

INTRODUCTION

Diagnostic staging imaging (SI) for asymptomatic stage I-II patients (pts) is not routinely recommended, but is warranted for stage II-III pts with high risk biological subtypes, where previous trials have shown up to a 15% rate of de novo metastatic disease. NCCN guidelines endorse CT CAP and bone scan as standard SI (STD) for stage III pts, but not PET/CT, and PET/CT is not covered by many insurance payers. We present data on the performance and value of PET/CT.

OBJECTIVES

1. Compare staging practices at four cancer centers in the United States (UCSF, UMinn, UAB, and Georgetown)
2. Determine the rate of de novo metastatic disease and compare the rate of false positives (FP), defined as incidental findings on SI proven benign by subsequent workup, between STD and PET/CT
3. Determine the value and cost-effectiveness of STD vs. PET/CT

METHODS

- Data were available for 799 high risk clinical stage II-III pts screened for I-SPY2 at UCSF, UMinn, UAB, and Georgetown.
- Of these, 564 pts ranging in age from 25-81 (median = 48) had complete records that were retrospectively reviewed for type of SI and FP.
- Economic evaluation conducted from the payer perspective using the mean national 2018 Medicare Physician Fee Schedule (MPFS) and representative costs from the UCSF billing department.
- Healthcare Common Procedure Coding System/Current Procedural Terminology codes (HCPCS/CPT) was utilized to derive outpatient and physician fees. Costs were rounded to the nearest dollar.
- The incremental cost effectiveness ratio (ICER) measured the cost of using PET/CT per percent pt who avoided a FP.

RESULTS

Site	% true positive
UCSF	4.2% (17/403)
UMinn	3.7% (4/107)
UAB	6.4% (14/219)
Georgetown	3.6% (3/83)
Total	4.8% (38/799)

Table 1. Standard and PET/CT scans detected de novo metastatic disease in the trial population. Of the 4.8% true positives detected, 2.3% were detected by STD and 2.5% by PET/CT.

