Chapter

9

MIPAV
Image Submission Tool

CHAPTER 9 – MIPAV IMAGE SUBMISSION TOOL

The modules provide a combination of web-based functionality and downloadable tools that support data definition, data contribution, and data access throughout the research life cycle. To ensure the quality of uploaded data and also to make data easy to query, the imaging data should be submitted in a specific format and range values should comply with the values defined in the data dictionary. All submitted research data must be validated against the values defined in the data dictionary prior to submission.

In order to help researchers to upload/download data to the data repository, BRICS provides a set of tools that includes:

- **MIPAV Image Submission and Validation** - used for imaging data to create the image submission package. Also, this tool assists researchers with the submission of imaging data.
- **Data Validation** - verifies that data conforms to the required format and range values defined in the data dictionary. It also creates a data submission package (XML) and submission ticket (XML) that can be uploaded to the data repository via the Data Upload module.
- **Data Upload** - assists researches in uploading their data to the data repository (in the form of a submission package and submission ticket).
- **Data Download** - assists researches in downloading data from the data repository.

The Imaging Data Submission and Validation tool accepts the brain imaging data (in the form of **brain image file** and a **CSV file**) from a researcher and validates the metadata associated with the image files against the values defined in the data dictionary. It then creates an image submission package. The tool also provides a report of any data discrepancies, errors, and warnings received. If any validation errors are found, an image submission package cannot be created. In that case, the researcher should edit data to fix all errors, first, and then re-validate the data.

The MIPAV plugin is used to package and submit unprocessed and processed brain images in DICOM format through a variety of formats including DICOM, MINC 1.0 and 2.0, Analyze, NIfTI-1, AFNI and SPM. If you are using a different file format, please contact your program administrator to have it added to the list of supported standards.

To submit imaging data to the repository, you are required to run a component of the MIPAV application. Using the MIPAV Image Submission Package Creation Tool, you can prepare your image data for submission by following the steps outlined in the sections to follow.

MIPAV is a Java application and can be run on virtually any platform any Java-enabled platform such as Windows, UNIX, or Macintosh OS X. The Image Submission Package Creation Tool is executed locally on your system as a Java Web Start application.

The Data Repository users can download selected datasets from the repository to their local machines. The Data Download tool (available via the Data Repository module) assists users in this task. The tool runs locally as a Java Web Start application on a user's computer (requires the Java runtime environment).

9.1 OBJECTIVE

This chapter provides information for users on how to:

- Launch the imaging tool;
- Use the image tool manually;
- Use the image tool with an input CSV;
- Validate and Upload an imaging dataset to the Data Repository; and
- Submit imaging data to the repository.

9.1.1 Supported Image Formats

The plug-in supports all file formats supported by MIPAV including processed and unprocessed medical images in DICOM, and NIfTI format. If you are using different file format not supported by MIPAV, please contact MIPAV support and/or BRICS Operations.

9.1.2 System Requirements

The most recent version of 64-bit Java Runtime Environment (JRE) (version 8 or above) is required in order to run the MIPAV Image Submission Package Creation Tool.

9.1.3 Submitting Imaging Data

To submit imaging data to the BRICS repository, you are required to run a Java Web Start application. Using the MIPAV Image Submission Package Creation Tool, you can prepare your image data for submission by following the steps outlined in the next sections.

When medical image files are loaded into the MIPAV Image Submission Package Creation Tool, the tool extracts out any available image header metadata, and attempts to map the image header metadata onto the Data Elements in the selected Form Structure. The quality and amount of image header metadata that can be extracted out of an image volume will depend on the medical image file format, the scanner on which the images were acquired, and the de-identification process performed.

There are two ways in which you can load imaging data to the BRICS repository using the MIPAV Imaging Submission tool:

1. **Manual Process:** If you are loading images manually, you may use the "**Add Form Structure"** button to manually choose a BRICS Form Structure and enter data element values for that Form Structure. Follow the manual loading process outlined in the sections below to load images.

2. **Batch Process:** If you are loading multiple images at a time, follow this process to fill out a CSV template provided to load your images without manual data entry via the MIPAV Image Submission Package Creation Tool.

Module Input

1. **De-identified Medical Image(s)** in one of supported formats.

2. **Corresponding Input CSV** files with metadata, if using the Batch Process.
3. **Additional Metadata** describing the medical images not available via the image file header, or the user's input CSV file(s).

Module Output

1. The original medical image(s) in one of the supported formats (zipped up if the image volume is comprised of more than one file on disk),
2. Output CSV file(s) for each Form Structure in your submission, ready for validation by the Data Validation module,
3. An image thumbnail file (JPEG) for each medical image volume,
4. The Output log that lists all image files and CSV files added to the image submission package. It also displays the path(s) to the directory where the image package(s) is stored.

9.1.4 MIPAV Image Submission Package Creation Tool Input

Data can be loaded into the Imaging tool in the form of medical image file(s) and optional input CSV files that contain additional patient/subject/visit information (not stored in the image header) as well as image related metadata.

The following information is required for all image submissions:

1. The patient/subject information including the GUID;
2. The image information including the imaging file(s), some image acquisition metadata, image QA/QC information.

Medical Image File Format Support

The MIPAV Image Submission Package Creation Tool supports dozens of medical image file formats, including NIfTI, and many variants of the DICOM format.

When adding your image data to the MIPAV Image Submission Package Creation Tool, you have different options for how to select and package your de-identified data files:

- A ZIP archive containing the files comprising the image dataset (e.g., all of the slice files of a multifile DICOM image volume, or the .img/.hdr file set of an Analyze format dataset) and only the files from the image dataset.
- A gzipped tar archive (commonly referred to as a tarball, or .tar.gz format), containing all file files of the image dataset.
- If the image file format of your data is a single-file format (such as a .nii NIfTI file, or a multi-frame DICOM file), you can directly select the image file via the Imaging Tool graphical user interface, or through an input CSV file.
- If the image file format of your data is a multi-file format (such as most DICOM datasets, where each slice of the image is stored in a separate file), you can load the dataset in the Imaging Tool user interface by checking the "Open as multifile" checkbox in the "**Image Information.ImgFile**" Browse dialog before selecting any file from the , or when using an input CSV by specifying a directory containing only the image volume files (from only series/acquisition) in each row of the "**Image Information.ImgFil**e" column.

9.1.5 Output Image Submission Package

The Imaging Data Submission packages includes:

- A compressed brain image (ZIP)
- A JPG file that can be used as a thumbnail to preview the image in the database
- A CSV file with the metadata describing the image.

By default, the CSV file with metadata and the imaging file(s) should be located in the same directory.

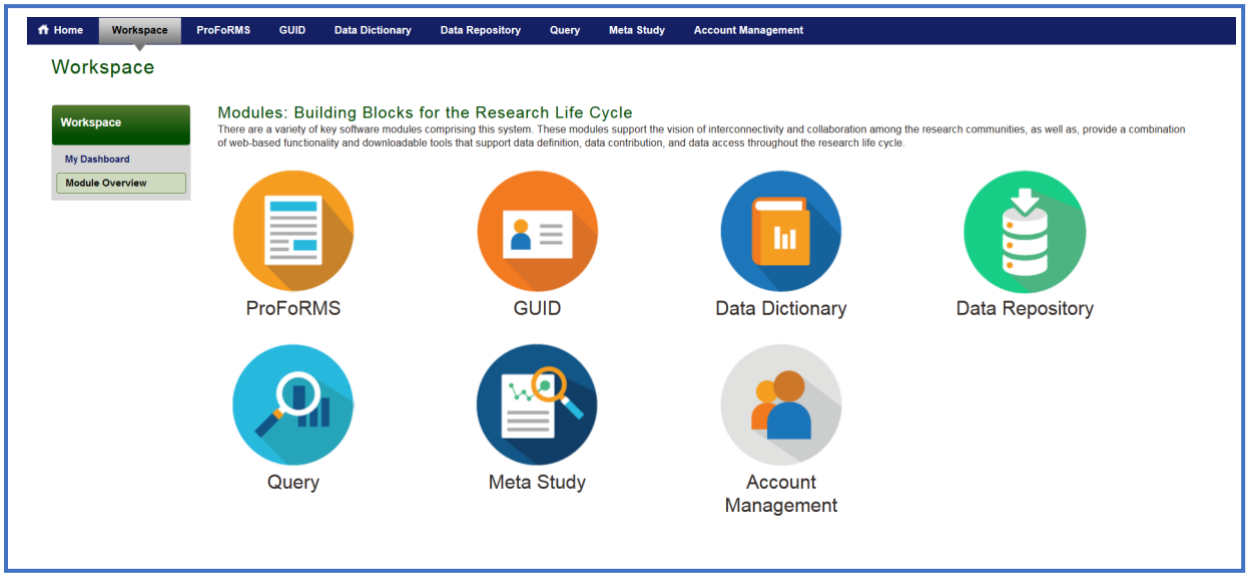
When running the module, you are asked to specify the Output directory which would be used by the module to store temporary files, validation logs, and image submission packages. Specify the Output directory in the Output Directory for Validation tool box.

9.2 Launching/Navigating The MIPAV Image Submission Package Creation Tool

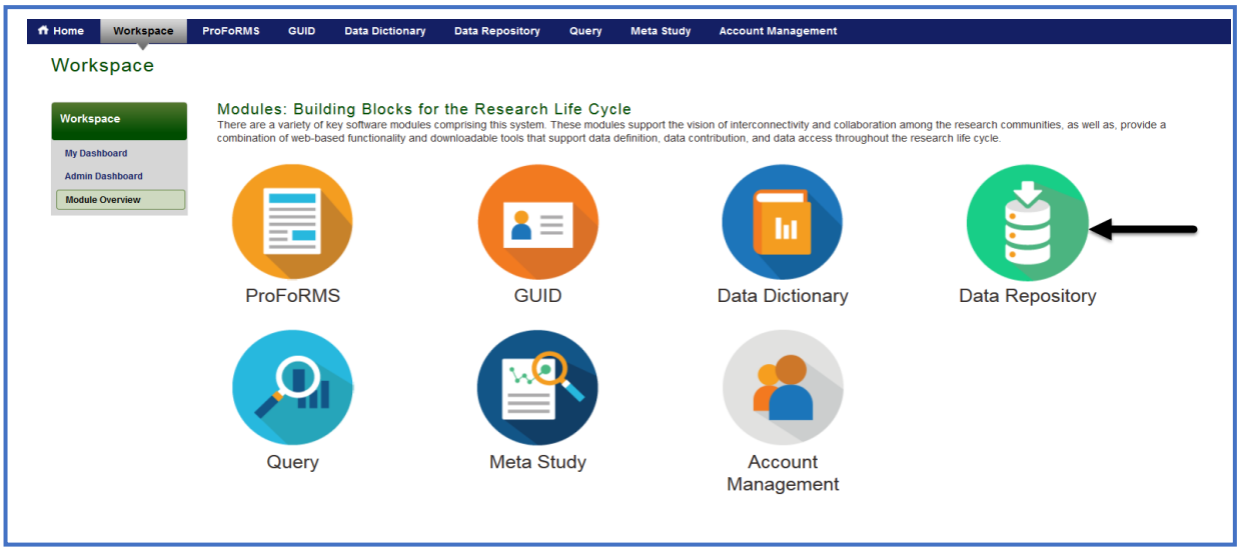
To submit imaging data to the BRICS repository, you are required to run a Java Web Start application, to properly prepare your data for Validation and Upload. Using the MIPAV Image Submission Package Creation Tool, you can prepare your image data for submission by following the steps outlined in the next sections.

To launch the MIPAV tool: Perform the following actions:

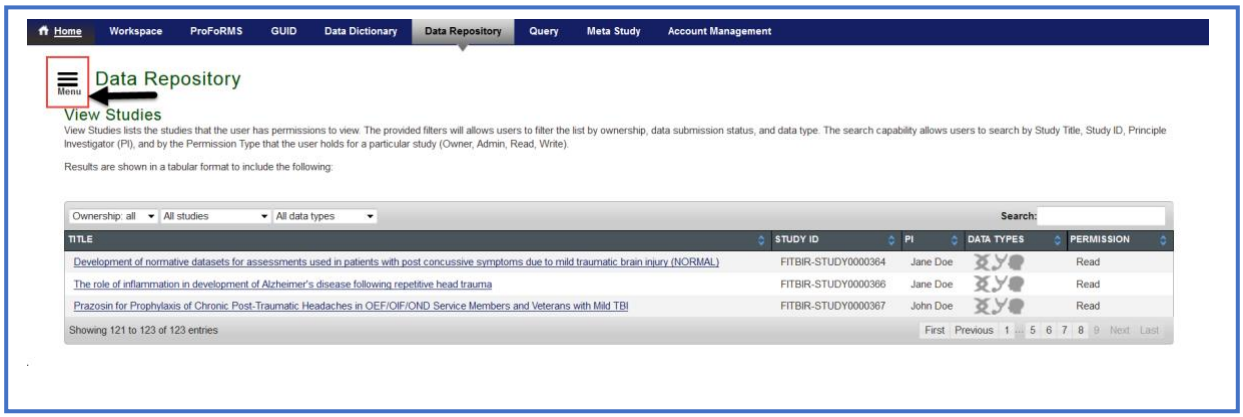
1. Navigate to your Workspace,



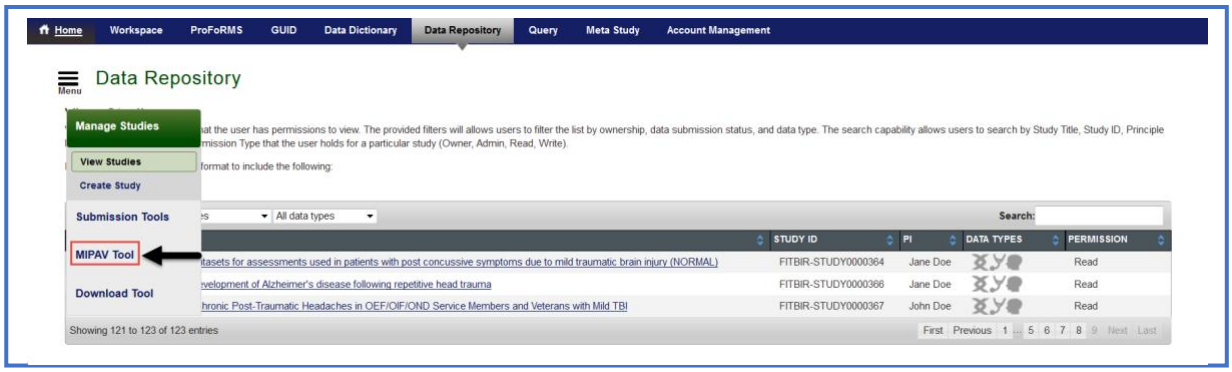
2. Click the **Data Repository** module from your Workspace,



