

# PROSTATE

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**Objectives:**

Upon completion of this presentation, students will be able to:

- ✦ Describe the embryology of the prostate and its relational anatomy.
- ✦ Discuss the function of the prostate and correlating lab values.
- ✦ Identify the indications for a prostate ultrasound.
- ✦ Discuss protocol and the sonographic appearance of the prostate.
- ✦ Distinguish between benign and malignant processes.
- ✦ Recognize the process of a prostate biopsy.

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## ANATOMY

- LIES BETWEEN THE UROGENITAL DIAPHRAGM AND BLADDER OUTLET
- OVAL, CONE, OR CHESTNUT SHAPED
- AVERAGE SIZE: 3-4 CM IN LENGTH  
2-3 CM IN HEIGHT & WIDTH
- PROSTATE VOLUME: GENERALLY INCREASES WITH AGE (<30 CC)
- ENLARGING PROSTATE PRODUCES MORE PROSTATE SPECIFIC ANTIGEN (PSA)

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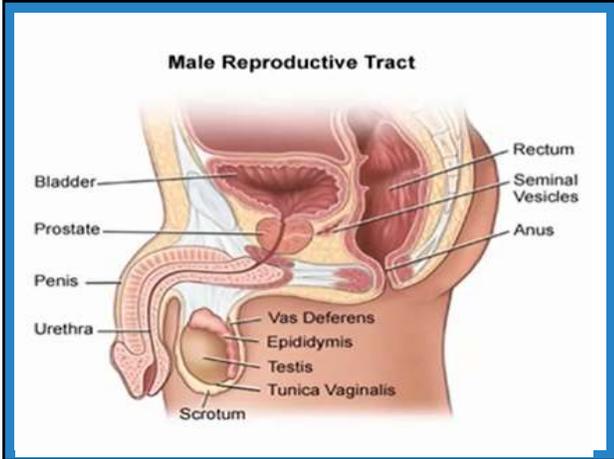
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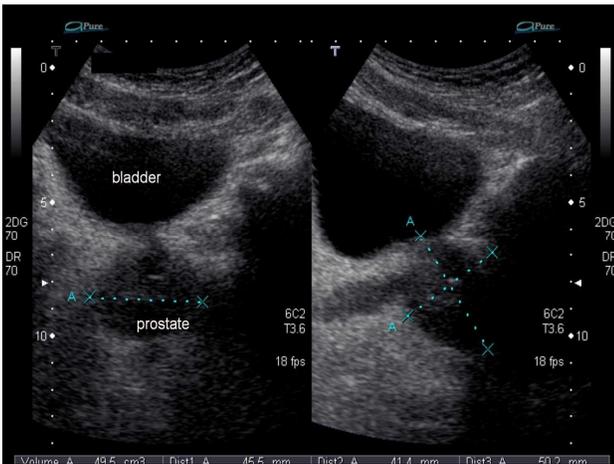
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## ANATOMY (cont'd)

- COMPOSED OF GLANDULAR AND FIBROMUSCULAR TISSUE
- ENCAPSULATED WITH COLLAGEN, SMOOTH MUSCLE AND ELASTIN
- FIVE LOBES:
  - ANTERIOR (FIBROMUSCULAR PORTION)
  - MIDDLE
  - POSTERIOR
  - LATERAL (2)

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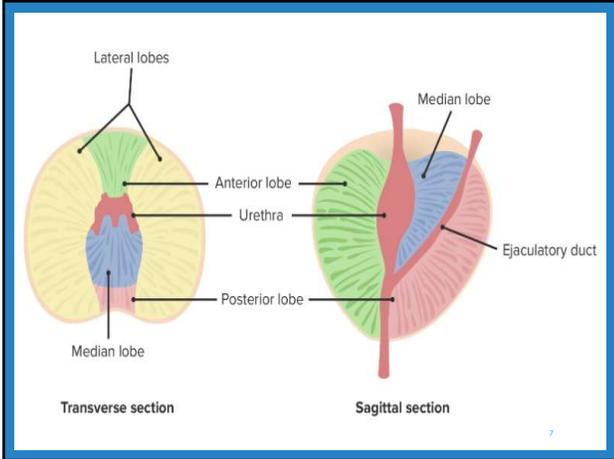
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## ANATOMY (cont'd)

FOUR MAIN REGIONS:

1. CENTRAL ZONE (CZ)
  - BASE OF PROSTATE
  - 25% GLANDULAR TISSUE
2. PERIPHERAL ZONE (PZ)
  - 70% GLANDULAR TISSUE
  - EXTENDS FROM THE BASE TO THE APEX IN THE POSTERIOR GLAND

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## ANATOMY (cont'd)

3. TRANSITIONAL ZONE (TZ)
  - 5% OF GLANDULAR TISSUE
  - ENLARGES WITH BPH
4. ANTERIOR FIBROMUSCULAR STROMA
  - DEVOID OF GLANDULAR TISSUE
  - COMPOSED OF ONLY FIBROUS AND MUSCULAR TISSUE

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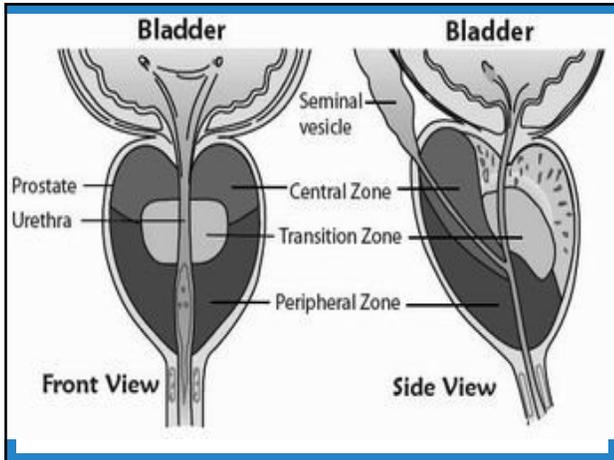
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## ANATOMY (cont'd)

- LOCATION
  - INFERIOR TO SEMINAL VESICLES AND BLADDER
  - SURROUNDS PROSTATIC URETHRA
  - ANTERIOR TO RECTUM
  - POSTERIOR TO SPACE OF RETZIUS

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## FUNCTION

- SECRETES A THIN, ALKALINE FLUID INTO THE PROSTATIC URETHRA BY THE PROSTATIC DUCTS
- SECRETION CONSTITUTES THE MAJORITY OF THE SEMINAL FLUID AND AIDS IN THE MOTILITY OF THE SPERM
- GLANDULAR TISSUE PRODUCES PROSTATE SPECIFIC ANTIGEN (PSA)
- TESTOSTERONE AND DIHYDROTESTOSTERONE REGULATES PROSTATE GROWTH AND FUNCTION
- MOST ACCURATE METHOD TO CALCULATE PROSTATE FUNCTION IS BY CALCULATING PROSTATE-SPECIFIC ANTIGEN DENSITY (PSAD)

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## LAB VALUES

- PROSTATE SPECIFIC ANTIGEN (PSA)
  - PROTEIN PRODUCED BY NORMAL AND MALIGNANT CELLS OF THE PROSTATE GLAND
  - NORMAL <4.0 ng/mL
  - ELEVATED LEVELS OF PSA MAY INDICATE PROSTATE CANCER, A NONCANCEROUS CONDITION SUCH AS PROSTATITIS, OR PROSTATE ENLARGEMENT
- PSA ASSAYS
  - MONOCLONAL
  - POLYCLONAL

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## VARIANTS OF THE PROSTATE

- AGENESIS OF SEMINAL VESICLE
  - ASSOC. WITH IPSIALTERAL RENAL AGENESIS
- CYSTS
- PROSTATIC UTRICLE CYST
  - ASSOC. WITH UNILATERAL RENAL AGENESIS
- EJACULATORY DUCT CYST
- MULLERIAN DUCT CYST
- AGENESIS OF VAS DEFERNIS

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## INDICATIONS FOR EXAM

- URINARY SYMPTOMS
- ABNORMAL PSA/LAB SCREENING
- ABNORMAL DIGITAL EXAM
- PAIN
- HEMATOSPERMIA
- OLIGOSPERMIA
- INFERTILITY

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## SONOGRAPHIC EVALUATION

- CAN BE PERFORMED BOTH TRANSABDOMINALLY OR TRANSRECTALLY
- \*TRANSRECTAL PREFERRED FOR SPATIAL RESOLUTION AND IMAGE OPTIMIZATION

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## SONOGRAPHIC EVALUATION (CONT'D)

