

STAFF MEMORANDUM TO THE COMMISSIONER FOR DETERMINATION OF NEED

Applicant Name	BMC Health System, Inc.
Applicant Address	One Boston Medical Center Place, Boston, MA 02118
Filing Date	August 14, 2023
Type of DoN Application	Substantial Change in Service, DoN-required Equipment
Total Value	\$7,994,800.00
Project Number	BMCHS-23050914-RE
Ten Taxpayer Groups (TTG)	None
Community Health Initiative (CHI)	\$399,740.00
Staff Recommendation	Approval
Commissioner Review	Delegated

Project Summary and Regulatory Review

BMC Health System, Inc. (Applicant) submitted an Application for a Substantial Change in Service-DoN required Equipment at the main campus of Boston Medical Center Corporation (“BMC”, “Hospital”) located at One Boston Medical Center Place, Boston, MA 02118. The Proposed Project consists of the addition of one Magnetic Resonance Imaging unit (“MRI”) and associated renovations. The total capital expenditure of the Proposed Project is \$7,994,800.00; the Community Health Initiatives (“CHI”) contribution is \$399,740.00.

This Proposed Project is for a Substantial Change in Service for DoN Required Equipment, which is reviewed under the DoN regulation 105 CMR 100.000 whereby the Department must determine that need exists for a Proposed Project, on the basis of material in the record, where the Applicant makes a clear and convincing demonstration that the Proposed Project meets each Determination of Need Factor set forth within 105 CMR 100.210.

This Amended Staff Report Replaces the Original Staff Report. Final Amended 11/21/23. The changes are scriveners’ **edits and appear in red.**

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Background: BMC Health System (Applicant) and Application Overview

The Applicant, BMC Health System, Inc. is a Massachusetts not-for-profit corporation, located at One Boston Medical Center Place, Boston, Massachusetts 02118. BMC Health System is an integrated health care system that provides primary, specialty, and tertiary care, as well as access to a managed care organization, an accountable care organization (ACO), and other health related programs, to populations in the Boston metropolitan area, individuals throughout Greater Boston, Massachusetts, and beyond.

BMC Health System is the sole corporate member of four entities including Boston Medical Center Corporation, the site of the Proposed Project.¹ All four provide a variety of services with BMC Health System providing governance and long-term strategic planning as well as budgetary and financial assistance, while overseeing operations.

BMC is a 514-bed urban academic medical center² ("AMC") that is a safety net hospital,³ and a high public payer hospital.⁴ It provides specialty, secondary, and tertiary care for patients with complex medical needs and operates a Level I Adult, and Level II Pediatric trauma center as well as ambulatory care. It is the primary teaching affiliate for the Boston University School of Medicine. In addition to its main hospital campus, BMC also offers services to patients through various hospital satellites, school-based health centers, and physician group locations, as well as four community health center partners:⁵

¹ (1) Boston Medical Center Corporation- the site of the Proposed Project; (2) Boston Medical Center Health Plan, Inc.- a non-profit corporation established to administer the WellSense Health Plan, a managed care organization providing comprehensive health insurance coverage options through Medicaid, Qualified Health Plans, and Senior Care Options to Massachusetts and New Hampshire residents; (3) Cornerstone Health Solutions, LLC, a pharmacy management services business with expertise in the operation of advanced health system specialty pharmacy programs; and (4) BMC Insurance Co., Ltd. of Vermont, a non-profit dormant captive insurance company originally formed to provide insurance coverage for property and certain liability exposures arising from acts of terrorism under the Terrorism Risk Insurance Act of 2002.

² BMC was incorporated as a Massachusetts charitable corporation in 1996 with the merger of Boston City Hospital, Boston Specialty and Rehabilitation Hospital, and the Boston University Medical Center Hospital.

³ Safety Net Hospitals have a legal mandate to serve all populations and typically serve a proportionately higher number of uninsured, [Medicaid](#), [Medicare](#), [Children's Health Insurance Program](#) (CHIP), low-income, and other vulnerable individuals than their "non-safety net hospital" counterpart. https://en.wikipedia.org/wiki/Safety_net_hospital

⁴ Massachusetts categorizes certain acute hospitals as High Public Payer hospitals (HPP) for the purpose of setting MassHealth rates. To qualify for the HPP Supplemental Payment, a hospital must have received more than 63% of its Gross Patient Service Revenue (in FY21) from government payers and free care, as determined by the Executive Office of Health and Human Services (EOHHS) based on the Hospital's FY21 Massachusetts Hospital Cost Report.

<https://www.chiamass.gov/high-public-payer-hospitals/>

⁵ Codman Square Health Center ("CSHC"), including CSHC and TechBoston Academy School Health Center; East Boston Neighborhood Health Center ("EBNHC"), including EBNHC's 20 Maverick Square, 79 Paris Street, and 10 Gove Street locations; EBHS School Based Health Center; Winthrop Community Health Center; and South End Community Health Center, including its 1601 Washington Street and 400 Shawmut Ave locations; DotHouse Health; and South Boston Community Health Center ("SBCHC"), including SBCHC's, 386 West Broadway, 409 West Broadway, and 505 Congress Street locations. The Applicant provided demographic information on these centers separately. The information systems on these centers are not integrated with BMC's system, and patients who receive care in multiple locations may be counted more than once and included in BMC's Patient Panel demographic information.

The Proposed Project is for the addition of one MRI at BMC. The Applicant asserts the Proposed Project will alleviate wait-times for MRI, increase timely access to MRI for inpatient and out-patients thereby providing for improved health comes, efficiencies and cost containment.

Patient Panel⁶

Of the four corporate entities, Boston Medical Center Corporation, the owner and operator of the BMC, is the Applicant's sole corporate affiliate involved in the direct provision of patient care services. Accordingly, the Applicant relies upon BMC's patient panel to determine the need for the Proposed Project.

Table 1 shows the unique number of patients served in fiscal years 2019 through March 2023. Despite decreasing slightly in FY20 during the height of the COVID-19 pandemic, the Applicant notes that the patient panel increased by 22% overall between FY19 and FY22.

Table 1: FY 19-YTD- FY 23⁷- Overview of Patient Panel

BMC	FY 19	FY20	FY21	FY22	FY 23 YTD
	Count	Count	Count	Count	Count
Total Unique Patients	228,138	207,237	299,258	278,408	177,685

The Applicant’s demographic profile for the period covering FY19 through six months of FY23 demonstrates that BMC serves a diverse patient panel.

Table 2: FY 22 and YTD 23⁸- BMC Patient Demographic Profile for BMC and MRI

	BMC		MRI	
	FY 22	YTD FY 23	FY 22	YTD FY 23
Gender	%	%	%	%
Female	55.6%	57.4%	60.0%	60.8%
Male	44.4%	42.5%	40.0%	39.2%
Other/Unknown	0.0%	0.1%	- ¹⁰	- ⁹
Age				
0-17	14.7%	14.9%	3.0%	3.1%
18-64	71.3%	68.8%	72.5%	73.3%
65+	14.0%	16.2%	24.5%	23.6%

⁶ As defined in 105 CMR 100.100, Patient Panel is the total of the individual patients regardless of payer, including those patients seen within an emergency department(s) if applicable, seen over the course of the most recent complete 36-month period by the Applicant or Holder.

⁷ BMC's FY is from 10/1 – 9/30. FY23 data are provided YTD through 3/2023 and, therefore, are subject to change. Accordingly, caution should be exercised in utilizing these data for purposes of annual comparisons. Please note that FY23 data are inclusive of patients seen at BBHC, which opened in October 2022.

⁸ BMC's FY is from 10/1 – 9/30. FY23 data are provided YTD through 3/2023 and, therefore, are subject to change. Accordingly, caution should be exercised in utilizing these data for purposes of annual comparisons. Please note that FY23 data are inclusive of patients seen at BBHC, which opened in October 2022.

⁹ Includes: "Male" and "Other/Unknown" for confidentiality due to data counts <11.

Unknown	0.1%	0.1%	_ 11	_ 10
Race/Ethnicity¹¹				
American Indian/Alaska Native	0.3%	0.3%	0.3%	0.4%
Asian	4.9%	4.5%	4.4%	4.4%
Black/African American	31.9%	34.9%	34.9%	35.9%
Hispanic/Latino	15.8%	18.5%	21.0%	22.5%
Native Hawaiian/Pacific Islander	0.1%	0.3%	0.3%	0.3%
White/Caucasian	25.0%	24.1%	25.4%	23.6%
Other ¹²	21.9%	17.2%	13.7%	12.9%
Geographic Origin				
Dorchester	18.7%	18.5%	18.1%	17.9%
Boston	15.6%	14.6%	13.8%	13.6%
Roxbury	4.6%	4.7%	4.7%	4.8%
Brockton	3.5%	3.9%	3.9%	4.4%
Mattapan	3.5%	3.4%	3.4%	3.4%
Hyde Park	3.2%	3.1%	2.7%	2.8%
Revere	2.7%	3.0%	3.6%	4.0%
Quincy	2.8%	2.8%	3.1%	2.7%
Chelsea	2.1%	2.3%	2.7%	2.7%
Lynn	2.1%	2.3%	2.9%	3.0%
All Other	41.3%	41.4%	41.1%	40.5%

Staff notes the following observations about data from Tables 2 and 3:

- **Age:** Patients between the ages of 18-64 represent ~70% of BMC’s overall and MRI patients; however, MRI patients aged 65+ represent significantly higher proportion of MRI patients than of overall patients (~25% vs ~15% depending on the year.) MRI patients aged 0-17 represent a significantly lower proportion than overall patients (~3.0% vs ~14.8%).
- **Race/Ethnicity:** In FY 22, ~32% of overall patients self-identified as predominantly Black/African American, 25% as White/Caucasian, and ~16% as Hispanic/Latino. For MRI patients, these percentages are similar except that Hispanic/Latino’s proportion of MRI is higher (~21% vs ~15.5%)
- **Patient Origin:** BMC’s overall and its MRI patients mainly reside in the Boston/Greater Boston area, with nearly 60% of patients residing in the following 10 communities: Dorchester, Boston, Roxbury, Brockton, Mattapan, Hyde Park, Revere, Quincy, Chelsea, and Lynn.
- **ACO and Alternative Payment Method (APM) Contracts:** The percentage of BMC’s overall, and BMC’s MRI primary care lives covered by alternative payer mix (“APM”) and ACO contracts was 29% and 25.6% respectively in FY22.
- **Payer Mix:** The largest portion of BMC’s overall and MRI payor mix is insurance through public payers; in FY22, BMC’s public payer mix was ~~over 6~~ nearly 55%, while BMC’s MRI public payer

¹⁰ Includes: "65+" and " Unknown" for confidentiality due to data with counts <11.