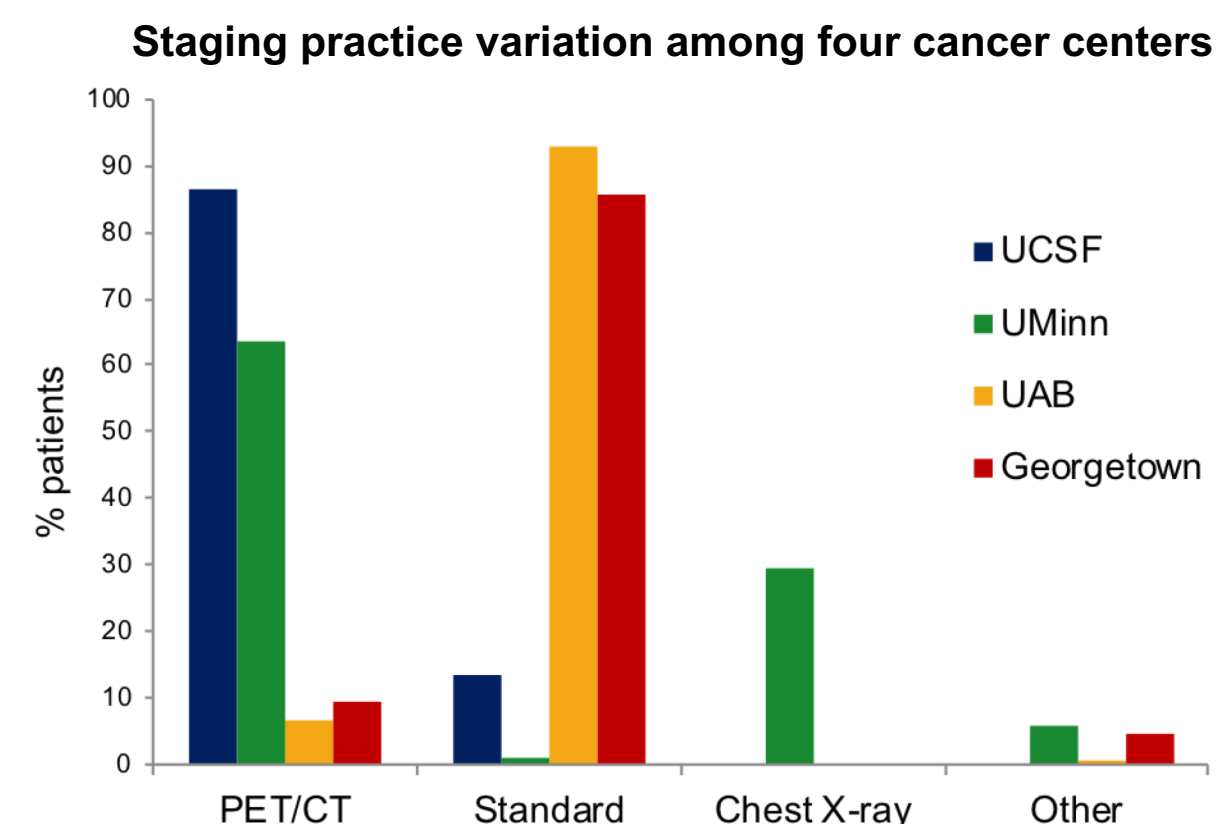


Figure 1. Staging practice varied significantly among the four cancer centers ($p < 0.0001$). STD was used for most pts at UAB (92.8%) and Georgetown (85.7%). PET/CT was used for most pts at UCSF (86.6%) and UMinn (63.6%). Chest X-ray was used for 29.5% of pts at UMinn.

False Positive Rate			
Site	Standard (n = 231)	PET/CT (n = 298)	p
UCSF	25.7% (9/35)	11.1% (25/226)	< 0.05
UMinn	0.0% (0/1)	10.7% (6/56)	
UAB	22.0% (31/141)	10.0% (1/10)	
Georgetown	20.4% (11/54)	16.7% (1/6)	
Total	22.1% (51/231)	11.1% (33/298)	

Table 2. PET/CT scans generated significantly fewer FPs than STD. 22.1% of pts who received STD imaging had a FP, compared to 11.1% of pts who received PET/CT imaging. Mean time between incidental finding on SI to determination of FP was 10.8 days. Of note, 11.3% (26/231) of STD pts received PET/CT as required FP work-up.

Days from cancer diagnosis to initiation of neoadjuvant chemotherapy			
	Standard (n = 194)	PET/CT (n = 227)	p
Mean	44.3 (14 – 112)	37.5 (12 – 100)	< 0.05
Median	42	35	

Table 3. Time to initiation of treatment was shorter for those who received PET/CT. When controlling for cancer site difference, the mean time between cancer diagnosis to initiation of neoadjuvant chemotherapy was significantly different between pts who received STD vs. PET/CT imaging upfront.

Aggregate cost analysis of the four cancer centers		
	Standard (n = 231)	PET/CT (n = 298)
Baseline staging procedure	\$211,476	\$420,424
False positive work-up	\$49,948	\$19,332
Mean cost per patient	\$1,132	\$1,476
Mean increase from baseline	\$216 (23.6%)	\$65 (4.6%)
ICER	\$31	

Table 4. PET/CT scans are likely cost-effective with an ICER of \$31 per percent pt who avoided a FP. Mean increase from baseline price due to FP workup was \$216 (23.6%) for STD vs. \$64 (4.6%) for PET/CT. Costs determined from the MPFS.

Hospitals have the power to set prices

Cost analysis at UCSF using Medicare reimbursements		
	Standard (n = 35)	PET/CT (n = 226)
Baseline staging procedure	\$43,256	\$244,301
False positive work-up	\$9,540	\$14,336
Mean cost per patient	\$1,236	\$1,081
ICER	- \$10	
Cost analysis at UCSF using Anthem Blue Cross reimbursements		
Baseline staging procedure	\$31,291	\$375,529
False positive work-up	\$14,023	\$31,291
Mean cost per patient	\$3,080	\$1,662
ICER	- \$95	

Table 5. Initial staging with PET/CT is cost saving at UCSF, where price of PET/CT < STD. Cost savings were \$10 (Medicare payment perspective) and \$95 (private payer perspective) per percent pt who avoided a FP. Costs determined from the UCSF billing department.

CONCLUSIONS

1. Initial staging with PET/CT resulted in two-fold fewer false positives
2. PET/CT reduced the direct costs of FP workup procedures that took a mean time of 10.8 days to resolve
3. Patients who received PET/CT upfront started treatment sooner
4. PET/CT is likely cost-effective from both Medicare and private payer perspectives
5. Hospitals should promote patient-centered approach to metastatic imaging workup and price PET/CT ≤ STD
6. NCCN and insurers should be aware and reconsider coverage policies

PATIENT ADVOCATE'S PERSPECTIVE¹

- The question of whether cancer has spread causes significant distress for newly diagnosed patients.
- False positives perpetuate anxiety and fear in patients especially while waiting for impending confirmatory results. Reducing false positives is of enormous value to patients both in time and stress.
- Getting the right information to start treatment sooner is extremely important.
- Clinical adoption of PET/CT would help improve treatment decisions and quality of life.

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