

Title:

Association of hospital characteristics with readmission and complication outcomes among patients receiving radiotherapy and brachytherapy for breast cancer: A Nationwide Readmissions Database Analysis

List of Supplementary Tables

Table S1. Diagnosis and procedure codes used in the present study in condition ascertainment.

Table S2. Baseline characteristics of BC patients stratified by radiotherapy and brachytherapy treatment, 2016-2021.

Table S3 Baseline characteristics of BC patients receiving radiotherapy vs. brachytherapy stratified by hospital teaching status, 2016-2021.

Table S4 Outcomes of in-hospital mortality, readmission and complications for BC patients receiving radiotherapy vs. brachytherapy stratified by hospital teaching status, 2016-2021.

Table S5. Unadjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Table S6. Age-adjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Table S7. Year-adjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Table S8. Age- and Year-adjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Table S9. Clinical characteristic-adjusted* clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Table S10. Hospital characteristic-adjusted* clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Table S11. Clinical outcomes adjusted for age, year, baseline characteristics, clinical comorbidities, and hospital characteristics, stratified by hospital teaching status, 2016-2021.

Table S12 Adjusted and unadjusted multivariable quantile regression model: median net increase in hospital cost and length of stay.

Table S1. Diagnosis and procedure codes used in the present study in condition ascertainment.

	ICD-10 codes
Breast cancer	C50.01X, C50.11X, C50.21ZX, C50.31X, C50.41X, C50.51X, C50.61X, C50.81X, C50.91X, D05.0X, D05.1X
Comorbidities	
Chronic Obstructive Pulmonary Disease	I278, I279, J40, J41, J42, J43, J44, J45, J46, J47, J60, J61, J62', J63, J64, J65, J66, J67, J684, J701, J703
Diabetes	E100, E101, E106, E108, E109, E110, E111, E116, E118, E119, E120, E121, E126, E128, E129, E130, E131, E136, E138, E139, E140, E141, E146, E148, E149
Hypertension	I10.x, I11.0, I11.9
Obesity	E66.0X, E66.1, E66.2, E66.3, E66.8, E66.9
Alcohol Use	F101, F1010, F1011, F1012, F10120, F10121, F10129, F1014, F1015, F10150, F10151, F10159, F1018, F10180, F10181, F10182, F10188, F1019, F102, F1020, F1021, F1022, F10220, F10221, F10229, F1023, F10230, F10231, F10232, F10239, F1024, F1025, F10250, F10251, F10259, F1026, F1027, F1028, F10280, F10281, F10282, F10288, F1029, F10920, F10921, F10929, F1094, F1095, F10950, F10951, F10959, F1096, F1097, F1098, F10980, F10981, F10982, F10988, F1099
Smoking	F17, F172, F1720, F17200, F17201, F17203, F17208, F17209, F1721, F17210, F17211, F17213, F17218, F17219, F1722, F17220, F17221, F17223, F17228, F17229, F1729, F17290, F17291, F17293, F17298, F17299, Z87.891
Depression	F31.X, F32.X, F33.X, F34.X, F43.21, F43.23
Hypothyroidism	E02, E03.X, E89.0, E89.2
Anemic-deficiency	D50.0, D50.8, D50.9, D51.X, D52.X, D53.X, D61.X, D64.0, D64.1, D64.2, D64.3, D64.4, D64.9, D64.81, D64.89
Coagulopathy	D65-D68.x, D69.1, D69.3-D69.6
Neutropenia	D70.X