- TRANSABDOMINAL:
  - ❖ PATIENT SUPINE WITH FULL BLADDER
  - ❖ CURVILINEAR LOW FREQUENCY TRANSDUCER
  - ❖ USE BLADDER AS A WINDOW
  - ❖ SWEEP THROUGH PROSTATE GLAND LONGITUDINALLY AND TRANSVERSE TO OBTAIN NECESSARY IMAGES AND MEASUREMENTS

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## SONOGRAPHIC EVALUATION (CONT'D)

- TRANSRECTAL:
  - ❖ PATIENT DECUBITUS WITH KNEES CLOSE TO CHEST
  - ❖ HIGH FREQUENCY TRANSRECTAL TRANSDUCER
  - ❖ SWEEP THROUGH PROSTATE GLAND LONGITUDINALLY AND TRANSVERSELY TO OBTAIN NECESSARY IMAGES AND MEASUREMENTS
  - ❖ PREPARE PROBE FOR TROPHON DISINFECTION UPON COMPLETION OF EXAM

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## PROTOCOL

- TRANSVERSE BASE
- TRANSVERSE MID WITH AND WITHOUT MEASURE
- TRANSVERSE APEX
- TRANSVERSE SEMINAL VESICLES
- LONGITUDINAL MID WITH AND WITHOUT MEASURE
- LONG RIGHT OF MIDLINE
- LONG LEFT OF MIDLINE
- LONG SEMINAL VESICLES

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## TRANSRECTAL IMAGING

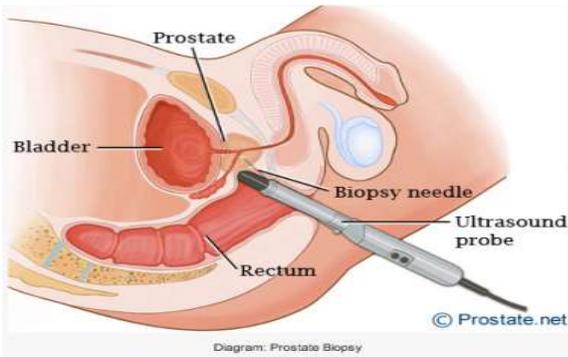


Diagram: Prostate Biopsy

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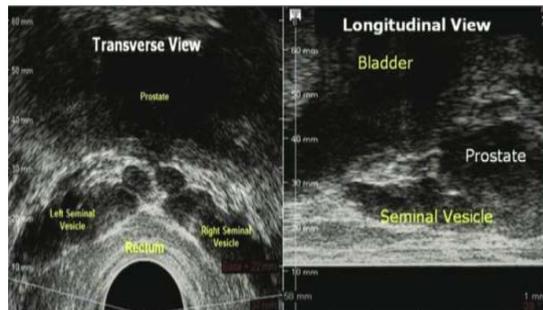
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## SONOGRAPHIC APPEARANCE SEMINAL VESICLES



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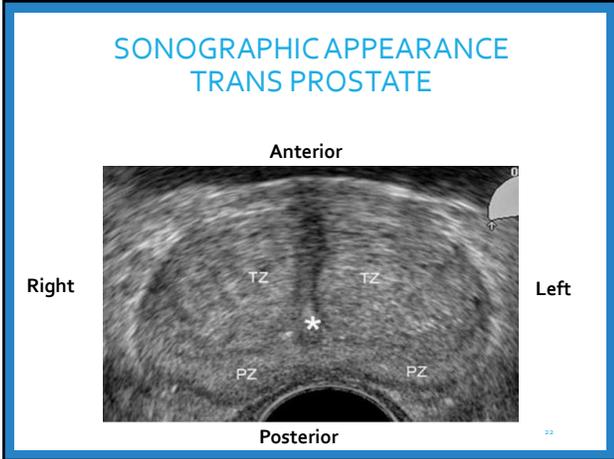
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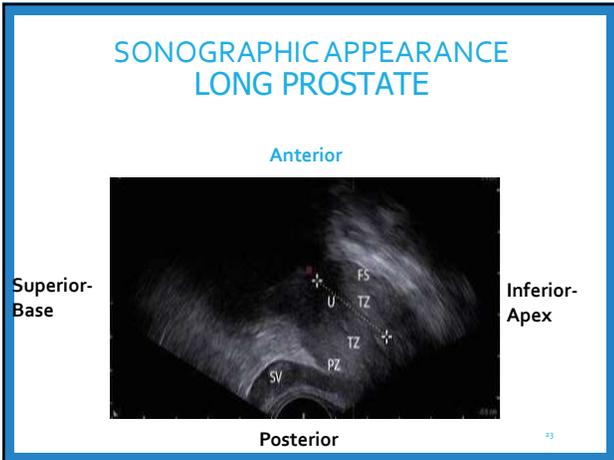
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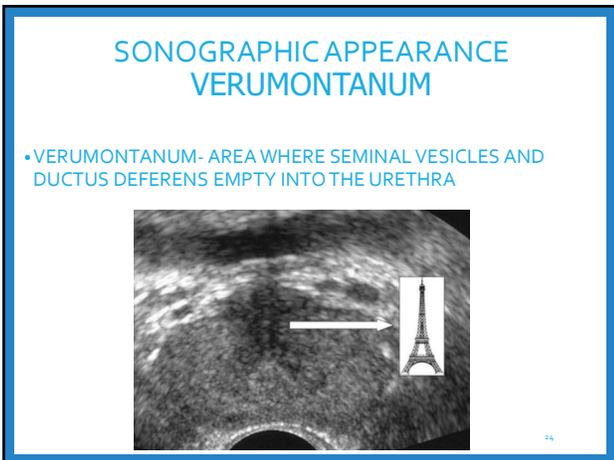
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# BENIGN DISEASES

