



**Independent Cost Analysis for
Dana-Farber Cancer Institute Determination of Need
DoN Application #: DFCI-23040915-HE**

Appendix

January 10, 2025

Prepared for Submission to:

Massachusetts Department of Public Health

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I. DATA SOURCES USED IN THE ICA REPORT

1. The ICA requirements and DPH's request for the FTI ICA Report involved use of several datasets and data sources for empirical analyses to address specific questions and issues. These include claims data as well as demographic, health, capacity, pricing, and cost trend data. For convenience, this section summarizes the key data sources and information used; the FTI ICA Report includes references or citations to specific data sources in each of the sections or analyses.

A. Utilization and Cost Data

1. CHIA Massachusetts All-Payer Claims Database (APCD)

2. Massachusetts's Center for Health Information and Analysis (CHIA) collects, manages, and provides a detailed set of claims data for Massachusetts residents and employees covered by Massachusetts companies. The purpose of the dataset is to allow researchers and policymakers to analyze utilization, costs, and quality to improve the provision of healthcare in the Commonwealth of Massachusetts.¹ The APCD comprises dental, medical, and pharmacy claims data for both public and private insurance members. Private plans include all fully insured Massachusetts commercial plans and self-insured commercial plans that choose to report to CHIA.² Public plans, for purposes of this ICA analysis, include Medicare and Medicaid.³
3. The ICA analysis in this report uses APCD data which includes claims from 2018-2022. As the Proposed Project relates specifically to inpatient and outpatient services, FTI used the Medical Claims (MC) and Member Eligibility (ME) files. For the Medical Claims file, years covered are based on *Date of Service To*. The file contains dates of service and payments, amount of payment, diagnosis and procedure codes associated with claim, provider of service, and facility type. The Member Eligibility file contains information on demographic information and patient location.⁴

2. CHIA Case Mix Data

4. CHIA collects, manages, and provides a detailed set of hospital inpatient discharge data for all patients treated at Massachusetts hospitals. The dataset allows researchers and policymakers to

¹ Massachusetts All-Payer Claims Database (MA APCD) 2018-2022 Documentation Guide. Center for Health Information and Analysis. 2022. <https://www.chiamass.gov/assets/docs/p/apcd/MA-APCD-CY2022/MA-APCD-CY2022-Documentation-Guide.pdf>

² According to the Documentation Guide, by end of 2018, only 25% of members of self-insured plans were included.

³ Throughout the report and in all analyses, Medicaid refers to and includes MassHealth insurance coverage. Specific limitations on the CHIA data for MassHealth/Medicaid are addressed in the report.

⁴ See <https://www.chiamass.gov/assets/docs/p/apcd/MA-APCD-CY2022/MA-APCD-CY2022-Government-Request-Data-Specification-Workbook.xlsx> for a full listing of available data fields.

analyze utilization, costs, and quality.⁵ The CHIA Case Mix Data comprises emergency department, hospital outpatient observation, and hospital inpatient discharge data.

5. The ICA analysis in this report uses hospital inpatient discharge data from 2015-2022, including Diagnostic Groupers files, Diagnosis Code files, Organization files, Procedure Code files, Service files, and full Discharge files. Diagnosis Grouper files contain the CMS and APR DRGs for all discharges. The highest versioned Diagnostic Grouper file for each year was used. Diagnosis Code files contain all diagnoses associated with a given discharge.⁶ Organization files identify hospitals providing care in Massachusetts each given year with linkages to discharges. Procedure Code files contain HCPCS codes for procedures associated with each discharge. Service files contains details on revenue codes and procedure quantities for inpatient services. The full Discharge files contain details on length of stay, patient demographics, attending physicians.⁷

3. Medicare Claims Data

6. FTI obtained Medicare claims data for 2015-2021 through CHIA. These data are comprised of inpatient and outpatient claims data for Fee-for-Service Medicare. Base Claims files contain demographic and cost information associated with claims and Revenue Center files contain procedure and payment information.⁸

4. Methodology for Identifying Facilities

7. Provider facility identification is not standardized in the Massachusetts APCD. To assess utilization, costs, and prices on a facility basis, FTI developed standardized names for DFCI and other hospitals resulting in a crosswalk among unique facilities, addresses, affiliated health systems, and all associated NPIs. This crosswalk was developed through the following procedure.
8. **Step 1:** Identify unique facilities for DFCI, MGB, Beth Israel Lahey, and other major health systems. Using CHIA hospital profiles⁹ and independent research, FTI identified 74 unique Massachusetts hospital facilities reporting to CHIA.

⁵ Massachusetts Case Mix Hospital Inpatient Discharge 2023 Documentation Manual. Center for Health Information and Analysis. 2024. <https://www.chiamass.gov/assets/docs/r/hdd/FY23-Case-Mix-Hospital-Inpatient-Discharge-Documentation.pdf>.

⁶ See <https://www.chiamass.gov/assets/docs/p/apcd/MA-APCD-CY2020/MA-APCD-CY2020-Government-Request-Data-Specification-Workbook.xlsx> for a full listing of available data fields.

⁷ See <https://www.chiamass.gov/assets/docs/r/hdd/FY22-Case-Mix-Hospital-Inpatient-Discharge-Documentation-Guide.pdf> for a full listing of available Case Mix Data fields.

⁸ See <https://resdac.org/cms-data/files/ip-ffs/data-documentation> for inpatient data fields and <https://resdac.org/cms-data/files/op-ffs/data-documentation> for outpatient data fields.

