Application for Massachusetts Case Mix and Charge Data (Non-Government)
[Exhibit A – Data Application]

I. INSTRUCTIONS

This form is required for all Applicants, Agencies, or Organizations, hereinafter referred to as "Organization", except Government Agencies as defined in 957 CMR 5.02, requesting protected health information*. All Organizations must also complete the Data Management Plan, and attach it to this Application. The Application and the Data Management Plan must be signed by an authorized signatory. This Application and the Data Management Plan will be used by CHIA to determine whether the request meets the criteria for data release, pursuant to 957 CMR 5.00. Please complete the Application documents fully and accurately. Prior to receiving CHIA Data, the Organization must execute CHIA's Data Use Agreement. Organizations may wish to review that document prior to submitting this Application.*

Before completing this Application, please review the data request information on CHIA's website:

- Data Availability
- Fee Schedule
- Data Request Process

After reviewing the information on the website and this Application, please contact CHIA at casemix.data@state.ma.us if you have additional questions about how to complete this form.

The Application and all attachments must be uploaded to IRBNet. All Application documents can be found on the CHIA website.

Information submitted as part of the Application may be subject to verification during the review process or during any audit review conducted at CHIA's discretion.

Applications will not be reviewed until the Application and all supporting documents are complete and the required application fee is received.

A Fee Remittance Form with instructions for submitting the application fee is available on the CHIA website. If you are requesting a fee waiver, a copy of the Fee Remittance Form and any supporting documentation must be uploaded to IRBNet. Please be aware that if your research is funded and under that funding you are required to release raw data to the funding source, you may not receive CHIA Data.

II. FEE INFORMATION

1. Consult the most current Fee Schedule for Case Mix and Charge Data.

2. After reviewing the Fee Schedule, if you have any questions about the application or data fees, contact casemix.data@state.ma.us.

3. If you believe that you qualify for a fee waiver, complete and submit the Fee Remittance Form and attach it and all required supporting documentation with your application. Refer to the Fee Schedule (effective Feb 1, 2017) for fee waiver criteria.

4. Applications will not be reviewed until the application fee is received.

5. Data for approved Applications will not be released until the payment for the Data is received.

III. ORGANIZATION & INVESTIGATOR INFORMATION

Project Title:	Frailty, Aging, and Risk of Adverse Outcomes in Mitral Valve Prolapse (The FAR-OUT-MVP Study)
IRBNet Number:	2111579-1
Organization Requesting Data (Recipient):	Beth Israel Deaconess Medical Center, Inc
Organization Website:	www.bidmc.org/SmithCenter
Authorized Signatory for Organization:	Jennifer L. Mnich, JD
Title:	Research Contract Associate, Sponsored Programs Contracting
E-Mail Address:	jmnich@bidmc.harvard.edu
Telephone Number:	
Address, City/Town, State, Zip Code:	Beth Israel Deaconess Medical Center, 330 Brookline Avenue, Boston, MA 02215
Data Custodian: **(individual responsible for organizing, storing, and archiving Data)**	Yang Song, MSc
Title:	Biostatistics Manager
E-Mail Address:	ysong@bidmc.harvard.edu
Telephone Number:	617-632-7671
Address, City/Town, State, Zip Code:	Beth Israel Deaconess Medical Center, 330 Brookline Ave., Masco 4 - Smith Center, Boston, MA 02215
Primary Investigator (Applicant): **(individual responsible for the research team using the Data)**	Jordan Strom, MD, MSc
Title:	Director of the Echocardiography Laboratory and Director of Echocardiographic Research at Beth Israel Deaconess Medical Center
E-Mail Address:	jstrom@bidmc.harvard.edu
Telephone Number:	617-632-7672
Address, City/Town, State, Zip Code:	Beth Israel Deaconess Medical Center, 330 Brookline Ave., Masco 4 - Smith Center, Boston, MA 02215
Names of Co-Investigators:	N/A
E-Mail Addresses of Co-Investigators:	N/A

IV. PROJECT INFORMATION

IMPORTANT NOTE: Organization represents that the statements made below as well as in any study or research protocol or project plan, or other documents submitted to CHIA in support of the Data Application are

complete and accurate and represent the total use of the CHIA Data requested (the "Project"). Any and all CHIA Data released to the Organization under an approved application may ONLY be used for the express purposes identified in this section by the Organization, and for no other purposes. Use of CHIA Data for other purposes requires a separate Data Application to CHIA, with approval being subject to CHIA's regulatory restrictions and approval process. Unauthorized use is a material violation of your Organization's Data Use Agreement with CHIA.