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## BENIGN PROSTATIC HYPERTROPHY (BPH)

- OVER 70 YRS. OLD
- FREQUENTLY ENLARGED MEDIAN LOBE (TRANSITIONAL ZONE) BULGING UPWARD TO BLADDER
- SMOOTH ENLARGED GLAND (SOFT AND SYMMETRIC)

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## BPH (CONT'D)

**SONOGRAPHIC APPEARANCE:**

- ENLARGEMENT OF GLAND
- POSSIBLE ENLARGEMENT WITH OR WITHOUT DISTINCT NODULES
- HYPOECHOIC INNER REGION COMPARED TO PERIPHERAL
- CENTRAL AND PERIPHERAL ZONES MAY BE COMPRESSED
- MINUTE CALCULI (1-2mm) OFTEN CO-EXIST WITH BPH
- MAY HAVE THICKENED BLADDER WALL AND TRABECULATIONS
- POSSIBLE HYDRONEPHROSIS AND HYDROURETERS
- ASYMMETRIC ENLARGEMENT SHOULD BE EVALUATED FOR MALIGNANT CHANGE

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### BPH (CONT'D)

**TREATMENT:**

- MEDICATION
- SURGICAL THERAPIES:
  - > TURP: TRANSURETHRAL RESECTION OF THE PROSTATE
  - > PROSTATECTOMY

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### PROSTATITIS

- ACUTE INFLAMMATION
- ❖ USUALLY OCCURS IN PERIPHERAL ZONE
- ❖ COMPLICATION OF ABSCESS FORMATION
- ❖ SWELLING AND TENDERNESS ON EXAM
- ❖ DECREASED ECHOGENICITY
- ❖ UNIFORMLY HOMOGENEOUS
- ❖ INCREASED VASCULARITY

- SONOGRAPHIC FINDINGS:
  - ❖ USUALLY NORMAL APPEARANCE
  - ❖ MAY HAVE DIFFUSE HYPERECHOIC APPEARANCE OF PZ
  - ❖ HYPERVASCULARITY
  - ❖ HYPOECHOIC MASS
  - ❖ ABSCESS

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## PROSTATITIS (cont'd)

- CHRONIC INFLAMMATION
  - ❖ RECURRENT EPISODES OF ACUTE
  - ❖ CLINICAL PRESENTATION VARIES, MAY HAVE MODERATE SWELLING
  - ❖ MAY BE ASYMMETRICAL
- SONOGRAPHIC FINDINGS:
  - ❖ INHOMOGENEOUS TEXTURE WITH FOCAL HYPOECHOGENIC AREAS
  - ❖ COMMONLY CALCULI ARE PRESENT
  - ❖ CAPSULAR THICKENING AND/OR IRREGULARITY

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## PROSTATIC CALCULI

- SMALL
  - ❖ 2-3 mm
  - ❖ SHADOWING, COULD CAUSE REVERBERATION COMET TAIL ARTIFACT
  - ❖ IN BPH, TYPICALLY ARRANGED IN CHAIN NEAR NODULE
- LARGE
  - ❖ DENSE ECHOGENIC FOCI WITH SHADOWING