⁹ CHIA Massachusetts Acute Hospital Profiles at <https://www.chiamass.gov/massachusetts-acute-hospital-profiles/> (accessed July 30, 2024).

9. **Step 2:** Identify all possible names associated with each facility in the Massachusetts APCD. FTI used various search terms to identify potential provider names associated with each facility in the Massachusetts APCD, restricting to providers in Massachusetts.
10. **Step 3:** Finalize list of relevant information to create a standardized facility name. From the list of potential associated names, FTI conducted a manual review of each name and NPI to determine if it was a relevant facility and to assign standardized facility name to it. FTI also relied on other fields and source of information to correctly identify hospital satellite facilities. These data fields included billing provider identifiers and service ZIP codes. Where claims could be attributed to a system but not a particular facility, they were tagged as “Other” for that system.

5. Medical and Surgical Procedures

11. The Center for Medicare & Medicaid Services (CMS)’s Oncology Care Model program outlines ICD-10 codes used to define procedures types in the context of oncology in order to align incentives for care. In the OCM Prediction Model Code Lists for Performance Periods, 3,936 ICD-10 procedure codes are categorized as “Cancer-Related Surgery.”¹⁰ Claims with a “Cancer-Related Surgery” procedure were allocated to the surgical inpatient cancer care service line. All other inpatient cancer care claims were allocated to the medical inpatient cancer care service line.

6. Diagnostic Related Group (DRG) Weights

12. DRG weights from CMS were used to construct a case mix index, a measure of inpatient discharge acuity levels.¹¹

B. Demographic Data and Population Data

1. University of Massachusetts Donahue Institute Population Projections

13. The University of Massachusetts Donahue Institute (UMDI) produces population projections for Massachusetts at the city level. These projections were initially created with 2010 Census data and updated in 2024 with new inputs from 2020. These data are disaggregated to the city level, with projections made by age (in five-year bins) and sex. There are 351 municipalities included in the data set with eighteen age brackets and two sex categories for each town. These projections start with the 2020 census estimates as baseline and are projected for every five year increment through 2040.

2. Health Service Area (HSA) Definitions

¹⁰ Center for Medicare & Medicaid Services. Oncology Care Model at <https://www.cms.gov/priorities/innovation/innovation-models/oncology-care> (accessed June 7, 2024).

¹¹ Center for Medicare & Medicaid Services. FY 2023 IPPS Final Rule Home Page at <https://www.cms.gov/medicare/payment/prospective-payment-systems/acute-inpatient-pps/fy-2023-ipp-final-rule-home-page> (accessed August 2, 2022).

14. The Massachusetts' Department of Public Health's Bureau of Environmental Health's Executive Office of Health and Human Services (EOHHS) defines six health service regions (HSAs) using municipal boundaries. These six regions are designated as Western (102 municipalities), Central (65), Northeast (50), Metro West (60), Southeast (69), and Boston (5).¹² Using these definitions, FTI created a crosswalk to enable mapping claims data to HSAs.

3. ZIP Code Tabulation Areas (ZCTAs) and Massachusetts Municipalities

15. The U.S. Department of Housing and Urban Development's Office of Policy Development and Research (PD&R) maintains a crosswalk between county subdivisions (municipalities in the case of Massachusetts) and ZIP code tabulation areas (ZCTAs).¹³ Using these definitions, FTI mapped population projections from UMDI to ZCTAs and from ZCTAs to HSAs.

C. Data and Information Obtained from DFCI

1. DFCI DoN Application

16. The ICA analysis made reference to several sources of demographic and population data and information from DFCI's Application materials, including the Project Description & Narrative and DFCI Responses to DoN Questions.¹⁴ The DFCI Application included data on utilization and capacity. These data sources are primarily from DFCI internal data for DFCI locations or patients. Data and information sources used are referenced and sourced in the report and include several tables and analyses specific to the Proposed Project, including DFCI responses to questions. Unless otherwise noted, FTI had access only to tables as presented in the DFCI public submissions.

2. Additional Information from DFCI

17. DFCI provided a roster of 1,764 physicians with privileges at DFCI.¹⁵ The roster "includes physicians with privileges at Dana-Farber, defined as active staff who see patients." The dataset excludes active staff with no privileges and "Distinguished Staff." It contains the first and last name of each physician and their Massachusetts license number. FTI used this roster in its methodology for identifying DFCI inpatient patients.
18. FTI also requested additional information from DFCI regarding its imaging referrals to other facilities. In response, DFCI provided additional data an information that is referenced in the report.¹⁶

¹² https://matracking.ehs.state.ma.us/eohhs_regions/eohhs_regions.html

¹³ HUD USPS Zip Code Cross Walk Files. Department of Housing and Urban Development Office of Policy Development and Research (PD&R) https://www.huduser.gov/portal/datasets/usps_crosswalk.html

¹⁴ See all DoN Application materials located at <https://www.mass.gov/info-details/dana-farber-cancer-institute-inc-hospitalclinic-substantial-capital-expenditure> and the detailed files and documents located therein.

¹⁵ Letter from Caroline Powers to Lisa O'Connor, dated June 26, 2024.

¹⁶ Letter from Caroline Powers to Lisa O'Connor, dated August 14, 2024.

