

# Pulmonary Embolism in a Patient with Hematuria

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Radiology 3030

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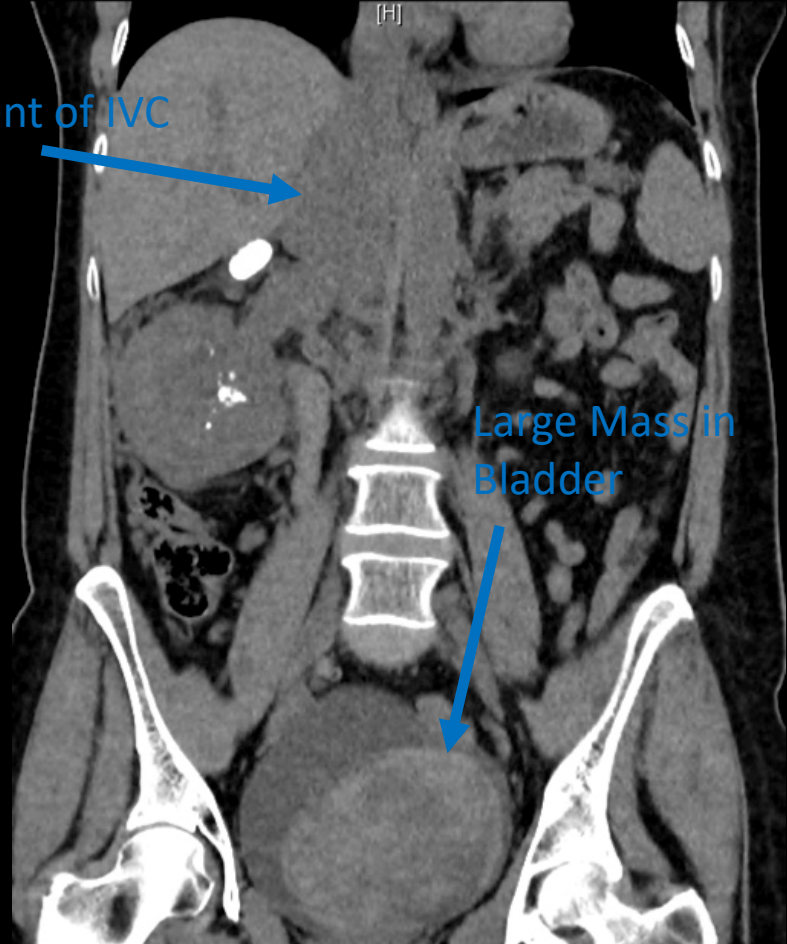
# Clinical History

- A 61 y/o F with a pmh of PE, hypothyroidism and RA presents to OSH s/p fall.
  - The pt reports intermittent hematuria for the past 6 months that progressed to severe hematuria the day before fall
  - Pertinent History: 2 weeks ago, pt visited OSH due to SOB and was diagnosed with PE, started on Eliquis and sent home
- Initial Work Up:
  - Afebrile, Vital Signs stable
  - INR 1.39, Cr 1.4, Hgb 11.3, WBC 11.9, UA – Neg nitrites, neg LE
  - CT Abd/pelvis non-contrast ordered to r/o nephrolithiasis...

They found this instead..