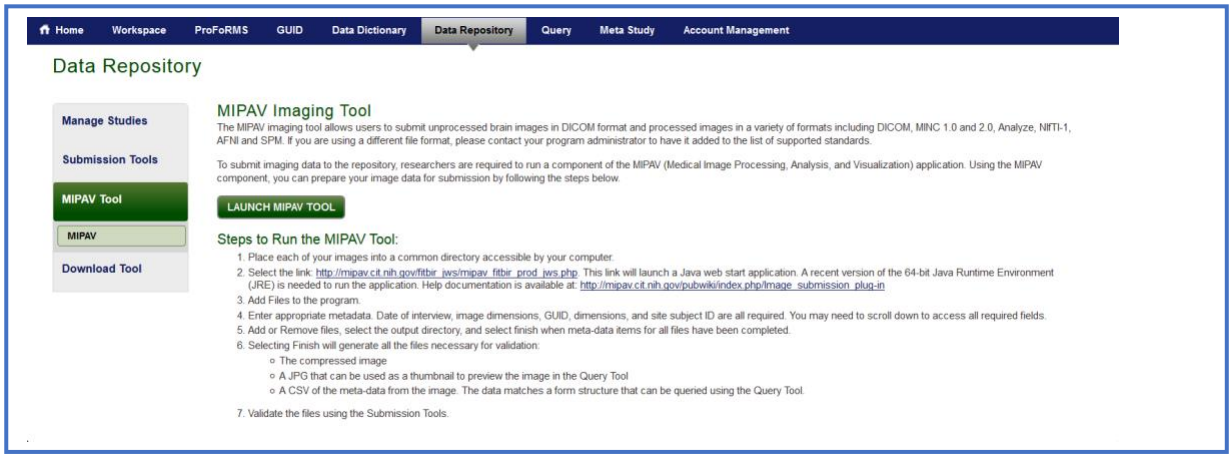
3. Click on the Menu collapsible menu button to expand the Data Repository menu options on the left tool bar.



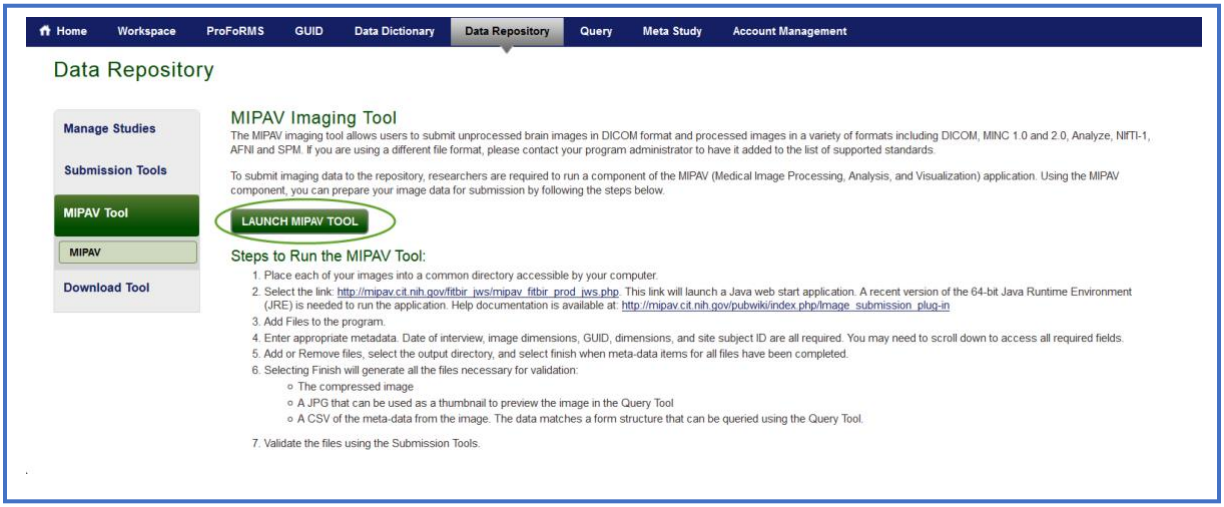
4. Click the **MIPAV Tool** on the left-side menu



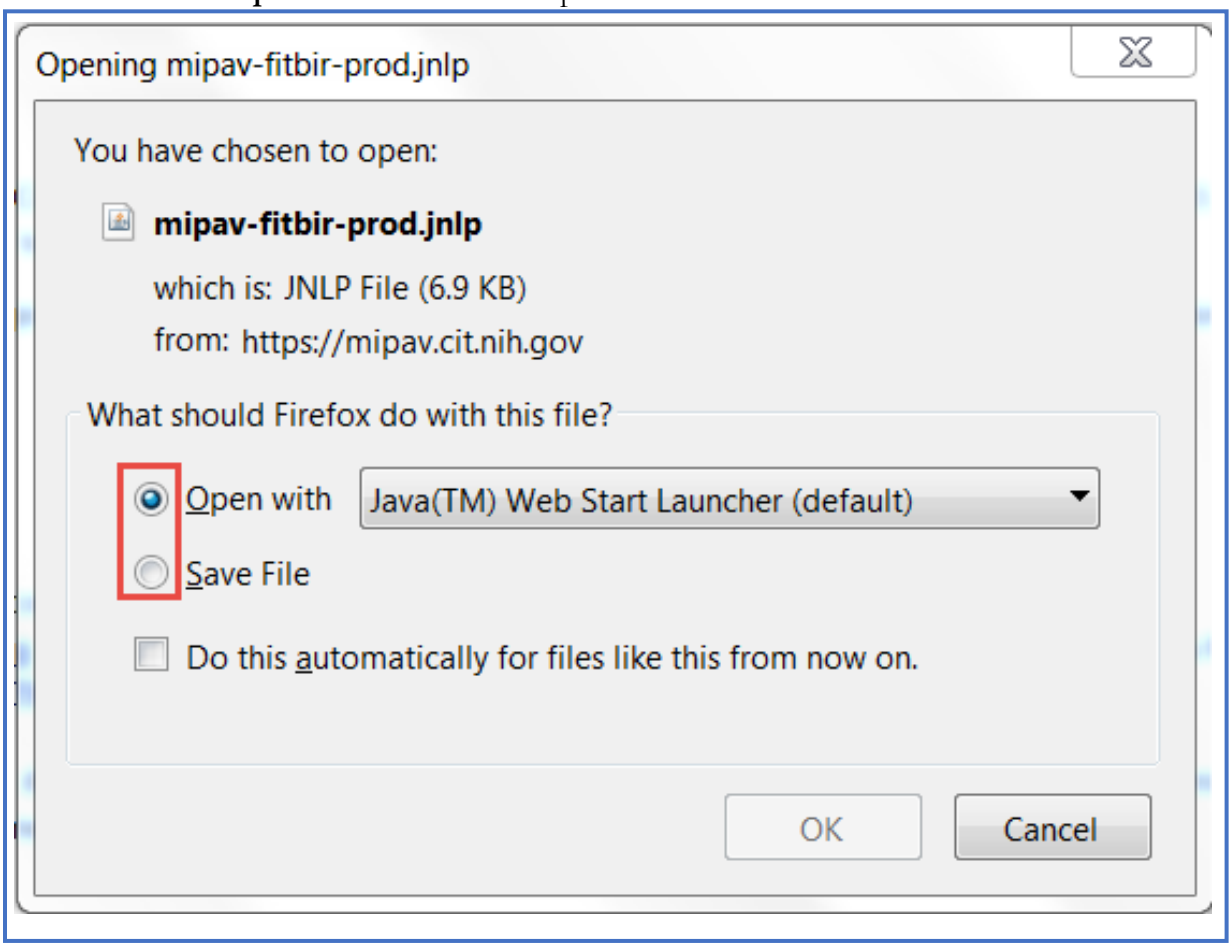
5. The **MIPAV Imaging Tool** page appears.



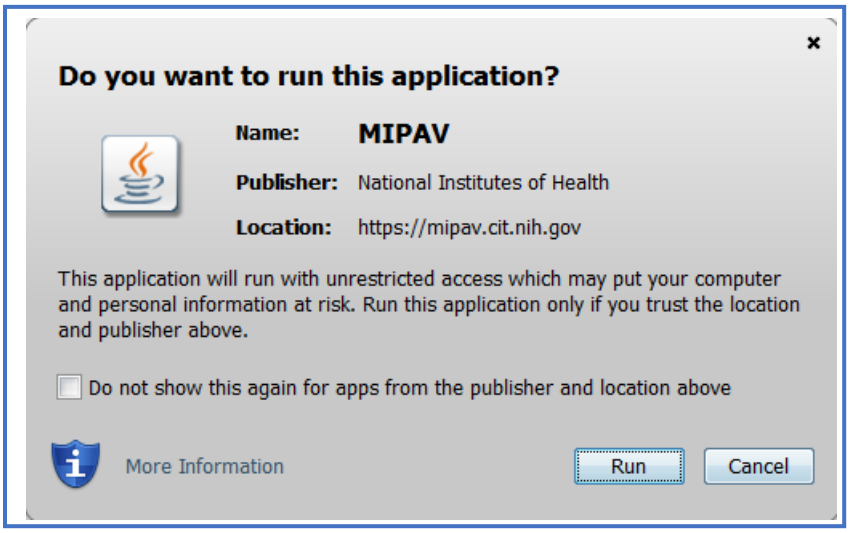
6. Click the **Launch MIPAV Tool** button. The Java Web Start Launcher opens



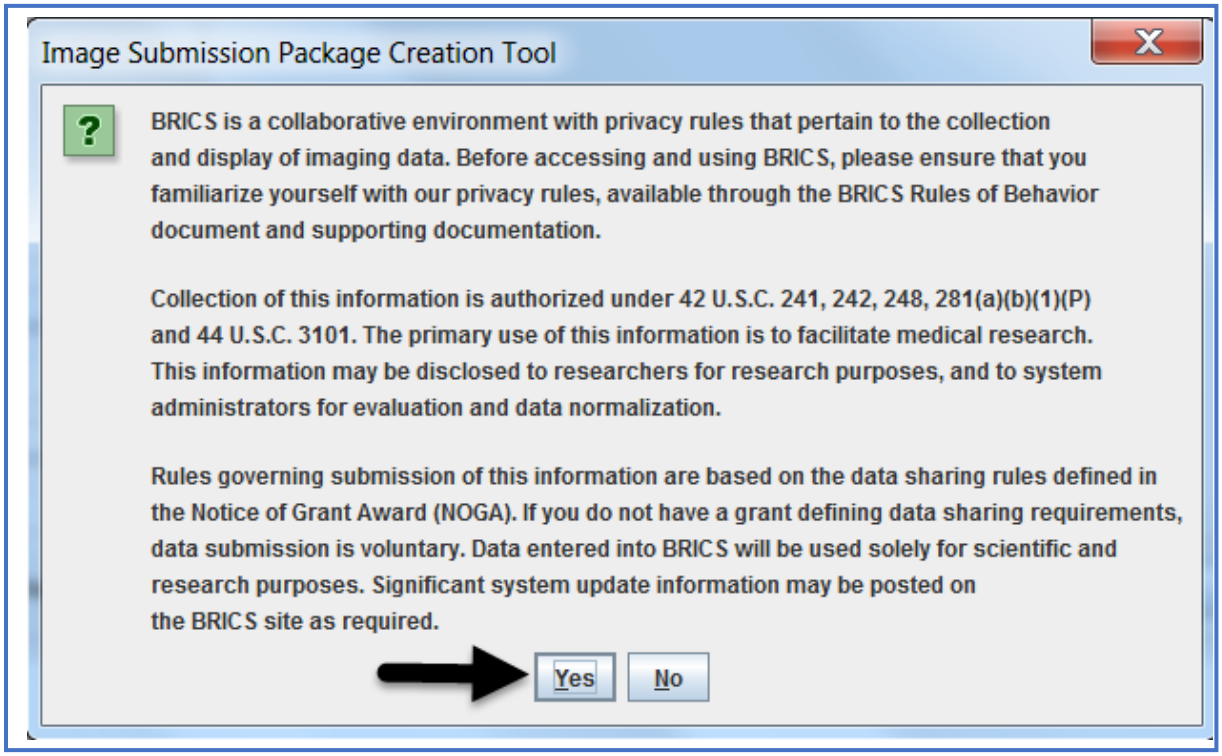
7. Select the **Open with** or **Save File** option to launch the MIPAV tool.