1. What will be the use of the CHIA Data requested? [Check all that apply]

☒ Epidemiological	☐ Health planning/resource allocation	☐Cost trends
☒ Longitudinal Research	☐ Quality of care assessment	☐ Rate setting
☐ Reference tool	☒ Research studies	☐ Severity index tool (or other derived input)
☐ Surveillance	☐ Student research	☐ Utilization review of resources
☐ Inclusion in a product	☐ Other (describe in box below)	

N/A

2. Provide an abstract or brief summary of the specific purpose and objectives of your Project. This description should include the research questions and/or hypotheses the Project will attempt to address, or describe the intended product or report that will be derived from the requested Data and how this product will be used. Include a brief summary of the pertinent literature with citations, if applicable.

Mitral valve prolapse (MVP) is a common valvular disorder with an estimated prevalence of 2 to 3% in the general population. While MVP was once felt to have a benign prognosis based on community-based studies demonstrating a low occurrence of adverse events, more recent investigation has suggested that the natural history of asymptomatic MVP in the community is heterogeneous and may be associated with excess cardiovascular and non-cardiovascular morbidity and mortality. In particular, there is increasing recognition of a subset of arrhythmic MVP that may present with ventricular arrhythmias or sudden cardiac death (SCD). A number of risk factors for arrhythmogenesis in this setting have been identified including fibrosis of the papillary muscles and inferobasal left ventricular wall, felt secondary to myocardial stretch due to hypermobility of the mitral leaflets and subvalvular apparatus, and mitral annular disjunction (MAD), a distinct separation between the mitral annulus and the basal portion of the inferolateral wall which may be present in ~30% of patients with MVP and may be associated with ventricular arrhythmias in up to 1/3 of individuals.

Still, multiple questions remain about MVP and risk of SCD. For example, it is not known how much SCD risk varies by age, as prior studies on this topic enrolled small cohorts with a predominantly younger population. In this setting, frailty, "a state of increased vulnerability and reduced ability to maintain homeostasis after a stressful event resulting from an impairment in multiple physiologic systems," has emerged as a common and significant risk factor for adverse outcomes in several valvular heart diseases, including mitral regurgitation (MR). Whether aging and frailty modify the relationship between MVP and risk of adverse cardiac events, independent of MR severity, remains uncertain. Paradoxically, and in contrast to other valvular heart diseases, in these small prior studies, older age may actually be associated with lower risk of adverse events, but this may be due to selection of more symptomatic younger individuals with MVP or a survivor effect. We have previously demonstrated that phenotypic frailty can be identified readily using administrative claims data and, in the setting of aortic valve disease, is associated with excess risk, but not treatment effect heterogeneity. In this study, we seek to extend this line of investigation to MVP, to assess whether aging and frailty modifies the risk from MVP. To accomplish this, we propose linkage of our large, structured institutional echocardiogram and cardiac magnetic

resonance (CMR) report and image databases at Beth Israel Deaconess Medical Center (BIDMC), which capture information on MVP endotypes, to the Massachusetts Case Mix dataset (MACM), which contains 100% inpatient, emergency department, and outpatient claims across all public and private payers providing insurance to Massachusetts residents and employees. We will then use this unique dataset to investigate the following aim:

Aim: In linked MACM and BIDMC echocardiogram and CMR data, to determine whether MVP is associated with risk of mortality, cardiovascular morbidity (composite of heart failure, atrial fibrillation, cerebrovascular event, endocarditis), and need for mitral valve replacement (MVR), and whether this relationship varies by age and frailty as well as operative status (e.g., pre- or post-MVR).

H1: MVP will be associated with an excess risk of mortality, cardiovascular morbidity, and need for MVR compared to those without MVP and the risk of mortality or cardiovascular morbidity will be markedly attenuated by receipt of MVR.

H2: The relationship of MVP with excess risk of mortality, cardiovascular morbidity, and need for MVR will be greatest amongst younger individuals and MVR will attenuate this risk regardless of age.

H3: The relationship of MVP with excess risk of mortality, cardiovascular morbidity, and need for MVR will be lower in those with frailty and MVR will attenuate this risk regardless of frailty status.