Nausea and Vomiting	R11.X
Metabolic disorders	E70.9, E71.548, E72.9, E73.9, E74.9, E75.6, E76.9, E77.9, E78.9, E80.7, E83.9, E84.9, E85.9, E86.9, E87.8, E88
AKI	N17.9, N19
CKD	N18.32, N18.4, N18.5, N18.6, N18.9, I12.0, Z49.0, Z99.2
Coronary Artery Disease	I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, I42.5-I42.9, I43.x, I50.x, P29.0
Atrial Fibrillation	I48.91, I48.92
Liver Disease	K70.0, K70.1, K70.2, K70.3, K70.4, K70.9, K71.X, K72.X, K73.X, K74.0-K74.69, K75.X, K76.X, K77.X
Pneumonia	J18.0, J18.1, J18.2, J18.8, J18.9, J12.X, J13, J14, J15.X, J16.X, J17, J18.X
Congestive, CHF	I50, I50.1, I50.20, I50.21, I50.22, I50.23, I50.3, I50.30, I50.31, I50.32, I50.33, I50.4, I50.40, I50.41, I50.42, I50.43, I50.8, I50.81, I50.810, I50.811, I50.812, I50.813, I50.814, I50.82, I50.83, I50.84, I50.89, I50.9
Endocarditis	A39.51, A54.83, B33.21, B37.6, I01.1, I33.0, I33.9, I38, I39
Personal history of irradiation	Z92.3
Outcome	
Brachytherapy	
Diagnosis Code	Y84.2, Z51.0, W88.1XXA
Surgical Procedure Codes	DM000ZZ, DM001ZZ, DM002ZZ, DM003Z0, DM003ZZ, DM004ZZ, DM005ZZ, DM006ZZ, DM010ZZ, DM011ZZ, DM012ZZ, DM013Z0, DM013ZZ, DM014ZZ, DM015ZZ, DM016ZZ, DM20DZZ, DM20HZZ, DM20JZZ, DM21DZZ, DM21HZZ, DM21JZZ, DMY07ZZ, DMY0FZZ, DMY17ZZ, DMY1FZZ, C75LYZZ, CW53YZZ, CW54YZZ, CW56YZZ, CW73YZZ, DB070ZZ, DB071ZZ, DB072ZZ, DB073Z0, DB073ZZ, DB074ZZ, DB075ZZ, DB076ZZ, DB27DZZ, DB27HZZ, DB27JZZ, DBY77ZZ, DBY7FZZ, DBY7FZZ, DH060ZZ, DH061ZZ, DH062ZZ, DH063Z0, DH063ZZ, DH064ZZ, DH065ZZ, DH066ZZ, DHY67ZZ, DHY6FZZ, DW020ZZ, DW021ZZ, DW022ZZ, DW023Z0, DW023ZZ, DW024ZZ, DW025ZZ, DW026ZZ, DW22DZZ, DW22HZZ, DW22JZZ, DWY27ZZ, DWY2FZZ, OWPB41Z, OWPBX1Z, OWW901Z, OWW931Z, OWW941Z, OWW9X1Z, OWWB01Z, OWWB31Z, OWWB41Z, OWWBX1Z, DB050ZZ, DB051ZZ, DB052ZZ, DB053Z0, DB053ZZ, DB054ZZ, DB055ZZ, DB056ZZ, DB25DZZ, DB25HZZ, DB25JZZ, DBY57ZZ, DBY5FZZ, OWWC01Z, OWWC31Z, OWWC41Z, OWWCX1Z, DB060ZZ, DB061ZZ, DB062ZZ, DB063Z0, DB063ZZ, DB064ZZ, DB065ZZ, DB066ZZ, DB26DZZ, DB26HZZ, DB26JZZ, DBY67ZZ, DBY6FZZ, DB080ZZ, DB081ZZ, DB082ZZ, DB083Z0, DB083ZZ, DB084ZZ, DB085ZZ, DB086ZZ, DB28DZZ, DB28HZZ, DB28JZZ, DBY87ZZ, DBY8FZZ, DW040ZZ, DW041ZZ, DW042ZZ, DW043Z0, DW043ZZ, DW044ZZ, DW045ZZ, DW046ZZ, DWY47ZZ, DWY4FZZ, CW7NYZZ, DW050ZZ, DW051ZZ, DW052ZZ, DW053Z0, DW053ZZ, DW054ZZ, DW055ZZ, DW056ZZ, DWY57ZZ, DWY5FZZ, DP040ZZ, DP041ZZ, DP042ZZ, DP043Z0, DP043ZZ, DP044ZZ, DP045ZZ, DP046ZZ, DPY47ZZ, DPY4FZZ, D7010ZZ, D7011ZZ, D7012ZZ, D7013Z0, D7013ZZ, D7014ZZ, D7015ZZ, D7016ZZ, D721DZZ, D721HZZ, D721JZZ, D7Y1FZZ, D7050ZZ, D7051ZZ, D7052ZZ, D7053Z0, D7053ZZ, D7054ZZ, D7055ZZ, D7056ZZ, D725DZZ, D725HZZ, D725JZZ, D7Y5FZZ, C75YZZ, C75DYZZ, C75JYZZ, C75KYZZ, C75LYZZ, C75MYZZ, C75NYZZ, C75PYZZ, C75YYZZ, C76YYZZ, D7030ZZ, D7031ZZ, D7032ZZ, D7033Z0, D7033ZZ, D7034ZZ, D7035ZZ, D7036ZZ, D7040ZZ, D7041ZZ, D7042ZZ, D7043Z0, D7043ZZ, D7044ZZ, D7045ZZ, D7046ZZ, D7050ZZ, D7051ZZ, D7052ZZ, D7053Z0, D7053ZZ, D7054ZZ, D7055ZZ, D7056ZZ, D7060ZZ, D7061ZZ, D7062ZZ, D7063Z0, D7063ZZ, D7064ZZ, D7065ZZ, D7066ZZ, D7070ZZ, D7071ZZ, D7072ZZ, D7073Z0, D7073ZZ, D7074ZZ, D7075ZZ, D7076ZZ, D7080ZZ, D7081ZZ, D7082ZZ, D7083Z0, D7083ZZ, D7084ZZ, D7085ZZ, D7086ZZ, D723DZZ, D723HZZ, D723JZZ, D724DZZ, D724HZZ,

