

Supplementary Online Content

Billig JI, Lu Y, Momoh AO, Chung KC. A nationwide analysis of cost variation for autologous free flap breast reconstruction. *JAMA Surg*. Published online July 19, 2017. doi:10.1001/jamasurg.2017.2339

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Diagnosis and Procedure Codes for Breast Cancer and Free Flap Breast Reconstruction

Coding System	Codes	Definition
ICD-9* Diagnosis Code	174.0	Malignant neoplasm of female breast: nipple and areola
	174.1	Malignant neoplasm of female breast: central portion
	174.2	Malignant neoplasm of female breast: upper inner-quadrant
	174.3	Malignant neoplasm of female breast: lower-inner quadrant
	174.4	Malignant neoplasm of female breast: upper-outer quadrant
	174.5	Malignant neoplasm of female breast: lower-outer quadrant
	174.6	Malignant neoplasm of female breast: axillary tail
	174.8	Malignant neoplasm of female breast: other sites
	174.9	Malignant neoplasm of female breast: unspecified
	233.0	Carcinoma in situ of breast
	238.3	Neoplasm of uncertain behavior of breast
	239.3	Neoplasm of unspecified nature of breast
	v16.3	Family history of malignant neoplasm
	v10.3	Personal history of breast malignant neoplasm
	v84.01	Genetic susceptibility to malignant neoplasm of breast
	v50.41	Prophylactic removal of breast
ICD-9* Procedure Code	85.70	Other total reconstruction of breast (free-flap)
	85.73	Transverse rectus abdominis myocutaneous flap, free
	85.74	Deep interior epigastric artery perforator (DIEP) flap, free
	85.75	Superficial inferior epigastric artery (SIEA) flap, free
	85.76	Gluteal artery perforator (GAP) flap, free

* International Classification of Disease, Ninth Revision, Clinical Modification

eTable 2. Code List for Surgical Complications, Systemic Complications, and Charlson Comorbidity Index

Variables	ICD-9* code
Surgery-specific complications	
Wound dehiscence	998.11
Wound infection	998.5, 998.51, 998.59, 998.6
Flap revision	86.75
Hematoma	998.11, 998.12
Microvascular anastomosis complications	39.4, 39.41, 39.49, 86.75, 38.0, 38.3, 39.3, 39.30, 39.31, 39.32, 39.56, 39.57, 39.58, 39.59
Transfusion	99.0, 99.00, 99.03, 99.04, v58.2
Systemic complications	
Stroke	997.02
Urinary	997.5
Deep venous thrombosis/ Pulmonary embolism	415.1, 415.11, 415.19, 451.1, 451.2, 451.81, 451.19, 453.4, 453.41, 453.42, 453.8, 453.9, v12.51, 997.2, 999.2, 997.79
Digestive	997.4, 536.1, 536.2, 558.9, 560, 560.1, 560.2, 560.9
Cardiovascular	997.1, 428.0, 428.1, 428.2, 428.3, 428.9, 40, 411, 411.1, 411.81, 411.89, 427.9, 427.31, 427.32, 427.3, 427.0, 427.8, 427.81, 427.89
Respiratory	997.3, 997.39, 518.5, 518.4, 480, 481, 482, 483, 484, 485, 486, 480.8, 482.8, 514
Charlson Comorbidity Score	
1 each	Myocardial Infarction: 410-410.9, 412 Congestive heart failure: 428-428.9 Peripheral Vascular disease: 443.9, 441 (441.0-441.9), 785.4, v43.4, procedure 38.48 Cerebrovascular disease: 430-438 Dementia: 290-290.9 Chronic pulmonary disease: 490-496, 500-505, 506.4 Rheumatologic disease: 710.0, 710.1, 710.4, 714.0-714.2, 714.81, 725 Peptic ulcer disease: 531-534.9 Mild liver disease: 571.2, 571.5, 571.6, 571.4-571.49 Diabetes: 250-250.3, 250.7 Diabetes with chronic complications: 250.4-250.6

2 each	Hemiplegia or paraplegia: 344.1, 342-342.9 Renal disease: 582-582.9, 583-583.7, 585, 586, 588-588.9 Malignancy: 140-172.9, 174-195.8, 200-208.9
3 each	Moderate or Severe liver disease: 572.2-572.8, 456.0-456.21
6 each	Metastatic solid tumor: 196-199.1 AIDS: 042-044.9

* International Classification of Disease, Ninth Revision, Clinical Modification

eTable 3. Effect Estimates of Patients Who Underwent Autologous Free Flap Breast Reconstruction by Hospital Volume From 2008 to 2010 in the U.S.†

