5 years	A
	Or recommend pap + HPV every 5 years		
>65 years	against screening if have had adequate prior screening and are not otherwise at high risk for cervical cancer.		A
Had Hysterectomy + removal of cervix + no prior precancerous lesion or cervical cancer.			D

"Adequate" Cervical Cancers Screening:

- 3 consecutive negative cytology
- or 2 consecutive negative HPV results

Primary prevention of cervical cancer → pap smear every 3 years

Hematological Malignancies Screening:

no routine screening tests

Lung Cancer Screening:

Screening modality: Low dose chest CT scan

Prostate Cancer Screening:

Population	Grade
Men aged 55 to 69 yrs	C
Men 70 yrs & older	D

Thyroid Cancer Screening:

Population	Grade
Adults	D

Liver Cancers Screening:

Best screening modality: Ultrasound of Liver

Uterine Cancers Screening:

No evidence that screening reduces mortality

Ovarian Cancers Screening:

Population	Grade
Asymptomatic women	D

Factors & Trends Affecting Cancer Control:

1. **Tobacco**
2. **Alcohol**
3. **Unhealthy Diet, Physical Inactivity, Overweight And Obesity**
4. **Hepatitis B Virus (HBV)**
5. **Environmental Exposure to Carcinogens**
6. **Occupational Exposure to Carcinogens**
7. **Radiation**

Good luck!