	D724JZZ, D725DZZ, D725HZZ, D725JZZ, D726DZZ, D726HZZ, D726JZZ, D727DZZ, D727HZZ, D727JZZ, D728DZZ, D728HZZ, D728JZZ, D7Y3FZZ, D7Y4FZZ, D7Y5FZZ, D7Y6FZZ, D7Y7FZZ, D7Y8FZZ
Radiotherapy	
Surgical Procedure Codes	DM1097Z, DM1098Z, DM1099Z, DM109BZ, DM109CZ, DM109YZ, DM10B6Z, DM10B7Z, DM10B8Z, DM10B9Z, DM10BB1, DM10BBZ, DM10BCZ, DM10BYZ, DM1197Z, DM1198Z, DM1199Z, DM119BZ, DM119CZ, DM119YZ, DM11B6Z, DM11B7Z, DM11B8Z, DM11B9Z, DM11BB1, DM11BBZ, DM11BCZ, DM11BYZ, 0HHT01Z, 0HHT31Z, 0HHT71Z, 0HHT81Z, 0HHTX1Z, 0HHU01Z, 0HHU31Z, 0HHU71Z, 0HHU81Z, 0HHUX1Z, 0HHV01Z, 0HHV31Z, 0HHV71Z, 0HHV81Z, 0HHVX1Z, 0HPT01Z, 0HPT31Z, 0HPT71Z, 0HPT81Z, 0HPTX1Z, 0HPU01Z, 0HPU31Z, 0HPU71Z, 0HPU81Z, 0HPUX1Z, DB1797Z, DB1798Z, DB1799Z, DB179BZ, DB179CZ, DB179YZ, DB17B6Z, DB17B7Z, DB17B8Z, DB17B9Z, DB17BB1, DB17BBZ, DB17BCZ, DB17BYZ, DW1297Z, DW1298Z, DW1299Z, DW129BZ, DW129CZ, DW129YZ, DW12B6Z, DW12B7Z, DW12B8Z, DW12B9Z, DW12BB1, DW12BBZ, DW12BCZ, DW12BYZ, 0WH801Z, 0WH831Z, 0WH841Z, CW73NZZ, CW73YZZ, DB1597Z, DB1598Z, DB1599Z, DB159BZ, DB159CZ, DB159YZ, DB15B6Z, DB15B7Z, DB15B8Z, DB15B9Z, DB15BB1, DB15BBZ, DB15BCZ, DB15BYZ, 0WH901Z, 0WH931Z, 0WHB01Z, 0WHB31Z, 0WH941Z, 0WHB41Z, 3E0L3HZ, DB1697Z, DB1698Z, DB1699Z, DB169BZ, DB169CZ, DB169YZ, DB16B6Z, DB16B7Z, DB16B8Z, DB16B9Z, DB16BB1, DB16BBZ, DB16BCZ, DB16BYZ, 0WHC01Z, 0WHC31Z, 0WHC41Z, DB1897Z, DB1898Z, DB1899Z, DB189BZ, DB189CZ, DB189YZ, DB18B6Z, DB18B7Z, DB18B8Z, DB18B9Z, DB18BB1, DB18BBZ, DB18BCZ, DB18BYZ, CW7N8ZZ, CW7NGZZ, CW7NNZZ, CW7NPZZ, CW7NYZZ, DWY5GDZ, DWY5GFZ, DWY5GGZ, DWY5GHZ, DWY5GYZ, D71197Z, D71198Z, D71199Z, D7119BZ, D7119CZ, D7119YZ, D711B6Z, D711B7Z, D711B8Z, D711B9Z, D711BB1, D711BBZ, D711BCZ, D711BYZ, 07HM01Z, 07HM31Z, 07HM41Z, D71597Z, D71598Z, D71599Z, D7159BZ, D7159CZ, D7159YZ, D715B6Z, D715B7Z, D715B8Z, D715B9Z, D715BB1, D715BBZ, D715BCZ, D715BYZ, D71397Z, D71398Z, D71399Z, D7139BZ, D7139CZ, D7139YZ, D713B6Z, D713B7Z, D713B8Z, D713B9Z, D713BB1, D713BBZ, D713BCZ, D713BYZ, D71497Z, D71498Z, D71499Z, D7149BZ, D7149CZ, D7149YZ, D714B6Z, D714B7Z, D714B8Z, D714B9Z, D714BB1, D714BBZ, D714BCZ, D714BYZ, D71597Z, D71598Z, D71599Z, D7159BZ, D7159CZ, D7159YZ, D715B6Z, D715B7Z, D715B8Z, D715B9Z, D715BB1, D715BBZ, D715BCZ, D715BYZ, D71697Z, D71698Z, D71699Z, D7169BZ, D7169CZ, D7169YZ, D716B6Z, D716B7Z, D716B8Z, D716B9Z, D716BB1, D716BBZ, D716BCZ, D716BYZ, D71797Z, D71798Z, D71799Z, D7179BZ, D7179CZ, D7179YZ, D717B6Z, D717B7Z, D717B8Z, D717B9Z, D717BB1, D717BBZ, D717BCZ, D717BYZ, D71897Z, D71898Z, D71899Z, D7189BZ, D7189CZ, D7189YZ, D718B6Z, D718B7Z, D718B8Z, D718B9Z, D718BB1, D718BBZ, D718BCZ, D718BYZ, 07HN01Z, 07HN31Z, 07HN41Z, 3E0W3HZ
Wound (hemorrhage, hematoma, seroma, fat necrosis, wound dehiscence, postoperative fistula)	T81.30XA, T81.32XA, T81.31XA, T81.89XA, T81.83XA, S21.129A, S21.029A, I97.42, I97.620, J95.62, J95.831, L76.01, L76.02, L76.21, L76.22, M96.810, M96.811, M96.830, M96.831, G97.32, G97.62, I97.42, I97.621, J95.62, J95.861, L76.01, L76.02, L76.31, L76.32, M96.810, M96.811, M96.840, M96.841, G97.64, I97.622, J95.863, L76.33, L76.34, M96.842, M96.843, N64.1, G97.32, G97.62, I97.418, I97.621, J95.62, J95.861, L76.02, L76.02, G97.64, I97.622, J95.863, L76.34, M96.842, M96.843
Infection (mastitis, abscess, cellulitis, lymphangitis, postoperative infection)	K68.11, T81.83XA, N61.0, N61.1, L03.319, L03.329, L03.119, L03.129, L03.90, L03.91, L08.0, T85.79XA, T81.4XXA
Stroke	I97.811, I97.821
Deep venous thrombosis/pulmonary embolism	I26.90, I26.99, T80.0XXA, T81.718A, T81.72XA, T82.817A, T82.818A, I26.99, I80.209, I80.10, I80.3, I80.219, I82.40, I82.419, I82.429, I82.439, I82.4Y9, I82.449, I82.499, I82.4Z9, I82.890, I82.91, Z86.718, T81.718A, T81.72XA, T80.1XXA, T81.718A, T81.72XA, K91.XXX
Digestive	K91.XXX, K31.0, R11.10, K52.3, K52.89, K52.9, K56, K56.0, K56.7, K56.2, K56.600, K56.601, K56.609
cardiotoxicity	I50.814, I50.9, I50.1, I50.810, I50.811, I50.811, I50.812, I50.813, I50.82, I50.83, I50.84, I50.89, I24.8, I50.2X, I50.3X, I20.0, I24.0, I24.8, I49.9, I48.91, I48.92, I48.92, I47.1, I49.5, R00.1, I49.8
Respiratory	J95.859, J95.88, J95.89, J95.89, J98.4, J95.2, J13, J18.1, J18.1, J15.9, J12.9, J17, J18.9, J18.2, J81.1, J15.8
neurological disorders	G62.82, S44.21XS
skin disorders	L56.8, L57.8, L57.9, L58.0, L58.1, L58.9, L59.8
lung diseases	J70.0, J70.1
lymphedema	I89.0, I97.2
Impaired Shoulder Joint Mobility	S14.3XXA, S14.3XXD, S14.3XXS, G54.0, G54.5
Unknown	T66.XXXA, T66.XXXD, T66.XXXS, W88.1XXS
Clinical Characteristics	
Metastatic status	C77, C78, C79, C7B, C800
Breast, conserving, surgery ^a	0HBT0ZZ, 0HBT3ZZ, 0HBT7ZZ, 0HBT8ZZ, 0HBTXZZ, 0HBU0ZZ, 0HBU3ZZ, 0HBU7ZZ, 0HBU8ZZ, 0HBUXZZ, 0HBV0ZZ, 0HBV3ZZ, 0HBV7ZZ, 0HBV8ZZ, 0HBVXZZ, 0HBYXZZ
Mastectomy ^b	0HTT0ZZ, 0HTU0ZZ, 0HTV0ZZ
Chemotherapy ^c	3E00X05, 3E00X0M, 3E01305, 3E0130M, 3E02305, 3E0230M, 3E03002, 3E03003, 3E03005, 3E0300M, 3E0300P, 3E030GN, 3E03302, 3E03303, 3E03305, 3E0330M, 3E0330P, 3E033GN, 3E04002, 3E04003, 3E04005, 3E0400M, 3E0400P, 3E040GN, 3E04302, 3E04303, 3E04305, 3E043