Large R Renal Mass

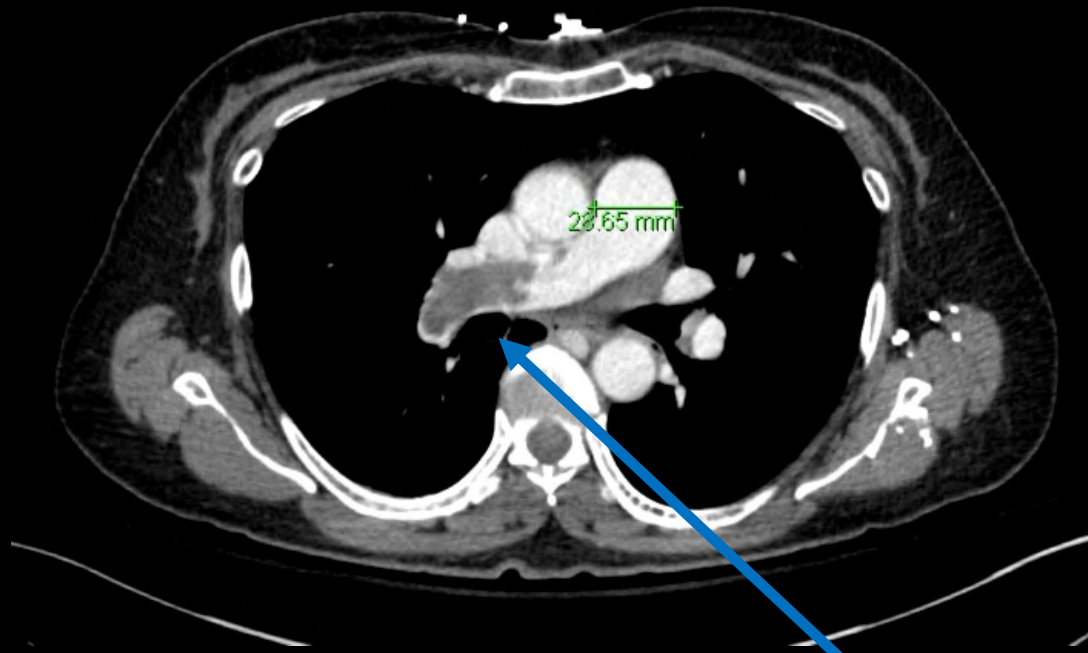


Involvement of IVC

Large Mass in Bladder

# Transferred to MHH – Day 1

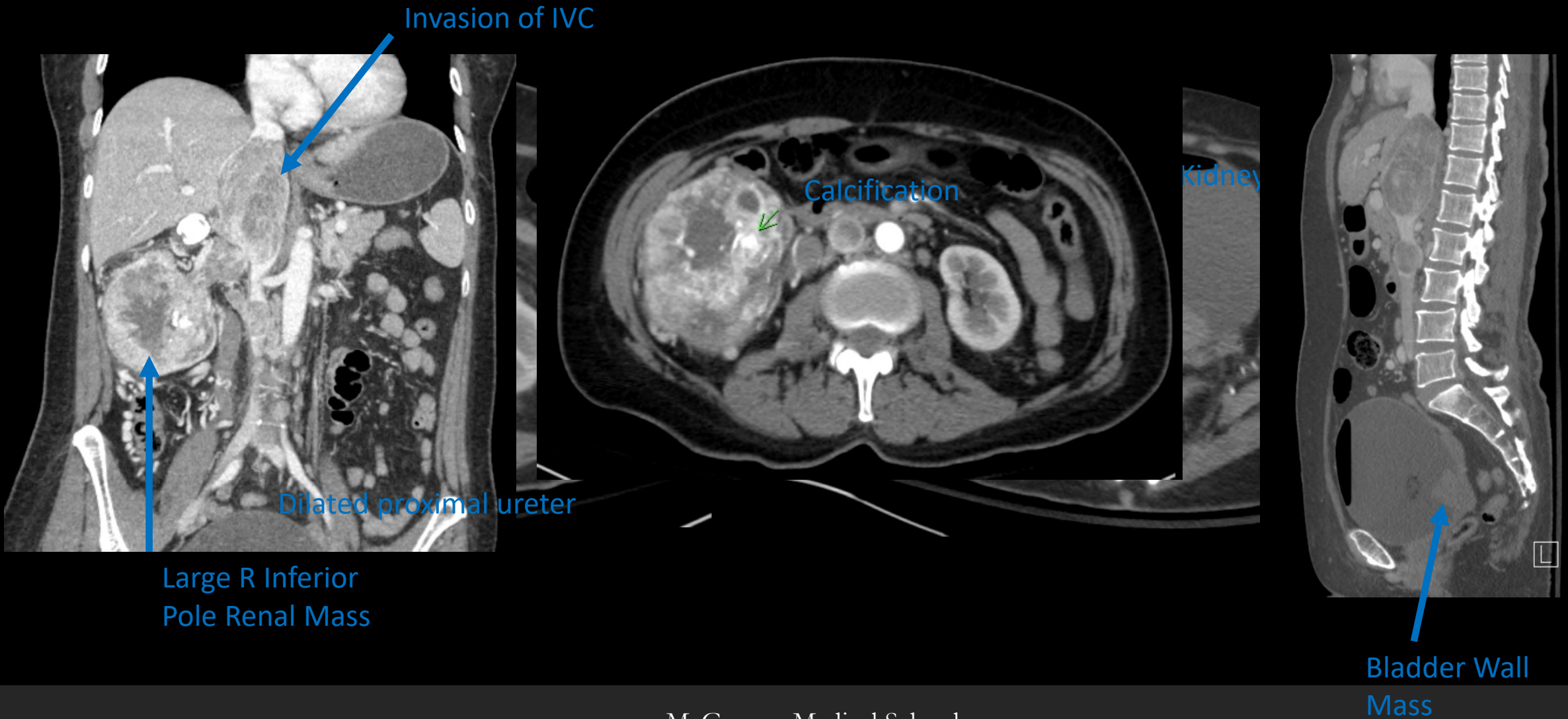
CT Chest w/Contrast



Pulmonary Embolus

# Day 1

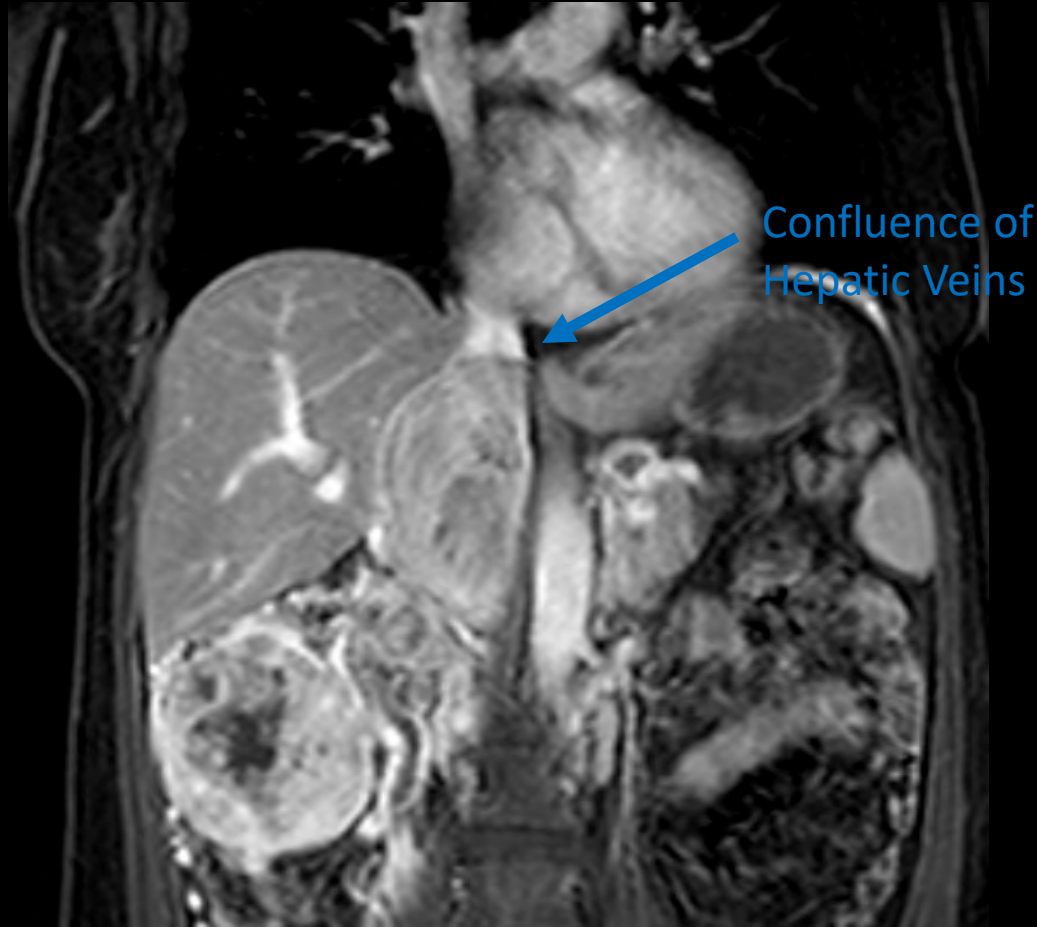
CTA abdomen/pelvis with contrast



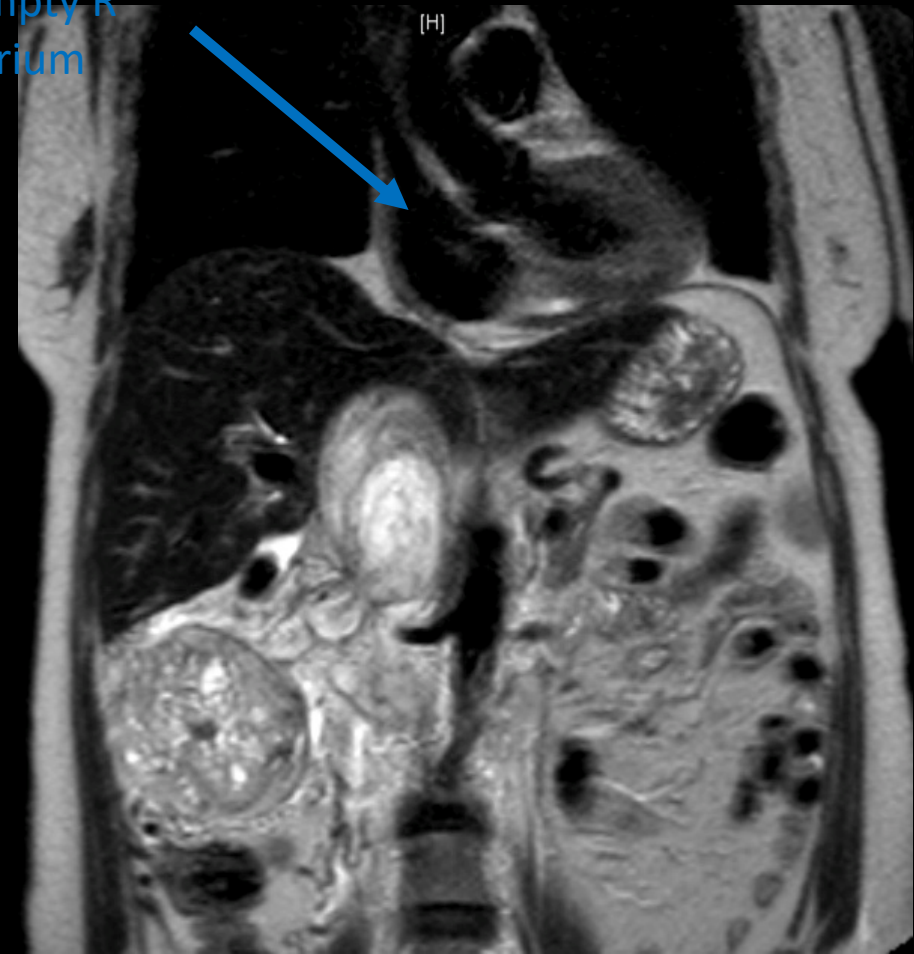


# Day 4

## MR Abdomen with and without Contrast



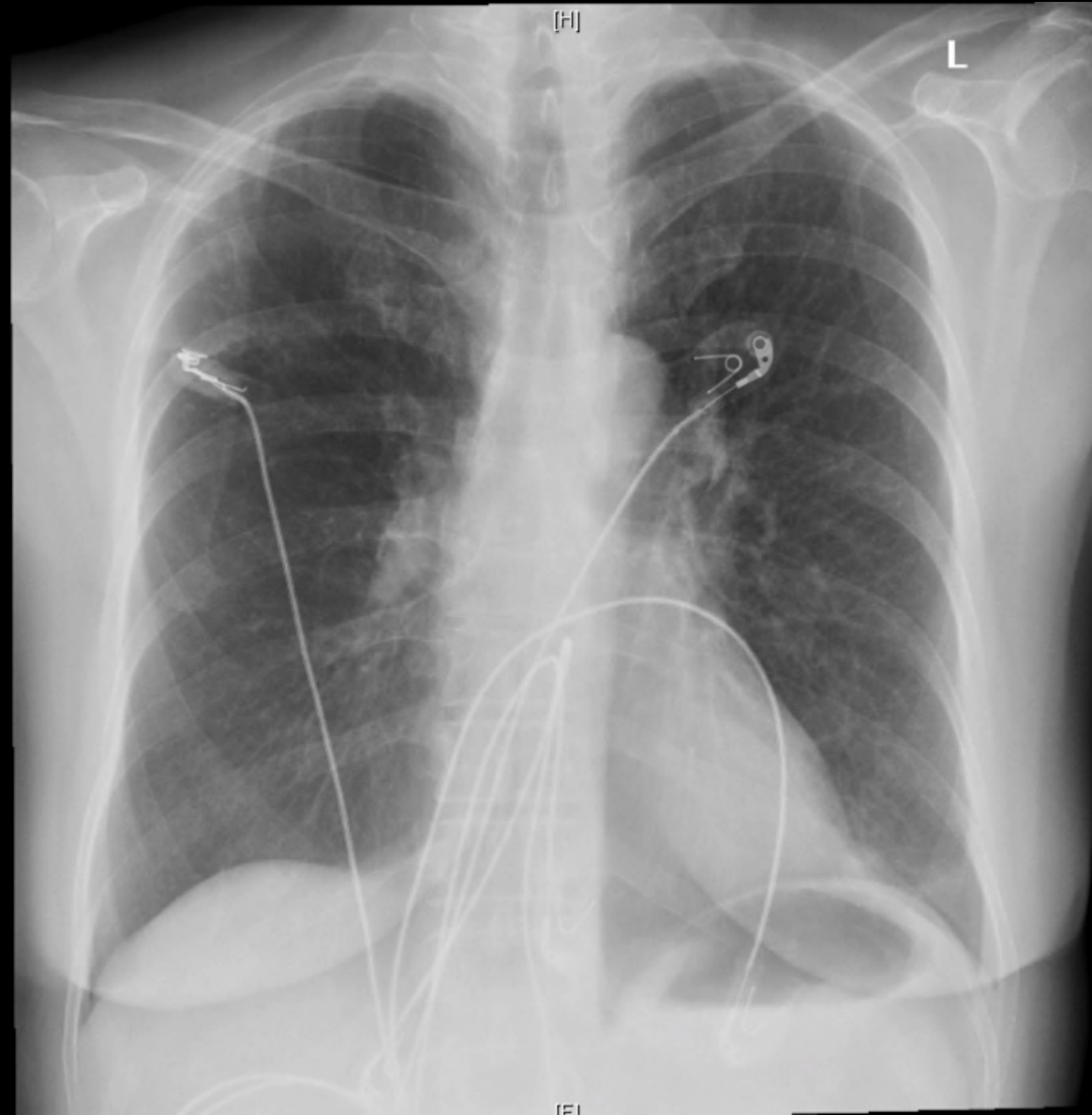
Empty R  
atrium



# Day 1

CXR 1-view

Appears Normal!



# Key Imaging Findings

- Tumor pulmonary emboli in R main pulmonary artery extending into main lobar branches