Direct linkage to institutional echocardiogram and CMR data is feasible using patient identifiers and will create a novel data repository with complete demographic, clinical, treatment, and outcome information for linked participants who have received an echocardiogram or CMR at BIDMC. Given that the majority of BIDMC patients live in MA or are out-of-state residents who are members of the MA General Insurance Council (GIC), whose claims are captured as part of MACM, we expect this linkage to provide critical clinical and outcome information on a large segment of those undergoing evaluation for valvular heart disease at BIDMC, and would capture outcomes regardless of the site of occurrence. Not only would this dataset be unique in its ability to evaluate the proposed study questions, but it would be a lasting resource for future investigations into the relationship of cardiac structure and function to clinical outcomes. Such future studies could incorporate more granular phenotyping such as serum biomarkers, radiomics, or metabolomics/proteomics, for example, to better elucidate mechanistic insights into MVP and other structural heart diseases.

This study will additionally address important unanswered questions about risk in MVP. In addition to creating a unique data repository, the proposed study will directly evaluate the role of age and frailty and risk of adverse cardiac events in MVP. Moreover, it will establish whether or not this risk is independent of the severity of mitral regurgitation and associated clinical comorbidities. It will allow for integration of multiple imaging biomarkers of risk to assess which are most strongly and independently related to risk for death and non-death outcomes.

The project and proposed linkage are funded by a previously-awarded administrative supplement to NIH/NHLBI (1K23HL144907).

3. Has an Institutional Review Board (IRB) reviewed your Project?

☒ Yes [*If yes, a copy of the approval letter and protocol must be included with the Application package on IRBNet.*]
☐ No, this Project is not human subject research and does not require IRB review.

4. **Research Methodology**: Applications must include either the IRB protocol or a written description of the Project methodology (typically 1-2 pages), which states the Project objectives and/or identifies relevant research questions.

This document must be included with the Application package on IRBNet and must provide sufficient detail to allow CHIA to understand how the Data will be used to meet objectives or address research questions.

V. PUBLIC INTEREST

1. Briefly explain why completing this Project is in the public interest. Use quantitative indicators of public health importance where possible, for example, numbers of deaths or incident cases; age-adjusted, age-specific, or crude rates; or years of potential life lost. *Uses that serve the public interest under CHIA regulations include, but are not limited to: health cost and utilization analysis to formulate public policy; studies that promote improvement in population health, health care quality or access; and health planning tied to evaluation or improvement of Massachusetts state government initiatives.*

This study will serve to provide further guidance on the risk associated with MVP as well as other structural and functional abnormalities of the cardiovascular system as ascertained using cardiac imaging techniques such as echocardiography and cardiovascular magnetic resonance imaging (CMR). Echocardiography represents the most common form of cardiac imaging, with 25% of all Medicare FFS beneficiaries receiving at least one echocardiogram annually. The implication of findings on echocardiography have direct public health relevance given its prevalent use in the population. CMR is an increasingly used cardiac imaging modality which improves upon the tissue characterization and anatomical detail identified compared to echocardiography. Thus, it provides complementary information that can be used to understand the relevance of cardiac structural and functional abnormalities on future risk of cardiovascular outcomes. Moreover, cross-comparative studies of echocardiography and CMR to evaluate which identifies risk better in certain clinical conditions are of great need to understand the optimal methods for managing structural heart disease. For example, MVP is one of the most common congenital abnormalities encountered in clinical practice with an estimated prevalence of 2.6%. Identification of high-risk subsets of this common disease is critical to providing optimal risk stratification and guiding future treatment strategies for prevention of these risks.

VI. DATASETS REQUESTED

The Massachusetts Case Mix and Charge Data ("Case Mix") are comprised of Hospital Inpatient Discharge, Emergency Department and Outpatient Hospital Observation Stay Data collected from Massachusetts' acute care hospitals, and satellite emergency facilities. Case Mix Data are updated each fiscal year (October 1 – September 30) and made available to approved data users. For more information about Case Mix Data, including a full list of available elements in the datasets please refer to release layouts, data dictionaries and similar documentation included on CHIA's website.

Data requests are typically fulfilled on a one time basis, however; certain Projects may require years of data not yet available. Applicants who anticipate a need for future years of data may request to be considered for a subscription. Approved subscriptions will receive, upon request, the same data files and data elements included in the initial release annually or as available. Please note that approved subscription request will be subject to the Data Use Agreement, will require payment of fees for additional Data, and subject to the limitation that the Data can be used only in support of the approved Project.

1. Please indicate below whether this is a one-time request, or if the described Project will require a subscription.

☒ One-Time Request **OR** ☐ Subscription

2. Specify below the dataset(s) and year(s) of data requested for this Project, and your justification for requesting *each* dataset. Data prior to 2004 is not available.