	3E0430P, 3E043GN, 3E05002, 3E05003, 3E05005, 3E0500M, 3E0500P, 3E050GN, 3E05302, 3E05303, 3E05305, 3E0530M, 3E0530P, 3E053GN, 3E06002, 3E06003, 3E06005, 3E0600M, 3E0600P, 3E060GN, 3E06302, 3E06303, 3E06305, 3E0630M, 3E0630P, 3E063GN, 3E09305, 3E0930M, 3E09705, 3E0970M, 3E09X05, 3E09X0M, 3E0A305, 3E0A30M, 3E0B305, 3E0B30M, 3E0B705, 3E0B70M, 3E0BX05, 3E0BX0M, 3E0C305, 3E0C30M, 3E0C705, 3E0C70M, 3E0CX05, 3E0CX0M, 3E0D305, 3E0D30M, 3E0D705, 3E0D70M, 3E0DX05, 3E0DX0M, 3E0E305, 3E0E30M, 3E0E705, 3E0E70M, 3E0E805, 3E0E80M, 3E0F305, 3E0F30M, 3E0F705, 3E0F70M, 3E0F805, 3E0F80M, 3E0G305, 3E0G30M, 3E0G705, 3E0G70M, 3E0G805, 3E0G80M, 3E0H305, 3E0H30M, 3E0H705, 3E0H70M, 3E0H805, 3E0H80M, 3E0J305, 3E0J30M, 3E0J705, 3E0J70M, 3E0J805, 3E0J80M, 3E0K305, 3E0K30M, 3E0K705, 3E0K70M, 3E0K805, 3E0K80M, 3E0L305, 3E0L30M, 3E0L705, 3E0L70M, 3E0M305, 3E0M30M, 3E0M705, 3E0M70M, 3E0N305, 3E0N30M, 3E0N705, 3E0N70M, 3E0N805, 3E0N80M, 3E0P305, 3E0P30M, 3E0P705, 3E0P70M, 3E0P805, 3E0P80M, 3E0Q305, 3E0Q30M, 3E0Q705, 3E0Q70M, 3E0R302, 3E0R303, 3E0R305, 3E0R30M, 3E0S302, 3E0S303, 3E0S305, 3E0S30M, 3E0U305, 3E0U30M, 3E0V305, 3E0V30M, 3E0W305, 3E0W30M, 3E0Y305, 3E0Y30M, 3E0Y705, 3E0Y70M, XW03351, XW04351
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^a Procedure, Codes, were, defined, based, on, CCS, procedure, category, (breast, conserving, surgery, [166]), from, <https://www.hcup-us.ahrq.gov/toolssoftware/ccsr/prccsr.jsp#download>.