¹¹ Race/ethnicity data are based on patient self-reporting. For patients that reported multiple races, the primary race (the race selected first) was utilized for purposes of this DoN data pull.

¹² “Other” includes Not Specified, Other, Declined - Not Available, and Unknown.

mix was greater than 70% of all MRI patients (including MassHealth, Managed Medicaid, Commercial Medicare, and Medicare FFS, ~~Free Care/HSN, and All Other~~).

Table 3: FY 22 - BMC APM/ACO Contract and Payer Mix Percentages

Type of Contract	BMC		MRI	
	FY22	FY23 YTD	FY22	FY23 YTD
APM and ACO	29.0%	32.7%	25.6%	26.6%
Non-APM and Non-ACO	71.0%	67.3%	74.4%	73.4%
Commercial¹³	33.9%	29.4%	26.2%	24.6%
<i>HMO/POS</i>	11.4%	9.4%	7.5%	7.9%
<i>PPO</i>	9.3%	8.1%	6.2%	5.5%
<i>Other¹⁴</i>	13.1%	11.9%	12.5%	11.2%
Public				
MassHealth	13.5%	15.5%	18.1%	18.8%
Managed Medicaid	27.8%	32.5%	26.9%	28.2%
Commercial Medicare	6.5%	8.7%	13.6%	14.2%
Medicare FFS	6.9%	7.3%	11.7%	10.4%
Free Care/HSN	2.3%	1.7%	1.5%	1.5%
All Other ¹⁵	9.1%	4.9%	2.0%	2.3%

Factor 1a: Patient Panel Need

In this section, staff assesses whether the Applicant has sufficiently demonstrated need for the Proposed Project by the Applicant’s Patient Panel.

The Applicant states that it assessed patient panel demographics, historical utilization trends, MRI capacity, and Demographic trends to establish the need for the Proposed Project. As a result of its analysis the Applicant attributes the need for the proposed project to the following:

1. Historic Growth in MRI Scan Volume
2. Existing Capacity and Increased MRI unit Down-time
3. Population Growth and an Aging Population
4. BMC’s Status as a Health Safety Net (HSN) Hospital
5. Implementation of DoN Project #BMCHS-22080908-HE for Inpatient Service Expansion
6. Need to Meet Existing and Future MRI Needs

¹³ “Commercial” includes: Aetna, Allways Health Partners, Blue Cross Blue Shield, WellSense Health Plan f/k/a BMC HealthNet, Cigna, Fallon, Harvard Pilgrim Health Care, Tufts, United, and Other Commercial Plan.

¹⁴ Note that the Applicant is not always able to isolate whether a Commercial plan is HMO/POS or PPO/Indemnity. In these instances, “Commercial – Other” has been provided an alternative category.

¹⁵ “All Other”: Workers Comp, Motor Vehicle Accident, Government Other (e.g., Corrections, TriCare, VA), COVID-19 HRSA Uninsured Treatment Fund, International, Other Payer, and Not Specified.

1. Historic Growth in MRI Scan Volumes

BMC operates three (3) MRI units, all located on BMC’s main campus that need to service increasing numbers of patients.¹⁶ The number of unique patients receiving MRI services at BMC increased by 23.2% from FY20 to FY21, and by 4.3% from FY21 to FY22.¹⁷ In addition to growth in unique patients, BMC’s historical MRI scan volumes have increased annually. Table 4 shows that total MRI scan volume at BMC increased by 28.9% (from FY20 to FY22).

Table 4: BMC MRI Historical Scan Volumes FY 2020-FY 22 and YTD 2023

	FY20	FY21	FY22	FY23 YTD¹⁸
Total MRI Scans	18,100	22,565	23,331	19,044
Source of Origination¹⁹				
Inpatient MRI Scans	4,113	4,837	4,913	3,818
Outpatient MRI Scans	11,913	15,714	16,218	13,388
ED MRI Scans	2,074	2,014	2,200	1,838

The most recent three-years’ scans (FY20-22) analysis shows the following, with little fluctuation:

- that of the total volume, inpatients comprised ~21.3% of all MRIs, outpatients ~70%, and ED patients ~9%;
- that inpatient MRI scans increased by 19.5%, outpatient scans by 36%, and ED scans by 6.1%;
- when annualized, data suggest that MRI scan volume will exceed 25,000 scans for FY23.

In order to accommodate the increased volume, BMC implemented measures, which increased the number of MRI timeslots and improved patient throughput, including the following:

1. FY19: Weekend outpatient hours were established on Saturday and Sunday, 7AM-7:30PM;

¹⁶ one (1) 1.5T MRI unit and two (2) 3T MRI units.

¹⁷ BMC Application Narrative Table 3, p.5 <https://www.mass.gov/doc/narrative-pdf-boston-medical-center-don-required-equipment/download>

¹⁸ BMC’s FY is from 10/1 – 9/30. FY23 data is provided YTD through 6/2023 and, therefore, is subject to change.

¹⁹ The Applicant provided the following explanation of the classification of MRI patients. Typically, bedded outpatients, as well as observation and ED patients are classified as outpatients. However, when attributing MRI scan volume, there are some exceptions- 1) For patients that initiate care through the ED and are discharged as outpatients, including bedded outpatients or observation patients – MRI scan volume is attributed to the ED MRI Scans category. 2) For patients that initiate care through the ED and are admitted to an inpatient unit and discharged with inpatient classification, MRI scan volume is attributed to the Inpatient MRI Scans category. 3) For outpatients that do not initiate care within the ED, including elective bedded outpatients and observation patients, MRI scan volume is attributed to the Outpatient MRI Scans category. 4) For inpatients that do not initiate care within the ED, MRI scan volume is attributed to the Inpatient MRI Scans category.

2. March 2020: BMC began scheduling routine inpatient MRIs during overnight shifts which the Applicant notes is not an ideal practice for patients. BMC ensures that patients' screening processes are completed ahead of time and staffs the overnight shift with two technologists;
3. April 2022: Evening outpatient hours were extended Monday-Friday from 7AM-9:30PM;
4. October 2022: MRI Protocol review increased throughput by reducing the timeslots from 40-minutes²⁰ to 30-minute timeslots for some types of scans.

The Applicant asserts that despite implementing the above noted measures, in FY22, all three (3) of the Hospital's existing units operated at greater than 90% capacity (~93%)²¹ and wait times to access MRI scans persist. Inpatients needing MRI at BMC averaged 8.5 hours in FY22; and wait-times for outpatient MRIs averaged 50 days.²² These delays lead to longer lengths of stay for inpatients, and delays in diagnosis and treatment for both inpatients and outpatients, all of which can lead to poorer clinical outcomes and higher costs for BMC's patients.

2. Existing Capacity and Increased MRI Unit Down-time

With the units operating at over 90% capacity, as demand increases system reliability has been exacerbated. Two (2) of BMC's existing three (3) MRI units have periodic unscheduled downtime due to the age of one unit (16-years), and to one unit being "problematic" because of excessive downtime.^{23,24} While the industry standard annual downtime for MRIs is 30-60 hours per unit, in FY22, BMC's total MRI downtime was 624 hours (3 times the standard for three units is 90-180 hours).^{1, 25} Patients are negatively impacted when the units are down, since scans must be rescheduled for another day (undergoing the same long wait times they already experienced for the initial appointment). The Applicant estimates that ~400 patients were impacted by the downtime issues in FY22, and YTD in FY23 approximately 100 patients have been impacted by the downtime. As a result, of delayed diagnosis and treatment, costs can increase, and patient outcomes can worsen.

3. Population Growth and an Aging Population

²⁰ The Applicant asserts that 40 minutes is the industry standard.

²¹ Staff inquired how it calculates capacity, to which the Applicant responded: "Each unit operates 13.1 hours per day for outpatient scans and conducts approximately 1.5 scans per hour. Over the course of a year, the MRI units operate 357 days (holidays are excluded) for outpatient scans. Consequently, each MRI has the capacity to conduct 7,015 outpatient scans per year. If you multiply the total number of scans by the 3 MRI units – 21,045 outpatient scans are possible annually. In FY22, BMC performed 18,418 outpatient MRI scans, consequently outpatient scan utilization is approximately 88%. Of BMC's existing MRI units, two units also perform inpatient MRI scans – when amalgamating inpatient and outpatient capacity – the hospital's MRI units are operating at greater than 90% capacity."

²² This is 20 days longer than the target. Outpatient wait times are based on the third next available appointment which is industry standard and measures average length of time in days between the day a patient makes a request for an appointment and the third available appointment. The inpatient number provided includes ED patients, observation patients, and bedded outpatients.

²³ Lean manufacturing downtime is the period of time in which a system or machine is out of order.

<https://www.worximity.com/blog/definition-of-downtime>

²⁴ As described by the Applicant

²⁵ Preliminary data for YTD (through February 2023) show that 2 of the 3 units had 120 downtime hours.

The Applicant asserts the additional MRI capacity is needed to meet the increased demand due to population growth, particularly related to those 65+.