II. SERVICE LINE DEFINITIONS

A. Inpatient Imaging Revenue and Procedure Codes

19. The following National Uniform Billing Committee (NUBC) revenue center codes were used to identify inpatient imaging.
20. **CT Scans:** 0350, 0351, 0352, 0359
21. **MRI Scans:** 0610, 0611, 0612, 0614, 0615, 0616
22. **PET-CT Scans:** 0404
23. Additionally, inpatient PET-CT scans were identified by any discharge with an ICD-10 procedure code with the first character "C" and the third character "3".

B. Outpatient Procedure Codes

24. The following procedure codes comprising the outpatient service lines definitions used in the ICA analysis.
25. **Outpatient CT:** CPT codes were identified from the AAPC code list. Codes were augmented through manual inspection of CPT codes to ensure all CT CPT codes were included: 70450, 70460, 70470, 70480, 70481, 70482, 70486, 70487, 70490, 70491, 70496, 70498, 71250, 71270, 71275, 72125, 72126, 72128, 72129, 72131, 72132, 72192, 72193, 72194, 73200, 73201, 73700, 73701, 74150, 74160, 74170, 74174, 74175, 74176, 74178, 75571, 75572, 75574, 76377, 76380, 71260, 74177, 78608, 78815, 78816.
26. **Outpatient PET-CT:** CPT codes were identified from the AAPC code list. Codes were augmented through manual inspection of CPT codes to ensure all PET-CT CPT codes were included: 78429, 78430, 78431, 78433, 78814, 78815, 78816.
27. **LINAC:** CPT and HCPCS codes were identified from Medicare Local Coverage Determination (LCD) for Radiation Therapies reference articles and other regulatory references.¹⁷ Codes were augmented through manual inspection of CPT and HCPCS codes to ensure all LINAC CPT and HCPCS codes were included: 77401, 77402, 77403, 77404, 77406, 77407, 77408, 77409, 77411, 77412, 77413, 77414, 77416, 77418, 77385, 77386, 61796, 61797, 61798, 61799, 77371, 77372,

¹⁷ See, for example, Center for Medicare and Medicaid Services. Billing and Coding: Radiation Therapies. <https://www.cms.gov/medicare-coverage-database/view/article.aspx?articleid=59350&ver=11&=>; Billing and Coding Guidelines for Radiation Oncology Including Intensity Modulated Radiation Therapy (IMRT). https://downloads.cms.gov/medicare-coverage-database/lcd_attachments/34652_13/L34652_RAD014_BCG.pdf; and NC Department of Health and Human Services. 2019 at <https://info.ncdhhs.gov/dhsr/ncsmfp/2019/2019smfp.pdf>.

III. SUPPLEMENTAL TABLES TO THE ICA REPORT

A. Inpatient Cancer Care

Table A1: Projected Inpatient Cancer Care Discharges by Patient Origin, 2025¹⁹

County	Statewide	DFCI
Middlesex County	20.1%	20.3%
Essex County	12.1%	8.3%
Worcester County	11.3%	6.1%
Norfolk County	11.1%	19.2%
Suffolk County	10.6%	17.7%
Plymouth County	9.5%	10.9%
Bristol County	7.9%	7.1%
Hampden County	6.2%	1.8%
Barnstable County	4.4%	4.3%
Berkshire County	2.0%	0.7%
Hampshire County	1.9%	0.6%
Franklin County	1.0%	0.3%
Dukes County	0.3%	0.1%
Nantucket County	*	*
Windham County	*	*
Unknown County	1.3%	2.6%

¹⁹ Note: 2025 projections do not include out-of-state discharges. A * indicates the number of discharges is less than 11 and has been redacted to comply with data confidentiality requirements.

Table A2: Projected Demographic Characteristics of Inpatient Cancer Care Patients by Health System, 2025²⁰

		State %	DFCI %	BWH %	BIDMC %	MGH %
Age	18-34	2%	4%	3%	2%	4%
	35-54	10%	15%	11%	15%	13%
	55-64	18%	22%	21%	23%	20%
	65-74	30%	32%	31%	33%	30%
	75+	35%	25%	31%	26%	30%
	Other	5%	2%	4%	2%	3%
Sex	Female	45%	49%	48%	49%	44%
	Male	50%	49%	49%	49%	53%
Payor Type	Medicare	65%	56%	62%	56%	59%
	Commercial	20%	30%	26%	31%	28%
	Medicaid/MassHealth	9%	10%	8%	9%	10%
	Other Government	3%	2%	1%	3%	2%
	Self-Pay/Other	3%	2%	3%	2%	3%
Race	White	83%	76%	79%	75%	83%
	Black/African American	7%	11%	11%	10%	5%
	Asian	3%	5%	3%	5%	4%
	Other	4%	4%	5%	3%	6%
Ethnicity	Non-Hispanic	94%	94%	94%	95%	93%
	Hispanic	6%	6%	6%	5%	7%
DRG Weight	0-1	16%	14%	18%	7%	13%
	1-2	57%	52%	48%	43%	51%
	2+	27%	34%	33%	51%	36%
	Case Mix Index	2.1	2.5	2.7	2.5	2.5
	Average Length of Stay	7.0	8.6	8.2	8.2	7.9
	Average Daily Census	1,500	251	68	161	182
Total	Total	100%	100%	100%	100%	100%

²⁰ Note: 2025 projections do not include out-of-state discharges.