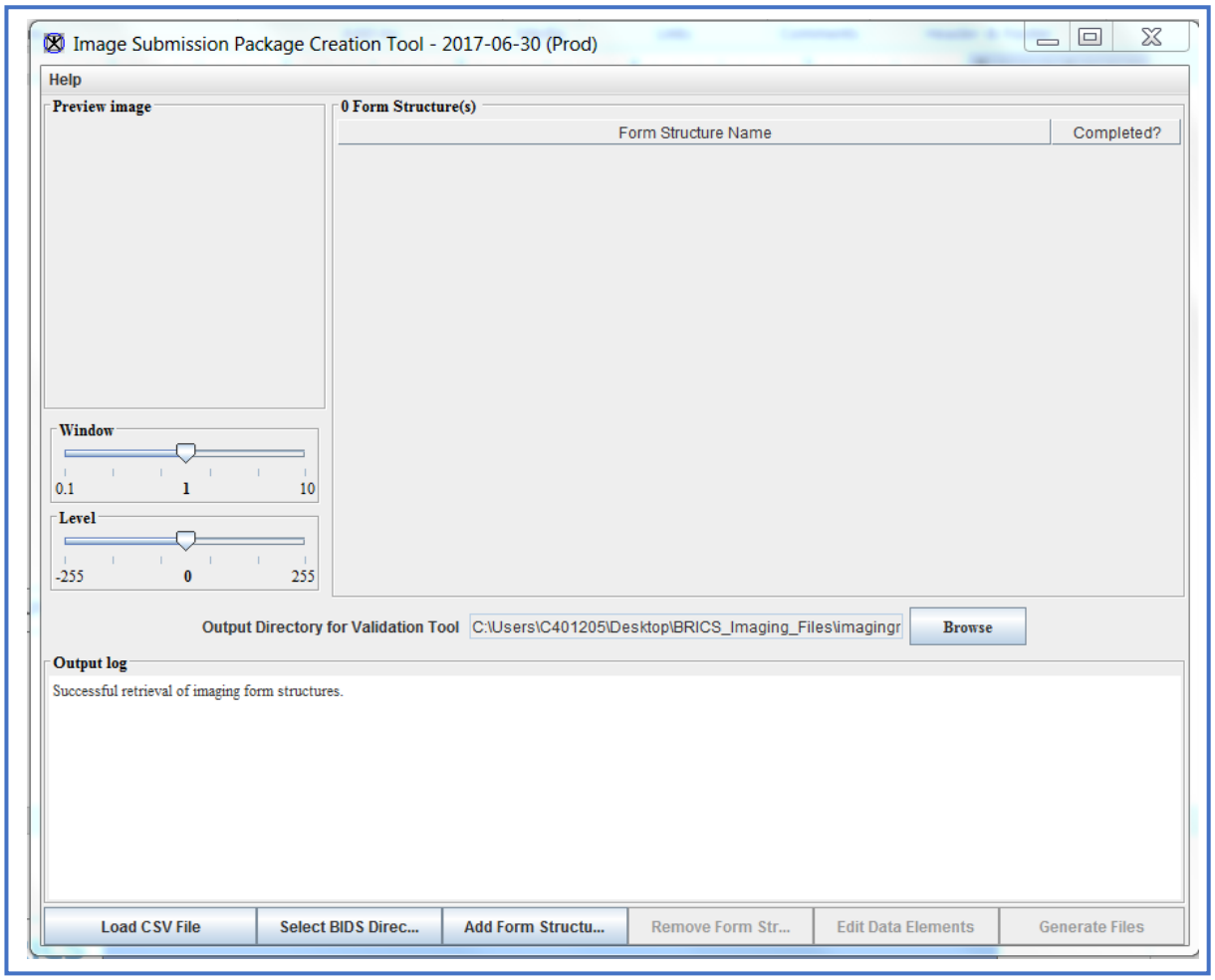
8. Click the **Run** button to run the MIPAV application on your computer.



9. To continue, you **MUST** read and accept the warning banner by Clicking on the **Yes** button to run and retrieve imaging structures from BRICS Data Dictionary. Click the **No** button to exit the application.

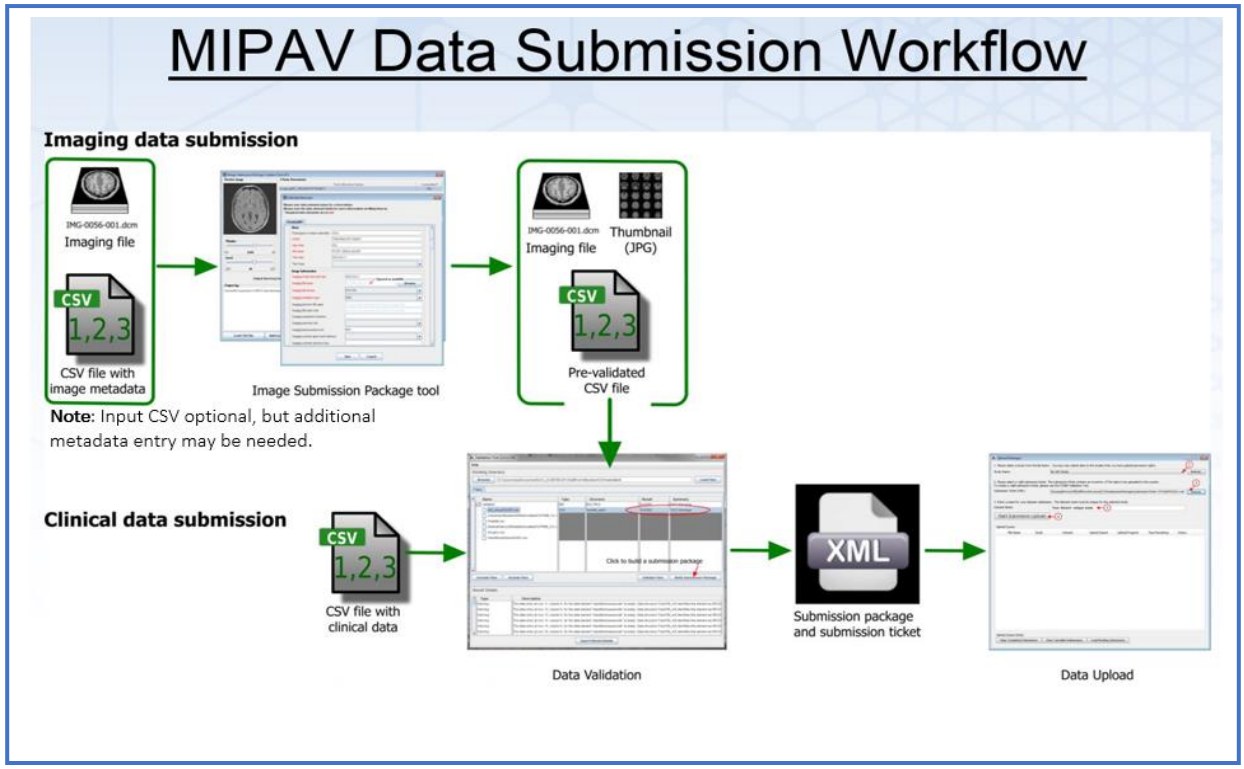


10. The **Image Submission Package Creation Tool** opens.



9.3 Using The MIPAV Image Submission Package Creation Tool

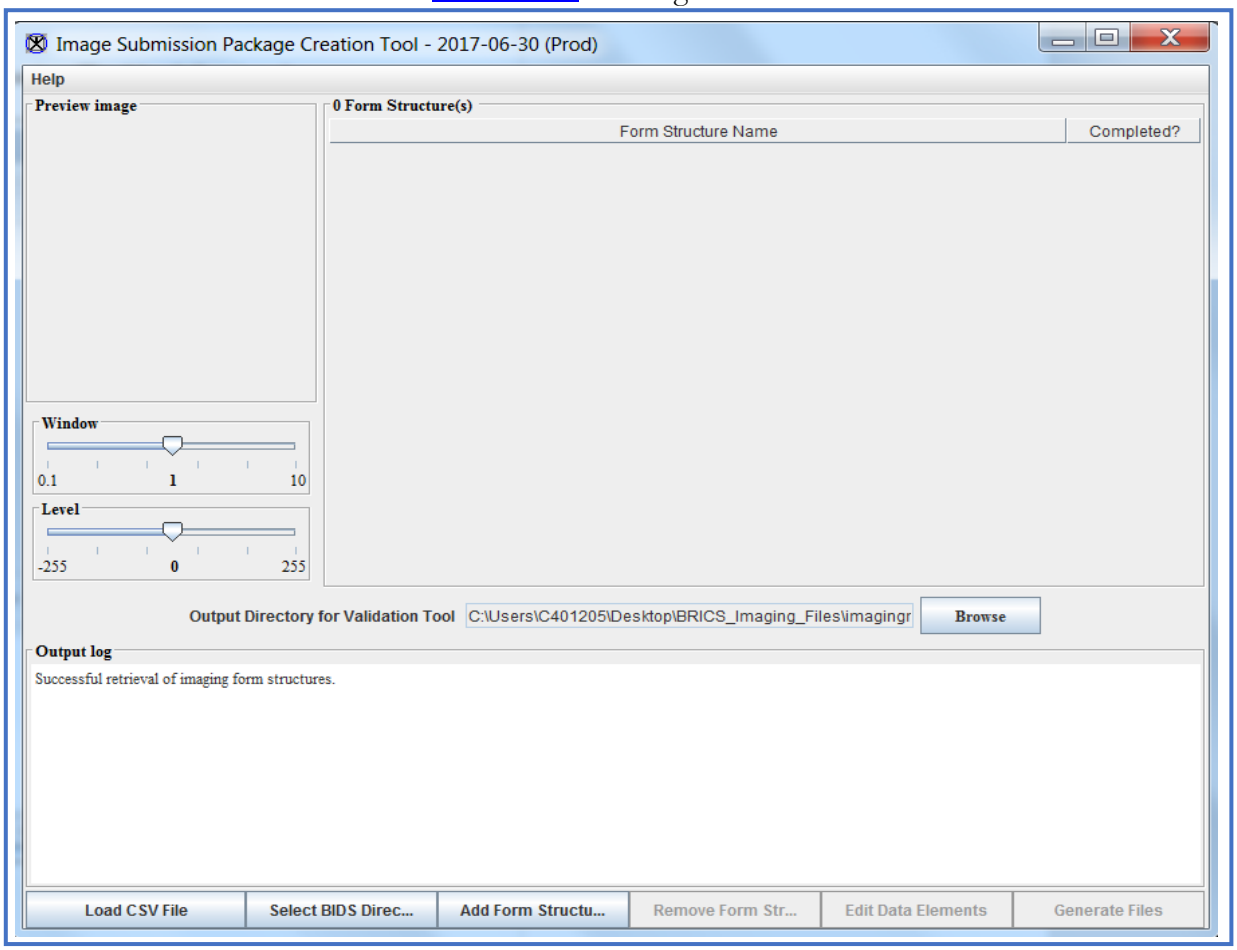
MIPAV Data Submission Workflow:



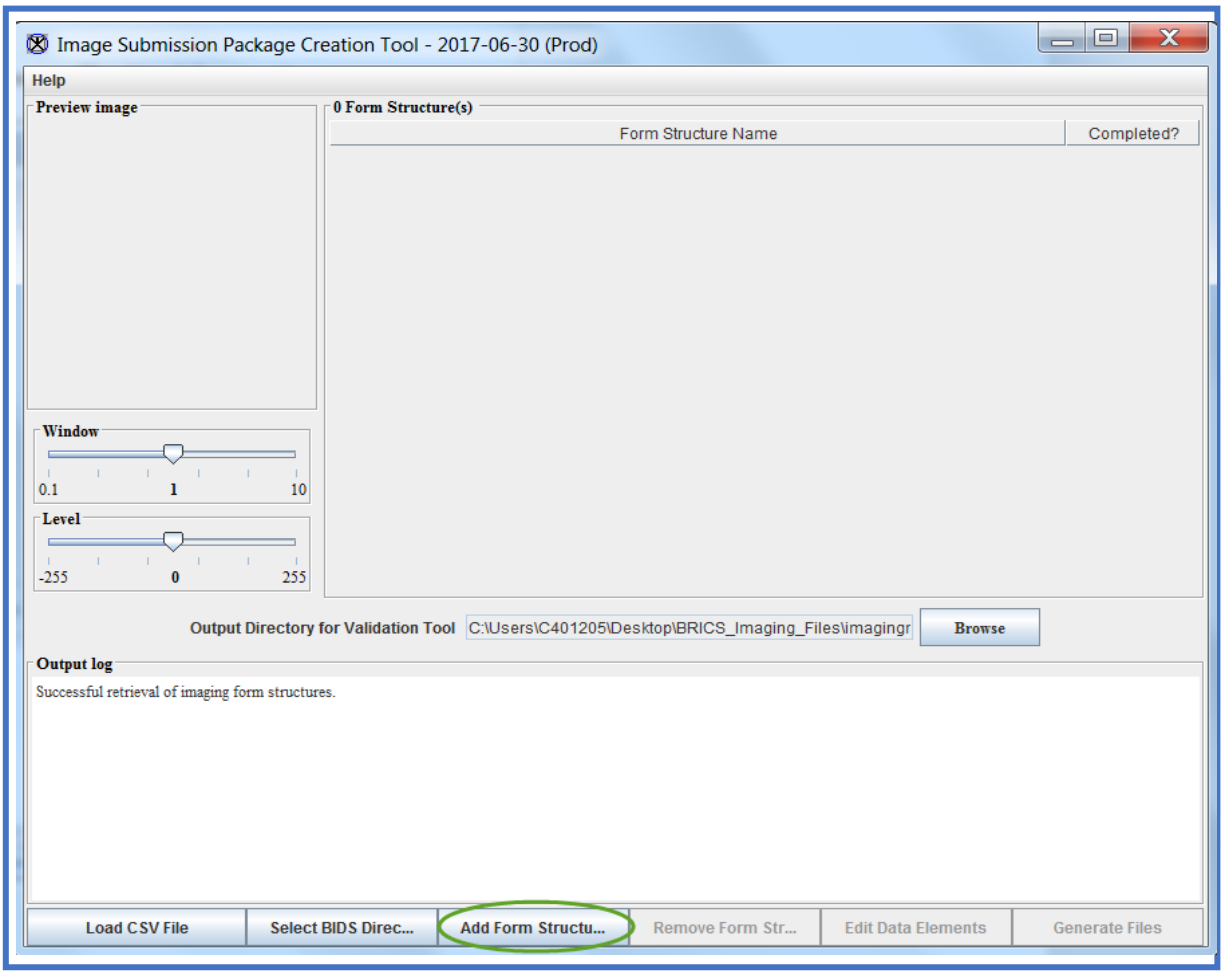
Manual Loading Process

Perform the following actions:

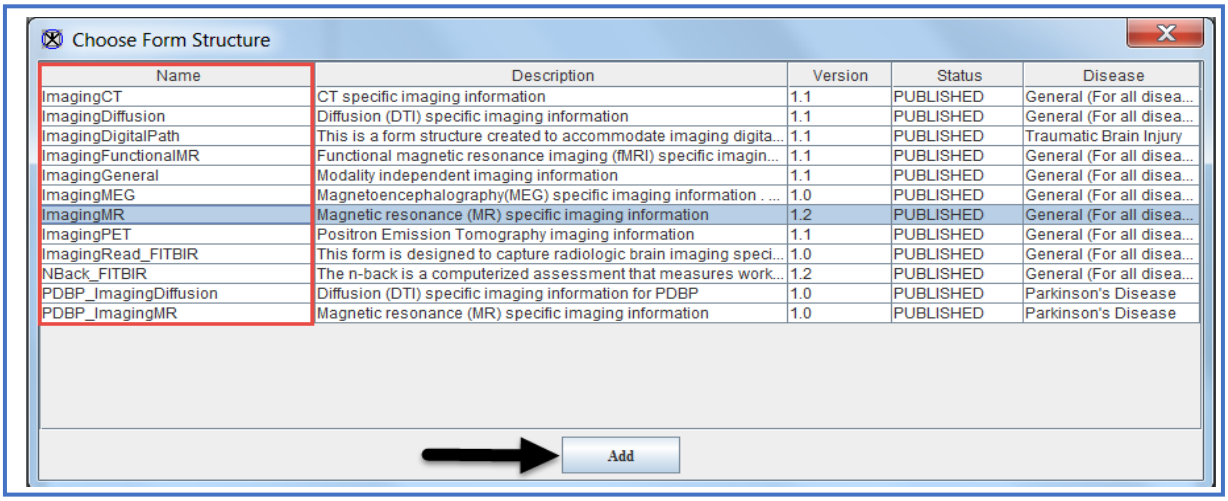
1. Launch the **MIPAV Image Submission Package Creation Tool** by following the instructions as outlined in Section 9.2 of this guide.



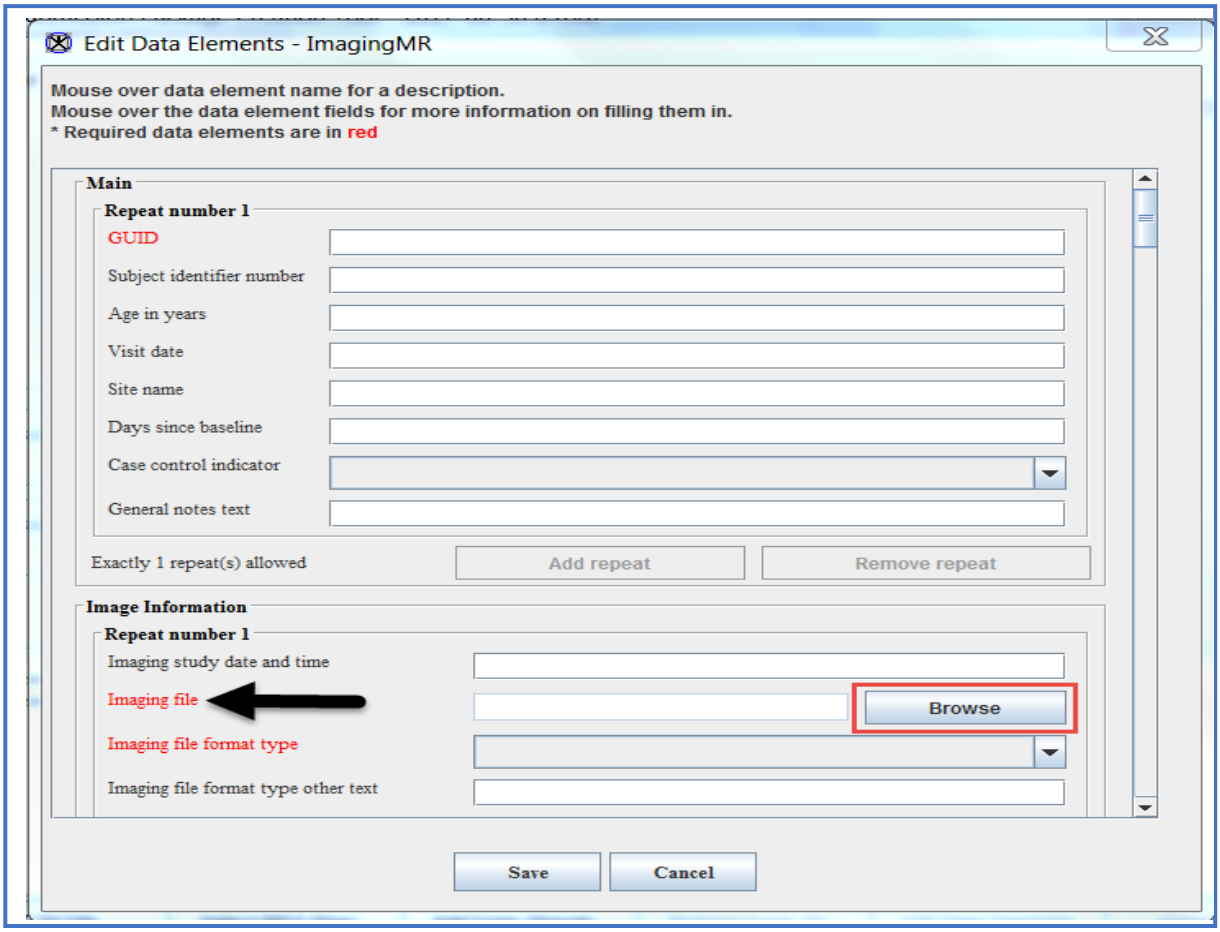
2. In the main window, Click the **Add Form Structure** button to choose a published Imaging Form Structure from the BRICS Data Dictionary.



3. The **Choose Form Structure** dialog box appears, listing the form structures available from the BRICS data dictionary. Select the Form Structure that is appropriate for the image volume you want to load next, and Click the **Add** button.

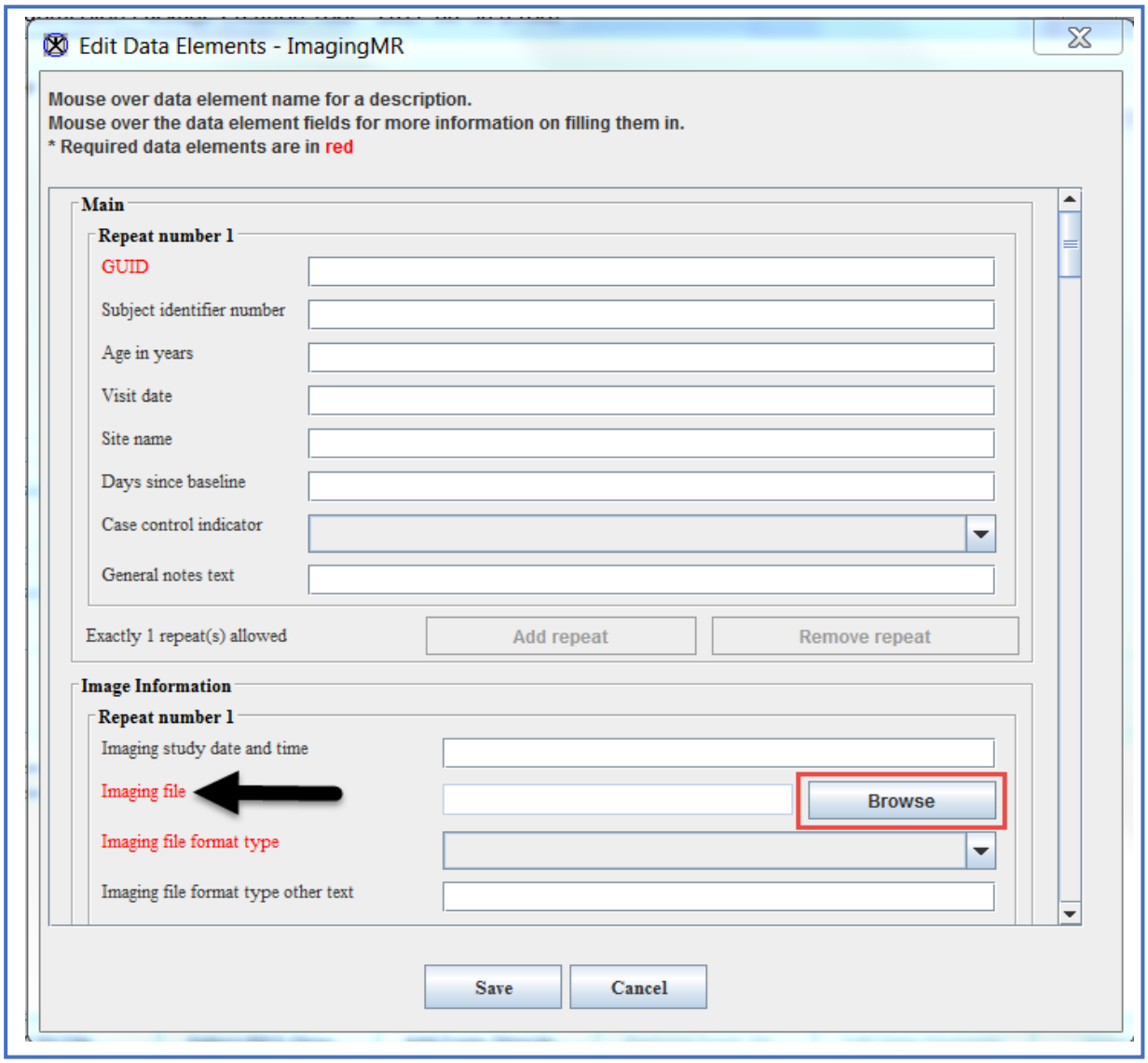


4. The **Edit Data Elements** window appears populated with i) the data elements from the selected form structure and ii) with metadata from the CSV file. Review the information in the Edit Data Elements window. Make sure that all required fields are filled in.

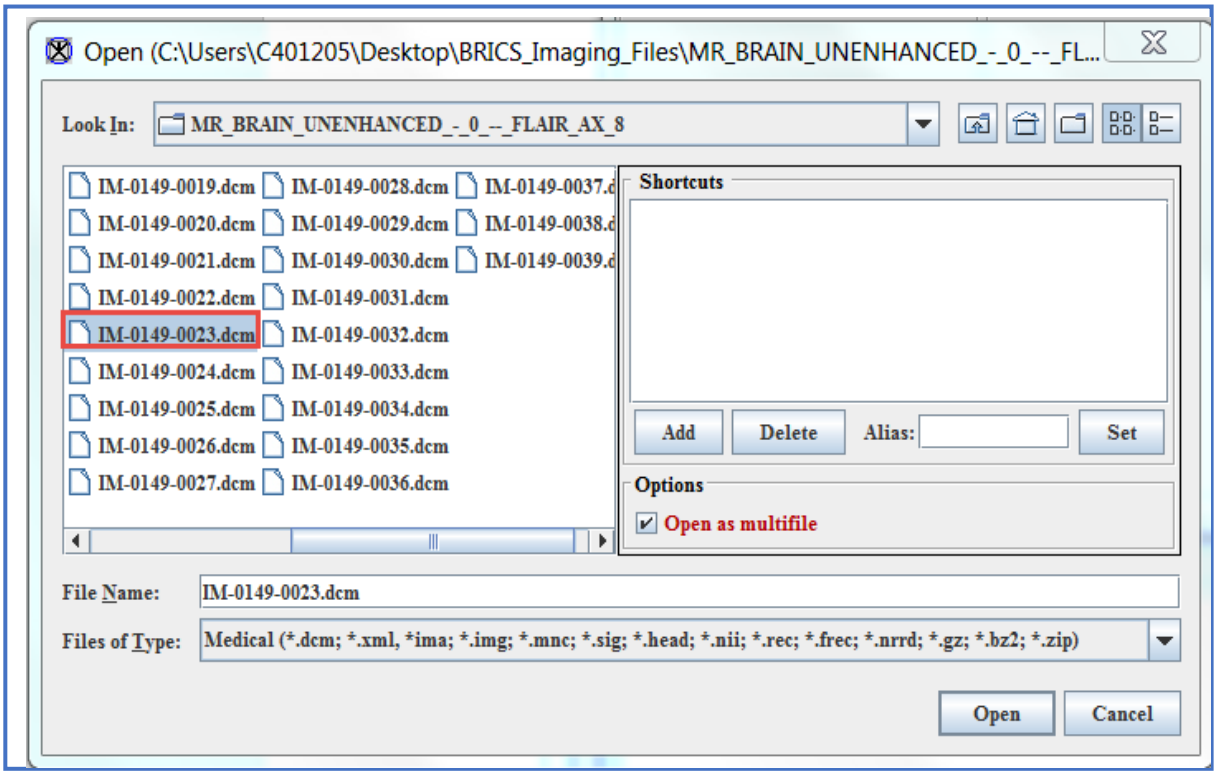


5. To load the image data into the Image Submission Package Creation Tool, navigate to the **Imaging File** field and use the **Browse** button to open the Open File dialog box and select the file.