<https://www.hcup-us.ahrq.gov/toolssoftware/ccs/CCSUsersGuide.pdf>

^b Procedure, Codes, were, defined, based, on, CCS, procedure, category: mastectomy, (167).

^c Procedure, Codes, were, defined, based, on, CCS, procedure, category: cancer, chemotherapy, (224).

Table S2. Baseline characteristics of BC patients stratified by radiotherapy and brachytherapy treatment, 2016-2021.

	Overall N=9030	Radiotherapy-only N=8297	Brachytherapy ± Radiotherapy N=733	P-value
	N (%)	N (%)	N (%)	
Age (y), median (IQR)	61 (51, 70)	61 (51, 71)	59 (49, 68)	<0.001
Age at admission				0.002
18~24	7 (0.1%)	5 (0.1%)	2 (0.3%)	
25~34	215 (2.4%)	203 (2.4%)	12 (1.6%)	
35~44	911 (10.1%)	813 (9.8%)	98 (13.4%)	
45~54	1784 (19.8%)	1628 (19.6%)	156 (21.3%)	
55~64	2416 (26.8%)	2203 (26.6%)	213 (29.1%)	
65~74	2217 (24.6%)	2047 (24.7%)	170 (23.2%)	
75+	1480 (16.4%)	1398 (16.8%)	82 (11.2%)	
Year				<0.001
2016	925 (10.2%)	787 (9.5%)	138 (18.8%)	
2017	1700 (18.8%)	1554 (18.7%)	146 (19.9%)	
2018	1657 (18.3%)	1514 (18.2%)	143 (19.5%)	
2019	1771 (19.6%)	1631 (19.7%)	140 (19.1%)	
2020	1492 (16.5%)	1402 (16.9%)	90 (12.3%)	
2021	1485 (16.4%)	1409 (17.0%)	76 (10.4%)	
LOS, median (IQR)	3 (2, 7)	4 (2, 8)	2 (1, 3)	<0.001
Cost, Mean (SD)	25380.5 (34422.9)	25624.5 (35472.5)	22622.7 (18651.9)	0.078
Insurance type				<0.001
Medicare	4004 (44.4%)	3747 (45.2%)	257 (35.1%)	
Medicaid	1345 (14.9%)	1256 (15.2%)	89 (12.1%)	
Private insurance	3401 (37.7%)	3037 (36.6%)	364 (49.7%)	
Self-pay	83 (0.9%)	79 (1.0%)	4 (0.5%)	
No charge	11 (0.1%)	10 (0.1%)	1 (0.1%)	
Other	176 (2.0%)	158 (1.9%)	18 (2.5%)	
Income quartile				0.044
0-25th percentile	1909 (21.4%)	1785 (21.8%)	124 (17.1%)	
26th to 50th percentile	2107 (23.6%)	1909 (23.3%)	198 (27.3%)	
26th to 50th percentile	2264 (25.4%)	2090 (25.5%)	174 (24.0%)	
76th to 100th percentile	2635 (29.6%)	2407 (29.4%)	228 (31.5%)	
CCI				<0.001
0~4	1856 (22.1%)	1550 (20.2%)	306 (41.9%)	
5~6	1417 (16.8%)	1233 (16.0%)	184 (25.2%)	
7~8	975 (11.6%)	888 (11.6%)	87 (11.9%)	
9+	4165 (49.5%)	4012 (52.2%)	153 (21.0%)	
Comorbidities				
COPD	241 (2.7%)	240 (2.9%)	1 (0.1%)	<0.001
Depression	190 (2.1%)	179 (2.2%)	11 (1.5%)	0.494
Diabetes	970 (10.7%)	888 (10.7%)	82 (11.2%)	0.921
Hypertension	462 (5.1%)	443 (5.3%)	19 (2.6%)	0.005
Hypothyroidism	1296 (14.4%)	1230 (14.8%)	66 (9.0%)	<0.001
Alcohol abuse	79 (0.9%)	78 (0.9%)	1 (0.1%)	0.081
Smoker	2540 (28.1%)	2355 (28.4%)	185 (25.2%)	0.193
Obesity	864 (9.6%)	791 (9.5%)	73 (10.0%)	0.932
Anemic-deficiency	1345 (14.9%)	1304 (15.7%)	41 (5.6%)	<0.001
Coagulopathy	352 (3.9%)	346 (4.2%)	6 (0.8%)	<0.001
Neutropenia	384 (4.3%)	382 (4.6%)	2 (0.3%)	<0.001
Nausea and Vomiting	457 (5.1%)	430 (5.2%)	27 (3.7%)	0.207
Metabolic disorders	130 (1.4%)	130 (1.6%)	0 (0.0%)	0.003
AKI	839 (9.3%)	826 (10.0%)	13 (1.8%)	<0.001
CKD	360 (4.0%)	346 (4.2%)	14 (1.9%)	0.011
Coronary Artery Disease	797 (8.8%)	768 (9.3%)	29 (4.0%)	<0.001
Atrial Fibrillation	374 (4.1%)	365 (4.4%)	9 (1.2%)	<0.001

Liver Disease	268 (3.0%)	257 (3.1%)	11 (1.5%)	0.051
Pneumonia	643 (7.1%)	643 (7.7%)	0 (0.0%)	<0.001
Congestive	877 (9.7%)	847 (10.2%)	30 (4.1%)	<0.001
Endocarditis	14 (0.2%)	14 (0.2%)	0 (0.0%)	0.538
Personal history of irradiation	1773 (19.6%)	1715 (20.7%)	58 (7.9%)	<0.001
Discharge quarter				0.486
Jan.-Mar.	2183 (24.2%)	2002 (24.1%)	181 (24.7%)	
Apr.-Jun.	2193 (24.3%)	2027 (24.4%)	166 (22.6%)	
Jul.-Sep.	2227 (24.7%)	2023 (24.4%)	204 (27.8%)	
Oct.-Dec.	2427 (26.9%)	2245 (27.1%)	182 (24.8%)	
Hospital bed size				0.721
Small	1230 (13.6%)	1143 (13.8%)	87 (11.9%)	
Medium	2157 (23.9%)	1978 (23.8%)	179 (24.4%)	
Large	5643 (62.5%)	5176 (62.4%)	467 (63.7%)	
Hospital location				0.624
Large metropolitan areas	6265 (69.4%)	5744 (69.2%)	521 (71.1%)	
Small metropolitan areas	2463 (27.3%)	2275 (27.4%)	188 (25.6%)	
Micropolitan areas	231 (2.6%)	209 (2.5%)	22 (3.0%)	
Not metropolitan or micropolitan	71 (0.8%)	69 (0.8%)	2 (0.3%)	
Ownership				0.001
Government, nonfederal	1132 (12.5%)	1037 (12.5%)	95 (13.0%)	
Private, non-profit	7106 (78.7%)	6501 (78.4%)	605 (82.5%)	
Private, invest-own	792 (8.8%)	759 (9.1%)	33 (4.5%)	

Abbreviations: BC, breast cancer; IQR, interquartile range; SD, standard deviation; CCI, Charlson comorbidity index; COPD, chronic obstructive plumeria disease; LOS, length of stay.

Table S3 Baseline characteristics of BC patients receiving radiotherapy vs. brachytherapy stratified by hospital teaching status, 2016-2021.

