Advanced Oncology Certified Nurse Practitioner

REVIEW COURSE 2024

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THE UNIVERSITY OF TEXAS
MD Anderson Cancer Center
Making Cancer History®

Diagnosis, Staging, and Treatment Planning

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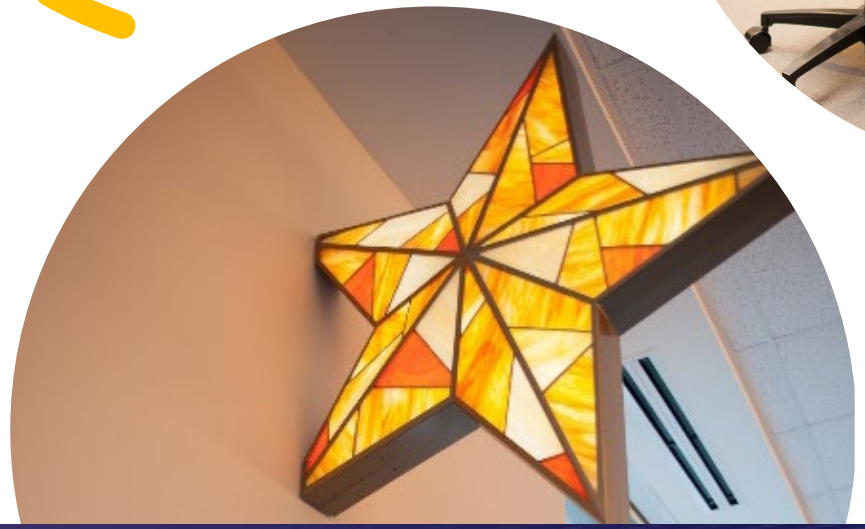


Topics of Focus
Signs and Symptoms of Cancer / Patient History
Physical Exam / Performance Status
Imaging
Diagnostic Procedures
Pathology
Staging and Grading
Diagnostic Evaluation of Common Malignancies

Cancer staging involves a comprehensive evaluation of:

- Burden of disease
- Sites of involvement
- Assessment of non-anatomic prognostic factors (i.e. tumor markers)

Symptoms	Signs
Subjective	Objective

Patient History

- Chronic illness – prolonged periods of immune deficiency increases risk
- Past infections – H. pylori, HPV, Hepatitis B and C, human herpesvirus-8, Epstein-Barr
- Past hospitalizations, previous surgeries and immunizations
- Detailed family history
- Social history as well as occupation and environmental exposure

Performance Status

ECOG (Eastern Cooperative Oncology Group)
0 – Fully active, able to carry out all pre-disease performance without restriction
1 – Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature (e.g. light housework, office work)
2 – Ambulatory and capable of all self-care but unable to carry out any work activities; up and about more that 50% of waking hours
3 – Capable of only limited self-care; confined to bed or chair more that 50% of waking hours
4 – Completely unable to complete self-care and confined or bed or chair
5 – Dead

KPS (Karnofsky Performance Scale)
100% - Normal; no complaints; NED
90% - Able to carry on normal activity; minor signs or symptoms of disease
80% - Normal activity with effort; some signs or symptoms of disease
70% - Cares for self; unable to carry on normal activity or to do active work
60% - Requires occasional assistance but is able to care for most personal needs
50% - Requires considerable assistance and frequent medical care
40% - Disabled; requires special care and assistance
30% - Severely disabled; hospital admission indicated although death no imminent
20% - Very sick; hospital admission necessary; active supportive treatment necessary
10% - Moribund; rapid progression of fatal processes
0% - Dead

ECOG	KPS
0	100%
1	80-90%
2	60-70%
3	40-50%
4	10-30%
5	0%

Sensitivity and Specificity

Sensitivity =

The ability of the test to accurately identify a particular disease and expressed as a percentage.

$$\frac{\text{\# of pts who test positive}}{\text{Total \# of patients who actually have the disease}}$$

*can vary based on stage and volume of disease

Specificity =

The ability of the test to accurately identify the absence of a particular disease (%).