☒ **Hospital Inpatient Discharge Data** ☒ 2004 ☒ 2005 ☒ 2006 ☒ 2007 ☒ 2008 ☒ 2009 ☒ 2010 ☒ 2011 ☒ 2012 ☒ 2013 ☒ 2014 ☒ 2015 ☒ 2016 ☒ 2017 ☒ 2018 ☒ 2019 ☒ 2020 ☒ 2021
Describe how your research objectives require Inpatient Discharge data: Inpatient discharge data will be used to identify hospitalizations for cardiovascular outcomes of interest (e.g. myocardial infarction, cardiac arrest, heart failure) amongst people who have had cardiac imaging at BIDMC. Additionally, it can be used to construct clinical indicator variables based on validated claims-algorithms for use in multivariable adjustment.
☒ **Outpatient Hospital Observation Stay Data** ☒ 2004 ☒ 2005 ☒ 2006 ☒ 2007 ☒ 2008 ☒ 2009 ☒ 2010 ☒ 2011 ☒ 2012 ☒ 2013 ☒ 2014 ☒ 2015 ☒ 2016 ☒ 2017 ☒ 2018 ☒ 2019 ☒ 2020 ☒ 2021
Describe how your research objectives require Outpatient Hospital Observation Stay data: Outpatient hospital observation data are necessary to provide a full picture of the clinical outcomes of individuals with MVP and other diseases where cardiac imaging is involved as it may be used in studies of health utilization (e.g. cost, testing) and hospital revisits, which may not be adequately captured by readmission data alone.
☒ **Emergency Department Data** ☒ 2004 ☒ 2005 ☒ 2006 ☒ 2007 ☒ 2008 ☒ 2009 ☒ 2010 ☒ 2011 ☒ 2012 ☒ 2013 ☒ 2014 ☒ 2015 ☒ 2016 ☒ 2017 ☒ 2018 ☒ 2019 ☒ 2020 ☒ 2021
Describe how your research objectives require Emergency Department data: Outpatient hospital observation data are necessary to provide a full picture of the clinical outcomes of individuals with MVP and other diseases where cardiac imaging is involved as it may be used in studies of health utilization (e.g. cost, testing) and hospital revisits, which may not be adequately captured by readmission data alone.

VII. DATA ENHANCEMENTS REQUESTED

State and federal privacy laws limit the release and use of Data to the minimum amount of data needed to accomplish a specific Project objective.

Case Mix Data are released in Limited Data Sets (LDS). All applicants receive the "Core" LDS, but may also request the data enhancements listed below for inclusion in their analyses. Requests for enhancements will be reviewed by CHIA to determine whether each represents the minimum data necessary to complete the specific Project objective.

For a full list of elements in the release (i.e., the "Core" elements and enhancements), please refer to release layouts, data dictionaries and similar documentation included on CHIA's website.

Please note that CHIA Case Mix Data contain reports produced using proprietary computer software created, owned, and licensed by the 3M Company. All Copyrights in and to the 3M APR™ Software, and to the 3M APR™ DRG classification system(s) (including the selection, coordination and arrangement of all codes) are owned by 3M. All rights reserved.

1. Specify below which enhancements you are requesting in addition to the "Core" LDS.

Geographic Subdivisions

State code, five-digit ZIP code, and 3-digit ZIP code are available for patients residing in CT, MA, ME, NH, RI, VT, and NY. City or Town of residence is available for residents of MA only. States outside of this region will be coded as XX ("Other").

Select *one* of the following options:

☐ 3-Digit Zip Code (Standard)	☐ 3-Digit Zip Code & City/Town ***	☐ 5-Digit Zip Code ***	☒ 5-Digit Zip Code & City/Town ***
***If requested, provide justification for requesting 5-Digit Zip Code or City/Town. Refer to specifics in your methodology:** Complete geographic information (5-digit zip code and city/town) will help in identifying issues of direct relevance to MA vs. other states and will be useful for geographic analyses evaluating differences or disparities across geographic regions within the New England area.			

Demographic Data

Select *one* of the following options:

☐ Not Requested (Standard)	☒ Race & Ethnicity***
** If requested, provide justification for requesting Race and Ethnicity. Refer to specifics in your methodology:** We will examine differences in outcomes of MVP, as well as rates of SCD between different racial and ethnic groups to understand race-based disparities and inequities in cardiovascular care.	

Date Resolution

Select *one* of the following options for dates of admissions, discharges, and significant procedures.