Table A3: Projected DFCI Payor Mix, 2025-2040²¹

Payer	Actual	Status Quo	Projected			
	2022	2025	2025	2030	2035	2040
Medicare/Managed Medicare	49%	51%	56%	60%	62%	63%
Commercial/HMO/PPO	38%	35%	30%	27%	25%	24%
Medicaid/Managed Medicaid	10%	10%	10%	9%	9%	9%
Self-Pay/Other	2%	2%	2%	2%	2%	2%
Other Gov	2%	2%	2%	2%	2%	2%

²¹ Note: 2025 projections do not include out-of-state discharges.

Table A4: Projected Massachusetts Inpatient Cancer Care Discharges and Shares by Hospital, 2025²²

System	Hospital Name	Discharges	Share of Discharges	Medical Discharges	Share of Medical Discharges	Surgical Discharges	Share of Surgical Discharges
Total		78,122	100%	68,047	100%	10,076	100%
Mass General Brigham	Total	17,800	22.8%	15,395	22.6%	2,405	23.9%
Mass General Brigham	Massachusetts General Hospital	8,989	11.5%	7,631	11.2%	1,359	13.5%
Mass General Brigham	Brigham and Women's Hospital	3,220	4.1%	3,020	4.4%	199	2.0%
Mass General Brigham	North Shore Medical Center - Salem Campus	1,875	2.4%	1,698	2.5%	178	1.8%
Mass General Brigham	Newton-Wellesley Hospital	1,679	2.1%	1,476	2.2%	203	2.0%
Beth Israel Lahey Health	Total	13,077	16.7%	9,548	14.0%	3,529	35.0%
Beth Israel Lahey Health	Beth Israel Deaconess Medical Center - East Campus	4,271	5.5%	1,741	2.6%	2,530	25.1%
Beth Israel Lahey Health	Lahey Hospital & Medical Center - Burlington	2,912	3.7%	2,349	3.5%	562	5.6%
Dana-Farber Cancer Institute	Dana-Farber Cancer Institute	9,529	12.2%	9,529	14.0%		
Dana-Farber Cancer Institute	Dana-Farber Cancer Institute	9,529	12.2%	9,529	14.0%		
UMass Memorial Health Care	Total	5,424	6.9%	4,698	6.9%	726	7.2%
UMass Memorial Health Care	UMass Memorial Medical Center - University Campus	2,684	3.4%	2,568	3.8%	116	1.2%
Steward Health Care System	Total	4,579	5.9%	4,029	5.9%	550	5.5%
Baystate Health	Total	4,080	5.2%	3,648	5.4%	431	4.3%
Baystate Health	Baystate Medical Center	3,324	4.3%	2,907	4.3%	416	4.1%
Tufts Medicine	Total	3,971	5.1%	3,479	5.1%	492	4.9%
Tufts Medicine	Tufts Medical Center	1,811	2.3%	1,501	2.2%	310	3.1%
South Shore Health System	Total	3,304	4.2%	3,032	4.5%	271	2.7%
South Shore Health System	South Shore Hospital	3,304	4.2%	3,032	4.5%	271	2.7%
Boston Medical Center	Total	2,376	3.0%	2,059	3.0%	317	3.1%
Boston Medical Center	Boston Medical Center - Menino Pavilion Campus	2,376	3.0%	2,059	3.0%	317	3.1%
Southcoast Health System	Total	2,375	3.0%	2,139	3.1%	236	2.3%
Southcoast Health System	St. Luke's Campus	1,201	1.5%	1,099	1.6%	102	1.0%
Southcoast Health System	Charlton Memorial Campus	928	1.2%	804	1.2%	124	1.2%
Cape Cod Healthcare	Total	2,141	2.7%	1,976	2.9%	164	1.6%
Cape Cod Healthcare	Cape Cod Hospital	1,550	2.0%	1,418	2.1%	131	1.3%
Tenet Healthcare	Total	1,895	2.4%	1,650	2.4%	245	2.4%
Other Health Systems	Total	7,573	9.7%	6,865	10.1%	708	7.0%

²² Note: 2025 projections do not include out-of-state discharges.

Table A5: Projected Massachusetts Inpatient Cancer Care Commercial Discharges and Shares by Hospital, 2025²³