$$\frac{\text{\# of patients who test negative}}{\text{\# of tested patients who do not have the disease}}$$

False +

Positive result in individual who does not have disease

False –

Negative result in an individual who does have disease

Imaging Modalities

Plain radiographs

Mechanism: exposes x-ray film to ionizing radiation that penetrates the body with variation from bald to white depending on the amount of absorption based on density

Gas/Air – Black

Fat – Gray/Black

Soft tissue – Gray

Bone – White

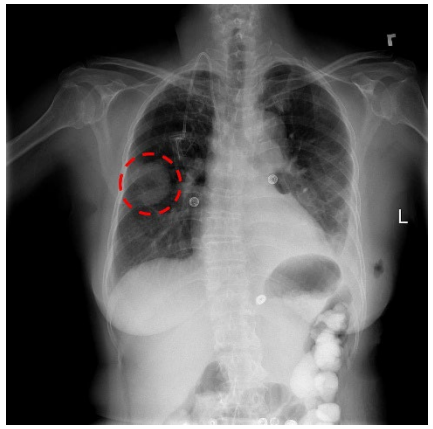


Photo reference: https://www.nih.gov/news-events/news-releases/nih-clinical-center-provides-one-largest-publicly-available-chest-x-ray-datasets-scientific-community

Uses: Bone metastasis (especially lytic) or Impending fracture; Initial evaluation of soft tissue mass, Cardiopulmonary disease, Initial staging for disease that commonly travels to

Ultrasonography

Mechanism: Sound waves with high frequencies causes wave to be reflected and create and ECHO. Echogenicity depends on density.

Strong echo – liver/bone – light gray/white

Moderate echo – soft tissue – medium gray

No echo – fluid – black

Uses: abdominal organs, reproductive organs, breasts, heart, evaluate fluid collections such as pericardial and pleural ascites, DVT, guide procedures such as thoracentesis, paracentesis, lesion biopsy, abscess drainage and RFA

Barium Studies

- Mechanism: Radiopaque - enhances contrast between tissues
- Uses: evaluating oropharyngeal and pharyngeal function, motility and mucosal abnormalities

Photo reference:
https://commons.wikimedia.org/wiki/File:Barium_swallow_of_malignancy_oesophagus_01.jpg

Computed Tomography (CT)

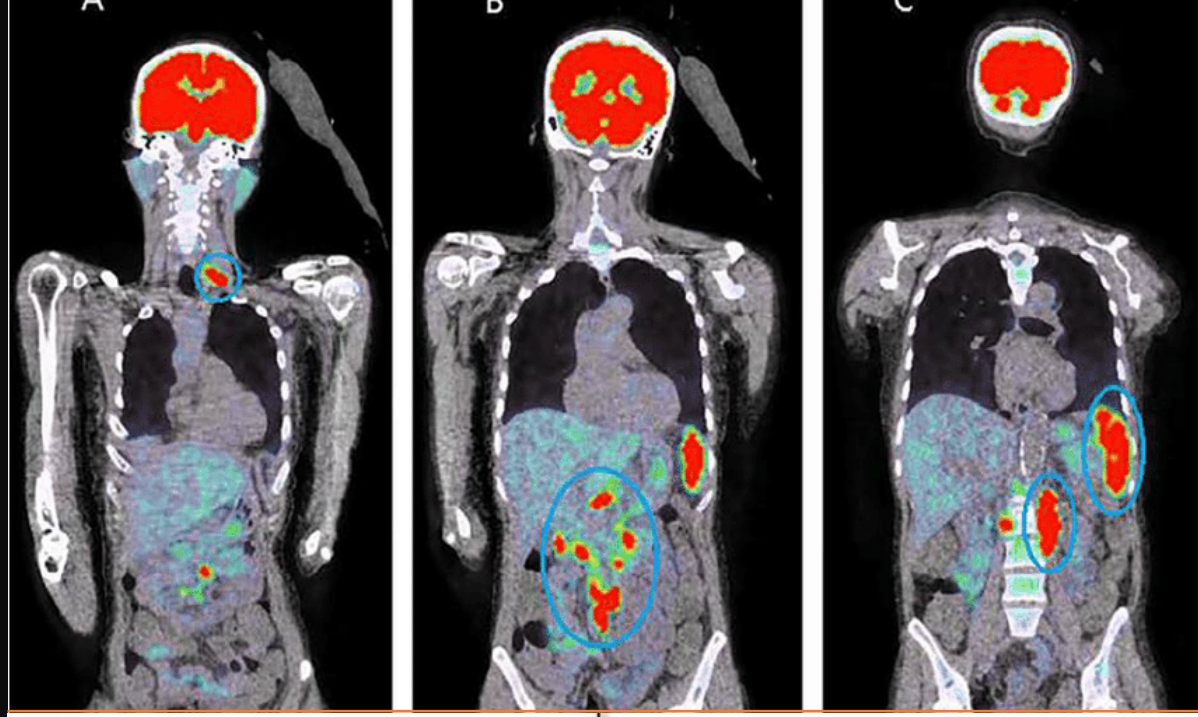
Mechanism: cross-sectional views of the body as if looking up at it from the patients' feet; multidirectional x-rays by rotating around the body that create cross-sectional 2D images or computer assisted construction of 3D images