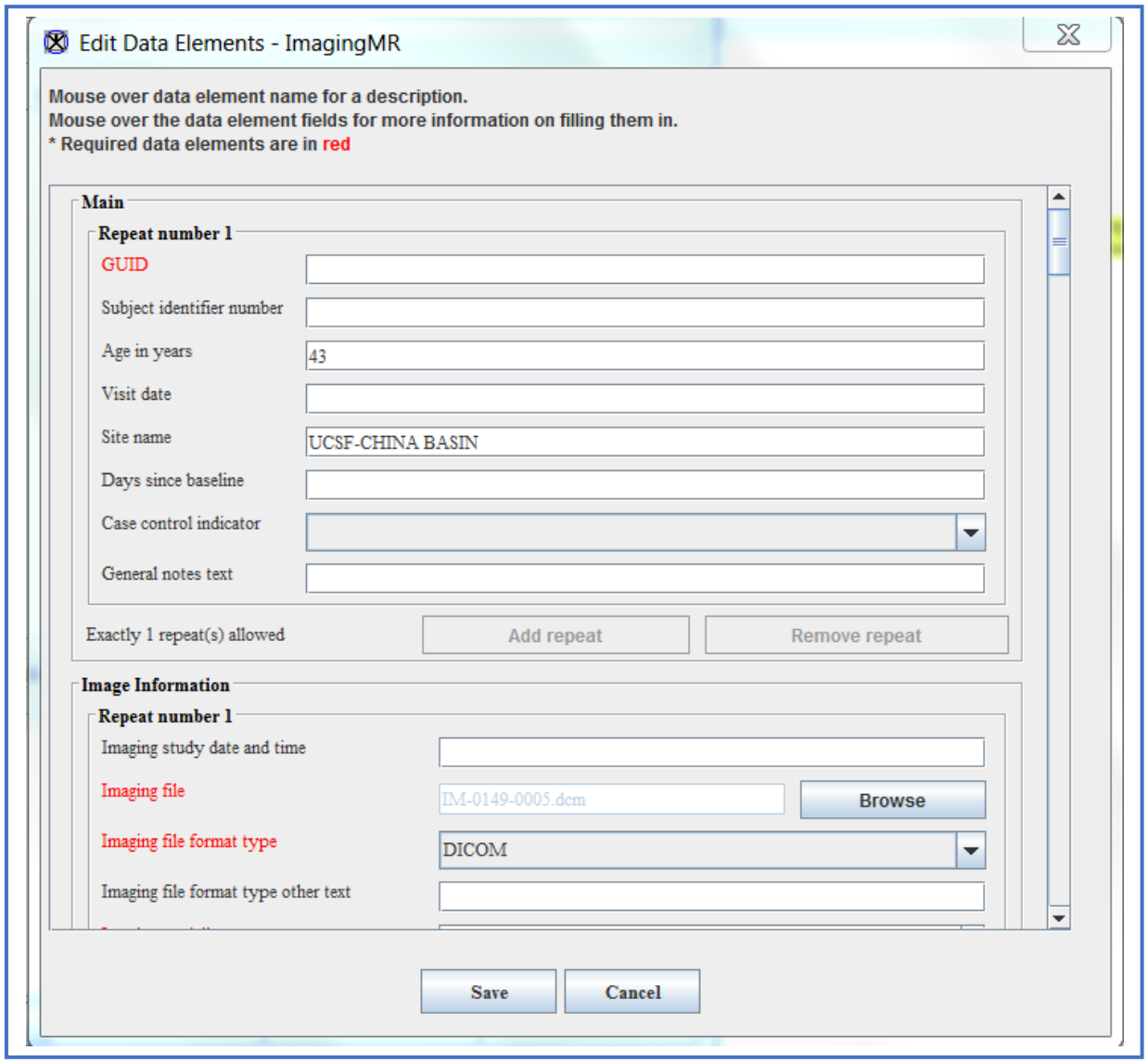
   The **Edit Data Elements** window appears populated with the data elements from the selected form structure. Review this information. The required fields appear in **RED**. You can place your mouse over the Data Element names on the left and the Data Element fields on the right to see more information about each Data Element and any guidelines for its entry.



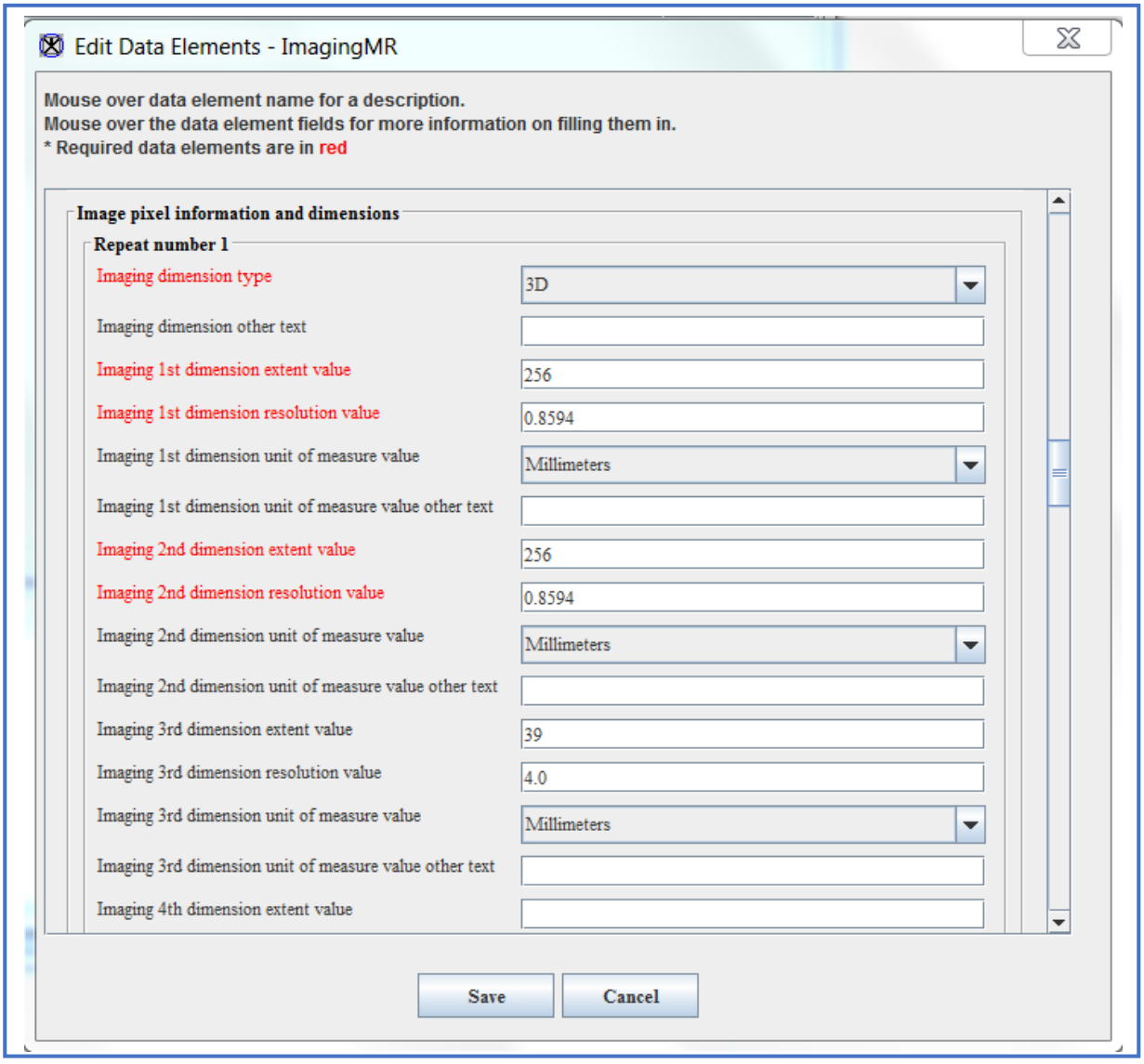
6. In the dialog that appears, browse to the location of the image acquisition you want to load into the Imaging Tool. If your image dataset is contained within a single file (for example, it is in single file NIfTI format, a single file DICOM, or a .zip/.tar.gz file containing all the image files comprising your image series), select the file and press the Open button. If your data is stored in multiple files on disk (for example, it is in one slice per file DICOM format and has not been put in a .zip file), select any one file from the DICOM dataset, check the "Open as multifile" button on the dialog, and then press the Open button. Checking the "Open as multifile" button will instruct the Imaging Tool to search the parent directory of the file you selected for other DICOM files that are part of the same DICOM series. Once the Imaging Tool finds all these files, it will load them all together as one 3D or 4D image volume, as appropriate.



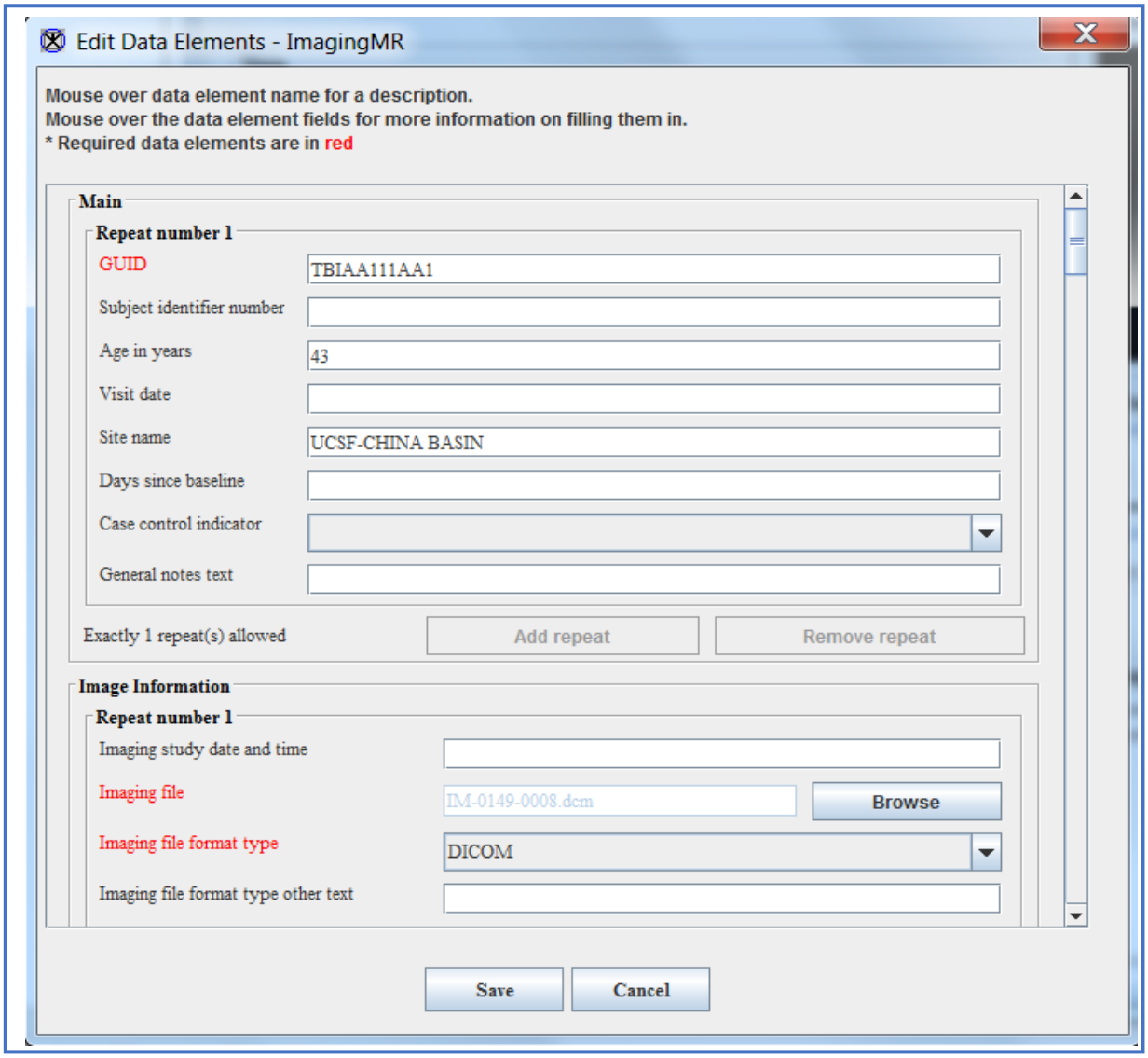
7. After you have selected an image dataset, it will be loaded into the Imaging Tool, and the Imaging Tool will attempt to map any pertinent image header metadata from the files onto the Data Elements in the current Form Structure. The quantity and quality of the extracted image header metadata will vary depending on the image file format (with DICOM generally providing the most information), scanner manufacturer, and any post-acquisition processing that was performed. Review the extracted Data Element values, and then manually enter values for required Data Elements and any missing image information that is important for fully describing your data to other researchers.