The anticipated growth among BMC’s patient panel is supported by population growth estimates of the University of Massachusetts’ Donahue Institute (“UMDI”).²⁶ The majority of BMC’s MRI Patients are from the Greater Boston region where from 2020 to 2040 the overall population growth is expected to be 14.2%, while for Massachusetts it is projected to grow 6.4%.²⁷ When segmented by age from 2020 and 2040, for the Greater Boston region, the highest percentage growth projection is within the 65+ age cohort, at 40.7%,²⁸ while for the 0-64 age cohort growth is 9.6%.²⁹

Due to the population growth, in particular within the 65+ age cohort, the Applicant anticipates that the need for BMC’s MRI services will continue to increase. Patterns of MRI use show that imaging rates tend to be higher among older adults since it is utilized in diagnosing and treating a many age-related conditions.³⁰ The Hospital’s data are consistent with the literature. Patients 65+ not only account for a significant portion of BMC’s MRI unique patients (24.5% in FY22) but have also increased at a higher rate over the last three fiscal years than all other age cohorts (42.6% growth from FY20 to FY22 compared to 24.5% growth for MRI patients 0-64). Fiscal Year 2023 YTD data suggest that these trends within BMC’s MRI patient population will continue into the future.

4. BMC’s Status as a Health Safety Net Hospital

The *Fiscal Year (“FY”) 2022 Health Safety Net Annual Report* outlines that BMC provided over \$102 million of care to patients qualifying for the HSN, making the hospital the largest provider of HSN care in Massachusetts.³¹ In comparison, the hospital with the second largest percentage of HSN care provided \$30.5M in services.³² Further, BMC’s patient panel shows that the majority of its patients receive insurance coverage through a public payer, receive free care, or are covered under the HSN.

The Applicant asserts that BMC’s high volume of what it references as “vulnerable patients” further supports the need for the Proposed Project. The Applicant stresses that given the high volumes, it is essential that BMC provide timely access to a depth of necessary services, such as MRI, so as not to negatively impact outcomes so as to ensure equitable access.

5. Implementation of DoN Project #BMCHS-22080908-HE for Inpatient Service Expansion

In FY 2022, the Applicant received approval for DoN Project #BMCHS-22080908-HE which is projected to be completed in FY 2024. The project includes the addition of seventy (70) new inpatient beds, five (5) new inpatient operating rooms (“ORs”), and other project components.

²⁶ UMDI is a public service, research, and economic organization that contracts with the Commonwealth of Massachusetts to develop population projections for Massachusetts for use in both public and private planning initiatives.

²⁷ *UMDI-DOT Vintage 2018 – EXCEL Age/Sex Details*, MASSACHUSETTS POPULATION ESTIMATES PROGRAM, UMASS DONAHUE INSTITUTE, http://pep.donahue-institute.org/publications/AgeSexDetails_UMDI-DOT_V2018.xlsx.

²⁸ *Id.*

²⁹ *Id.*

³⁰ WORLD HEALTH ORGANIZATION, *WORLD REPORT ON AGING AND HEALTH (2015)*, available at http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811_eng.pdf.

³¹ The Massachusetts Health Safety Net (“HSN”) makes payments to hospitals and community health centers for health care services provided to low-income Massachusetts residents who are uninsured or underinsured.

³² *Id.*

As the number of inpatient beds and inpatient ORs is expanded through implementation of the approved project, the number of inpatient referrals for MRI services will grow and will exacerbate the current capacity constraints; therefore, the additional MRI capacity is needed to accommodate the additional inpatients who historically comprise ~21.3% of all MRIs. (see Table 5). The Applicant’s projections account for these additional patients, as described below.

6. Need to Meet Existing and Future MRI Needs

As discussed above the Applicant anticipates that demand for MRI services will continue to grow into the future. Projected demand is based on several factors including, but not limited to, the historic trends and downtime, a growing and aging population, BMC’s status as a HSN hospital, and the Hospital’s plans to implement approved DoN Project #BMCHS-22080908-HE for expansion of its inpatient services.

Table 5 provides the Hospital’s five-year MRI Scan Volumes following implementation of the Proposed Project. Specifically, the Hospital anticipates that the additional MRI unit, which will expand capacity for inpatient scans and operate thirteen (13) hours per day, seven (7) days per week³³ for outpatient referrals, thereby allowing for approximately 8,300 more MRI scans per year; this is approximately a 29% increase in MRI capacity. The surge in volume coincides with the anticipated increased demand due to the opening of the 70 inpatient beds and ORs, and with reducing the outpatient backlog. By year three demand is expected to level off for outpatient and ED services. By year four, volume is projected to stabilize for inpatient MRI demand.

Table 5: BMC Projected MRI Scan Volume

Category	FY24	% Change	FY25	% Change	FY26	% Change	FY27	% Change	FY28
Inpatient	5,091	22.0%	6,212	1.7%	6,316	9.7%	6,929	0.0%	6,929
Outpatient	17,692	24.2%	21,966	3.6%	22,753	1.2%	23,015	0.0%	23,015
Emergency	2,451	4.0%	2,550	2.0%	2,601	2.0%	2,653	0.0%	2,653
Total	25,234	21.8%	30,728	3.1%	31,670	2.9%	32,597	0.0%	32,597

Analysis

The expansion of MRI services will accommodate BMC’s patient growth, particularly with regard to patients 65+; ensure the provision of equitable care to BMC’s diverse population by facilitating timely access to quality imaging services at one of New England’s largest HSN hospitals;³⁴ ease the strain on the Hospital’s existing MRI units and help with downtime issues which exacerbate wait times, disrupt patient care, and increase migration to higher-cost providers; and accommodate the increased number of inpatient MRI referrals anticipated upon implementation of BMC’s approved inpatient service expansion.

³³ Except for certain holidays, such as Christmas, etc.

³⁴ Data from 2021 reflect that Yale New Haven provided more uncompensated care in this specific year, making BMC – one of the largest HSN providers in New England based on total uncompensated care. ³⁴

<https://www.definitivehc.com/resources/healthcare-insights/hospitals-highest-total-uncompensated-care-costs>

Factor 1: b) Public Health Value, Improved Health Outcomes and Quality of Life; Assurances of Health Equity

In this section staff will assess whether the Proposed Project adds measurable public health value in terms of improved health outcomes and quality of life for the Applicant's existing Patient Panel, while providing reasonable assurances of health equity.

Public Health Value, Health Outcomes, and Quality of Life

The Applicant asserts that the Proposed Project will help improve health outcomes and quality of life for the Patient Panel by expanding access to much needed MRI services. Proposed Project is supported by evidence-based literature that illustrates the essential role that HSN hospitals play, and the impacts of adequate access to MRI imaging on patient satisfaction and outcomes.

1. Importance of HSN Hospitals

HSN hospitals, including BMC, play an essential role in the Massachusetts health care systems by providing care to low-income and vulnerable populations, including the uninsured and individuals with Medicaid as well as populations facing health inequities, such as racial and ethnic minorities. Despite the significant reduction in un-insurance levels in Massachusetts that occurred with health care reform, studies show that following that legislation, the demand for care at HSN facilities continues to rise, and that most HSN patients do not view these facilities as providers of last resort; rather, they prefer the types of care that are offered and use the facilities willingly.²

Given that BMC and other HSN hospitals are anticipated to continue to play a disproportionately large role in providing inpatient, emergency, and ambulatory care to the area's most under-resourced patients into the future, it is essential that such hospitals have the resources and depth of services, such as advanced imaging, including MRI, necessary to provide such disadvantaged patients with timely access to high-quality care that does not jeopardize patient outcomes so as to achieve the objectives of equitable care.³

2. MRI Technology

MRI is a non-invasive imaging technology that is used within many fields of medicine, without the use of damaging ionizing radiation.⁴ MRI uses a powerful magnetic field and pulses of radio waves to create detailed images of the body's internal organs, tissues, and structures.⁵ MRI images provide anatomical and functional information that can be used for disease detection, diagnosis, and treatment monitoring.^{6, 7} Clinical use of MRI began in the 1980s. Technological advances over time have vastly increased its clinical applications;⁸ it is the imaging modality of choice for diagnosing neurologic, musculoskeletal, and cardiovascular disease.⁹ Most clinical MRIs are 1.5T or 3T, with the 1.5T being the most prevalent.¹⁰

With regard to the Proposed Project, the most prevalent conditions for which BMC patients received MRI services between FY20 to FY22 involved the brain, spine, musculoskeletal system, abdomen, pelvis, breast, chest, and heart. The imaging capabilities of a 1.5T MRI technology make this machine the preferred imaging modality for certain of these areas and the conditions that impact them.¹¹

One benefit of a 1.5T MRIs is they are associated with faster exam times (than lesser strength units), which improves throughput, workflow, and accessibility, thereby enabling timelier diagnosis, treatment, and increased patient and/or provider satisfaction.^{12, 13} This efficiency is significant for BMC given the increasing need for expanded MRI capacity to ensure its ability to serve its vulnerable populations including the elderly and under-resourced. (As discussed under Factor 1(a)).

Another benefit of the 1.5T MRI is that until recently, patients with cardiovascular implanted electronic devices (“CIEDs”), or other foreign objects (shrapnel, etc.) were not eligible for MRI because the risk that the magnetic field would interact with the device/object and potentially lead to severe complications and even death.¹⁴ Recent studies have found that some implants/objects are safe in a 1.5T MRI unit, but not in higher tesla magnets.¹⁵ With these findings the lower strength 1.5T MRI enables these patients to have scans, and artifacts from devices/foreign objects are less prominent in 1.5T MRIs (than in in higher tesla magnets), allowing for higher quality images.¹⁶

While MRI can be used for all age cohorts, it is particularly important for the large cohort of BMC patients who are aged 65 and older as many of the conditions discussed herein are more prevalent with age.¹⁷ Given that the need for these types of scans increases with age and given the projected growth among the older adult cohort, the Applicant anticipates that demand for MRI services for these specific clinical categories at BMC will increase into the future.