Magnetic – Resonance Imaging (MRI)

- Mechanism: Uses radiofrequency waves in the presence of a strong magnetic field which detects different frequency emissions in the cells of the body to generate high-resolution, multiplanar images
- Uses: Brain, Spinal Cord, Musculoskeletal conditions

Radionuclide Imaging Techniques

- Mechanism: Administration of radioactive material and detection using a gamma camera
  - Bone Scans (scintigraphy)
  - PET scans



- Photo credits: https://www.mayoclinic.org/tests-procedures/bone-scan/about/pac-20393136 and
- https://www.researchgate.net/figure/FDG-PET-CT-scans-indicating-hypermetabolic-lymph-nodes-areas-circled-in-blue-A-the_fig2_282908373

Deauville Scoring for Positron Emission Tomography-Computed Tomography

- 1 – No uptake
- 2 – Uptake less than the mediastinum
- 3 – Uptake greater than the mediastinum but less than or equal to the liver
- 4 – Moderately increased uptake that is greater than the uptake of the liver
- 5 – Markedly increased uptake greater than the uptake of the liver, and/or presence of new lesions

Overview of Staging and Grading

TNM Staging System is used for most solid cancers (American Joint Committee on Cancer (AJCC) and International Union Against Cancer)

T – The size or extent of tumor

N – The extent of lymph node involvement

M – Metastasis

Clinical Staging

Assessment of the extent of the cancer before initiation of treatment or within 4 months after the date of diagnosis (whichever is shorter)

Pathologic Staging

Assessment of the extent of the cancer based on surgical specimens

Abbreviations

cTNM - clinical

pTNM - pathologic

ypTNM – staging after neoadjuvant treatment

rTNM – staging at time of recurrence

Grading is the degree of differentiation of a tumor and is distinct from the stage

Well differentiated or low grade: closely resemble the tissue of origin and generally associated with a favorable response

High-grade or minimally or undifferentiated: cells are significantly different that the tissue of origin or at times impossible to discern

