Introduction

- Cancer ranks 2nd to cardiovascular disease as the leading cause of death in the Gaza Strip.
- Death rate increased from 10.3% in 2007 to 13.6 in 2012.
- Some related factors: nutrition, physical inactivity, stress, obesity, and other lifestyle factors (preventable).
- Some other factors may be genetic, or associated with chemical weapons used in wars by Israeli soldiers.
Definition:

- Cancer is the growth of abnormal cells that tend to invade neighboring tissue and spread to distant body sites.
- Condition of uncontrolled cellular proliferation; no limits; no purpose.
- For a cell to become cancerous, the following genetic alterations must occur:
  - spur cell growth;
  - inactivate genes that normally slow growth;
  - allow cells to keep dividing,
  - allow cells to live on with abnormalities (Lack of apoptosis);
  - recruit normal cells to support and nourish them, and to develop strategies that prevent the immune system from destroying them.
Major tips:

- The importance of early detection: Hx, risk factors

![Memory Jogger](image)
Cancer is classified by the tissues or blood cells in which it originates. Most cancers derive from epithelial tissues and are called carcinomas. Others:

- glandular tissues (adenocarcinomas)
- connective, muscle, and bone tissues (sarcomas)
- tissue of the brain and spinal cord (gliomas)
- pigment cells (melanomas)
- plasma cells (myelomas)
- lymphatic tissue (lymphomas)
- leukocytes (leukemia)
- erythrocytes (erythroleukemia).
The Cell Clock

- The cells possess some counting system that tells them when to stop dividing.

- **Uncontrolled growth**

  - Cancer cells first develop from a mutation in a single cell.
  - They go through the cell cycle more often than normal,
  - resulting in an overabundance of abnormal cells.

- Uncontrolled cellular reproduction occurs when cells become independent of normal growth control signals (autonomous).

- At a certain stage of development, the cancer cell fails to mature into the type of normal cell from which it originated, cancer cells can spread from the site of origin, a process called metastasis.
Histologic characteristics of cancer cells

Cancer is a destructive (malignant) growth of cells, which invades nearby tissues and may metastasize to other areas of the body. Dividing rapidly, cancer cells tend to be extremely aggressive.
Tumor Cell Markers

• Specific substances released into the blood, urine, or spinal fluid. They may be specific antigens present on the cancer cells.

• Some tumor antigens are similar to fetal antigens and are called oncofetal antigens.

• **Clinical Implications of Tumor Cell Markers**

  Tumor cell markers are clinically important before, during, and after treatment. Examples

  • Alpha-fetoprotein for liver, ovarian and testicular cancers
  • Carcinoembryonic antigen for colorectal cancer
  • hCG for many tumors, including usually cancer of the uterus
  • CA-125, a protein released from female reproductive organs as well as from the lining of the chest and peritoneal cavities (ovarian cancer).

• N.B., Failure to detect a tumor cell marker does not mean that an individual is cancer-free.
The person's age, sex, and overall health, nutritional status, and the immune system affect a tumor's growth rate.

Certain hormonal states (e.g., pregnancy) may stimulate certain tumor growth rates,

Stress may affect the host's ability to restrict the development or growth of a tumor.

Location in the body and its blood supply.

The degree of cellular anaplasia and the presence or absence of tumor growth factors.
Tumor treatment often depends on the grade and stage of the cancer.

**Grading**: An assessment of the tumor based on the degree of anaplasia it demonstrates; poorly differentiated (highly anaplastic) cells are assigned a high grade.

**Staging**: A clinical decision about the size of a tumor, the degree of local invasion, and the degree to which it has metastasised.

**Local Growth of a Tumor**
- compressing the cells and blocking off their blood supply
- release chemicals or enzymes to kill neighboring cells.
- To grow beyond a certain size, tumors must stimulate the development of their own blood supply (angiogenesis) to meet high metabolic demands.
Metastasis

- Movement of cancer cells from one part of the body to another; spread of cancer cells from the original (primary) site in the blood or lymph to a new, secondary site.
- The term malignancy refers to the ability of a tumor to metastasize.
- Cancer cells metastasize three ways:
  - by circulation through the blood and lymphatic system
  - by accidental transplantation during surgery
  - by spreading to adjacent organs and tissues.
Process of Metastasis

1. Detachment

2. Invasion

3. Dissemination and Seeding

When the secondary site has reached a critical size, the tumor cells will again begin to produce tumor angiogenesis factor and new blood vessel formation will be initiated to support growth of this secondary site.
What causes cancer?