Analysis

Staff notes BMC has experienced high MRI utilization, as well growth in its Patient Panel, and a decline in reliability of two of its MRI units, all of which continue to impact MRI throughput. Further impacting throughput will be the increased demand for scans when the approved 70 new beds come into service.

Staff notes further that as a hospital that has a high percentage of patients on public payer plans or who are uninsured, this expansion in MRI capacity will likely diminish delays in access for the most under-resourced patients and as a result, it is anticipated that BMC will continue playing a significant role in providing timely emergency, inpatient, and ambulatory care to the area’s most vulnerable patients into the future.¹⁸ As a result, the increase in MRI throughput will improve access to timely treatment in the appropriate setting, and reduce risks associated with delayed diagnosis and treatment, which will improve outcomes and quality of life improving patient experience.

Staff finds that with the reporting measures in Appendix 1, the Applicant has sufficiently outlined a case for improved health outcomes and quality of life for its Patient Panel.

Health Equity and Social Determinants of Health (SDoH)

The Applicant affirms its commitment to health equity for all patients and states that through the Proposed Project, it will improve the accessibility of BMC’s services for “the area’s most under-resourced patients.”³⁵ The Applicant characterized its health equity and SDoH focus as a structural

³⁵ Boston Medical Application Narrative pp 2, 3, 19, 21,25, 26 <https://www.mass.gov/doc/application-and-narrative-pdf-boston-medical-center-hospitalclinic-substantial-capital-expenditure/download>

part of BMC’s operations, asserting that its existing programs and efforts will be advanced through the Proposed Project. Highlights include:

1. Health Safety Net Hospital
2. #123 Equity Pledge Campaign
3. Culturally Appropriate Care and Language Access
4. Health Equity Accelerator

1. HSN Hospital

The Applicant states that the majority of communities that BMC serves are Boston census tracts that are federally designated medically underserved populations. Research shows that after the implementation of health insurance reform, the proportion of minority patient hospital discharges at minority-serving hospitals in Massachusetts increased despite the expanded access to non-safety net hospitals. Researchers suggest several possible explanations for this increase over the study period including patient loyalty and access to such services as insurance assistance, interpretation, and intensive case management which are often unavailable at other facilities due to poor reimbursement rates.¹⁹

BMC’s MRI patient panel shows high percentages of patients who receive insurance coverage through a public payers – in FY22, BMC’s MRI public payer mix included greater than 70% of all MRI patients.

2. #123 Equity Pledge Campaign

BMC participates in the American Hospital Association’s #123Equity Pledge Campaign³⁶, which strives to eliminate health and health care disparities among racially, ethnically and culturally diverse individuals and identifies areas of focus on to ensure high-quality, equitable care for everyone. BMC describes examples of progress in these areas through culturally appropriate care and language access.

3. Culturally Appropriate Care and Language Access

The Applicant has adopted the Culturally and Linguistically Appropriate Service (CLAS) standards in six areas, as per DPH’s guide to CLAS, many of which are connected with the #123Equity Pledge Campaign. These include: Foster Cultural Competence, Build Community Partnerships, Collect and Share Diversity Data, Benchmark: Plan & Evaluate, Reflect and Respect Diversity, and Ensure Language Access.³⁷

The Applicant states that greater than one-quarter of BMC’s patients do not speak English as a primary language and highlights its efforts to reduce linguistic barriers for limited- English proficiency (“LEP”) and deaf and hard of hearing (“DHH”) patients seeking care through its Interpreter Services Department (“ISD”). All medical care and services are offered free of charge in 263+ languages (sixteen

³⁶ The Campaign requires hospital leaders to accelerate progress in the following areas: (1) Increasing collection and use of race, ethnicity, language preference and other socio-demographic data; (2) Increasing cultural competency training; (3) Increasing diversity in leadership and governance; and (4) Improving and strengthening community partnerships.

³⁷ See Details of each area in DoN Application Narrative PP 20-25. <https://www.mass.gov/doc/narrative-pdf-boston-medical-center-don-required-equipment/download>

via in-person interpretation and 250+ are facilitated via necessary equipment and remote access³⁸) 24 hours per day and 7 days per week including holidays. The ISD a team is comprised of approximately sixty (60) professional medical interpreters³⁹ or language facilitators to help patients receive the care they need by enabling the provider and patient to effectively communicate, thereby ensuring equal access to care. This includes providing necessary equipment to the visually, speech and hearing impaired.

4. Health Equity Accelerator

The Applicant states that patients benefit when all patients receive the care and services that they need in the appropriate setting and by a diverse staff. In 2021, BMC launched its Health Equity Accelerator with the vision of transforming health care to health justice and well-being through understanding and addressing drivers of racial inequities, through (1) revisiting conclusions derived from standard statistical analyses; (2) adopting a mindset that if you do not find an inequity, you need to look harder; (3) seeking novel insights through primary research with the appropriate mix of patients; and (4) engaging with community members to achieve both insights and impact.²⁰ Care teams are seeking to understand how a health system perpetuates health inequities by looking internally to determine where inequities are in the patient population, understand the associated drivers, and take accountability.²¹

Analysis

DoN staff assessed the Proposed Project's impact on equitable access to care. The Interpreter Services, SDoH screening, and campaigns/initiatives demonstrate BMC's commitment to promoting health equity.

As a standard condition of approval of the Proposed Project, as set out in DoN regulation 105 CMR 100.310, all Determination of Need Holders must provide a plan for approval by the Office of Health Equity for the development and improvement of language access and assistive services provided to individuals with disabilities, non-English speaking, Limited English Proficiency (LEP), and American Sign Language (ASL) patients.

Staff finds that with the standard conditions, the Applicant has sufficiently outlined a case for improved health outcomes and health equity.

Factor 1: c) Efficiency, Continuity of Care, Coordination of Care

Following implementation of the Proposed Project, BMC plans to continue its existing process for population health management to ensure efficiency in continuity and coordination of care. While these are not uniquely developed for MRI patients, they will benefit from them where applicable. These processes have three components: 1) discharge and readmissions programming, 2) Complex Care Management ("CCM") programming, and 3) Screening protocols.

³⁸ Equipment includes Video Interpreting Units for communicating in ASL, Telecommunications devices for the deaf include TTY/TDD, mobile phone for text messaging and email, and amplified telephones

³⁹ Professional medical interpreters (ISD staff and contracted freelance interpreters) who possess the necessary language and interpreting skills to competently interpret between providers and LEP and DHH patients

1. Discharge and Readmissions programming

The Applicant described several discharge interventions that help link patients to needed services, prevent readmissions, and improve health outcomes. First a post-discharge protocol has staff proactively schedule follow-up appointments 48 hours prior to discharge. The Hospital's Central Discharge Team with inpatient and ambulatory staff expanded this intervention to cover all patients discharged from the ED and from inpatient services. General Internal Medicine (GIM) Post-Discharge Clinic, performs no-show outreach and rescheduling both in-person (20%) and via telehealth (80%). Patients seen by the GIM Post-Discharge Clinic have lower risk-adjusted readmission rates than patients without GIM follow up. Patients utilizing BMC's expanded inpatient services who are at moderate to high for readmission risk have access to the clinic.

BMC's Hospital Admission Reduction Program ("HARP") focuses on reducing 30-day readmission rates among moderate to high utilizer patients who are 65+ and are covered by Medicare FFS or the Medicare Shared Savings Program by identifying patients while they are admitted and following them post-discharge into the community to catch clinical decline in the immediate post-discharge period. The Applicant also highlights Disease Specific Programs currently in place (including Chronic Obstructive Pulmonary Disease and heart failure) that aim to prevent readmission through patient education. In addition, to identify potential drivers of readmission, there is a monthly review and analysis of Medicare readmissions.

2. Complex Care Management (CCM) Programming

BMC also has a CCM program for its complex ACO patients to offer identified longitudinal, transitional and urgent care needs as appropriate. The CCM partners with community-based supports to coordinate care, address social barriers, and engage patients as active participants in their care in order to achieve patient-identified goals, improve health related outcomes, and reduce avoidable hospital utilization. The program includes supports for behavioral health, housing needs, and domestic violence resources. The Hospital states that impact data show that the CCM program helps patients manage their health and reduces unnecessary inpatient utilization for enrolled members.

3. Screening Protocols

The Applicant notes that it implemented SDoH screening protocols beginning in 2018 using its Tool for Health & Resilience In Vulnerable Environments (THRIVE), an Electronic Health Record (EHR) based SDoH screening and referral program; it strives to understand social needs impacting patients' health, improve patient care by communicating those needs to care teams, and partner with community-based organizations to eliminate systemic barriers that prevent patients from thriving. The Applicant currently has plans to enhance the THRIVE process by tracking the status of a patient referral and follow-up to ensure requested assistance is obtained.

Analysis

Staff finds that the Applicant's care coordination and discharge processes will contribute positively to continuity, and coordination of care and thereby improve efficiency through established pre-discharge

planning protocols, appointment scheduling and no-show follow-up and tracking of community-based care. With programs for patient follow-up and analysis of the reasons for readmission, an environment for ongoing adaptability to patient needs and process improvement based on those needs has shown positive outcomes. Staff finds that the Applicant has sufficiently described meaningful programs to demonstrate it has met the requirements of Factor 1(c).

Factor 1: d) Consultation

The Applicant has provided evidence of consultation, both prior to and after the Filing Date, with all government agencies that have licensure, certification or other regulatory oversight, which has been done and will not be addressed further in this report.

Factor 1: e) Evidence of Sound Community Engagement through the Patient Panel

The Department's Guideline for community engagement defines "community" as the Patient Panel and requires that, at minimum, the Applicant must "consult" with groups representative of the Applicant's Patient Panel. Regulations state that efforts in such consultation should consist of "engaging community coalitions statistically representative of the Patient Panel."

The Applicant's engagement efforts focused on soliciting feedback the Proposed Project including need, design details, layout, and community-related benefits to maximize the Hospital's ability to meet its patient panel demand, promote high-quality outcomes, and ensure patient satisfaction.