System	Hospital Name	Discharges	Share of Discharges	Medical Discharges	Share of Medical Discharges	Surgical Discharges	Share of Surgical Discharges
Total		15,697	100%	12,463	100%	3,234	100%
Mass General Brigham	Total	4,296	27.4%	3,428	27.5%	868	26.8%
Mass General Brigham	Massachusetts General Hospital	2,473	15.8%	1,995	16.0%	478	14.8%
Mass General Brigham	Brigham and Women's Hospital	831	5.3%	761	6.1%	70	2.2%
Mass General Brigham	Newton-Wellesley Hospital	348	2.2%	261	2.1%	87	2.7%
Mass General Brigham	North Shore Medical Center - Salem Campus	267	1.7%	212	1.7%	56	1.7%
Dana-Farber Cancer Institute	Dana-Farber Cancer Institute	2,847	18.1%	2,847	22.8%		
Dana-Farber Cancer Institute	Dana-Farber Cancer Institute	2,847	18.1%	2,847	22.8%		
Beth Israel Lahey Health	Total	2,682	17.1%	1,418	11.4%	1,264	39.1%
Beth Israel Lahey Health	Beth Israel Deaconess Medical Center - East Campus	1,314	8.4%	377	3.0%	937	29.0%
Beth Israel Lahey Health	Lahey Hospital & Medical Center - Burlington	580	3.7%	395	3.2%	185	5.7%
Tufts Medicine	Total	901	5.7%	735	5.9%	165	5.1%
Tufts Medicine	Tufts Medical Center	536	3.4%	424	3.4%	112	3.5%
UMass Memorial Health Care	Total	739	4.7%	558	4.5%	181	5.6%
UMass Memorial Health Care	UMass Memorial Medical Center - University Campus	348	2.2%	321	2.6%	27	0.8%
Steward Health Care System	Total	723	4.6%	579	4.6%	144	4.5%
Baystate Health	Total	629	4.0%	517	4.1%	113	3.5%
Baystate Health	Baystate Medical Center	541	3.4%	431	3.5%	110	3.4%
South Shore Health System	Total	503	3.2%	416	3.3%	87	2.7%
South Shore Health System	South Shore Hospital	503	3.2%	416	3.3%	87	2.7%
Tenet Healthcare	Total	300	1.9%	231	1.9%	69	2.1%
Milford Regional Medical Center	Total	278	1.8%	247	2.0%	31	1.0%
Southcoast Health System	Total	272	1.7%	219	1.8%	53	1.6%
Southcoast Health System	St. Luke's Campus	135	0.9%	114	0.9%	21	0.7%
Southcoast Health System	Charlton Memorial Campus	125	0.8%	95	0.8%	30	0.9%
Berkshire Health Systems	Total	264	1.7%	213	1.7%	50	1.6%
Berkshire Health Systems	Berkshire Medical Center - Berkshire Campus	254	1.6%	203	1.6%	50	1.6%
Boston Medical Center	Total	252	1.6%	205	1.6%	47	1.4%
Boston Medical Center	Boston Medical Center - Menino Pavilion Campus	252	1.6%	205	1.6%	47	1.4%
Cape Cod Healthcare	Total	202	1.3%	169	1.4%	33	1.0%
Cape Cod Healthcare	Cape Cod Hospital	154	1.0%	125	1.0%	29	0.9%
Other Health Systems	Total	809	5.2%	681	5.5%	128	4.0%

²³ Note: 2025 projections do not include out-of-state discharges.

Table A6: Estimated Changes in Inpatient Cancer Care Costs for Commercial Patients

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	-4.5%	0.3%	-0.1%	-0.1%	-\$25,868,148	\$1,479,968	-\$807,758	-\$807,758
2030	-4.5%	0.2%	-0.2%	-0.2%	-\$25,078,086	\$1,355,227	-\$855,974	-\$855,974
2035	-4.5%	0.2%	-0.2%	-0.2%	-\$24,602,501	\$1,314,375	-\$853,625	-\$853,625
2040	-4.4%	0.2%	-0.2%	-0.2%	-\$24,853,882	\$1,312,239	-\$876,611	-\$876,611

Table A7: Estimated Changes in Inpatient Cancer Care Costs for Medicare Patients

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	-0.5%	-0.6%	0.2%	1.2%	-\$5,136,233	-\$5,936,585	\$1,428,313	\$10,797,024
2030	-0.5%	-0.6%	0.1%	1.1%	-\$5,878,856	-\$6,793,255	\$1,621,112	\$12,324,829
2035	-0.5%	-0.6%	0.1%	1.1%	-\$6,383,385	-\$7,376,166	\$1,759,476	\$13,380,709
2040	-0.5%	-0.6%	0.1%	1.1%	-\$6,606,271	-\$7,637,508	\$1,852,018	\$13,923,418

Table A8: Estimated Changes in Inpatient Cancer Care Costs for Medicaid Patients

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	2.3%	-3.8%	0.8%	0.8%	\$2,577,403	-\$4,160,492	\$910,506	\$910,506
2030	2.4%	-3.7%	0.9%	0.9%	\$2,570,517	-\$4,020,379	\$939,986	\$939,986
2035	2.4%	-3.6%	0.9%	0.9%	\$2,629,129	-\$3,973,779	\$995,627	\$995,627
2040	2.4%	-3.5%	1.0%	1.0%	\$2,765,317	-\$4,013,344	\$1,088,335	\$1,088,335

Table A9: Estimated Changes in Inpatient Care Costs with Supply-Induced Demand for Commercial Patients, GAC Backfill

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	3.6%	4.6%	4.5%	4.5%	\$100,439,732	\$127,787,848	\$125,500,120	\$125,500,120
2030	3.8%	4.7%	4.7%	4.7%	\$102,845,961	\$129,279,272	\$127,068,072	\$127,068,072
2035	3.9%	4.8%	4.8%	4.8%	\$104,796,701	\$130,713,576	\$128,545,576	\$128,545,576
2040	4.0%	4.9%	4.8%	4.8%	\$106,873,190	\$133,039,312	\$130,850,464	\$130,850,464

Table A10: Estimated Changes in Inpatient Care Costs with Supply-Induced Demand for Medicare Patients, GAC Backfill

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	2.2%	2.2%	2.3%	2.5%	\$113,058,546	\$112,258,200	\$119,623,096	\$128,991,808
2030	2.3%	2.3%	2.4%	2.6%	\$130,380,184	\$129,465,784	\$137,880,160	\$148,583,872
2035	2.4%	2.3%	2.5%	2.7%	\$143,412,274	\$142,419,504	\$151,555,136	\$163,176,368
2040	2.4%	2.4%	2.5%	2.7%	\$151,521,233	\$150,490,000	\$159,979,520	\$172,050,928

Table A11: Estimated Changes in Inpatient Care Costs with Supply-Induced Demand for Medicaid Patients, GAC Backfill