☐ Year (YYYY)(Standard)	☐ Month (YYYYMM) ***	☒ Day (YYYYMMDD)***
***If requested, provide justification for requesting Month or Day. Refer to specifics in your methodology:** To derive time-to-event outcomes for use in survival analyses, we need complete date information including year, month, and day.		

Practioner Identifiers (UPN)

Select *one* of the following options.

☐ Not Requested (Standard)	☐ Hashed ID ***	☐ Board of Registration in Medicine Number(BORIM) ***
***If requested, provide justification for requesting Hashed ID or BORIM Number. Refer to specifics in your methodology:		

Unique Health Information Number (UHIN)

Select *one* of the following options.

☐ Not Requested (Standard)	☒ UHIN Requested ***
*** If requested, provide justification for requesting UHIN. Refer to specifics in your methodology: The UHIN will be used to identify unique individuals across different admissions to different institutions which is necessary to inform readmission rates and strategies to prevent them.	

Hashed Mother's Social Security Number

Select *one* of the following options:

☒ Not Requested (Standard)	☐ Hashed Mother's SSN Requested ***
*** If requested, provide justification for requesting Hashed Mother's SSN. Refer to specifics in your methodology: Click here to enter text.	

VIII. DATA LINKAGE

Data linkage involves combining CHIA Data with other data to create a more extensive database for analysis. Data linkage is typically used to link multiple events or characteristics within one database that refer to a single person within CHIA Data.

1. Do you intend to link or merge CHIA Data to other data? ☒ Yes
   ☐ No linkage or merger with any other data will occur

2. If yes, please indicate below the types of data to which CHIA Data will be linked. [Check all that apply]
   ☒ Individual Patient Level Data (e.g. disease registries, death data)
   ☐ Individual Provider Level Data (e.g., American Medical Association Physician Masterfile)
   ☐ Individual Facility Level Data (e.g., American Hospital Association data)
   ☐ Aggregate Data (e.g., Census data)
   ☐ Other (please describe):

3. If yes, describe the dataset(s) to which the CHIA Data will be linked, indicate which CHIA Data elements will be linked and the purpose for each linkage.

In this submission, we propose the linkage of our institutional databases (all echocardiograms and CMR reports and images at BIDMC) to a state-wide, comprehensive, all-payer database from the MA CHIA Case Mix dataset.

Specifically, BIDMC keeps granular structured report data derived from 398,042 transthoracic echocardiogram reports (2000-2023) and 14,679 CMR reports (2000-2023), including information on MVP (presence, severity) as well as its associations (e.g. flail leaflet, severity of mitral regurgitation, late gadolinium enhancement, left ventricular ejection fraction) that are derived from routine clinical echocardiogram and CMR reads. Long-term storage for echocardiogram and CMR images is through the BIDMC Picture Archiving and Communications System (PACS) server that links to the echocardiogram and CMR reports through unique patient identifiers (e.g. medical record number). We propose to directly link the echocardiogram and CMR reports (and by extension, their respective images) to Case Mix claims (through medical record number or an alternative identifier) for the purposes of understanding the relationship of cardiac structure and function to outcomes. We propose to use CHIA Core elements for this purpose but additionally request 5-digit zip code and City, Town information as well as race/ethnicity data, ~~provider ID information (through the BORIM identifiers)~~, and elements of dates in order to provide the fullest possible picture on the utilization and outcomes of care for those with abnormalities, as identified by imaging, and differences in care across strata of geography ~~and provider types~~. For the specific project, we will identify adults with MVP using structured fields of the TTE and CMR reports.

Case Mix hospital inpatient and discharge claims will be used to identify frailty using several claims-based frailty indices (CFIs). As the study period overlaps the date of transition to ICD-10 (October 1, 2015), two different CFIs will be used to define frailty based on the year of the study (CMR or TTE) in the linked MACM-dataset. Before October 1, 2015, frailty will be defined using claims for hospitalizations in the 6 months preceding the date of service, according to the technique by Segal et al., which uses the Fried frailty phenotype as the reference standard. This CFI was derived using ICD-9-CM claims linked to the Cardiovascular Health Study, externally validated in the National Health and Aging Trend Study, and has been shown to predict outcomes similarly to the frailty phenotype. We have demonstrated that this CFI is associated with worse impairments in in-person assessments of frailty, disability, cognitive dysfunction, and nutrition amongst patients with severe AS in the CoreValve studies. Of note, while this CFI was derived based on a dichotomous definition of frailty (i.e., the Fried definition), it nevertheless predicts adverse risk on a continuous basis. For studies on or after October 1, 2015, frailty will be defined using claims for hospitalizations in the 12 months preceding the date of service, according to the technique by Kim et al., which uses the Rockwood deficit-accumulation frailty approach as the reference standard. This CFI was derived using the 2006 Medicare Current Beneficiary Survey and validated using the 2008 Health and Retirement Study. It was subsequently adapted for use in the ICD-10 scheme.