- On June 12, 2023, hospital representatives met with the Community Advisory Board ("CAB")⁴⁰ members to present an overview of the Proposed Project and related CHI processes where the CAB discussed amalgamating these funds with BMC's current CHI, how to move forward with the selection of health priorities and how to move upstream initiatives forward.
- On June 26, 2023 the Applicant published a legal notice regarding the Proposed Project in the *Boston Herald* and prominently on the BMC website.
- On June 26, 2023 and June 29, 2023 the Applicant hosted two community meetings⁴¹ to engage patients, staff, community members, and local neighborhood stakeholders around the Proposed Project. The meetings were publicized via flyers within BMC's service area and sent out via multiple channels, and through outreach to local resident and community members.⁴²
- On June 15, 2023, Hospital representatives met with the BMC PFAC⁴³ to present an overview of the Proposed Project.

⁴⁰ Comprised of 11 members, representing 11 diverse constituencies, the BMC CAB was established to advise the Hospital on how best to use CHI investments, based on identified health priorities, to catalyze change and leverage other city, state, federal and other philanthropic investments.

⁴¹ Held over Zoom at different times of the day – one in the morning and one in the evening after normal business hours – to promote increased participation.

⁴² The Equity Partnership Network ListServe was determined to be the best option for informing community and staff.

⁴³ Sponsored by the Hospital's Patient Experience Department, BMC's PFAC aims to improve operations across BMC Health System and achieve its mission for patient-centered and equitable care. In compliance with DPH's Hospital Licensure Regulations, BMC's PFAC is co-chaired by a staff member and a patient/family member; and at least 50% of PFAC members are current or former patients and/or family members and are representative of the community served by BMC.

Specifically, BMC's PFAC is currently comprised of eleven (11) patient/family advisors. BMC's PFAC is dedicated to creating

Fourteen (14) individuals attended the meeting, including six (6) PFAC members and eight (8) staff members (including MRI operations, legal, and facilities staff for learning purposes). There was discussion around the Proposed Project including PFAC members asking about accessibility, current wait times, and the need for additional MRI capacity. Hospital representatives responded about the Hospital's approach to careful resource planning with measured campus development so as to remain sensitive to the integrity of the surrounding neighborhoods while addressing the needs of the growing patient panel.

Analysis

Staff finds that the Applicant engaged a broad array of community members and held multiple meetings and has therefore addressed the community engagement standard for Consult in the planning phase of the Proposed Project. As a result of the above analysis, Staff finds that the Applicant has met the provisions of Factor 1(e).

Factor 1: f) Competition on Price, Total Medical Expenses (TME), Costs and Other Measures of Health Care Spending

The Applicant asserts that the Proposed Project competes based on price, total medical expenses (TME), provider costs, and other recognized measures of health care spending by addressing BMC's current capacity constraints and providing timely access to services for all patients including the Hospital's large "under-resourced patient population."

As noted throughout, when patients have timely access to appropriate imaging modalities, clinicians can improve health outcomes through expedited diagnoses and more accurately screen for certain conditions, such as cancer, leading to more appropriate therapeutic interventions and the effective monitoring of the efficacy of treatment, all of which lead to reduced costs.²² The Applicant cites numerous studies that have found that more timely access to diagnostic tools, such as MRIs reduce costs due to expedited care and more accurate staging.^{23, 24} Researchers at Harvard Medical School have found a correlation between monies spent on in-patient imaging and overall cost savings, specifically for every \$1 spent on this type of imaging, \$3 is saved.²⁵ Additionally, every \$385 spent on imaging decreases a patient's hospital stay by one day, saving approximately \$3,000 per patient.²⁶ Other disease specific studies have found that increased imaging may save up to \$1.2 billion annually in the treatment of certain patients, such as those who have suffered strokes.²⁷

It is well established that noninvasive imaging tests, such as MRI, have led to a significant reduction of invasive testing, such as exploratory surgery, leading to reduced costs.²⁸ Imaging also can be valuable merely by contributing information that is needed to guide patient management and optimizing patient care. MRI and CT scan costs accounts for less than 3% of Medicare spending in the US and

open and trusting partnerships. "The PFAC follows and strives to fulfill BMC's three cornerstone values: 1) Build on Respect, Powered by Empathy – BMC's PFAC cares about the Hospital's patients, employees, and community, and is committed to doing right by them each and every day. 2) Move Mountains – Impossibility doesn't live here. Instead, BMC's PFAC is motivated by what can be and it will move mountains to make it happen. 3) Many Faces Create Our Greatness – Diversity is BMC's heart and soul and when it comes to inclusion, BMC's PFAC is all in." see page 30 DoN narrative <https://www.mass.gov/doc/narrative-pdf-boston-medical-center-don-required-equipment/download>

frequently these modalities replace more invasive and expensive tests.²⁹ Given that additional scanning capacity at BMC will reduce wait times leading to more timely care, the Proposed Project will compete on the basis of price and other cost factors.

The Proposed Project also competes on the basis of recognized measures of health care spending by allowing BMC to optimize its population health management and value-based reimbursement efforts by screening and assisting more patients with costs associated with the social drivers of health which have proven public health value. A report from the American Hospital Association provides that socioeconomic factors are responsible for approximately 40% of a patient's health, while access to care and overall quality care account for only 20%.³⁰ Consequently, by addressing patients' SDoH needs, providers can significantly reduce health care costs. Examples of programs that reduce health care costs overall include addressing food insecurity through available food resource programs and lower-cost grocery stores, providing access to affordable housing, and creating transportation programs that make accessing health care and other social support services easier.³¹

BMC has integrated SDoH programming into its clinical models, ensuring that patients' health care and SDoH needs are addressed. The Hospital has invested in a diverse group of community partnerships throughout its various targeted neighborhoods. Some of these investments include: \$1 million for a no-interest loan and a \$400,000 operating subsidy to support a new, Good Food Markets in a new housing development in Roxbury; \$1 million for a stabilization fund that will provide grants to community-based organizations to help families avoid eviction in and around Boston; and \$1 million to Pine Street Inn, Boston Health Care for the Homeless Program, and other community partners to create a housing stabilization program for individuals with complex medical problems, including SUDs. The Proposed Project will allow BMC to screen additional patients for SDoH and further invest in social programming, ultimately leading to reductions in health care costs.

Analysis

Cost containment on a statewide level is impacted through pricing, which is a function of what providers charge payers, what payers agree to pay. While payment contracts between providers and Medicare and Medicaid are relatively transparent, those between individual providers and commercial payers are confidential.³² As a result, staff cannot assess how BMC's contracts with payers. However, we know that BMC has a high public payer mix which has fixed prices and also that BMC has the among lowest relative prices from the top three commercial payers³³ compared to its cohort of the five other AMCs.³⁴

Staff find that the Proposed Project has the potential to control spending through reducing delays in access to care, and accelerating diagnosis and treatment, and improving efficiencies. As described herein, Staff finds that the Applicant described means whereby the Proposed Project will likely compete on the basis of price, TME, provider costs and other recognized measures of health care spending. Staff further notes that by providing adequate capacity at a lower cost provider, BMC, can reduce costs by minimizing diversions to other higher cost AMC providers. As a result of the above analysis, Staff finds that the Applicant has met the provisions of Factor 1(f).

Factor 2: Cost Containment, Improved Public Health Outcomes and Delivery System Transformation

For Factor 2, the Applicant must demonstrate that the Proposed Project will meaningfully contribute to the Commonwealth's goals for cost containment, improved public health outcomes, and delivery system transformation beyond the Patient Panel.

Cost Containment

The Applicant cites research findings that the provision of timely care in an appropriate setting has proven to reduce mortality and morbidity for chronic conditions, which translates to better patient clinical outcomes and reduced costs.³⁵

The Applicant asserts the Proposed Project will meet the Commonwealth's goals in the following ways. First, an increase in MRI scanning capacity will enable more timely access to care and treatment. When patients have access to services earlier in the disease phase, both health outcomes and overall health care costs are improved based on staging and the efficacy of treatment. Second, the Applicant, determined that a less costly 1.5T MRI unit (than a 3T) is the better option for BMC since, as discussed under Factor 1(b) and (f), more patients can be scanned on this unit, improving patient throughput and thereby access.

Improved Public Health Outcomes

As more fully detailed throughout Factor 1, the Proposed Project will improve public health outcomes by improving access to MRI services at BMC by reducing wait-times and the overall "no show rate." When patients have reduced wait times for services, they seek care sooner and are more apt to attend appointments. Expedited imaging can ensure appropriate staging of a disease, and appropriate, timely therapies are administered, leading to less stress for a patients and families. Accordingly, through the Proposed Project, public health outcomes will be improved.

As a result of the Proposed Project, the Hospital's sustainability as an academic HSN hospital will be ensured and, the Applicant asserts, this will lead to improved public health outcomes for Greater Boston's vulnerable and underserved populations into the future.

Delivery System Transformation

BMC's goal is not only to treat disease, but also to understand and address its root causes. Research has shown that health is shaped by more than just quality health care; social and environmental factors known collectively as SDoH (e.g., lack of employment, income, stable housing or food, limited education, etc.) also have an impact, contributing to chronic disease and mental health issues and creating barriers to accessing health care.

As discussed in Factor 1(b) and (c), BMC has integrated robust SDoH programming into its clinical models. Efforts around SDoH screening at the Hospital are aimed at understanding the social needs impacting patients' health, improving patient care by communicating social needs to care teams,

partnering with community-based organizations to eliminate systemic barriers that prevent patients from thriving, and providing patients with information on hospital-based and community resources that can mitigate their social needs. Examples of hospital-based and community programs and resources that BMC connects its patients and families to include investments in housing, food-related programs, programs related to education, job training, and employment, programs and services that support financial wellness (e.g., programs that help people apply for health coverage, access no- or low-cost medications, obtain food and groceries, pay their utility bills, file tax returns and secure refunds, etc.), programs related to violence and building safer communities, and more.