- A cell’s transformation from normal to cancerous is called carcinogenesis.
- Carcinogenesis has no single cause but probably results from complex interactions between viruses, physical and chemical carcinogens, and genetic, dietary, immunologic, metabolic, and hormonal factors.
  - **1. The virus factor**: Epstein-Barr virus, Burkitt’s lymphoma, Hodgkin’s disease, and nasopharyngeal cancer, cytomegalovirus, and herpes simplex virus type 2 are linked to cancer of the cervix.
  - **2. Sun light**: linked to skin cancers
  - **3. Environment**
  - **4. Immune factor**
  - **5. Nutrition**
  - **6. Genetic**
  - **7. Hormones**
Clinical Manifestations of cancer

- Cachexia; wasting of fat and protein
- Anemia
- Fatigue; poor nutrition, protein malnutrition, and poor oxygenation of tissues resulting from anemia..

- Disorders
  - breast cancer
  - cervical cancer
  - endometrial cancer
  - leukemia
  - lung cancer
Breast cancer is the most common cancer in women, 70% of cases occur after age 50. It ranks 2nd cause of death.

**Risk factors:**
- a family history
- premenopausal woman older than age 45
- obesity
- recent use of hormonal contraceptives
- early menarche or late menopause
- first pregnancy after age 30
- high-fat diet
- colon, endometrial, or ovarian cancer
- postmenopausal progestin and estrogen therapy
- alcohol use
- benign breast disease.
Breast quadrants

This illustration shows the quadrants of the right breast and the Tail of Spence. The upper outer quadrant is the most common site of breast cancer.
Cervical cancer

- Cervical cancer is the 3rd most common cancer of the female reproductive system.
- It’s classified as either preinvasive or invasive.
  - Preinvasive cancer ranges from minimal cervical dysplasia to carcinoma in situ.
  - Carcinoma in situ describes abnormal epithelial cells that are as yet confined to a certain area and thus considered preinvasive lesions.
  - Preinvasive cancer is curable in 75% to 90% of patients with early detection and proper treatment. If untreated, it may progress to invasive cervical cancer, depending on the form.
• In invasive disease, usually squamous cell carcinoma, cancer cells penetrate the basement membrane and can spread directly to contiguous pelvic structures or disseminate to distant sites by way of lymphatic routes.
• Invasive cancer typically occurs between ages 30 and 50; it rarely occurs younger than age 20.

**How it happens?**
• HPV is accepted as the cause of virtually all cervical dysplasias and cervical cancers. A recently approved vaccine is recommended for women and girls ages 9 to 26 years to protect against cervical cancer.
Predisposing factors

- intercourse at a young age (younger than age 16)
- multiple sexual partners
- herpes virus 2
- other bacterial or viral infections.
What to look for

- Preinvasive cancer produces no symptoms or other clinical changes.
- In early invasive cervical cancer, the patient history includes:
  - abnormal vaginal bleeding, such as a persistent vaginal discharge that may be yellowish, blood-tinged, and foul smelling.
  - postcoital pain and bleeding
  - bleeding between menstrual periods
  - unusually heavy menstrual periods.
- The patient history may suggest one or more of the predisposing factors for this disease.
Now I get it!

Looking at cervical cancer

The illustrations below show cervical carcinoma in situ and squamous cell carcinoma of the cervix.
Advancement

If the cancer has advanced into the pelvic wall, the patient may report:

- gradually increasing flank pain, which can indicate sciatic nerve involvement.
- leakage of urine, which may point to metastasis into the bladder with formation of a fistula.
- leakage of stool, which may indicate metastasis to the rectum with fistula development.
Papanicolaou (Pap) test identifies abnormal cells.
Colposcopy determines the source of the abnormal cells seen in the Pap test.
Cone biopsy is performed if endocervical curettage is positive.
The Vira/Pap test permits examination of the specimen’s DNA structure to detect HPV.
Lymphangiography, cystography, and major organ and bone scans, can detect metastasis.
Battling Illness

Treating cervical cancer

Accurate clinical staging will determine the type of treatment. Preinvasive lesions may be treated with total excisional biopsy, cryosurgery, laser destruction, conization (followed by frequent Pap test follow-ups) or, rarely, hysterectomy. Therapy for invasive squamous cell carcinoma may include radical hysterectomy and radiation therapy (internal, external, or both). Rarely, pelvic exenteration may be performed for recurrent cervical cancer.