Relevant covariates will include demographics (age, sex, race, ethnicity, median income for zip code of residence, insurance), clinical variables, TTE variables, and CMR variables. Clinical variables will be assessed using 30 Medicare Chronic Conditions Data Warehouse indicators that will be constructed using validated claims algorithms using a 1-2 year lookback period prior to the date of service. TTE variables include left ventricular ejection fraction, left ventricular dimensions and volumes, left and right atrial size, right ventricular size and function, peak tricuspid velocity (an estimate of pulmonary hypertension severity), and the severity of valvular stenosis and regurgitation (e.g., tricuspid and aortic regurgitation, aortic stenosis). CMR variables include all aforementioned TTE variables in addition to presence, amount, and location of LGE, post-contrast T1 and T2 times, and extracellular volume (ECV) using tissue mapping techniques.

4. If yes, for each proposed linkage above, please describe your method or selected algorithm (e.g., deterministic or probabilistic) for linking each dataset. If you intend to develop a unique algorithm, please describe how it will link each dataset.

We propose deterministic linkage to be performed by the statistical team at CHIA. Briefly, we will amend the existing DUA between the BIDMC and CHIA for the Massachusetts Cardiovascular registry to include the BIDMC echocardiogram and CMR datasets. As CHIA has information on medical record number (MRN) provided by hospitals, we will plan to link participants by MRN using other identifiers (name and social security number) to verify a correct match. Using a secure data portal, BIDMC officials will send the required identifiers (MRN, name, and social security number) to CHIA to perform direct linkage. We anticipate that > 80% of individuals will be successfully linked.

5. If yes, attach or provide below a complete listing of the variables from all sources to be included in the final linked analytic file.

Relevant covariates will include demographics (age, sex, race, ethnicity, median income for zip code of residence, insurance), clinical variables, TTE variables, and CMR variables. Clinical variables will be assessed using 30 Medicare Chronic Conditions Data Warehouse indicators that will be constructed using validated claims algorithms using a 1-2 year lookback period prior to the date of service. TTE variables include left ventricular ejection fraction, left ventricular dimensions and volumes, left and right atrial size, right ventricular size and function, peak tricuspid velocity (an estimate of pulmonary hypertension severity), and the severity of valvular stenosis and regurgitation (e.g., tricuspid and aortic regurgitation, aortic stenosis). CMR variables include all aforementioned TTE variables in addition to presence, amount, and location of LGE, post-contrast T1 and T2 times, and extracellular volume (ECV) using tissue mapping techniques.

6. If yes, please identify the specific steps you will take to prevent the identification of individual patients in the linked dataset.

A unique study identifier (study_id) will be assigned to each study participant. Other than MRN, name, social security number, and elements of dates (date of imaging, date of outcome), no PHI will be necessary for this study. Information linking this PHI to the participant study_id will be kept on secure servers behind the BIDMC firewall, only accessible to the PI and study investigators. The file will be locked and password protected, with the password only known to the PI and study investigators. All other demographic, clinical, laboratory or imaging information will be kept separately from this file, linked to the participant study_id, but not the PHI. Upon the conclusion of the study, the file containing PHI will be securely deleted at the earliest opportunity and the PHI will not be reused or disclosed to any other person or entity. Moreover, we will not be contacting, intervening, or interacting with any subjects or their healthcare practitioners for this study. To further mitigate the risk of loss of patient privacy, access to the datasets will be restricted to necessary personnel who have received appropriate training in human subject protection, patient privacy, and data safeguards, including established standard operating procedures at BIDMC. All users' access of the received and developed datasets in this study will be tracked and access will be carried out in a secure manner. All output containing individual-level information will be treated as confidential data and is never transferred electronically via email or other protocols. Shredders will be used on any printed material containing individual identifiers.

IX. PUBLICATION / DISSEMINATION / RE-RELEASE

1. Do you anticipate that the results of your analysis will be published or made publically available? If so, how do you intend to disseminate the results of the study (e.g., publication in professional journal, poster presentation, newsletter, web page, seminar, conference, statistical tabulation)? Any and all publication of CHIA Data must comply with CHIA's cell size suppression policy, as set forth in the Data Use Agreement. Please explain how you will ensure that any publications ***will not disclose a cell less than 11***, and percentages or other mathematical formulas that result in the display of a cell less than 11.