As examined in Factors 1(b), (c) and (f), BMC has numerous processes and programs in place to ensure linkages to services beyond the traditional medical model to remediate gaps created by SDOHs and improve health outcomes for its patients. BMC has integrated SDOH programming into its screening process with the aim of 1) understanding the social needs impacting patients' health, 2) improving patient care by communicating social needs to care teams, 3) partnering with community-based organizations to eliminate systemic barriers that prevent patients from thriving, and 4) providing patients with information on hospital-based and community resources that can mitigate their social needs. The Applicant provided examples of patient linkages to community programs and resources, which include investments in housing, food-related programs, programs related to education, job training, employment, programs and services that support financial wellness (e.g., programs that help people apply for health insurance coverage, access no- or low-cost medications, obtain food and groceries, pay their utility bills, file tax returns and secure refunds, etc.), and programs related to building safer communities.

Factor 2 Analysis

For the Proposed Project, cost savings are achieved through efficient, timely access to necessary MRI services. The Applicant anticipates that the reductions MRI wait-times will lead to improvements in health outcomes and patient satisfaction.

BMC is a Disproportionate Share Hospital (DSH) as designated by the Federal Government, and a high-public payer (HPP) hospital as designated by CHIA, and as such is an important provider of access for patients in greater Boston relying on government-sponsored insurance programs. Reporting on the Massachusetts health care system shows that a higher mix of public-payer patients is associated with lower commercial relative prices.^{36, 37, 38} Additionally, providers that are federally designated as DSHs receive high volumes of publicly insured patients and simultaneously receive lower reimbursement rates from commercial insurers.³⁹ Therefore, maintaining access to the high level of tertiary care health care services for its patient panel is paramount to their ability to access other programs related to SDOH.

Central to the goal of Delivery System Transformation is the integration of social services and community-based expertise. The Applicant has described multiple programs targeting its service area population and has incorporated screenings for SDOH into their electronic health record and actively use the data to direct its investment into community resources that assist with patient's needs. Further, as an MassHealth ACO, the Applicant is subject to requirements regarding SDOH and patient population health needs.

As a result of information provided by the Applicant and additional analysis, staff finds that the Applicant has demonstrated that the Proposed Project has met Factor 2.

Factor 3: Relevant Licensure/Oversight Compliance

The Applicant has provided evidence of compliance and good standing with federal, state and local laws and regulations and will not be addressed further in this report.

Factor 4: Demonstration of Sufficient Funds as Supported by an Independent CPA Analysis

Under Factor 4, the Applicant must demonstrate that it has sufficient funds available for capital and operating costs necessary to support the Proposed Project without negative effects or consequences to the existing patient panel. Documentation sufficient to make such finding must be supported by an analysis by an independent CPA.

The scope of the analysis included review and analysis of supporting documentation including:

1. Audited Financial Statements of BMC Health System, Inc. including consolidating balance sheets and statements of operations as of and for the years ended September 30, 2022 and 2021 and as of and for the years ended September 30, 2021 and 2020, provided June 9, 2023;
2. Six-Year Financial Forecast (Projections), including related assumptions for BMC Health System, Inc. for the fiscal years ending 2023 through 2028, provided June 23, 2023 and updated July 5, 2023;
3. Projected income statements for the Project, including detailed assumptions and supporting documentation for the fiscal years 2025 through 2029, provided June 17, 2023;
4. Schedule of Estimated Total Capital Expenditure, provided May 12, 2023; including related MRI quote, provided June 28, 2023, and construction budget and project schematics, provided July 7, 2023.

The review included analysis of key metrics that fall into three categories: profitability, liquidity, and solvency.⁴⁴

Revenues

The CPA only analyzed net patient service revenue (“NPSR”) identified by the Applicant in both their historical and projected (FY24-28) financial information since it is the only revenue category on which the Proposed Project would have an impact. The first year in which incremental revenue is present for the proposed capital project is FY 2025. The incremental revenue from the proposed capital project represents approximately 0.31% of BMC’s NPSR in FY 2025, and approximately 0.29% of BMC’s NPSR in

⁴⁴ Profitability metrics, such as EBIDA, EBIDA Margin, Operating Margin, Total Margin, and Debt Service Coverage Ratio are used to assist in the evaluation of management performance in how efficiently resources are utilized. Liquidity metrics, such as Unrestricted Cash Days on Hand and Unrestricted Cash to Debt, measure the quality and adequacy of assets to meet current obligations as they come due. Solvency metrics, such as Debt to Capitalization, Total Assets and Total Net Assets, measure the company’s ability to service debt obligations.

FY 2028. The CPA's opinion is that revenue growth projected by Management reflects a reasonable estimation based primarily on historical operations.

Operating Expenses

The CPA analyzed each of the categorized operating expenses for reasonableness and feasibility as it relates to the projected revenue items. In order to determine the reasonableness of the Projections for the fiscal years 2024 through 2028, the operating expense review was based on the actual operating results for the years ended 2022 and 2021 at BMC. Based upon analysis of the projected results from 2024 through 2028 the proposed project would represent approximately 0.04% of BMC's operating expenses in FY2025 and in FY 2028. The CPA's opinion that the growth in operating expenses projected by Management is reasonable based primarily on historical operations.

Non-operating Gains/Expenses and Other Changes in Net Assets

The items in these categories relate to investment account activity (realized and unrealized) and pension plan funded status and do not directly relate to the Proposed Project. Because these items are unpredictable, nonrecurring, or dependent upon market fluctuations, the nonoperating activity was analyzed in aggregate by comparing them to historical data. Accordingly, it is CPA's opinion that the pro-forma nonoperating gains/expenses and other changes in net assets are reasonable.

Capital Expenditures and Cash Flows

The CPA reviewed historical capital expenditures and cash flows in order to determine whether BMC anticipated reinvesting sufficient funds for technological upgrades and property, plant and equipment and whether the cash flow would be able to support that reinvestment. Current and projected capital projects and loan financing obligations included within the Projections and the impact of those projected expenditures on BMC's cash flow were considered. Following its review of materials and discussions with management, it is CPA's the opinion that the pro-forma capital expenditures and their resulting impact on the Applicant's cash flows are reasonable.

Since the impact of the Proposed Project represents a relatively insignificant portion of the operating revenues (approximately .31%) and of projected total assets (approximately 0.17%) of the Applicant's for Fiscal Year 2025, the CPA determined that the Projections are not likely to result in insufficient funds available for capital and ongoing operating costs necessary to support the proposed project. Therefore, the proposed new MRI unit and related renovations at the Hospital are financially feasible and within the financial capability of the Applicant.

Factor 4 Analysis

Staff is satisfied with the CPA's analysis of the Proposed Project's projections. As a result of information provided by the Applicant and additional analysis, staff finds that the Applicant has demonstrated that the Proposed Project has met Factor 4.

Factor 5: Assessment of the Proposed Project's Relative Merit

The Applicant considered and rejected one alternative, continue with the *status quo*, to the Proposed Project and to forego the expansion of MRI capacity and continue to operate BMC's main campus without any changes to existing MRI capacity.

Alternative Quality: Without the Proposed Project, MRI utilization rates will continue to rise to unsustainable levels as patient volumes continue to increase, throughput will continue to be negatively impacted, and patients will continue to face increased wait times and delays in diagnosis and treatment which will negatively impact patient's health outcomes and quality of life. With improved access to MRI services, turnaround times in diagnosis and treatment will improve for BMC's vulnerable and aging patient panel, as described in Factor 1.

Alternative Efficiency: Without additional MRI capacity, access challenges at BMC will persist and the area's most vulnerable patients will continue to face long wait times as well as delays in diagnosis and treatment.

As detailed throughout, the Proposed Project is designed to create additional MRI capacity, which in helping alleviate delayed access will improve throughput, ensure that patients can continue to receive coordinated care at BMC, and, thereby, provide efficiencies in care and costs.

Alternative Capital Expense: While there are no associated capital expenses with maintaining *status quo*, this would not address the need for additional MRI capacity at BMC, and, therefore, quality outcomes, operational efficiencies, and cost containment measures anticipated to be achieved through the Proposed Project would not be realized.

The capital expenditure for the Proposed Project represents a cost-effective approach to addressing the needs of the Applicant's under-resourced and aging Patient Panel and ensuring the Hospital's long-term ability to provide high-quality care.

Alternative Operating Costs: Although the *status quo* would not increase operating costs, it would not address the MRI capacity issues at BMC and consequently the quality outcomes, operational efficiencies, and cost containment measures the Applicant anticipates will be achieved through the Proposed Project would not be realized. The average incremental operating costs of the Proposed Project are anticipated to be approximately \$2,763,457.

Factor 5 Analysis

Staff finds that the Applicant has appropriately considered the quality, efficiency, and capital and operating costs of the Proposed Project and concurs that there are no feasible alternatives. As a result of information provided by the Applicant and additional analysis, staff finds that the Applicant has demonstrated that the Proposed Project has met Factor 5.

Factor 6: Fulfillment of DPH Community-based Health Initiatives Guideline

This is a DoN-required equipment project that will result in a Tier 1 Community-based Health Initiative (CHI) and a contribution to the Statewide Community Health and Healthy Aging Fund. As

a Tier 1 project, the Applicant, Boston Medical Center (BMC), will pool the local CHI funding with an approved DoN project #BMCHS-22080908-HE.

To fulfill Factor 6 requirements, the Applicant submitted a CHI Narrative, Self-Assessment and Addendum, Community Engagement Plan and Addendum, and the 2019 Community Health Needs Assessment (CHNA) and 2019-2022 Community Health Improvement Plan (CHIP) from the regional Boston, city-wide CHNA/CHIP Collaborative. Since the local CHI funding will be pooled with an existing project, the Applicant submitted similar documentation as they did for the DoN project #BMCHS-22080908-HE. The current Community Advisory Board (CAB) will be tasked with reviewing the 2022 CHNA as part of the health priority selection process to ensure synergies with the 2019 CHNA process and alignment with CHI principles.