	Teaching Hospital N=7177	Non-Teaching Hospital N=1853	P-value
	N (%)	N (%)	
Treatment type, n (%)			
Overall	7177 (100.0%)	1853 (100.0%)	1.000
Radiotherapy-only	6583 (91.7%)	1714 (92.5%)	0.298
Brachytherapy ± Radiotherapy	594 (8.3%)	139 (7.5%)	0.298
Age (y), median (IQR)	61 (51, 70)	64 (54, 73)	<0.001
Age at admission			<0.001
18~24	7 (0.1%)	0 (0.0%)	
25~34	187 (2.6%)	28 (1.5%)	
35~44	785 (10.9%)	126 (6.8%)	
45~54	1455 (20.3%)	329 (17.8%)	
55~64	1957 (27.3%)	459 (24.8%)	
65~74	1694 (23.6%)	523 (28.2%)	
75+	1092 (15.2%)	388 (20.9%)	
Year			<0.001
2016	693 (9.7%)	232 (12.5%)	
2017	1273 (17.7%)	427 (23.0%)	
2018	1294 (18.0%)	363 (19.6%)	
2019	1466 (20.4%)	305 (16.5%)	
2020	1226 (17.1%)	266 (14.4%)	
2021	1225 (17.1%)	260 (14.0%)	
LOS, Mean (SD)	4 (2, 8)	3 (2, 6)	<0.001
Insurance type			<0.001
Medicare	3027 (42.2%)	977 (52.8%)	
Medicaid	1134 (15.8%)	211 (11.4%)	
Private insurance	2781 (38.8%)	620 (33.5%)	
Self-pay	76 (1.1%)	7 (0.4%)	
No charge	8 (0.1%)	3 (0.2%)	
Other	142 (2.0%)	34 (1.8%)	
Income quartile			<0.001
0-25th percentile	1484 (20.9%)	425 (23.3%)	
26th to 50th percentile	1601 (22.6%)	506 (27.7%)	
26th to 50th percentile	1827 (25.8%)	437 (23.9%)	
76th to 100th percentile	2178 (30.7%)	457 (25.0%)	
Clinical characteristic			
Metastatic cancer	7112 (49.5%)	1640 (44.3%)	<0.001
Breast conservatory surgery	822 (5.7%)	286 (7.7%)	<0.001
Mastectomy	3506 (24.4%)	960 (25.9%)	0.066
Chemotherapy	366 (2.5%)	20 (0.5%)	<0.001
CCI			0.002
0~4	1503 (22.6%)	353 (20.1%)	
5~6	1075 (16.1%)	342 (19.5%)	
7~8	759 (11.4%)	216 (12.3%)	
9+	3321 (49.9%)	844 (48.1%)	
Comorbidities			
COPD	181 (2.5%)	60 (3.2%)	0.104
Depression	143 (2.0%)	47 (2.5%)	0.173
Diabetes	777 (10.8%)	193 (10.4%)	0.641
Hypertension	357 (5.0%)	105 (5.7%)	0.252
Hypothyroidism	1004 (14.0%)	292 (15.8%)	0.058
Alcohol abuse	60 (0.8%)	19 (1.0%)	0.522
Smoker	2034 (28.3%)	506 (27.3%)	0.394
Obesity	722 (10.1%)	142 (7.7%)	0.002
Anemic-deficiency	1049 (14.6%)	296 (16.0%)	0.154
Coagulopathy	280 (3.9%)	72 (3.9%)	1.000
Neutropenia	315 (4.4%)	69 (3.7%)	0.230
Nausea and Vomiting	371 (5.2%)	86 (4.6%)	0.387
Metabolic disorders	100 (1.4%)	30 (1.6%)	0.537
AKI	679 (9.5%)	160 (8.6%)	0.295
CKD	287 (4.0%)	73 (3.9%)	0.960
Coronary Artery Disease	629 (8.8%)	168 (9.1%)	0.717

Atrial Fibrillation	287 (4.0%)	87 (4.7%)	0.202
Liver Disease	226 (3.1%)	42 (2.3%)	0.055
Pneumonia	484 (6.7%)	159 (8.6%)	0.007
Congestive, CHF	684 (9.5%)	193 (10.4%)	0.270
Endocarditis	11 (0.2%)	3 (0.2%)	1.000
Personal history of irradiation	1460 (20.3%)	313 (16.9%)	0.001
Discharge quarter			0.546
Jan.-Mar.	1757 (24.5%)	426 (23.0%)	
Apr.-Jun.	1731 (24.1%)	462 (24.9%)	
Jul.-Sep.	1772 (24.7%)	455 (24.6%)	
Oct.-Dec.	1917 (26.7%)	510 (27.5%)	
Hospital bed size			0.038
Small	1007 (14.0%)	223 (12.0%)	
Medium	1726 (24.0%)	431 (23.3%)	
Large	4444 (61.9%)	1199 (64.7%)	
Hospital location			<0.001
Large metropolitan areas	5370 (74.8%)	895 (48.3%)	
Small metropolitan areas	1807 (25.2%)	656 (35.4%)	
Micropolitan areas	0 (0.0%)	231 (12.5%)	
Not metropolitan or micropolitan	0 (0.0%)	71 (3.8%)	
Ownership			<0.001
Government, nonfederal	969 (13.5%)	163 (8.8%)	
Private, non-profit	5715 (79.6%)	1391 (75.1%)	
Private, invest-own	493 (6.9%)	299 (16.1%)	

Abbreviations: BC, breast cancer; IQR, interquartile range; SD, standard deviation; CCI, Charlson comorbidity index; COPD, chronic obstructive plumeria disease; LOS, length of stay.

Table S4 Outcomes of in-hospital mortality, readmission and complications for BC patients receiving radiotherapy vs. brachytherapy stratified by hospital teaching status, 2016-2021.

	Radiotherapy-only					Brachytherapy ± Radiotherapy N=733				
	Teaching Hospital N=6583		Non-Teaching Hospital N=1714		P-value	Teaching Hospital N=594		Non-Teaching Hospital N=139		P-value
Outcomes	N	%	N	%		N	%	N	%	
In-hospital mortality	282	4.3%	64	3.7%	0.343	2	0.3%	0	0.0%	0.494
Radiation-related complication	2828	43.0%	780	45.5%	0.047	72	12.1%	25	18.0%	0.066
Readmission outcomes										
30-day readmission	1128	17.1%	248	14.5%	0.009	31	5.2%	9	6.5%	0.558
90-day readmission	1727	26.2%	393	22.9%	0.006	52	8.8%	18	12.9%	0.130