- Large R inferior pole renal mass extending into inferior vena cava
- Posterior midline bladder wall mass – clot per Urology
- Stage: T-IIIb N-0 M-0
- Nephrometry Score: 12x

## Kidney cancer TNM staging AJCC UICC 8th edition

### Primary tumor (T)

T category	T criteria
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
T1	Tumor ≤7 cm in greatest dimension, limited to the kidney
T1a	Tumor ≤4 cm in greatest dimension, limited to the kidney
T1b	Tumor >4 cm but ≤7 cm in greatest dimension, limited to the kidney
T2	Tumor >7 cm in greatest dimension, limited to the kidney
T2a	Tumor >7 cm but ≤10 cm in greatest dimension, limited to the kidney
T2b	Tumor >10 cm, limited to the kidney
T3	Tumor extends into major veins or perinephric tissues, but not into the ipsilateral adrenal gland and not beyond Gerota's fascia
T3a	Tumor extends into the renal vein or its segmental branches, or invades the pelvicalyceal system, or invades perirenal and/or renal sinus fat but not beyond Gerota's fascia
T3b	Tumor extends into the vena cava below the diaphragm
T3c	Tumor extends into the vena cava above the diaphragm or invades the wall of the vena cava
T4	Tumor invades beyond Gerota's fascia (including contiguous extension into the ipsilateral adrenal gland)

### Regional lymph nodes (N)

N category	N criteria
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in regional lymph node(s)

### Distant metastasis (M)

M category	M criteria
M0	No distant metastasis
M1	Distant metastasis

### Prognostic stage groups

When T is...	And N is...	And M is...	Then the stage group is...
T1	N0	M0	I
T1	N1	M0	III
T2	N0	M0	II
T2	N1	M0	III
T3	NX, N0	M0	III
T3	N1	M0	III
T4	Any N	M0	IV
Any T	Any N	M1	IV

TNM: tumor, node, metastasis; AJCC: American Joint Committee on Cancer; UICC: Union for International Cancer Control.