The Community Health Needs Assessment was released by the Applicant in 2019 provided a summary of socio-demographic data, community assets, and highlights of health outcome information. Developed through data collection and analysis methods, the CHNA was conducted in collaboration with community organizations, health centers, hospitals and the Boston Public Health Commission. Key findings included: housing affordability; food insecurity; transportation; healthcare access and utilization; chronic disease; mental health; substance use; violence and trauma; maternal and child health; sexual health; environmental health; education; employment and workforce development; income and financial security; social environment; green space and the built environment; and obesity, nutrition and physical activity. The Applicant used these findings to develop the multi-year **2019-2022 Implementation Strategy/CHIP** that built upon the engagement work conducted by the regional Collaborative.

The Applicant's 2022 CHNA employed similar strategies for engagement, while connecting with more specific priority areas (e.g., housing, financial stability, behavioral health, and accessing services) and populations (e.g., low-wage workers, older adults, LGBTQ youth, etc.) identified in the 2019-2022 Implementation Strategy. The Community Advisory Board (CAB) will be tasked with reviewing the 2022 CHNA as part of the health priority selection process and identify strategies for implementation that align with the existing DoN project #BMCHS-22080908-HE and CHI principles.

The Self-Assessment and Addendum provided a summary of community engagement processes and socio-demographic information, data and highlights related to topics and themes of community needs related to the 2019 CHNA and Implementation Strategy. Through data analysis, surveys, and key informant gatherings, the Applicant and other partners participating in the city-wide CHNA/CHIP Collaborative identified the key priorities and strategies. Additionally, the Applicant worked with its CAB to conduct supplementary analysis in its priority neighborhoods. The Addendum provides community engagement plans of the 2022 CHNA.

Stakeholder Assessments are submitted by individuals who make up the Applicant's CAB and provide information on their individual engagement levels (e.g., their personal participation and role) and their analysis of how the Applicant engaged the community in community health improvement planning processes. Given that BMC is pooling local CHI funds with DoN project #BMCHS-22080908-HE, the Applicant and CHI team agreed the stakeholder assessments from the original project application will fulfill this requirement. As of September 2023, the current CAB does not reflect the group that provided oversight for the 2019 CHNA and consequently, would not be able to provide further detail

on the engagement that occurred. Therefore, additional stakeholder assessments are not required for this application.

The Community Engagement Plan and Addendum provided background information for, and explanation of existing CHNA planning processes. These elements focused on the 2019 and 2022 CHNA processes for Boston, as well as the supplementary engagement in the priority neighborhoods. Levels of engagement in all activity areas were identified.

The CHI Narrative provided background and overview information for the CHI processes. The narrative also outlines advisory duties for the advisory and allocation committees, and planned use of funding for evaluation and administrative activities. Additionally, the narrative outlines prior DoN related CHI work and community engagement strategies for the 2022 CHNA. The narrative concludes with CHI funds breakdown and the anticipated timeline for CHI activities.

The timeline, RFP processes, and use of evaluation and administrative funds are all appropriate and in line with CHI planning guidelines. The Applicant and their robust CAB will work together to ensure the 2022 CHNA and 2022-2025 CHIP are utilized in the selection of CHI strategies that meet Health Priority Guideline principles. This will help the Applicant continue to focus on the priority areas while integrating the recent CHNA/CHIP findings. In the existing Implementation Strategy, priority areas include housing, mental health and substance use, accessing services, financial and economic mobility, violence and trauma and food insecurity. DPH staff have determined that if the Applicant agrees to address community conditions and root causes while engaging in ongoing work with their CAB, CHI investment will continue to align appropriately with the Health Priorities Guideline.

The anticipated timeline for CHI activities includes a meeting of the CHI Advisory Board two months post approval, identifying the Health Priorities Strategies 5 months post approval, releasing an RFP to support transparent investment fix to six months later, with funding disbursed about ten months thereafter. With the administrative funds, the applicant's early plans are to develop and disseminate communication materials and support participation through meeting promotion and engagement barrier reduction activities.

Analysis

As a result of information provided by the Applicant and additional analysis, staff finds that with the conditions outlined below, and the ongoing communication on items outlined above, the Applicant will have demonstrated that the Proposed Project has met Factor 6.

Findings and Recommendations- Overall Application

As described herein, the Applicant supports the assertion that the proposed addition of one (1) new MRI on BMC's main campus will help alleviate capacity constraints and satisfy patient panel needs by decreasing wait times, helping address system reliability and downtime concerns, thereby providing members of BMC's patient panel, including those aged 65+ and those within identified under-resourced populations, with enhanced access to quality, efficiently-operated, and equitable MRI

services that are necessary to detecting and treating a variety of conditions and enhancing clinical outcomes.

Based upon a review of the materials submitted and with the addition of certain conditions, set out below and imposed pursuant to 105 CMR 100.360(A), the Department finds that the Applicant has met each DoN factor and recommends approval of this Application for Determination of Need.

Conditions to the DoN

1. Of the total required CHI contribution of \$399,740.00
 - a. \$38,375.04 will be directed to the CHI Statewide Initiative
 - b. \$345,375.36 will be dedicated to local approaches to the DoN Health Priorities
 - c. \$15,989.60 will be designated as the administrative fee.
2. To comply with the Holder's obligation to contribute to the Statewide CHI Initiative, the Holder must submit a check for \$38,375.04 to Health Resources in Action (the fiscal agent for the CHI Statewide Initiative).
 - a. The Holder must submit the funds to HRiA within 30 days from the date of the Notice of Approval.
 - b. The Holder must promptly notify DPH (CHI contact staff) when the payment has been made.

Payment should be sent to:
Health Resources in Action, Inc., (HRiA)
2 Boylston Street, 4th Floor
Boston, MA 02116
Attn: Ms. Bora Toro

Appendix I: Measures for Annual Reporting

To assess the impact of the Proposed Project, the Applicant has developed the following outcome measures. The Applicant will report this information to the Department's DoN Program staff as part of its annual report required by 105 CMR 100.310(A)(12) beginning one (1) year following implementation of the Proposed Project.

- 1. Patient Experience and Satisfaction:** Patients that have positive care experiences are more likely to seek additional care when necessary. BMC collects patient experience and satisfaction data via NRC Health patient experience surveys, which are administered to outpatients following a radiology encounter through automated phone calls and emails. Quantitative and qualitative survey data are compiled on the NRC Health platform, which facilitates reporting and data management. Due to the increased number of MRI units, the Applicant anticipates that patient experience and satisfaction ratings will improve given more timely access to care.

Measure: The Applicant will collect and provide data from the NRC Health survey question "How likely would you be to recommend this facility to your family and friends?".

Projections: Baseline: 79.9%; Year 1: 80.1%; Year 2: 80.3%; Year 3: 80.5%.

Monitoring: The Applicant will collect and provide data to DPH on an annual basis beginning one (1) year following implementation of the Proposed Project.

- 2. MRI Wait Times:** The Proposed Project seeks to address the existing and future needs of BMC's unique patient panel by providing increased access to timely, high-quality MRI services. The Applicant anticipates that MRI wait times will be reduced following implementation of the Proposed Project due to increased MRI capacity through the addition of the fourth MRI unit on BMC's main hospital campus.

- a. Outpatient Access to Care:** Time to third available appointment.

Measure: This measure will collect data based on the following calculation: Time interval (in days) from when the outpatient case was initiated for scheduling in EPIC to the third available outpatient appointment.⁴⁵ The Applicant will provide the following data to DPH: Median number of days between initiating outpatient MRI cases for scheduling and performing MRI.

Projections: Baseline: 50 days; Year 1: 40 days; Year 2: 30 days; Year 3: 20 days.

Monitoring: The Applicant will collect and provide data to DPH on an annual basis beginning one (1) year following implementation of the Proposed Project.

⁴⁵ Please note that outpatient wait times are based on the third next available appointment. This is industry standard and measures average length of time in days between the day a patient makes a request for an appointment and the third available appointment available.

- b. Outpatient Access to Care:** Number of patients not attending a scheduled appointment known as the “no show rate.”

Measure: This measure will collect data based on the following calculation: The percentage of appointment time lost because patients do not show up or cancel at the last minute. The no show-rate is calculated by dividing the number of no-shows (including late cancellations) by the total number of daily/weekly/monthly appointments. The applicant will provide the following data to DPH: MRI No-show rate.

Projections: Baseline: 26%; Year 1: 19%; Year 2: 14%; Year 3:10%

Monitoring: The Applicant will collect and provide data to DPH on an annual basis beginning one (1) year following implementation of the Proposed Project.

- 3. Critical Findings Reporting:** The Proposed Project seeks to ensure timely access to high-quality services for BMC’s existing and future patient panel. Currently, BMC has processes in place to ensure quality provision of its MRI services. For instance, when critical findings are registered for a patient, these findings are communicated directly from the radiologist to the ordering provider within 60 minutes. This process ensures that clinical decisions may be expedited and, therefore, impacts patient outcomes and quality of care. This process will continue following implementation of the Proposed Project.

Measure: This measure will collect and provide data on the number of radiologists conducting critical findings reporting on cases being interpreted.

Projections: Baseline: 100%; Year 1: 100%; Year 2: 100%; Year 3: 100%.

Monitoring: The Applicant will collect and provide data to DPH on an annual basis beginning one (1) year following implementation of the Proposed Project.