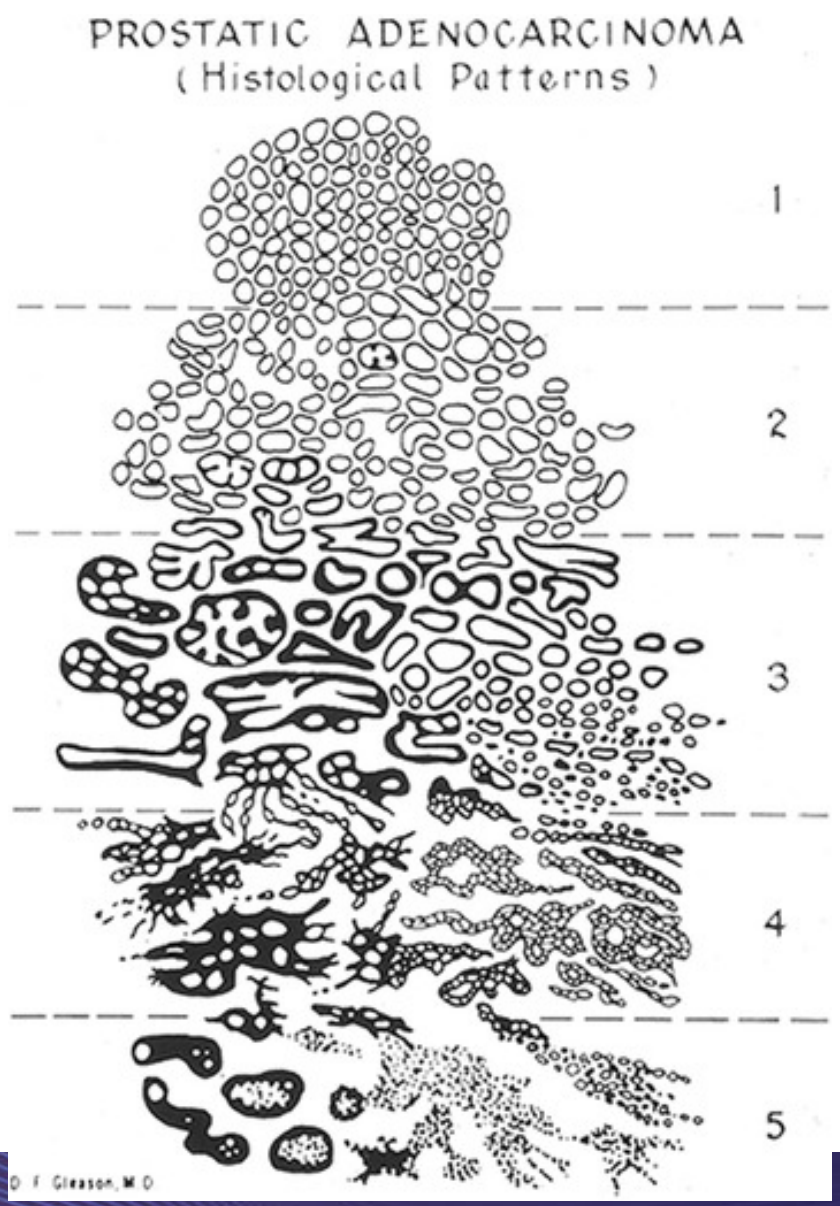


Photo credit:
https://radiotherapydictionary.blogspot.com/2018/02/gleason-score.html

Colorectal Cancer	
Initial Evaluation	Colonoscopy, CT C/A/P, and referral to Genetic Counseling if high risk
Presenting Symptoms	30% asymptomatic, rectal bleeding, change in bowel habits, pain, weight loss, mass, anemia
Risk Factors and Family History	Age >50, IBD, Diet high in red meat, lack of exercise, obesity, smoking, EtOH, lack of adequate vitamin B12 intake, 30% have family history, 5% with Lynch Syndrome, FAP

Diagnostic Tests and Staging - Colorectal

- **Radiology and Labs:**
- TRUS for rectal cancer to visualize the wall layers and perirectal spread
- CT C/A/P
- If polyps completely resected and favorable → no further surgery
- CEA is not useful in detecting early colorectal cancer, not used for screening but can monitor disease

Pathology:

- Primarily adenocarcinoma (96%)
- G1 (well differentiated) – G3 (poorly differentiated)
- Other histopathologic classifications: medullary, mucinous (colloid type), signet cell, undifferentiated, squamous cell (epidermoid), adenosquamous, small cell, NOS

Prognosis - Colorectal

- **Prognostic Factors:** Stage of disease at dx *, LVI, inadequate sampling of lymph nodes, high-grade tumors, and presentation with obstruction or perforation
- **For stage II and all patients <70 y/o:** Testing for microsatellite instability (MSI) and dMMR (variants of mismatch repair genes), not likely to benefit from adjuvant therapy, associated with Lynch syndrome