Hospital volume No. of patients		Medium volume (11-30 cases) hospitals vs low volume (≤ 10 cases) hospitals (1,029 vs 1,174)		High volume (≥ 31 cases) hospitals vs low volume (≤ 10 cases) hospitals (1,029 vs 1,099)	
		Odds Ratio	95% CI	Odds Ratio	95% CI
Dependent variable					
Cost		1.000024	(1.000018- 1.00003)	1.00002	(1.000014- 1.000027)
Independent variables					
Age		0.992	(0.983- 1.001)	0.983	(0.974-0.993)
Length of stay		1.101	(1.055- 1.149)	1.062	(1.017-1.110)
Insurance type					
	Medicare	0.602	(0.439- 0.825)	0.463	(0.331-0.646)
	Medicaid	0.721	(0.523- 0.993)	0.205	(0.128-0.329)
	Other insurance	0.717	(0.478- 1.074)	0.092	(0.040-0.215)
	Private insurance (ref)				
Median household income national quartile					
	First quartile	0.438	(0.518- 0.948)	0.619	(0.479-0.800)
	Second quartile	0.715	(0.564- 0.907)	0.612	(0.478-0.783)
	Third quartile	0.692	(0.561- 0.855)	0.609	(0.491-0.757)
	Fourth quartile (ref)				
Race					
	Black	0.701	(0.518- 0.948)	0.544	(0.388-0.763)
	Hispanic	0.660	(0.474-0.92)	1.614	(1.219-2.138)
	Other minorities	1.057	(0.723- 1.544)	1.637	(1.145-2.340)
	Unspecified	1.692	(1.311- 2.185)	1.586	(1.216-2.069)
	White (ref)				
Location					

	Midwest	2.207	(1.704-2.858)	2.345	(1.757-3.130)
	South	0.760	(0.598-0.967)	1.622	(1.258-2.090)
	West	1.856	(1.431-2.409)	3.200	(2.423-4.226)
	Northeast (ref)				
Charlson comorbidity index					
	1	0.816	(0.582-1.145)	0.673	(0.473-0.958)
	≥2	0.886	(0.743-1.057)	0.766	(0.641-0.916)
	0 (ref)				
Teaching hospital					
	Yes	3.249	(2.654-3.977)	9.375	(7.101-12.378)
	No (ref)				
Hospital type					
	Government	3.180	(2.478-4.079)	4.685	(3.522-6.234)
	Private (ref)				
Bed size					
	Medium	0.897	(0.653-1.234)	0.000	NA
	Large	1.206	(0.917-1.584)	1.232	(0.946-1.605)
	Small (ref)				
Surgery complication					
	Yes	1.290	(1.061-1.569)	0.671	(0.539-0.835)
	No (ref)				
Systemic complication					
	Yes	0.995	(0.828-1.195)	0.723	(0.596-0.876)
	No (ref)				

†From 2008-2012 Healthcare Cost and Utilization Project National Inpatient Samples Database

eTable 4. Effect Estimates of Patients Who Underwent Autologous Free Flap Breast Reconstruction by Region From 2008 to 2010 in the U.S.†

Location of Hospital (No. of patients)		West vs Northeast (798 vs 617)	
		Odds Ratio	95% CI
Cost		1.00011	(1.000093-1.000121)
Age		1.001	(0.989-1.013)
Length of stay		1.250	(1.171-1.334)
Insurance type			
	Medicare	1.089	(0.727-1.633)
	Medicaid	1.264	(0.793-2.014)
	Other insurance	0.485	(0.250-0.939)
	Private insurance (ref)		
Median household income national quartile			
	First quartile	0.999	(0.727-1.633)
	Second quartile	1.887	(0.793-2.014)
	Third quartile	1.449	(0.250-0.939)
	Fourth quartile (ref)		
Race			
	Black	0.385	(0.234-0.632)
	Hispanic	0.995	(0.691-1.433)
	Other minorities	1.583	(1.037-2.416)
	Unspecified	6.156	(2.611-14.517)
	White (ref)		
Hospital volume			
	11-30	1.856	(1.431-2.409)
	≥31	3.199	(2.422-4.225)
	≤10 (ref)		
Charlson comorbidity index			
	1	1.017	(0.630-1.642)
	≥2	0.407	(0.325-0.511)
	0 (ref)		
Teaching hospital			
	Yes	0.203	(0.146-0.282)
	No		
Hospital type			
	Government	NA	NA
	Private		
Surgery complication			
	Yes	0.902	(0.701-1.160)
	No		

Systemic complication		
Yes	0.892	(0.700-1.136)
No		
Bed size		
Small	0.868	(0.522-1.364)
Medium	1.811	(1.286-2.552)
Large		

†From 2008-2012 Healthcare Cost and Utilization Project National Inpatient Samples Database

eFigure: Flow diagram of patients undergoing free-flap breast reconstruction using National Inpatient Sample database, 2008-2010