Abbreviations: BC, breast cancer; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S5. Unadjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Outcomes	Non-Teaching hospital vs. Teaching hospital		
	Odds Ratio	95%CI	P-value
Overall			
In-hospital mortality	0.87	0.66, 1.14	0.316
Radiation-related complication	1.13	1.02, 1.26	0.018
Readmission outcomes			
30-day readmission	0.84	0.72, 0.97	0.016
90-day readmission	0.86	0.77, 0.98	0.020
Radiotherapy-only			
In-hospital mortality	0.87	0.66, 1.14	0.310
Radiation-related complication	1.11	1.01, 1.21	0.058
Readmission outcomes			
30-day readmission	0.82	0.70, 0.95	0.008
90-day readmission	0.84	0.74, 0.95	0.005
Brachytherapy ± Radiotherapy			
In-hospital mortality	0.00	NA	0.995
Radiation-related complication	1.59	0.97, 2.62	0.068
Readmission outcomes			
30-day readmission	1.26	0.58, 2.71	0.558
90-day readmission	1.55	0.88, 2.74	0.132

Abbreviations: OR, odds ratio; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S6. Age-adjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Outcomes	Non-Teaching hospital vs. Teaching hospital		
	Odds Ratio	95%CI	P-value
Overall			
In-hospital mortality	0.84	0.64, 1.11	0.223
Radiation-related complication	1.07	0.97, 1.19	0.181
Readmission outcomes			
30-day readmission	0.84	0.72, 0.97	0.019
90-day readmission	0.86	0.76, 0.97	0.018
Radiotherapy-only			
In-hospital mortality	0.84	0.64, 1.11	0.230
Radiation-related complication	1.06	0.95, 1.18	0.330
Readmission outcomes			
30-day readmission	0.82	0.71, 0.96	0.011
90-day readmission	0.84	0.74, 0.95	0.006
Brachytherapy ± Radiotherapy			
In-hospital mortality	0.00	NA	0.995
Radiation-related complication	1.46	0.88, 2.43	0.138
Readmission outcomes			
30-day readmission	1.24	0.57, 2.67	0.588
90-day readmission	1.49	0.84, 2.65	0.170

Abbreviations: OR, odds ratio; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S7. Year-adjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Outcomes	Non-Teaching hospital vs. Teaching hospital		
	Odds Ratio	95%CI	P-value
Overall			
In-hospital mortality	0.88	0.67, 1.17	0.379
Radiation-related complication	1.18	1.06, 1.31	0.002
Readmission outcomes			
30-day readmission	0.85	0.73, 0.98	0.027
90-day readmission	0.87	0.77, 0.99	0.028
Radiotherapy-only			
In-hospital mortality	0.88	0.66, 1.16	0.354
Radiation-related complication	1.15	1.03, 1.28	0.011
Readmission outcomes			
30-day readmission	0.83	0.71, 0.96	0.012
90-day readmission	0.84	0.74, 0.95	0.007
Brachytherapy ± Radiotherapy			
In-hospital mortality	0.00	NA	0.996
Radiation-related complication	1.61	0.97, 2.65	0.063
Readmission outcomes			
30-day readmission	1.27	0.59, 2.73	0.542
90-day readmission	1.55	0.88, 2.75	0.130

Abbreviations: OR, odds ratio; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S8. Age- and Year-adjusted clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Outcomes	Non-Teaching hospital vs. Teaching hospital		
	Odds Ratio	95%CI	P-value
Overall			
In-hospital mortality	0.86	0.65, 1.13	0.272
Radiation-related complication	1.12	1.01, 1.24	0.040
Readmission outcomes			
30-day readmission	0.85	0.73, 0.99	0.032
90-day readmission	0.87	0.77, 0.98	0.025
Radiotherapy-only			
In-hospital mortality	0.85	0.65, 1.13	0.264
Radiation-related complication	1.09	0.98, 1.22	0.104
Readmission outcomes			
30-day readmission	0.83	0.72, 0.97	0.017
90-day readmission	0.84	0.74, 0.95	0.007
Brachytherapy ± Radiotherapy			
In-hospital mortality	0.00	NA	0.996
Radiation-related complication	1.48	0.89, 2.45	0.130
Readmission outcomes			
30-day readmission	1.25	0.58, 2.70	0.572
90-day readmission	1.50	0.84, 2.66	0.167

Abbreviations: OR, odds ratio; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S9. Clinical characteristic-adjusted* clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

Outcomes	Non-Teaching hospital vs. Teaching hospital		
	Odds Ratio	95%CI	P-value
Overall			
In-hospital mortality	0.95	0.72, 1.26	0.736
Radiation-related complication	1.20	1.07, 1.34	0.001
Readmission outcomes			
30-day readmission	0.89	0.77, 1.03	0.121
90-day readmission	0.92	0.81, 1.04	0.172
Radiotherapy-only			
In-hospital mortality	0.96	0.73, 1.27	0.783
Radiation-related complication	1.18	1.05, 1.32	0.005
Readmission outcomes			
30-day readmission	0.88	0.75, 1.02	0.091
90-day readmission	0.89	0.79, 1.02	0.086
Brachytherapy ± Radiotherapy			
In-hospital mortality	0.00	NA	0.998
Radiation-related complication	1.58	0.95, 2.61	0.075
Readmission outcomes			
30-day readmission	1.22	0.57, 2.64	0.607
90-day readmission	1.54	0.87, 2.73	0.140

Abbreviations: OR, odds ratio; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S10. Hospital characteristic-adjusted* clinical outcomes of in-hospital mortality, readmission and complications stratified by hospital teaching status, 2016-2021.