Survival Rates - Colorectal

- Five year survival for colorectal cancer is 91% for patients with localized disease, 72% for patients with regional disease, and 17% for patients with distant metastasis
- Approximately 37% of cases are diagnosed at an early stage

Lung Cancer

Initial Evaluation	Pulmonary function tests, CT imaging, PET scan, and selective testing associated with distant metastasis or paraneoplastic syndromes. Palliative care involvement at the time of diagnosis with metastatic disease is recommended. Most common sites of metastasis are brain, bone, adrenal glands, contralateral lung, liver, pericardium, kidneys, and subcutaneous tissues.
Presenting Symptoms	Cough, shortness of breath, chest pain, and hemoptysis. Fatigue, frequent lung infections, weight loss, malaise, pain, loss of appetite, or hoarse voice.
Risk Factors	Smoking accounts for 85-90% of cases, Age, Previous cancer, Family history, Chemical exposures, Other lung disease, Exposure to infectious agents, Immunosuppression
Family History	May play a role as not all smoker develop lung cancer

Pathology

- 2 Major Classes of Lung Cancer
- SCLC
- NSCLC (85% of cases)
  - Nonsquamous (adenocarcinoma, large-cell) and squamous
    - Subtyped by pattern of growth (acinar, papillary, micropapillary or lepidic)

- IHC to distinguish various types of NSCLC
  - TTF-1 → present in 70-85% adenocarcinomas
  - p63 → Squamous cell carcinoma

Histologic grading is GX to G4 (undifferentiated)

Lung Cancer

- Staging uses TNM system for both SCLC and NSCLC
- Favorable PF include early stage, good PS, absence of weight loss >5%, and female sex
- 5-year survival is 61% for localized disease, 33% for regional disease and 7% for metastatic disease

Non-Hodgkin Lymphoma

Initial Evaluation	PET-CT and Bone marrow biopsy, Assess lymph nodes, liver and spleen on exam *Extranodal sites:* GI tract, lungs, bones, skin, liver, CNS, and testes
Presenting Symptoms	*B symptoms:* Fever, night sweats (often soaking), unexplained weight loss Fatigue, Abdominal fullness, Early satiety (related to splenomegaly), Enlarged lymph nodes (may wax and wane in low grade lymphomas)
Risk Factors	Exposure to chemicals or radiation, Hx of immunosuppressive therapy, Hx of autoimmune disorders, Hx of infection with specific viruses
Lab Evaluation	CBC with differential, CMP, LDH
Radiographic Examinations	PET-CT *In certain NHL subtypes:* Bone scan, Lumbar puncture, Cardiac function studies, MRI, Endoscopy/colonoscopy

Pathology

Excisional Biopsy (FNA not adequate for flow cytometry, IHC, and molecular testing) and BMBx (bone marrow involvement → stage IV)

WHO pathologic classification divides into >50 specific subtypes originating from within:

Mature B-cell neoplasms

Mature T-cell neoplasm

Natural Killer (NK)-cell neoplasms

Grading varies by subtype but generally low, intermediate, and high grade. Only intermediate and high grade lymphomas are considered curable.

NHL Staging

- Hodgkin and non-Hodgkin lymphomas DO NOT use TNM staging
- They use the Cotswolds-Modified Ann Arbor Staging System
- Importance of subscripts: A, B, X, E

NHL Prognosis

PROGNOSIS AND SURVIVAL

Unfavorable prognostic factors include older age, advanced stage, elevated LDH, extra-nodal involvement, poor performance status

Survival varies widely by cell type. For all NHL diagnoses combined 5-year relative survival rates are 86% for localized disease, 78% for reginal disease and 63% for distant involvement

Ovarian Cancer

- Initial evaluation include abdominal/pelvic exam, chest imaging, CT and/or U/S of abdomen/pelvis, CA 125 and referral to genetic counseling for high risk patients
- Presenting symptoms include pelvic/abdominal pain, urinary urgency or frequency, increased abdominal size or bloating and early satiety
- Risk factors are older age (>35 y/o) at first pregnancy or birth and nulliparity.