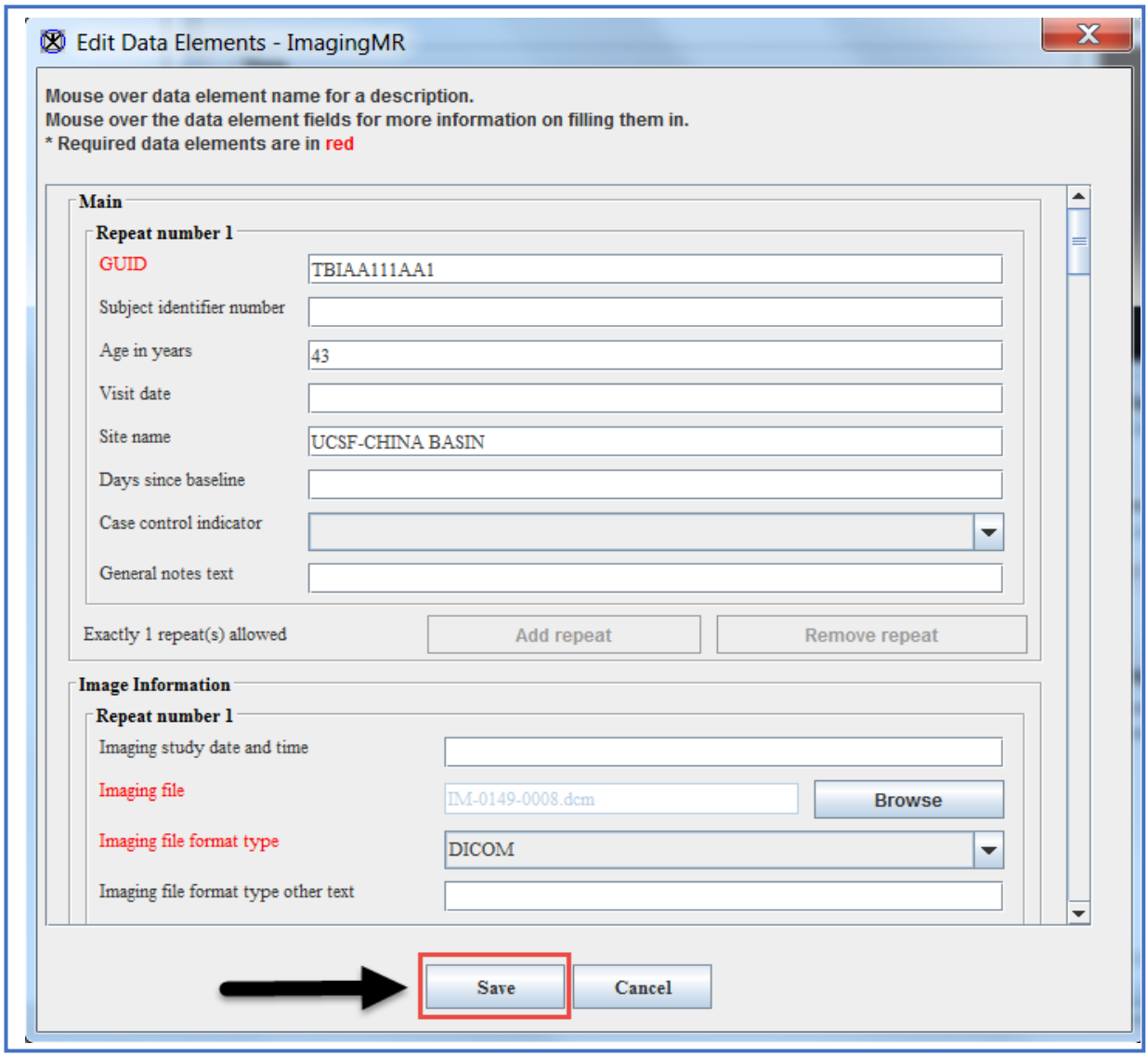
8. The required fields appear in red. If some of required fields are empty, the image submission package will fail validation.



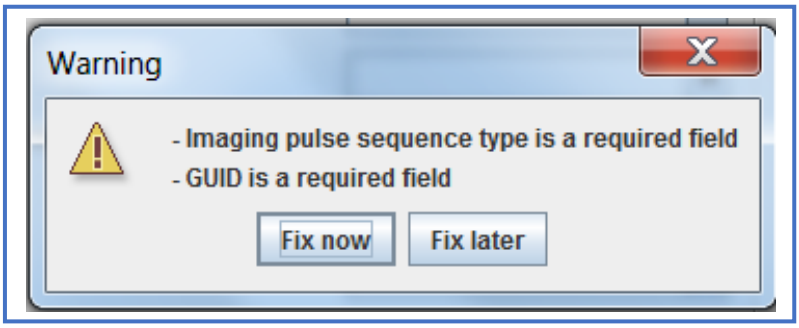
9. Review the information entered in the previous step. Make sure that all required fields (appear in red) are filled in. If some of required fields are empty, the form structure status will appear as not completed and you will not be able to generate an image submission package for later validation.



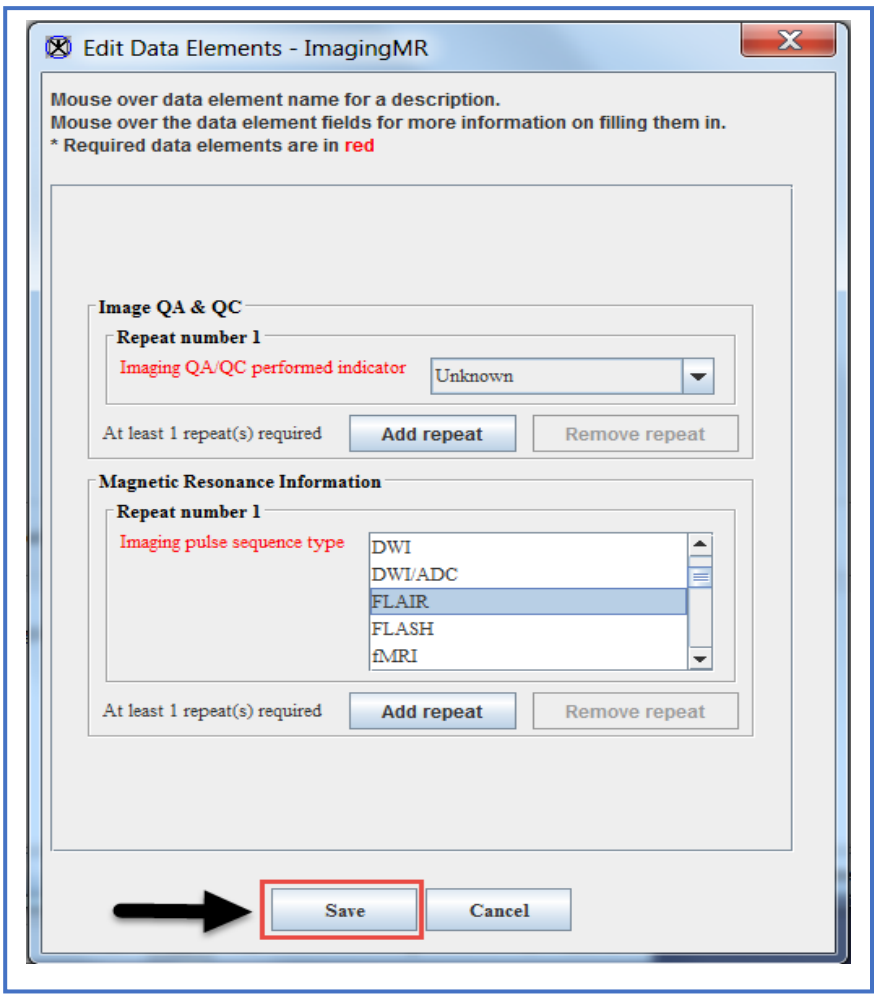
10. After all the Data Element values necessary to fully describe your imaging data for use by other researchers (not only the set of required fields) have been filled in, either via image header data extraction or manual entry, click the **Save** button. **Note** that depending on the form structure, the required data elements may vary.



11. If any required fields were not completed, you will be prompted to decide whether to fix them now, or defer them.

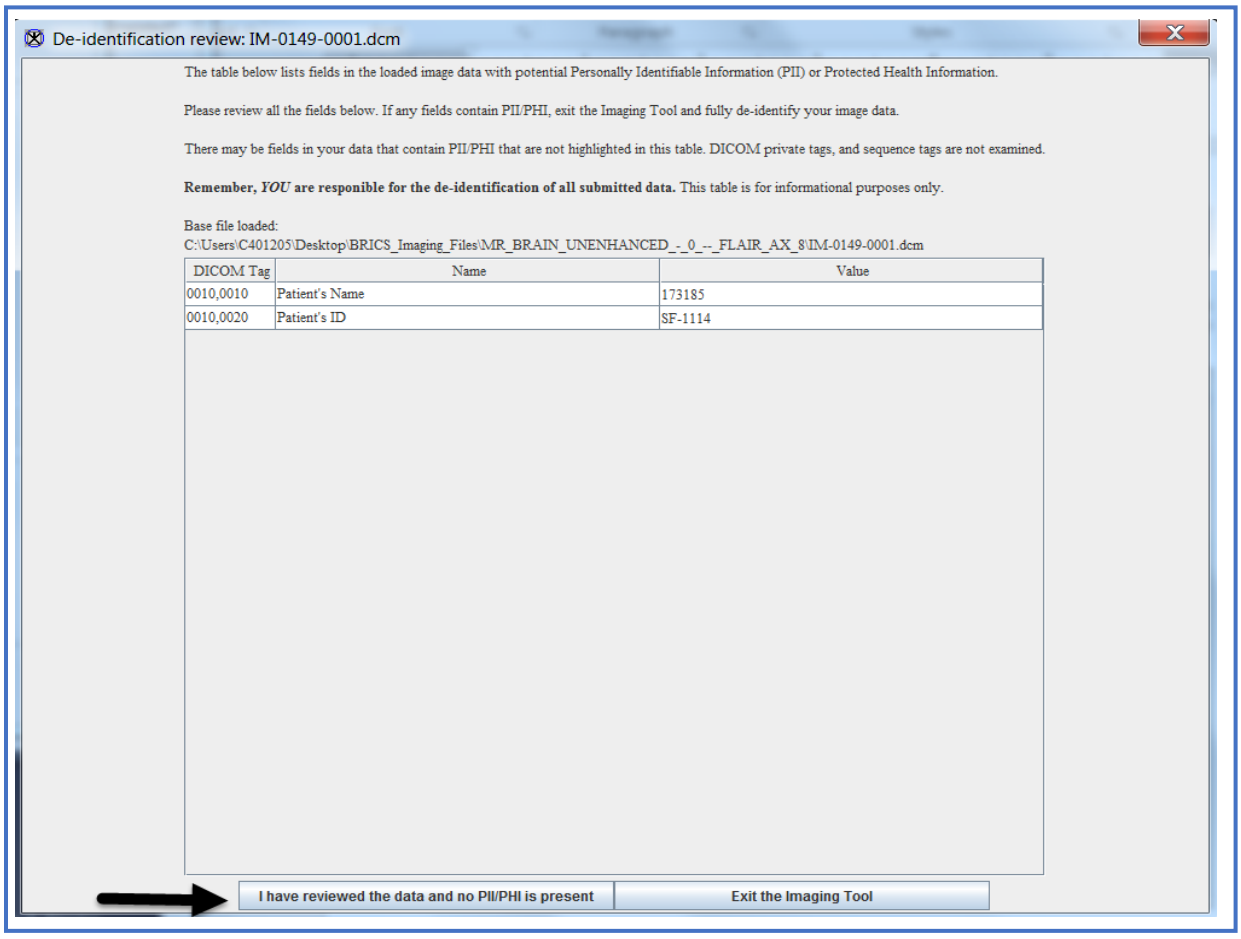


12. Choosing to "**Fix now**" will bring up a dialog only showing the incomplete required Data Elements. Enter the missing image information until all the required fields are complete. Click **Save** button.

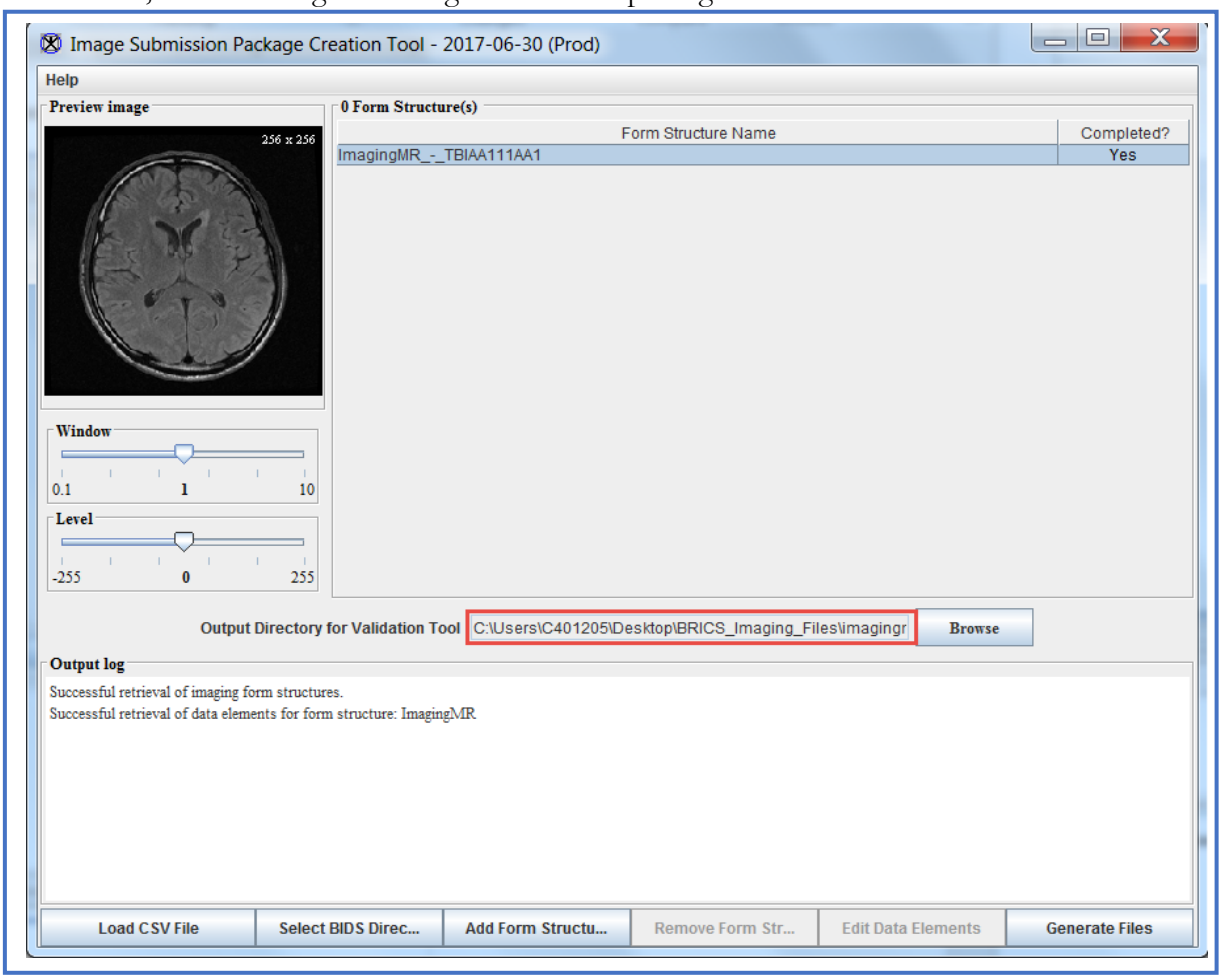


13. If your image data files contain any header tags that may contain personally identifiable information, a new dialog will appear, showing you the potentially problematic fields and their values. In the **De-Identification Review** dialog window, review all the fields that