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## PROSTATIC CYSTS

- USUALLY ASYMPTOMATIC
- ACQUIRED
  - ❖ RETENTION CYSTS
  - ❖ SMOOTH WALL
  - ❖ ANECHOIC WITH POSTERIOR ENHANCEMENT
- CONGENITAL
  - ❖ SEMINAL VESICLE

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**MALIGNANT DISEASES**

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**CARCINOMAS**

- SMALLER- GENERALLY LESS ECHOGENIC THAN SURROUNDING TISSUE
- LARGER- BECOME ISOECHOIC TO SURROUNDING TISSUE AND EVENTUALLY BECOME MORE ECHOGENIC

\*ULTRASOUND NOT ABLE TO DIFFERENTIATE MALIGNANT VS BENIGN LESIONS WITH CERTAINTY

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**SONOGRAPHIC APPEARANCE**

- IRREGULAR MARGINATED PERIPHERALLY HYPOECHOIC LESION
- CAPSULAR DISTORTION
- CAPSULAR DISRUPTION
- ECHOGENIC ASYMMETRY
- DISTENDED, THICK BLADDER WITH TRABECULATIONS
- BILATERAL HYDRONEPHROSIS AND HYDROURETERS
- LOSS OF SMOOTH CONTOUR IN AREA OF LESION INDICATING EXTRACAPSULAR SPREAD
- INCREASED VASCULARITY
- 25% OF CARCINOMAS MAY NOT BE SEEN SONOGRAPHICALLY WITH THE ENDORECTAL PROBE
  - LOCATED WITHIN CENTRAL GLAND OR ANTERIOR LOBE
  - MAJORITY FOUND IN PERIPHERAL ZONE

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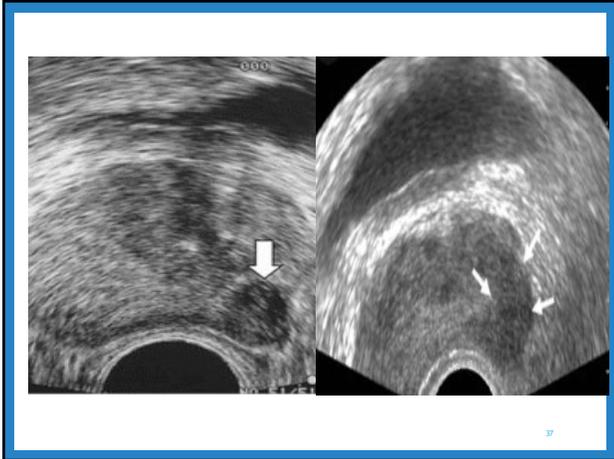
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**PROSTATE BIOPSY**

- INDICATED IN PATIENTS WITH QUESTIONABLE LAB WORK OR PRIOR IMAGING STUDIES/ ABNORMAL DIGITAL EXAM
- TRANSRECTAL
- TRANSPERINEAL (IF ABSENT RECTUM)
- MAY ALSO BE USED FOR ABSCESS DRAINAGE

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**PROSTATE BIOPSY  
(CONT'D)**

- LESION DIRECTED: BASED ON SONOGRAPHIC LESION (RARE)
- SYSTEMIC SEXTANT: SYSTEMATIC BX TO PERIPHERAL ZONE ONLY (ex-3 ON THE RT, 3 LT)
- PARASAGITTAL SEXTANT: SYSTEMIC SEXTANT BX + ADDITIONAL CORES IN LATERAL ASPECTS OF PERIPHERAL ZONE

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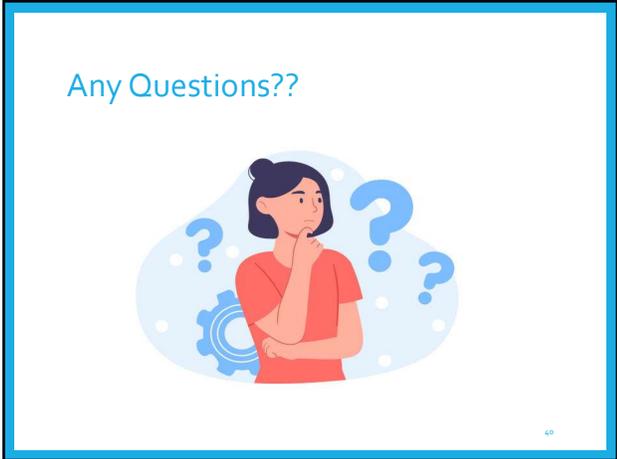
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