- Hereditary ovarian cancer occurs in 5 % of cases. BRCA1, BRCA2 and Lynch syndrome are associated. Family hx of 2 first degree relatives or hereditary nonpolyposis colorectal cancer.
- 90% of ovarian cancer has an epithelial histology based on the structure of origin within the ovary. The main histologic types include serous (70%), mucinous, endometrioid and clear cell.
- Grading from GX to G4.

Staging, Survival & Prognosis

- Staging is based on the FIGO and TNM staging systems
- Approximately 30% of ovarian cancer will be upstaged based on clinically occult surgical findings
- The most significant prognostic factor is stage at time of diagnosis
- 5-year survival is 93% for localized disease, 74% for regional disease, and 30% for metastatic disease

Prostate Cancer

Initial evaluation:
PSA, DRE, for life expectancy ≥5 years bone scan and pelvic CT or MRI

Symptoms: 90% of cases diagnosed by screening PSA, difficulty voiding or weakened stream are most common

Risk factors: Older age (median age at dx 67 y/o), Family history, African American race

Pathology: Nearly all are adenocarcinoma, multifocal, grading using the Gleason scoring system (1-5 + 1-5)

Prognosis and Survival: PF: stage, PSA levels and Gleason score; 100% 5-year survival for localized disease and 28% with distant metastasis