Yes, we anticipate that the dataset produced from this linkage will be used to produce manuscripts. The results from the linked dataset will be intended for publication in peer-reviewed journals. The results may also be presented at national and international conferences.

We will amend the existing DUA between the BIDMC and CHIA for a project recently submitted (IRBnet number: 1975670-1) which involves linking a procedural dataset to APCD and MACM data (under the name of Massachusetts Cardiovascular Registry). We will propose an addendum to this DUA to link these echocardiogram and CMR datasets. Thus, all use of data will be done in accordance with the approved CHIA DUA. All output containing individually identifiable information will be treated as confidential data. Such information will never be transferred electronically via e-mail or other protocols. This includes complying with CHIA's policy to suppress cell sizes less than 11.

2. Describe your plans to use or otherwise disclose CHIA Data, or any Data derived or extracted from such Data, in any paper, report, website, statistical tabulation, seminar, or other setting that is not disseminated to the public.

The results of research resulting from the linked dataset will be subject to presentation at academic conferences and publication in peer-reviewed journal articles.

3. What will be the lowest geographical level of analysis of data you expect to present for publication or presentation (e.g., state level, city/town level, zip code level, etc.)? Will maps be presented? If so, what methods will be used to ensure that individuals cannot be identified?

The lowest level of analysis will be at the zip code level. After linkage, data will be de-identified and no identifiable association between patient and outcome will be distributed or made publicly available. Maps may be used in future investigations, but will not be used for rare diseases or outcomes where individuals could be readily identify.

4. Will you be using CHIA Data for consulting purposes?
   - ☐ Yes
   - ☒ No

5. Will you be selling standard report products using CHIA Data?
   - ☐ Yes
   - ☒ No

6. Will you be selling a software product using CHIA Data?
   - ☐ Yes
   - ☒ No

7. Will you be using CHIA Data as in input to develop a product (i.e., severity index took, risk adjustment tool, reference tool, etc.)

☐ Yes
☒ No

8. Will you be reselling CHIA Data in any format not noted above?
☐ Yes
☒ No

If yes, in what format will you be reselling CHIA Data?

N/A

9. If you have answered "yes" to questions 5, 6, 7 or 8, please provide the name and a description of the products, software, services, or tools.

N/A

10. If you have answered "yes" to questions 5, 6, 7 or 8, what is the fee you will charge for such products, software, services or tools?

N/A

X. APPLICANT QUALIFICATIONS

1. Describe your previous experience using hospital data. This question should be answered by the primary investigator and any co-investigators who will be using the Data.

Investigators at the Smith Center for Outcomes Research in Cardiology at BIDMC have successfully used claims data from the Centers of Medicare and Medicaid Services, as well as, CHIA (case mix and APCD) for the publication of a variety of research projects. Success of such projects has been accompanied by the help of skilled statisticians with years of experience in analyzing Medicare claims data.

Dr. Jordan Strom, MD, MSc, has expertise in cardiac imaging, valvular heart disease, and frailty. He is Director of the Echocardiography Laboratory and Director of Echocardiographic Research at BIDMC. He is an NHLBI R01-funded investigator and Section Chief for Cardiovascular Imaging Research at the Smith Center. He is the inaugural leadership academy member elected to the Board of Directors of the American Society of Echocardiography. His research has been focused on the intersection of frailty and valvular heart disease on cardiovascular outcomes. As part of his NHLBI K23 (1K23HL144907), he validated the CFI that will be used in this study against in-person measures of frailty and has published on the role of frailty on heterogeneous treatment effects in trials of aortic valve replacement for aortic stenosis (AS). In addition to publishing on tricuspid valve prolapse and mitral regurgitation previously, he is first author of the largest study of AS and has published 17 studies to date on the topic, in addition to multiple studies on frailty. He is Co-PI of an international, multicenter parallel cohort study evaluating CV risk across the spectrum of AS severity. The above linkage is funded through an administrative supplement to year 5 of his NHLBI K23 (the FAR-OUT-MVP study).

2. **Resumes/CVs**: When submitting your Application package on IRBNet, include résumés or curricula vitae of the principal investigator and co-investigators. (These attachments will not be posted on the internet.)