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# Differential Diagnosis

- Renal Cell Carcinoma
- Transitional Cell Carcinoma of the renal pelvis
- Oncocytoma
- Angiomyolipoma
- Metastatic Disease

# Discussion

- Most Likely Diagnosis: Renal Cell Carcinoma
  - Clear Cell Carcinoma
  - Papillary
- 80 – 85% of primary renal neoplasms
- Management
  - Urology: Continuous Bladder Irrigation, eval for nephrectomy
  - Vascular Surgery: Consult due to IVC involvement
  - Oncology: Percutaneous biopsy if not good candidate
  - Interventional Radiology: Refused image guided targeted renal mass biopsy – will not change treatment

# Continued discussion - RCC

- Many patients are asymptomatic until disease is advanced
  - Approx. 25% of patients have distant metastasis or advanced local disease at presentation
- Classic Triad: Flank pain, Hematuria, Palpable abdominal Mass
  - Occurs in at most 9% of patients
  - Hematuria observed only with tumor invasion of the collecting system
  - Mass often only palpated in a thin adult
- IVC involvement – Lower extremity edema, ascites, Budd-Chiari syndrome
- Paraneoplastic Syndromes – Anemia, Hypercalcemia, Fever, Cachexia

# Continued Discussion

- “Previous studies have demonstrated that 10% of patients with idiopathic or unexplained pulmonary emboli were subsequently diagnosed with malignant tumors at 5–10 year follow-ups, indicating the requirement for greater attention to secondary pulmonary emboli caused by asymptomatic tumors”
- Find the Source of the thrombus!
  - US lower extremities, routine abdominal ultrasound
- Pay attention to characteristics of embolus on CT
  - Hyperdense regions suggest embolus of tumor origin
  - Homogenous and Hypodense – Bland Thrombus

# Final Diagnosis

- Stage 3 Renal Cell Carcinoma
- Tumor Pulmonary Emboli in R main pulmonary artery



# ACR appropriateness Criteria

<b>Variant 4: Gross hematuria. Initial imaging.</b>		
<b>Procedure</b>	<b>Appropriateness Category</b>	<b>Relative Radiation Level</b>
CTU without and with IV contrast	Usually Appropriate	☼☼☼☼
MRU without and with IV contrast	Usually Appropriate	○
CT abdomen and pelvis without and with IV contrast	May Be Appropriate	☼☼☼☼
MRI abdomen and pelvis without and with IV contrast	May Be Appropriate	○
MRI abdomen and pelvis without IV contrast	May Be Appropriate	○
US kidneys and bladder retroperitoneal	May Be Appropriate	○
CT abdomen and pelvis with IV contrast	May Be Appropriate	☼☼☼
CT abdomen and pelvis without IV contrast	May Be Appropriate	☼☼☼
Radiography abdomen and pelvis (KUB)	Usually Not Appropriate	☼☼
Arteriography kidney	Usually Not Appropriate	☼☼☼
Radiography intravenous urography	Usually Not Appropriate	☼☼☼

# Cost of Imaging

- 1 Chest X-ray 2 view = \$762.00
- 1 CT abd w/o Contrast = \$3788.25
- 1 CT Chest w/contrast = \$3936.25
- 1 CT Angio Abdomen = \$5150.00
- 1 MRI Abdomen w/o-w contrast = \$6845.00

**TOTAL = \$20,481.50**

Prices from Memorial Hermann charge description master:

<https://www.memorialhermann.org/patients-caregivers/pricing-estimates-and-information/>

# Take Home Points

- Pay attention to the characteristics of a thrombus
- Renal Cell Carcinoma is often asymptomatic until advanced disease
- Idiopathic Pulmonary Embolus warrants further workup
- Find the source of the thrombus

# References

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Questions?