Nomograms: Partin tables and Epstein criteria

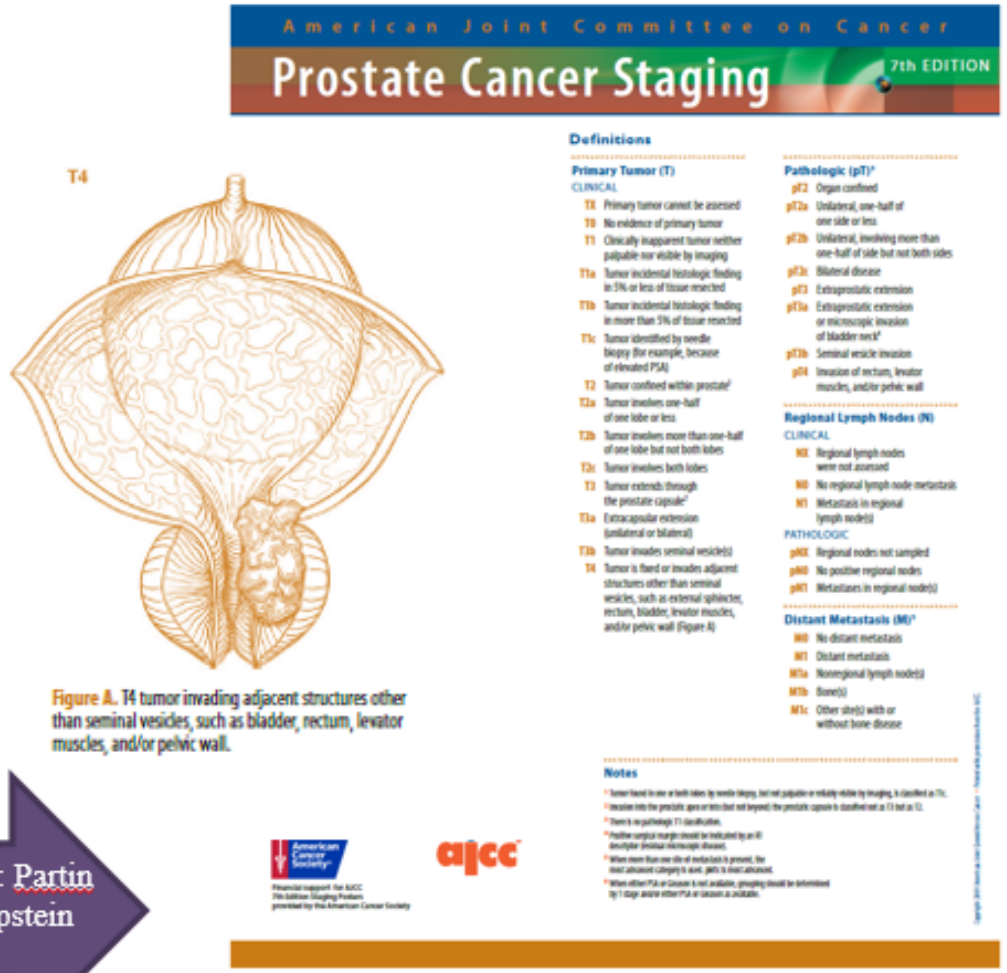
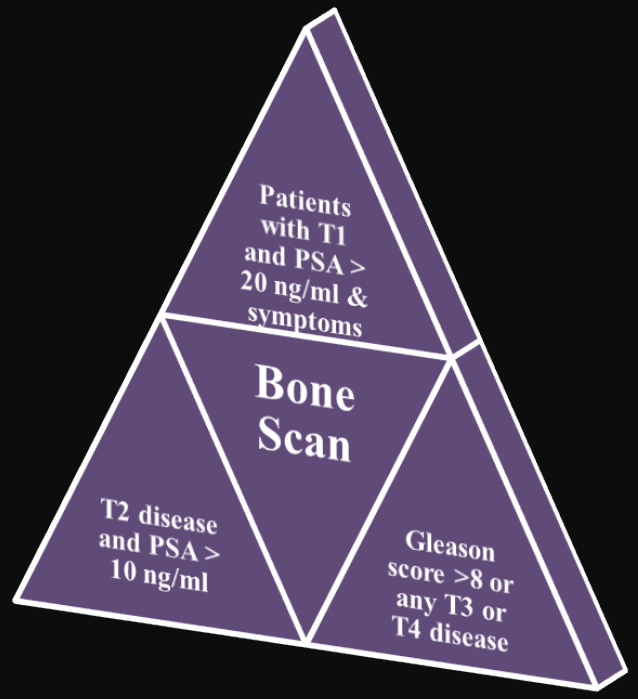
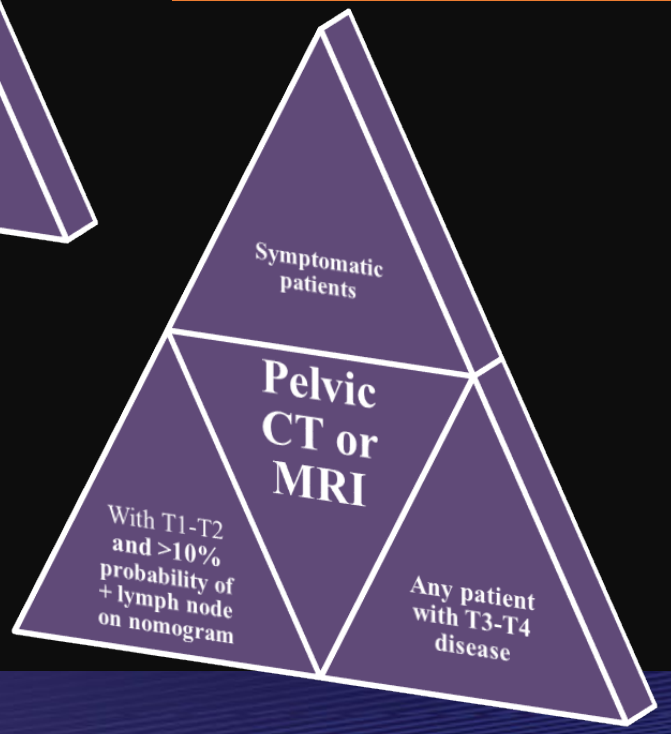


Photo credit: http://sxc.cancerstaging.org/references-tools/quickreferences/Pages/default.aspx

Prostate Cancer - Imaging





Thank you!

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