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	2.5%	1.8%	2.3%	2.3%	\$25,766,153	\$19,028,258	\$24,099,256	\$24,099,256
2030	2.5%	1.9%	2.4%	2.4%	\$26,291,689	\$19,700,794	\$24,661,158	\$24,661,158
2035	2.6%	2.0%	2.4%	2.4%	\$26,938,963	\$20,336,054	\$25,305,460	\$25,305,460
2040	2.7%	2.0%	2.5%	2.5%	\$27,926,346	\$21,147,686	\$26,249,364	\$26,249,364

Table A12: Estimated Changes in Inpatient Care Costs with Supply-Induced Demand for Commercial Patients, Cancer Care Backfill

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	4.0%	5.0%	4.9%	4.9%	\$110,282,977	\$137,631,093	\$135,343,367	\$135,343,367
2030	3.9%	4.9%	4.8%	4.8%	\$107,249,790	\$133,683,103	\$131,471,902	\$131,471,902
2035	3.9%	4.9%	4.8%	4.8%	\$105,584,074	\$131,500,950	\$129,332,950	\$129,332,950
2040	4.0%	4.9%	4.8%	4.8%	\$107,053,571	\$133,219,691	\$131,030,842	\$131,030,842

Table A13: Estimated Changes in Inpatient Care Costs with Supply-Induced Demand for Medicare Patients, Cancer Care Backfill

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	2.4%	2.4%	2.5%	2.5%	\$122,809,518	\$122,009,166	\$129,374,063	\$129,374,063
2030	2.5%	2.5%	2.6%	2.6%	\$141,858,034	\$140,943,635	\$149,358,002	\$149,358,002
2035	2.5%	2.5%	2.7%	2.7%	\$155,189,202	\$154,196,421	\$163,332,063	\$163,332,063
2040	2.6%	2.6%	2.7%	2.7%	\$162,006,617	\$160,975,380	\$170,464,906	\$170,464,906

Table A14: Estimated Changes in Inpatient Care Costs with Supply-Induced Demand for Medicaid Patients, Cancer Care Backfill

Forecast Year	DFCI Pricing Scenario				DFCI Pricing Scenario			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
2025	1.7%	1.0%	1.5%	1.5%	\$17,434,973	\$10,697,078	\$15,768,077	\$15,768,077
2030	1.6%	1.0%	1.5%	1.5%	\$17,134,015	\$10,543,120	\$15,503,485	\$15,503,485
2035	1.7%	1.0%	1.5%	1.5%	\$17,204,818	\$10,601,910	\$15,571,316	\$15,571,316
2040	1.7%	1.0%	1.5%	1.5%	\$17,741,513	\$10,962,853	\$16,064,532	\$16,064,532

B. Outpatient Diagnostic Imaging

Table A15: Projected Demographic Characteristics of DFCI Outpatient Imaging Patient Panel, 2025²⁴

		CT		PET-CT		Combined	
		<i>Total</i>	<i>%</i>	<i>Total</i>	<i>%</i>	<i>Total</i>	<i>%</i>
Age	18-34	781	2%	111	2%	892	2%
	35-54	3,898	10%	426	7%	4,324	10%
	55-64	6,134	16%	727	13%	6,861	15%
	65-74	15,352	40%	2,160	38%	17,512	40%
	75+	12,246	32%	2,263	40%	14,509	33%
Gender	Female	21,278	55%	2,807	49%	24,086	54%
	Male	17,130	44%	2,879	50%	20,009	45%
Payor Type	Medicare	22,648	59%	3,594	63%	26,243	59%
	Commercial	7,411	19%	955	17%	8,366	19%
	Other	4,284	11%	685	12%	4,969	11%
	Medicaid	4,252	11%	466	8%	4,718	11%
Total	Total	38,594	100%	5,701	100%	44,295	100%

²⁴ Note: 2025 projections do not include out-of-state discharges.

Table A16: Projected Statewide Outpatient CT Imaging Shares by Hospital, 2025²⁵

System	Projected 2025	
	Procedures	Share
Beth Israel Lahey Health	39,591	18.2%
Mass General Brigham	36,980	17.0%
Other	34,728	16.0%
Steward Health Care System	12,423	5.7%
UMass Memorial Health Care	12,374	5.7%
Tufts Medicine	9,430	4.3%
Baystate Health	9,423	4.3%
Dana-Farber Cancer Institute	9,055	4.2%
Southcoast Health System	6,302	2.9%
Cape Cod Healthcare	6,279	2.9%
South Shore Health System	5,703	2.6%
Milford Regional Medical Center	4,783	2.2%
Tenet Healthcare	4,248	2.0%
Berkshire Health Systems	3,528	1.6%
Boston Medical Center	3,488	1.6%
Emerson Hospital Health System	3,435	1.6%
Signature Healthcare	2,485	1.1%
Cambridge Health Alliance	2,350	1.1%
Sturdy Health	2,330	1.1%
Lawrence General Hospital	2,256	1.0%
Trinity Health	2,196	1.0%
Heywood Healthcare	1,968	0.9%
Valley Health Systems	1,323	0.6%
Boston Children's Hospital	577	0.3%

²⁵ Note: 2025 projections do not include out-of-state discharges.