Complications
Complications of surgery include:
• bladder dysfunction
• formation of lymphocytes or seromas after lymphadenectomy
• pulmonary embolism.

Complications of radiation therapy include:
• diarrhea
• abdominal cramping
• dysuria
• leukopenia.

Combined surgery and irradiation in the abdomen and pelvis may lead to small bowel obstruction, stricture and fibrosis of the intestine or rectosigmoid, and rectovaginal or vesicovaginal fistula.
Endometrial cancer

- Cancer of the endometrium (uterine cancer) is the most common gynecologic cancer.
- It typically affects postmenopausal females between ages 50 and 60, uncommon between ages 30 and 40 and rare before 30.
- Most premenopausal females developing uterine cancer have a history of anovulatory menstrual cycles or other hormonal imbalance.
How it happens

- **Predisposing factors:**
  - low fertility index and anovulation
  - history of infertility or failure of ovulation
  - abnormal uterine bleeding
  - obesity, hypertension, diabetes, or nulliparity
  - familial tendency
  - history of uterine polyps or endometrial hyperplasia
  - prolonged estrogen therapy
In most patients, uterine cancer is an adenocarcinoma that metastasizes late, usually from the endometrium to the cervix, ovaries, fallopian tubes, and other peritoneal structures. It may spread to distant organs, such as the lungs and the brain. Lymph node involvement can also occur.
What to look for

• Pre…
  • In a younger patient, it may also reveal spotting and protracted, heavy menstrual periods.

• …and post
  • A postmenopausal woman may report that bleeding began 12 or more months after menses had stopped.
  • In either case, the patient may describe the discharge as watery at first, then blood-streaked, and gradually becoming bloodier.
Endometrial, cervical, or endocervical biopsy confirms cancer.

Fractional dilatation and curettage.

Cervical biopsies and endocervical curettage pinpoint cervical involvement.

CT scans or MRI to detect metastasis to the myometrium, cervix, lymph nodes, and other organs.

Excretory urography and, possibly, cystoscopy evaluate the urinary system.

Proctoscopy or barium enema.

Blood studies, urinalysis, and ECG may also help in staging the disease.
I- **Surgery** has a better chance of curing a cancer if used on solid, well-circumscribed tumors.

- It may be used to *relief pain* or to *debulk* the tumor, which reduces burden and improves the response to chemotherapy or radiotherapy.

II- **Radiation therapy** uses ionizing radiation to kill cells primarily by altering the DNA enough that brakes on the cell cycle. Often, radiation is used in addition to surgery to shrink the tumor.
Chemotherapy uses drugs to destroy tumors which grow rapidly (most susceptible to chemotherapy).

- However, healthy cells are also susceptible to the damaging effects of chemotherapy.
- Chemotherapy is frequently used in addition to surgery or radiation therapy, but may be used alone. It also may be used for palliative purposes.
- Chemotherapy usually causes bone marrow suppression, which in turn causes fatigue, anemia, bleeding tendencies, and an increased risk of infection.
IV-Immunotherapy is a form of cancer treatment that takes advantage of the two cardinal features of the immune system: specificity and memory.

- Immunotherapy may stimulate the host's own immune system to respond more aggressively to a tumor,
- or tumor cells may be attacked by antibodies developed in the laboratory
Cancer Prevention

- Avoidance of cigarette smoking
- A diet rich in fruits, vegetables, and fiber and low in animal fat.
- Avoidance of sexually transmitted diseases

Cancer Detection

• Early cancer detection tests include self breast examination and mammography, prostate examination, self testicular examination, and regular skin examination.
• Some screening tests, including Pap smears, tests for intestinal polyps, and biopsies of abnormal skin lesions.