XI. USE OF AGENTS AND/OR CONTRACTORS

By signing this Application, the Organization assumes all responsibility for the use, security and maintenance of the CHIA Data by its agents, including but not limited to contractors. The Organization must have a written agreement with the agent of contractor limiting the use of CHIA Data to the use approved under this Application as well as the privacy and security standards set forth in the Data Use Agreement. CHIA Data may not be shared with any third party without prior written consent from CHIA, or an amendment to this Application. CHIA may audit any entity with access to CHIA Data.

Provide the following information for **all** agents and contractors who will have access to the CHIA Data. [*Add agents or contractors as needed.]*

AGENT/CONTRACTOR #1 INFORMATION	
Company Name:	
Company Website	
Contact Person:	
Title:	
E-mail Address:	
Address, City/Town, State, Zip Code:	
Telephone Number:	
Term of Contract:	

1. Describe the tasks and products assigned to the agent or contractor for this Project and their qualifications for completing the tasks.

2. Describe the Organization's oversight and monitoring of the activities and actions of the agent or contractor for this Project, including how the Organization will ensure the security of the CHIA Data to which the agent or contractor has access.

3. Will the agent or contractor have access to and store the CHIA Data at a location other than the Organization's location, off-site server and/or database?

☐ Yes
☐ No

4. If yes, a separate Data Management Plan **must** be completed by the agent or contractor.

AGENT/CONTRACTOR #2 INFORMATION

Company Name:	
Company Website	
Contact Person:	
Title:	
E-mail Address:	
Address, City/Town, State, Zip Code:	Click here to enter text.
Telephone Number:	
Term of Contract:	

1. Describe the tasks and products assigned to the agent or contractor for this Project and their qualifications for completing the tasks.

2. Describe the Organization's oversight and monitoring of the activities and actions of the agent or contractor for this Project, including how the Organization will ensure the security of the CHIA Data to which the agent or contractor has access.

3. Will the agent or contractor have access to and store the CHIA Data at a location other than the Organization's location, off-site server and/or database?

☐ Yes
☐ No

4. If yes, a separate Data Management Plan **must** be completed by the agent or contractor.

AGENT/CONTRACTOR #3 INFORMATION	
Company Name:	
Company Website	
Contact Person:	
Title:	
E-mail Address:	
Address, City/Town, State, Zip Code:	Click here to enter text.
Telephone Number:	
Term of Contract:	

5. Describe the tasks and products assigned to the agent or contractor for this Project and their qualifications for completing the tasks.

6. Describe the Organization's oversight and monitoring of the activities and actions of the agent or contractor for this Project, including how the Organization will ensure the security of the CHIA Data to which the agent or contractor has access.

XII. ATTESTATION

By submitting this Application, the Organization attests that it is aware of its data use, privacy and security obligations imposed by state and federal law *and* confirms that it is compliant with such use, privacy and security standards. The Organization further agrees and understands that it is solely responsible for any breaches or unauthorized access, disclosure or use of CHIA Data, including, but not limited to, any breach or unauthorized access, disclosure or use by any third party to which it grants access.

Organizations approved to receive CHIA Data will be provided with Data following the payment of applicable fees and upon the execution of a Data Use Agreement requiring the Organization to adhere to processes and procedures designed to prevent unauthorized access, disclosure or use of data.

By my signature below, I attest: (1) to the accuracy of the information provided herein; (2) this research is not funded by a source requiring the release of raw data to that source; (3) that the requested Data is the minimum necessary to accomplish the purposes described herein; (4) that the Organization will meet the data privacy and security requirements described in this Application and supporting documents, and will ensure that any third party with access to the Data meets the data use, privacy and security requirements; and (5) to my authority to bind the Organization.

Signature: (Authorized Signatory for Organization)	Jennifer L. Mnich Digitally signed by Jennifer L. Mnich Date: 2024.03.25 15:11:50 -04'00'
Printed Name:	Jennifer L. Mnich, JD
Title:	Research Contract Associate, SPC
Date:	03/25/2024

Attachments:
A completed Application must have the following documents attached to the Application or uploaded separately to IRBNet:
☒ 1. IRB approval letter and protocol (if applicable), or research methodology (if protocol is not attached)
☒ 2. Data Management Plan (including one for each agent or contractor that will have access to or store the CHIA Data at a location other than the Organization's location, off-site server and/or database);
☒ 3. CVs of Investigators (upload to IRBNet)

APPLICATIONS WILL NOT BE REVIEWED UNTIL THEY ARE COMPLETE, INCLUDING ALL ATTACHMENTS.