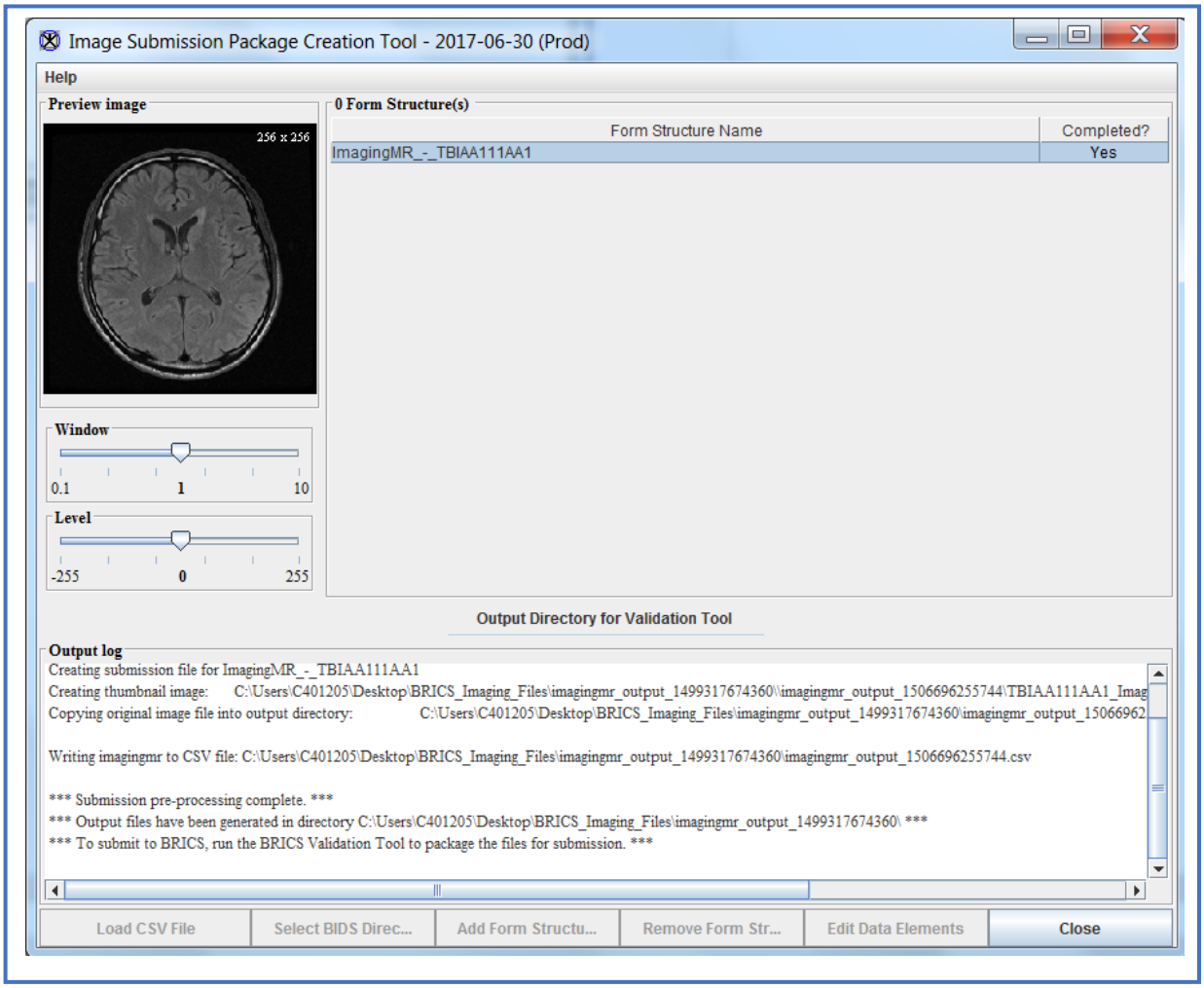
may contain PII/PHI. Click on the "**I have reviewed the data and no PII/PHI is present**" to continue OR Click the "**Exit the Imaging Tool**" button to leave the tool and perform additional de-identification on your image data.



14. Specify the **Output Directory** which would be used by the module to store temporary files, validation logs and image submission packages.



15. Click the **Generate Files** button. This will generate the image submission package. The output log message appears in the Output log window showing the progress, the image submission package file name(s) and location, and other helpful information. Finally, the image submission package appears in the **Output directory**.

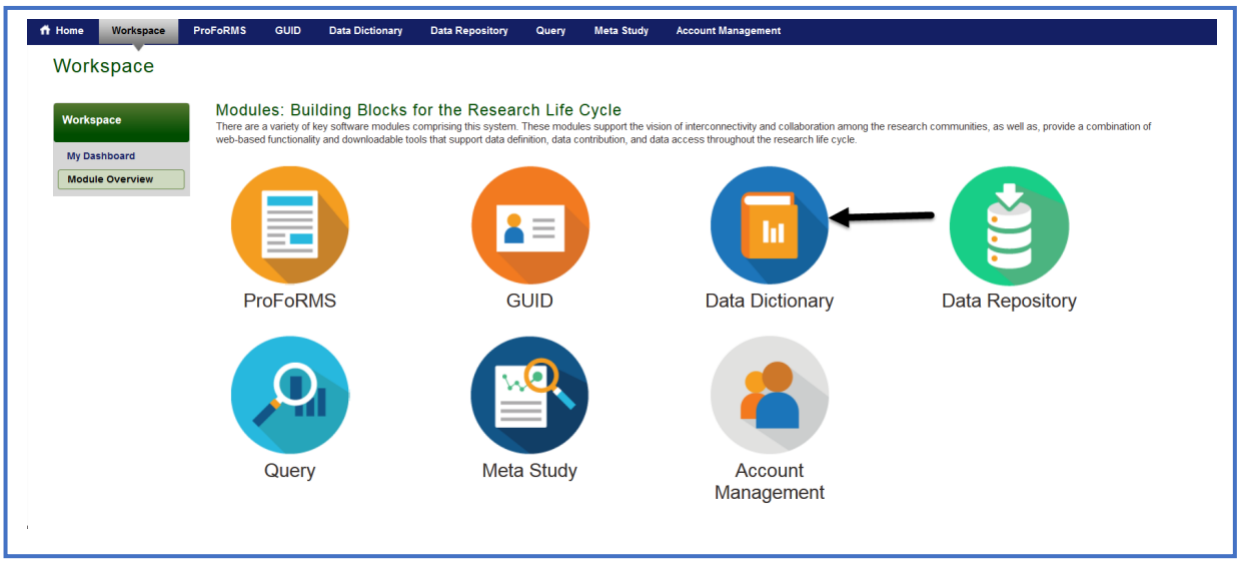


9.3.1 Creating a CSV Template

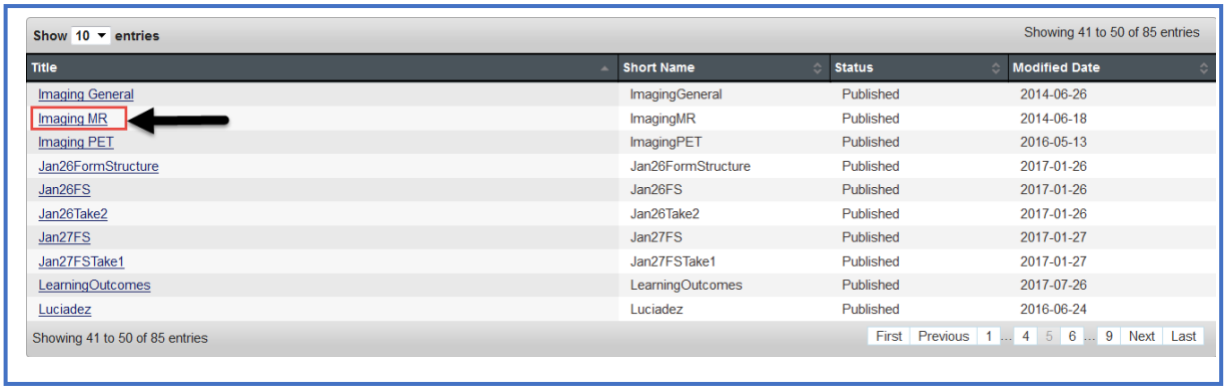
To create a CSV template: Perform the following actions:

1. Navigate to your Workspace

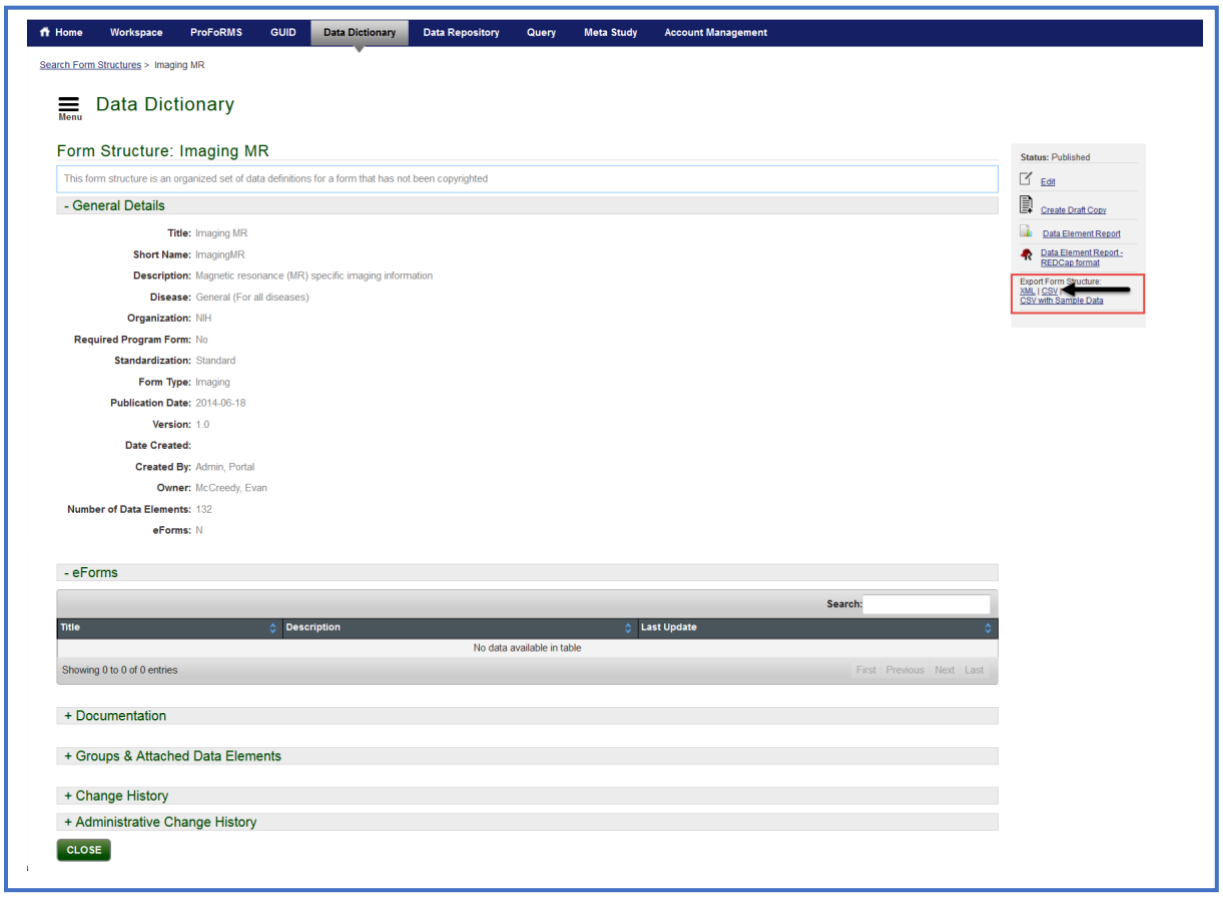
2. Click the **Data Dictionary** module from your Workspace