	Non-Teaching hospital vs. Teaching hospital		
Outcomes	Odds Ratio	95%CI	P-value
Overall			
In-hospital mortality	0.85	0.63, 1.14	0.284
Radiation-related complication	0.92	0.87, 0.98	0.980
Readmission outcomes			
30-day readmission	0.83	0.71, 0.97	0.016
90-day readmission	0.86	0.75, 1.00	0.024
Radiotherapy-only			
In-hospital mortality	0.85	0.63, 1.15	0.288
Radiation-related complication	0.99	0.88, 1.11	0.802
Readmission outcomes			
30-day readmission	0.81	0.69, 0.95	0.008
90-day readmission	0.83	0.73, 0.95	0.008
Brachytherapy ± Radiotherapy			
In-hospital mortality	0.00	NA	0.996
Radiation-related complication	1.31	0.77, 2.24	0.325
Readmission outcomes			
30-day readmission	1.37	0.62, 3.03	0.438
90-day readmission	1.60	0.88, 2.90	0.123

Abbreviations: OR, odds ratio; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S11. Clinical outcomes adjusted for age, year, baseline characteristics, clinical comorbidities, and hospital characteristics, stratified by hospital teaching status ,2016-2021.

	Non-Teaching hospital vs. Teaching hospital		
Outcomes	Odds Ratio	95%CI	P-value
Overall			
In-hospital mortality	0.77	0.57, 1.04	0.091
Radiation-related complication	1.14	1.01, 1.28	0.039
Readmission outcomes			
30-day readmission	0.87	0.74, 1.01	0.059
90-day readmission	0.88	0.78, 1.00	0.044
Radiotherapy-only			
In-hospital mortality	0.78	0.58, 1.06	0.108
Radiation-related complication	1.11	0.98, 1.26	0.115
Readmission outcomes			
30-day readmission	0.85	0.73, 0.99	0.037
90-day readmission	0.85	0.75, 0.97	0.015
Brachytherapy ± Radiotherapy			
In-hospital mortality	0.59	NA	1.000
Radiation-related complication	2.00	1.06, 3.78	0.033
Readmission outcomes			
30-day readmission	1.38	0.55, 3.47	0.494
90-day readmission	1.83	0.95, 3.53	0.073

Abbreviations: OR, odds ratio; Radiation-related complication, include radiation-induced wounds, infections, strokes, thrombotic events, gastrointestinal issues, cardiotoxicity and respiratory diseases, neurological disorders, skin conditions, pulmonary diseases, lymphedema, shoulder joint disorders, or unspecified conditions, patients with any of these were classified as having a radiation-related complication; Readmission, readmission analyses consider the time between the end of one admission and the start on the next admission.

Table S12 Adjusted and unadjusted multivariable quantile regression model: median net increase in hospital cost and length of stay.

	LOS				
	Unadjusted		Adjusted		
	Median (IQR)	Median Net Increase In LOS (Days,95%CI)	Median Net Increase In LOS (Days,95%CI) clinical	Median Net Increase In LOS (Days,95%CI) hospital	Median Net Increase In LOS (Days,95%CI) fully
Overall					
Teaching hospital	4 (2,8)	reference	reference	reference	reference
Non-Teaching hospital	3 (2,6)	-0.8 (-0.8, -0.8)	-0.4 (-0.7, -0.2)	-1.6 (-2.2, -0.9)	-0.5 (-0.6, -0.4)
Radiotherapy-only					
Teaching hospital	4 (2,8)	reference	reference	reference	reference
Non-Teaching hospital	3 (2,7)	-0.9 (-1.4, -0.4)	-0.5 (-0.8, -0.1)	-1.1 (-1.2, -1.0)	-0.6 (-0.7, -0.4)
Brachytherapy ± Radiotherapy					
Teaching hospital	2 (1,3)	reference	reference	reference	reference
Non-Teaching hospital	2 (1,2)	-0.1 (-0.4, 0.3)	-0.1 (-0.6, 0.4)	-0.2 (-0.3, -0.1)	-0.0 (-0.3, 0.2)
Cost, in 1,000 US dollars					
	Unadjusted		Adjusted		
	Median (IQR)	Median Net Increase In cost (\$,95%CI)	Median Net Increase In LOS (Days,95%CI) clinical	Median Net Increase In LOS (Days,95%CI) hospital	Median Net Increase In LOS (Days,95%CI) fully
	Median (IQR)	Median Net Increase In cost (\$,95%CI)	Median Net Increase In LOS (Days,95%CI) clinical	Median Net Increase In LOS (Days,95%CI) hospital	Median Net Increase In LOS (Days,95%CI) fully
Overall					
Teaching hospital	17.3 (9.2,30.8)	reference	reference	reference	reference
Non-Teaching hospital	14.5 (7.5,27.0)	-3.6 (-4.7, -2.6)	-2.9 (-3.9, -2.0)	-1.1 (-2.1, 0.1)	-0.2 (-1.0, 0.6)
Radiotherapy-only					
Teaching hospital	17.3 (9.7,31.0)	reference	reference	reference	reference
Non-Teaching hospital	13.9 (7.3,26.8)	-4.0 (-5.1, -3.0)	-3.3 (-4.3, -2.3)	-1.2 (-2.2, -0.1)	-0.3 (-1.1, 0.5)
Brachytherapy ± Radiotherapy					
Teaching hospital	17.9 (10.3,28.6)	reference	reference	reference	reference
Non-Teaching hospital	17.6 (10.5,29.7)	0.5 (-2.1, 3.0)	0.5 (-0.6, 0.4)	0.0 (-3.2, 3.3)	0.5 (-2.3, 3.2)

Abbreviations: LOS, length of stay; IQR, interquartile range.

^a Adjusted for clinical characteristics (including Metastatic cancer, breast conservatory surgery, mastectomy and chemotherapy);

^b Adjusted for hospital characteristics (including hospital bed size, hospital location and hospital ownership)

^c Adjusted for age, year, baseline comorbidities (including COPD, Depression, Diabetes, Hypertension, Hypothyroidism, Alcohol abuse, Smoker, Obesity, Anemic-deficiency, Coagulopathy, Neutropenia, Nausea and Vomiting, Metabolic disorders, AKI, CKD, Coronary Artery Disease, Atrial Fibrillation, Liver Disease, Pneumonia, Congestive, Endocarditis), personal history of irradiation, clinical characteristics (including Metastatic cancer, breast conservatory surgery, mastectomy and chemotherapy) and hospital characteristics (including hospital bed size, hospital location and hospital ownership)