References

- ¹ <https://mriaudio.com/the-hidden-costs-of-mri-scanner-downtime-and-how-to-avoid-it/>
- ² Lasser, et al., *Massachusetts Health Reform's Effect on Hospitals' Racial Mix of Patients and on Patients' Use of Safety-net Hospitals*, 54 *MEDICAL CARE* 827 (2016), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4989238/>; Ku, et al., *Safety-Net Providers After Health Care Reform: Lessons From Massachusetts*, 8 *ARCH INTERN. MED.* 1379 (2011), available at <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1105879>; Mohan, et al., *The health of safety net hospitals following Massachusetts health care reform: changes in volume, revenue, costs, and operating margins from 2006 to 2009*, 43 *INT. J. HEALTH SERV.* 321 (2013), available at <https://pubmed.ncbi.nlm.nih.gov/23821908/>.
- ³ Lasser, et al., *supra* note 1; Ku, et al., *supra* note 1; Mohan, et al., *supra* note 1; Kim, et al., *The Importance of Safety-Net Hospitals in Emergency General Surgery*, *J. GASTROINTESTINAL SURGERY* (2018), available at <https://www.researchgate.net/profile/Young-Kim-122/publication/326565167/The-Importance-of-Safety-Net-Hospitals-in-Emergency-General-Surgery/links/5b6300f30f7e9bc79a762ac1/The-Importance-of-Safety-Net-Hospitals-in-Emergency-General-Surgery.pdf>.
- ⁴ *Magnetic Resonance Imaging (MRI)*, NAT'L INST. BIOMEDICAL IMAGING & BIOENGINEERING, <https://www.nibib.nih.gov/science-education/science-topics/magnetic-resonance-imaging-mri> (last visited May 13, 2023); Moser, et al., *Magnetic resonance imaging methodology*, 36 *EUROPEAN J. NUCLEAR MED. & MOLECULAR IMAGING* 30 (2009), available at <https://link.springer.com/article/10.1007/s00259-008-0938-3>.
- ⁵ NAT'L INST. BIOMEDICAL IMAGING & BIOENGINEERING, *supra* note 3; Moser, et al., *supra* note 3.
- ⁶ NAT'L INST. BIOMEDICAL IMAGING & BIOENGINEERING, *supra* note 3; Moser, et al., *supra* note 3.
- ⁷ Tanenbaum, *3T MRI in clinical practice*, 34 *APPLIED RADIOLOGY* 8 (2005), available at <https://appliedradiology.com/articles/3t-mri-in-clinical-practice>.
- ⁸ Moser, et al., *supra* note 3.
- ⁹ *Id.*
- ¹⁰ *Technology Trends: MRI Time to Upgrade? — Considerations for the Move From 1.5T to 3T*, 17 *RADIOLOGY TODAY* 22 (2016), available at <https://www.radiologytoday.net/archive/rt0216p22.shtml>; *What Does Tesla Mean for an MRI and its Magnet?*, GE HEALTHCARE (2019), <https://www.gehealthcare.com/insights/article/what-does-tesla-mean-for-an-mri-and-its-magnet>.
- ¹¹ *Technology Trends: MRI Time to Upgrade? — Considerations for the Move From 1.5T to 3T*, 17 *RADIOLOGY TODAY* 22 (2016), available at <https://www.radiologytoday.net/archive/rt0216p22.shtml>; *What Does Tesla Mean for an MRI and its Magnet?*, *supra* note 9.
- ¹² Tanenbaum, *supra* note 6; *What Does Tesla Mean for an MRI and its Magnet?*, *supra* note 9.
- ¹³ Jung JI. *Magnetic Resonance Imaging for Patients with Cardiac Implantable Electronic Devices: Reduced Concerns Regarding Safety, but Scrutiny Remains Critical*. *Korean Circ J.* 2016 Nov;46(6):765-767. doi: 10.4070/kcj.2016.46.6.765. Epub 2016 Nov 1. PMID: 27826333; PMCID: PMC5099330.
- ¹⁴ *Id.*
- ¹⁵ Saman Nazarian, Roy Beinart, Henry R. Halperin. *Magnetic Resonance Imaging and Implantable Devices 2013*. *Circulation: Arrhythmia and Electrophysiology* 419-428. Vol. 6 doi:10.1161/CIRCEP.113.000116 <https://www.ahajournals.org/doi/abs/10.1161/CIRCEP.113.000116>
- ¹⁶ *Id.*
- ¹⁷ WORLD HEALTH ORGANIZATION, *supra* note **Error! Bookmark not defined.**
- ¹⁸ Lasser, et al., *supra* note 1; Ku, et al., *supra* note 1; Mohan, et al., *supra* note 1; Kim, et al., *supra* note 1
- ¹⁹ Lasser, et al., *Massachusetts Health Reform's Effect on Hospitals' Racial Mix of Patients and on Patients' Use of Safety-net Hospitals*, 54 *MEDICAL CARE* 827 (2016), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4989238/>; Ku, et al., *Safety-Net Providers After Health Care Reform: Lessons From Massachusetts*, 8 *ARCH INTERN. MED.* 1379 (2011), available at <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1105879>; Mohan, et al., *The health of safety net hospitals following Massachusetts health care reform: changes in volume, revenue, costs, and operating margins from 2006 to 2009*, 43 *INT. J. HEALTH SERV.* 321 (2013), available at <https://pubmed.ncbi.nlm.nih.gov/23821908/>.
- ²⁰ Mendez-Escobar, et al. *Health Equity Accelerator: A Health System's Approach – Boston Medical Center's Health Equity Accelerator Aims to Eliminate Barriers to Health Equity*, *NEW ENGLAND J. MED. CATALYST* (2022), available at

<https://catalyst.nejm.org/doi/full/10.1056/CAT.22.0115> .

²¹ Mendez-Escobar, et al. *Health Equity Accelerator: A Health System's Approach – Boston Medical Center's Health Equity Accelerator Aims to Eliminate Barriers to Health Equity*, NEW ENGLAND J. MED. CATALYST (2022), available at <https://catalyst.nejm.org/doi/full/10.1056/CAT.22.0115> .

²² Chandrajit.P. Raut et al., High Rates of Histopathologic Discordance in Sarcoma with Implications for Clinical Care, J. OF ONCOLOGY PRAG. 29, 10065, 10065-10065 (2011).

²³ Center for Financing, Access, and Cost Trends, AHRQ, Household Component of the Medical Expenditure Panel Survey, 2004

²⁴ Medical Imaging and Technology Alliance. <https://www.medicalimaging.org/medical-imaging/benefits-of-medical-imaging/health-care-costs-quality>. Accessed May, 2023.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.*

²⁸ van Beek EJR, Kuhl C, Anzai Y, Desmond P, Ehman RL, Gong Q, Gold G, Gulani V, Hall-Craggs M, Leiner T, Lim CCT, Pipe JG, Reeder S, Reinhold C, Smits M, Sodickson DK, Tempany C, Vargas HA, Wang M. Value of MRI in medicine: More than just another test? J Magn Reson Imaging. 2019 Jun;49(7):e14-e25. doi: 10.1002/jmri.26211. Epub 2018 Aug 25. PMID: 30145852; PMCID: PMC7036752.

²⁹ Lee DW, Duszak R Jr, Hughes DR. Comparative analysis of Medicare spending for medical imaging: sustained dramatic slowdown compared with other services. Am J Roentgenol 2013;201:1277–1282.

³⁰ *Social Determinants of Health*, AMERICAN HOSPITAL ASSOCIATION, <https://www.aha.org/social-determinants-health/populationcommunity-health/community-partnerships>; LaPointe, *How Addressing Social Determinants of Health Cuts Healthcare Costs*, REVCYCLE INTELLIGENCE: VALUE BASED CARE, <https://revcycleintelligence.com/news/how-addressing-social-determinants-of-health-cuts-healthcare-costs> (last visited Jul. 20, 2022).

³¹ LaPointe, *supra* note 39.

³² Massachusetts Health Policy Commission. 2022 Health Care Cost Trends Report and Policy Recommendations Chart pack. <https://www.mass.gov/doc/2022-cost-trends-report-chartpack/download>

³³ Blue Cross Blue Shield, Harvard Pilgrim Health Care, and Tufts Health Plan.

³⁴ Center for Health Information and Analysis. [Massachusetts Hospital Profiles. Technical Appendix.](https://www.chiamass.gov/assets/docs/r/hospital-profiles/2020/FY20-Massachusetts-Hospital-Profiles-Technical-Appendix.pdf) <https://www.chiamass.gov/assets/docs/r/hospital-profiles/2020/FY20-Massachusetts-Hospital-Profiles-Technical-Appendix.pdf>

³⁵ *Chartbook on Access to Health Care, Elements of Access to Health Care: Timeliness*, AGENCY FOR HEALTHCARE RESEARCH AND QUALITY, <https://www.ahrq.gov/research/findings/nhqrd/chartbooks/access/elements3.html> (last visited Jul. 20, 2022); Kaplan & Porter, *The Big Idea: How to Solve the Cost Crisis in Health Care*, HARVARD BUSINESS REVIEW (2011), <https://hbr.org/2011/09/how-to-solve-the-cost-crisis-in-health-care>.

³⁶ DiCenzo, D., & Freedman, J., Freedman HealthCare, Re-examining the Health Care Cost Drivers and Trends in the Commonwealth. A Review of State Reports (2008-2018). <https://www.mahp.com/wp-content/uploads/2019/05/freedman-report-2018-final.pdf>

³⁷ OFFICE OF ATT'Y GEN. MARTHA COAKLEY, EXAMINATION OF HEALTH CARE COST TRENDS AND COST DRIVERS PURSUANT TO G.L. C. 118G, § 6 ½(B): REPORT FOR ANNUAL PUBLIC HEARING (Mar. 2010). <https://www.mass.gov/doc/2010-examination-of-health-care-cost-trends-and-cost-drivers-with-appendix/download>

³⁸ MA HEALTH POLICY COMM'N, 2015 COST TRENDS REPORT PROVIDER PRICE VARIATION (Jan. 2016). <https://www.mass.gov/doc/2015-cost-trends-report-provider-price-variation/download>

³⁹ DiCenzo, D., & Freedman, J., Freedman HealthCare, Re-examining the Health Care Cost Drivers and Trends in the Commonwealth. A Review of State Reports (2008-2018). <https://www.mahp.com/wp-content/uploads/2019/05/freedman-report-2018-final.pdf>