Table A17: Projected Statewide Outpatient PET-CT Imaging Shares by Hospital, 2025²⁶

System	Projected 2025	
	Procedures	Share
Beth Israel Lahey Health	1,040	27.2%
Dana-Farber Cancer Institute	1,304	34.2%
Mass General Brigham	413	10.8%
Other	621	16.3%
Milford Regional Medical Center	183	4.8%
Boston Medical Center	153	4.0%
Southcoast Health System	85	2.2%
Emerson Hospital Health System	17	0.5%
Boston Children's Hospital	*	*
Trinity Health	*	*
Steward Health Care System	*	*

²⁶ Note: 2025 projections do not include out-of-state discharges. A * indicates the number of discharges is less than 11 and has been redacted to comply with data confidentiality requirements.

Table A18: Projected Changes in Outpatient CT Imaging Shares by Hospital, 2025²⁷

System	Status Quo 2025 Share	Projected 2025 Share	Change	Projected 2025 Share (SID)	Change
Dana-Farber Cancer Institute	3.4%	4.2%	0.8%	4.1%	0.7%
Mass General Brigham	17.8%	17.0%	-0.8%	17.6%	-0.1%
<i>Herfindahl-Hirschman Index</i>	<i>1,065</i>	<i>1,045</i>	<i>-21</i>	<i>1,055</i>	<i>-10</i>

Table A19: Projected Changes in Outpatient PET-CT Imaging Shares by Hospital, 2025²⁸

System	Status Quo 2025 Share	Projected 2025 Share	Change	Projected 2025 Share (SID)	Change
Dana-Farber Cancer Institute	25.0%	34.1%	9.1%	31.2%	6.3%
Mass General Brigham	19.9%	10.8%	-9.1%	18.2%	-1.7%
<i>Herfindahl-Hirschman Index</i>	<i>2,064</i>	<i>2,322</i>	<i>258</i>	<i>2, 186</i>	<i>121</i>

²⁷ Note: Approximately 16% of CT procedures are projected to be performed by entities that were not grouped in the ICA analysis. Because affiliations of these entities were unknown, FTI grouped them into a single “other system” for purposes of calculating HHI. Alternatively, treating them as each distinct entities reduces initial HHI to 810, but it does not meaningfully impact the projected changes in HHI.

²⁸ Note: Approximately 15% of PET-CT procedures are projected to be performed by entities that were not grouped in the ICA analysis. Because affiliations of these entities were unknown, FTI grouped them into a single “other system” for purposes of calculating HHI. Alternatively, treating them as each distinct entities reduces initial HHI to 1,803, but it does not meaningfully impact the projected changes in HHI.

Table A20: Estimated Changes in Outpatient Imaging Costs for Commercial Patients, 2025-2040

Year	CT		PET-CT	
	Baseline Projection	With Supply-Induced Demand	Baseline Projection	With Supply-Induced Demand
2025	0.1%	0.9%	1.3%	9.2%
2030	0.1%	1.0%	1.3%	9.1%
2035	0.1%	1.0%	1.3%	9.0%
2040	0.1%	1.0%	1.2%	8.8%

Year	CT		PET-CT	
	Baseline Projection	With Supply-Induced Demand	Baseline Projection	With Supply-Induced Demand
2025	\$259,983	\$1,746,699	\$192,240	\$1,368,509
2030	\$257,453	\$1,729,703	\$187,853	\$1,337,274
2035	\$253,455	\$1,702,846	\$181,810	\$1,294,261
2040	\$252,568	\$1,696,880	\$178,917	\$1,273,661

Table A21: Estimated Changes in Outpatient Imaging Costs for Medicare Patients, 2025-2040

Year	CT		PET-CT	
	Baseline Projection	With Supply-Induced Demand	Baseline Projection	With Supply-Induced Demand
2025	0.4%	1.4%	-1.4%	8.4%
2030	0.4%	1.4%	-1.4%	8.3%
2035	0.4%	1.3%	-1.3%	8.1%
2040	0.3%	1.3%	-1.3%	7.9%

Year	CT		PET-CT	
	Baseline Projection	With Supply-Induced Demand	Baseline Projection	With Supply-Induced Demand
2025	\$929,359	\$3,449,259	-\$314,352	\$1,893,607
2030	\$1,038,542	\$3,854,487	-\$349,090	\$2,102,866
2035	\$1,094,444	\$4,061,963	-\$367,534	\$2,213,973
2040	\$1,091,549	\$4,051,218	-\$367,902	\$2,216,186

Table A22: Estimated Changes in Outpatient Imaging Costs for Medicaid Patients, 2025-2040

Year	CT		PET-CT	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	0.5%	1.1%	2.7%	7.8%
2030	0.5%	1.1%	2.7%	7.8%
2035	0.5%	1.1%	2.7%	7.8%
2040	0.5%	1.1%	2.7%	7.8%

Year	CT		PET-CT	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	\$520,445	\$1,056,913	\$150,149	\$435,179
2030	\$526,231	\$1,068,662	\$153,359	\$444,481
2035	\$530,258	\$1,076,841	\$155,436	\$450,502
2040	\$537,498	\$1,091,545	\$156,986	\$454,994

C. Radiation Therapy Services

Table A23: Projected Demographic Characteristics of DFCI Radiation Therapy Patient Panel, 2025²⁹

		LINAC		CT Simulator	
		<i>Total</i>	<i>%</i>	<i>Total</i>	<i>%</i>
Age	18-34	553	1%	12	1%
	35-54	3,778	9%	123	12%
	55-64	5,863	14%	158	15%
	65-74	16,095	39%	435	42%
	75+	14,747	36%	299	29%
Gender	Female	20,661	50%	833	81%
	Male	20,375	49%	195	19%
Payor Type	Medicare	24,810	60%	576	56%
	Commercial	7,390	18%	209	20%
	Other	4,984	12%	130	13%
	Medicaid	4,065	10%	117	11%
Total	Total	41,249	100%	1,032	100%

²⁹ Note: 2025 projections do not include out-of-state discharges.

