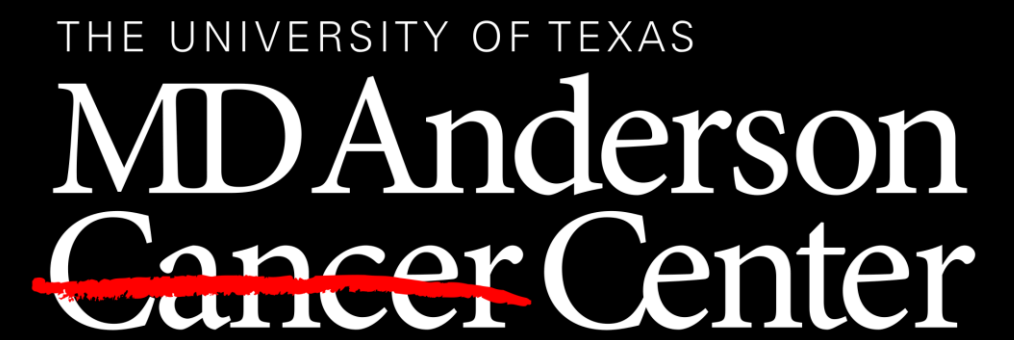




FFR cost-effectively reduces mortality based upon malignancy type: Propensity score and machine learning supported nationally representative case-control study of over 30 million+ hospitalizations

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Introduction

- In 2012, the World Health Organization (WHO) gathered data showing that cancer and cardiovascular disease are the two most common causes of mortality in Western countries.
- There is a bidirectional relationship between the two; cancer survivors have an increased cardiovascular burden and patients with cardiovascular diseases have an increase in cancer incidence.
- Each type of cancer has different clinical courses and outcomes.
- Randomized trials support the clinical benefit of fractional flow reserve (FFR), but its benefit if any in cancer patients is unknown.
- Despite the growing number of patients with both coronary artery disease and cancer there are no nationally representative studies of mortality and cost effectiveness for FFR versus non-FFR percutaneous coronary intervention (PCI).

Methods

- Backward propagation neural network machine learning supported and propensity score adjusted multivariable regression was conducted for the above outcomes in this case-control study of the 2016 National Inpatient Sample (NIS).
- Regression models were fully adjusted for age, race, income, geographic region, cancer metastases, mortality risk, and the likelihood of undergoing FFR versus non-FFR PCI (and also with length of stay [LOS] for cost).
- Analyses were also adjusted for the complex survey design to produce nationally representative estimates.

Results

- Of the 30,195,722 adult hospitalized patients nationally, 1,156,349 (3.83%) underwent PCI with 39,150 (3.39%) of them being performed with FFR. Of FFR patients, 11.14% were conducted in cancer patients, and 7.84% following inpatient cardiac stress tests. The most common primary malignancies in which PCI with FFR was performed included prostate (21.45%), skin (15.34%), breast (14.53%), lung (8.30%), and bladder (7.27%). In sub-group analysis among the 3,814 patients with an inpatient cardiac stress test followed by PCI revealed that 255 (6.69%) had PCI additionally with FFR .
- In propensity score adjusted multivariable regression, FFR versus non-FFR PCI significantly reduced inpatient mortality (OR 0.47, 95%CI 0.35-0.63; p<0.001) and length of stay (in days; beta -0.23, 95%CI -0.37- -0.09; p=0.001) while increasing cost (in USD; beta \$5,708.63, 95%CI 3,042.70-8,374.57; p<0.001), without significantly increasing complications overall or for cancer patients specifically.
- FFR versus non-FFR PCI was not significantly associated with cancer patients' mortality, LOS, cost, or complication types (including post-procedure bleeding, stroke, or acute kidney injury) (Table 2). The only cancers among all primary malignancies analyzed for which FFR versus non-FFR PCI significantly reduced mortality was for Hodgkin's lymphoma (OR 52.48, 95%CI 7.16-384.53; p<0.001) and rectal cancer (OR 24.38, 95%CI 2.24-265.73; p=0.009).

Figure 1

Bivariable analysis

Variable, (%)	Sample	Mortality		P-value
		Alive	Dead	
Demographic				
Age, mean (SD)	64.80 (12.99)	64.67 (12.98)	69.38 (12.79)	<0.001
Female	38.24%	38.20%	39.66%	0.018
Non-white race	27.75%	27.78%	26.84%	0.108
Income quartile				0.201
First	31.18%	31.20%	30.64%	
Second	26.58%	26.57%	27.02%	
Third	23.62%	23.64%	22.93%	
Fourth	18.61%	18.59%	19.41%	
Comorbidities				
Cancer	11.06%	11.01%	12.85%	<0.001
Metastasis	0.72%	0.68%	2.20%	<0.001
Mortality risk, mean (SD)	1.22 (1.04)	1.18 (1.02)	2.81 (0.49)	<0.001
Inpatient				
Complications	5.13%	4.86%	14.61%	<0.001
LOS, median (range)	3 (2-7)	3 (2-7)	5 (2-11)	<0.001
Cost USD, median (range)	71,574 (43,444-127,700)	70,517 (42,987-121,894)	143,036 (78,995-262,480)	<0.001

Figure 2

Regression analysis

Mortality	OR, 95%CI; p=value
Cancer overall	1.15, 0.58-2.30; p=0.686
Primary malignancy	
Prostate	1.80, 0.59-5.55; p=0.304
Skin	1.16, 0.23-5.78; p=0.858
Breast	0.67, 0.08-5.86; p=0.720
Lung	1.27, 0.27-6.09; p=0.764
Bladder	1.28, 0.14-11.39; p=0.822

Conclusions

The authors have no disclosures.

- This large propensity score analysis suggests that can FFR can safely and cost-effectively be performed inpatient for cancer patients, potentially with particular mortality benefit by primary malignancy type. Randomized trials must confirm the above.