

Chapter

1

Cancer Overview

Introduction

- Tumor: a mass of tissue formed via disruption of the normal cell cycle resulting in abnormal cell growth.
  - Benign: noncancerous due to the inability to invade neighboring tissues or spread to distant sites.
  - Malignant: cancerous due to ability to invade other tissues.
- Cancer: group of 100+ different diseases due to mutations in genetic material resulting in abnormal and uncontrolled cell growth.
- Metastasis: when cancer cells spread from the location of origin to another anatomical location.

Two main cancer classes and groupings:

| Hematologic |   | Solid     |   |
|-------------|---|-----------|---|
| Leukemia    | originates in blood-forming tissues, including bone marrow and spleen | Carcinoma | originates in major organs, skin, or tissues covering glands                      |
| Lymphoma    | originates in the lymphatic system                                    | Sarcoma   | originates in connective tissue like muscle or bone, or soft tissues like adipose |
| Myeloma     | originates in plasma cells  |           |   |

# Metastasis

| Route         | Definition  | Common   |
|---------------|---|--|
| Canalicular   | spread via the anatomical canalicular spaces  | carcinomas   |
| Hematogenous  | spread via bloodstream  | sarcomas, renal cell, follicular thyroid, and hepatocellular carcinoma |
| Lymphatic     | tumor cells reach regional lymph nodes and spread via the lymphatic system  | carcinomas   |
| Transcoelomic | malignancy spreads to body cavities via surface penetration of the peritoneal, pleural, pericardial, or subarachnoid spaces | ovarian  |

- Common during late-stage cancer and major contributor to morbidity and mortality.

Cancer-specific metastasis locations:

| Cancer Type | Main Sites of Metastasis                      |
|-------------|---|
| Bladder     | bone, liver, lung                             |
| Breast      | bone, brain, liver, lung                      |
| Colon       | liver, lung, peritoneum                       |
| Kidney      | adrenal gland, bone, brain, liver, lung       |
| Lung        | adrenal gland, bone, brain, liver, other lung |
| Melanoma    | bone, brain, liver, lung, skin, muscle        |
| Ovary       | liver, lung, peritoneum                       |
| Pancreas    | liver, lung, peritoneum                       |
| Prostate    | adrenal gland, bone, liver, lung              |
| Rectal      | liver, lung, peritoneum                       |
| Stomach     | liver, lung, peritoneum                       |
| Thyroid     | bone, liver, lung                             |
| Uterus      | bone, liver, lung, peritoneum, vagina         |

## General Statistics

- ≈1.9 million new cancer cases diagnosed in 2022 and 609,360 cancer deaths in the United States.
- Most commonly diagnosed cancers in 2022:

| Male          | Female        |
|---------------|---------------|
| Prostate 27%  | Breast 31%    |
| Lung 12%      | Lung 13%      |
| Colorectal 8% | Colorectal 8% |

| Lowest 5-Year Survival | Highest 5-Year Survival |
|------------------------|-------------------------|
| Mesothelioma 6.5%      | Testicular cancer 95.3% |
| Pancreatic cancer 7.3% | Melanoma of skin 91.3%  |
| Brain cancer 12.2%     | Thyroid cancer 87.4%    |

## Cancer in the Emergency Department Statistics

- Emergency Department (ED) usage rate for cancer patients is more than double that of the general US population with ≈51% of visits resulting in hospital admission.

| Time Frame from Diagnosis | ED Usage Rate |
|---------------------------|---------------|
| First 30 days             | 16%           |
| First 6 months            | 35%           |
| First year                | 44%           |

## Cancer Treatment Modalities

|                              |   |
|------------------------------|---|
| <b>Chemotherapy</b>          | drugs given orally, infused, or injected that are cytotoxic and/or inhibit cell division                          |
| <b>Radiotherapy</b>          | utilization of high dose radiation to kill and shrink tumors  |
| <b>Targeted cell therapy</b> | precisely identifies and attacks specific cellular proteins and genes involved in cancer cell growth and survival |

|                             |  |
|-----------------------------|--|
| <b>Hormone therapy</b>      | targets individual hormones to slow or stop breast and prostate cancers that utilize these hormones for growth |
| <b>Immunotherapy</b>        | assists immune system in fighting cancer either by amplifying or suppressing the innate immune response        |
| <b>Surgery</b>              | physical removal or debulking of the tumor   |
| <b>Stem cell transplant</b> | replaces damaged stem cells with healthy ones from an unrelated or related donor, or from patients themselves  |

- Treatment for each patient may include one or more modalities at any given time.

## References

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