Table A24: Projected Boston Area LINAC Shares by Hospital, 2025³⁰

System	Projected 2025	
	Procedures	Share
Beth Israel Lahey Health	1,737	32.2%
Dana-Farber Cancer Institute	1,337	24.8%
Mass General Brigham	1,023	19.0%
Boston Medical Center	648	12.0%
Tufts Medicine	324	6.0%
Steward Health Care System	217	4.0%
Other	111	2.1%

³⁰ Note: 2025 projections do not include out-of-state discharges.

Table A25: Projected Boston Area CT Simulator Shares by Hospital, 2025³¹

System	Projected 2025	
	Procedures	Share
Beth Israel Lahey Health	156	34.4%
Dana-Farber Cancer Institute	88	19.5%
Boston Medical Center	81	17.8%
Mass General Brigham	74	16.4%
Tufts Medicine	36	8.1%
Steward Health Care System	*	*
Other	*	*

³¹ A * indicates the number of discharges is less than 11 and has been redacted to comply with data confidentiality requirements.

Table A26: Projected Changes in Boston Area LINAC Shares by Hospital, 2025³²

System	Status Quo 2025 Share	Projected 2025 Share	Change	Projected 2025 Share (SID)	Change
Dana-Farber Cancer Institute	12.4%	24.8%	12.4%	22.0%	9.7%
Mass General Brigham	31.4%	19.0%	-12.4%	27.9%	-3.5%
<i>Herfindahl-Hirschman Index</i>	<i>2,373</i>	<i>2,210</i>	<i>-163</i>	<i>2,243</i>	<i>-130</i>

Table A27: Projected Changes in Boston Area CT Simulator Shares by Hospital, 2025³³

System	Status Quo 2025 Share	Projected 2025 Share	Change	Projected 2025 Share (SID)	Change
Dana-Farber Cancer Institute	5.9%	19.5%	13.6%	17.1%	11.3%
Mass General Brigham	30.0%	16.4%	-13.6%	26.4%	-3.6%
<i>Herfindahl-Hirschman Index</i>	<i>2,514</i>	<i>2,227</i>	<i>-287</i>	<i>2,186</i>	<i>-328</i>

³² Note: Approximately 2% of LINAC procedures are projected to be performed by entities that were not grouped in the ICA analysis. Because affiliations of these entities were unknown, FTI grouped them into a single “other system” for purposes of calculating HHI. Alternatively, treating them as each distinct entities does not meaningfully impact the projected HHIs or changes in HHI.

³³ Note: Approximately 3% of LINAC procedures are projected to be performed by entities that were not grouped in the ICA analysis. Because affiliations of these entities were unknown, FTI grouped them into a single “other system” for purposes of calculating HHI. Alternatively, treating them as each distinct entities does not meaningfully impact the projected HHIs or changes in HHI.

Table A28: Estimated Changes in Radiation Therapy Services Costs for Commercial Patients, 2025-2040

Year	LINAC		CT Simulator	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	-5.6%	10.3%	-10.6%	10.1%
2030	-5.6%	10.2%	-10.4%	9.9%
2035	-5.4%	10.1%	-10.3%	9.8%
2040	-5.4%	9.9%	-10.3%	9.7%

Year	LINAC		CT Simulator	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	-\$468,906	\$858,354	-\$38,745	\$36,766
2030	-\$464,863	\$851,950	-\$37,891	\$36,159
2035	-\$455,422	\$844,322	-\$37,868	\$36,035
2040	-\$457,927	\$847,137	-\$38,744	\$36,607

Table A29: Estimated Changes in Radiation Therapy Services Costs for Medicare Patients, 2025-2040

Year	LINAC		CT Simulator	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	-2.6%	3.1%	-10.9%	12.4%
2030	-2.5%	3.0%	-10.6%	12.2%
2035	-2.5%	3.0%	-10.4%	12.1%
2040	-2.5%	3.0%	-10.2%	11.9%

Year	LINAC		CT Simulator	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	-\$334,546	\$400,044	-\$75,615	\$86,040
2030	-\$370,908	\$443,103	-\$83,699	\$96,153
2035	-\$389,056	\$464,671	-\$86,393	\$100,557
2040	-\$387,843	\$463,192	-\$85,398	\$100,053

Table A30: Estimated Changes in Radiation Therapy Services Costs for Medicaid Patients, 2025-2040

Year	LINAC		CT Simulator	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	3.0%	2.8%	-1.7%	-3.8%
2030	3.0%	2.8%	-1.8%	-3.8%
2035	3.0%	2.8%	-1.8%	-3.8%
2040	3.0%	2.7%	-1.8%	-3.8%

Year	LINAC		CT Simulator	
	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>	<i>Baseline Projection</i>	<i>With Supply-Induced Demand</i>
2025	\$123,846	\$114,004	-\$10,139	-\$22,170
2030	\$128,276	\$117,638	-\$10,676	-\$22,707
2035	\$129,482	\$119,223	-\$11,189	-\$23,270
2040	\$129,396	\$119,801	-\$11,029	-\$23,301