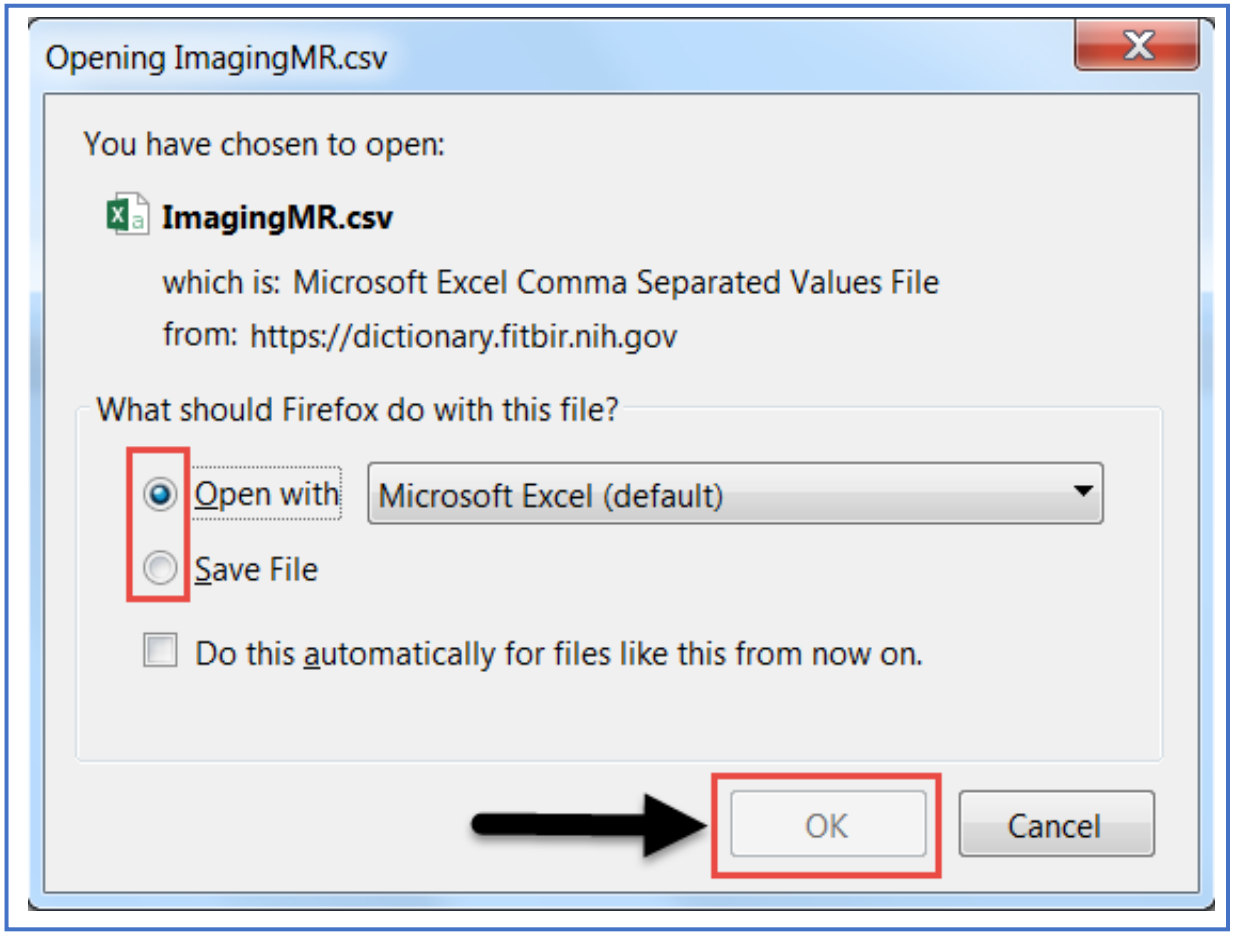
3. Select your **Form Structure** from the list of form structures.



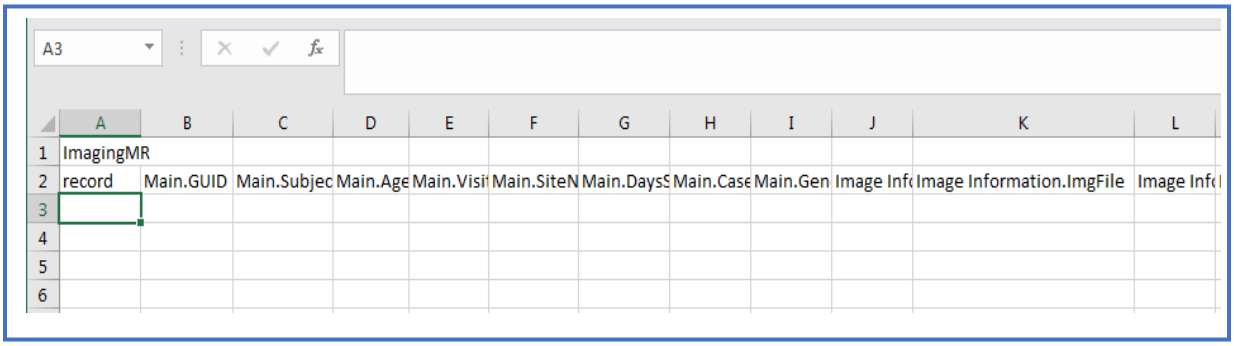
4. Click the **Export Form Structure** and choose CSV to export or Select CSV with sample data to export.



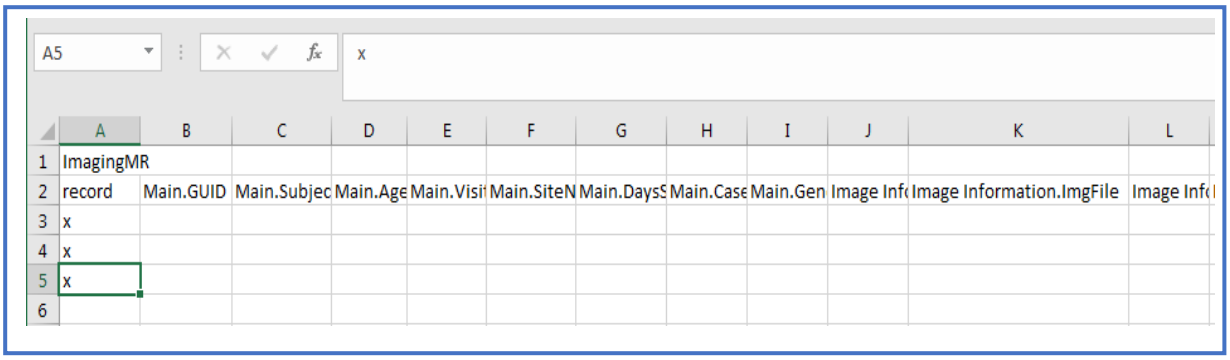
5. Select the radio button **Open with Microsoft Excel (default)** to open the CSV template Click the **Ok** button.



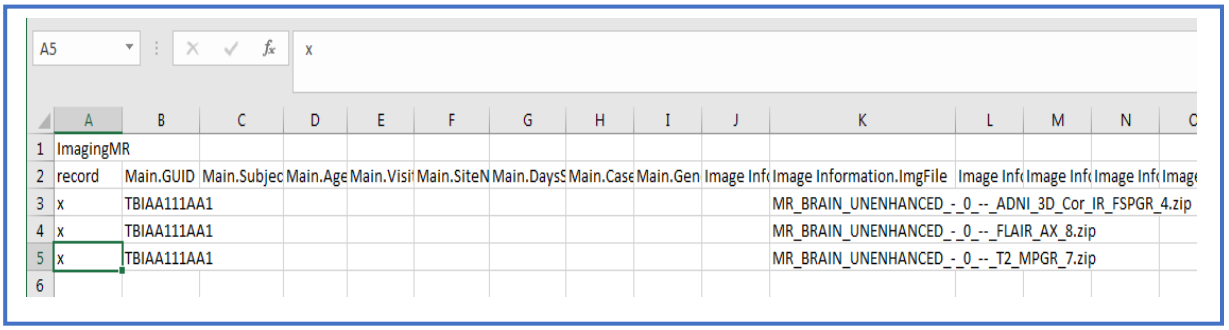
6. The CSV template will contain the name of the Form Structure and a listing of Data Elements organized by their Repeatable Group.



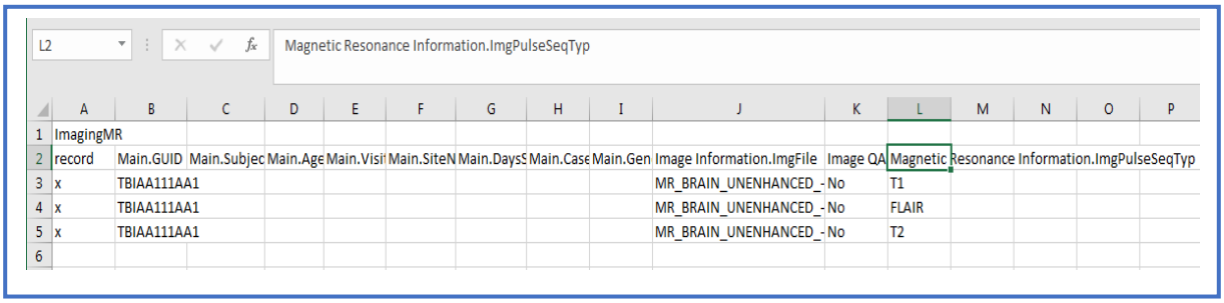
7. For each imaging record, place an '**x**' in the "**record**" column.



8. Provide important Data Element values for each imaging record. Pay special attention to the "**Imaging Information.ImgFile**" column, where you can specify the image data file to load for each imaging record. This imaging file can be a single file medical image file format (such as a .nii NIfTI file), a .zip or .tar.gz file containing a multi-file medical image acquisition (such as a multi-file DICOM image volume/series), or the path to a directory containing only the files constituting a multi-file medical image acquisition. When your input CSV is read by the MIPAV Image Submission Package Creation Tool, the file or files indicated in each row of this Data Element will be read in, and metadata in the image header will be mapped onto the other Data Elements for this image record.



9. Fill in the values for any other Data Elements that are necessary to fully describe your data. Any Data Elements whose values will be provided via the image header data mapping do not need to be specified in the input CSV. Aside from the "record" column, the CSV columns may be reordered, or removed if they are empty.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	ImagingMR															
2	record	Main.GUID	Main.Subjec	Main.Age	Main.Visi	Main.SiteN	Main.DaysS	Main.Case	Main.Gen	Image Information.ImgFile	Image QA	Magnetic	Resonance Information.ImgPulseSeqTyp			
3	x	TBIAA111AA1								MR_BRAIN_UNENHANCED_-	No	T1				
4	x	TBIAA111AA1								MR_BRAIN_UNENHANCED_-	No	FLAIR				
5	x	TBIAA111AA1								MR_BRAIN_UNENHANCED_-	No	T2				
6																

10. Continue steps 7 through 9 again for any other image data you want to include in this input CSV. Each input CSV should contain a maximum of approximately 100 image records. If you encounter an out of memory error while loading an input CSV, please contact **MIPAV support** and/or BRICS Operations.
11. Save your input CSV for use later in the **MIPAV Image Submission Package Creation Tool.**

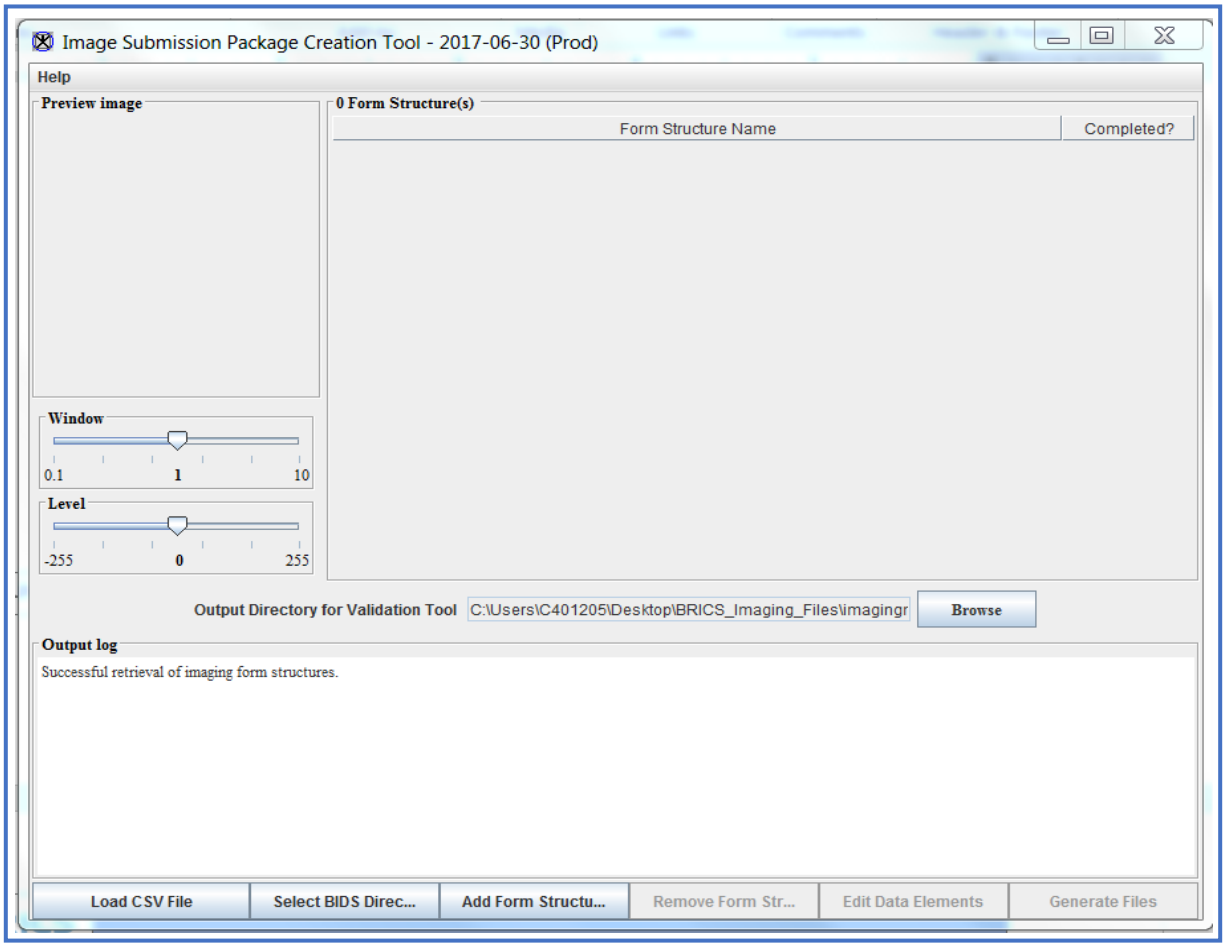
Multi Loading Process (Using CSV Files)

For instructions exporting the form structure as a CSV, please refer to Section 9.3.1 Creating a CSV Template of this manual.

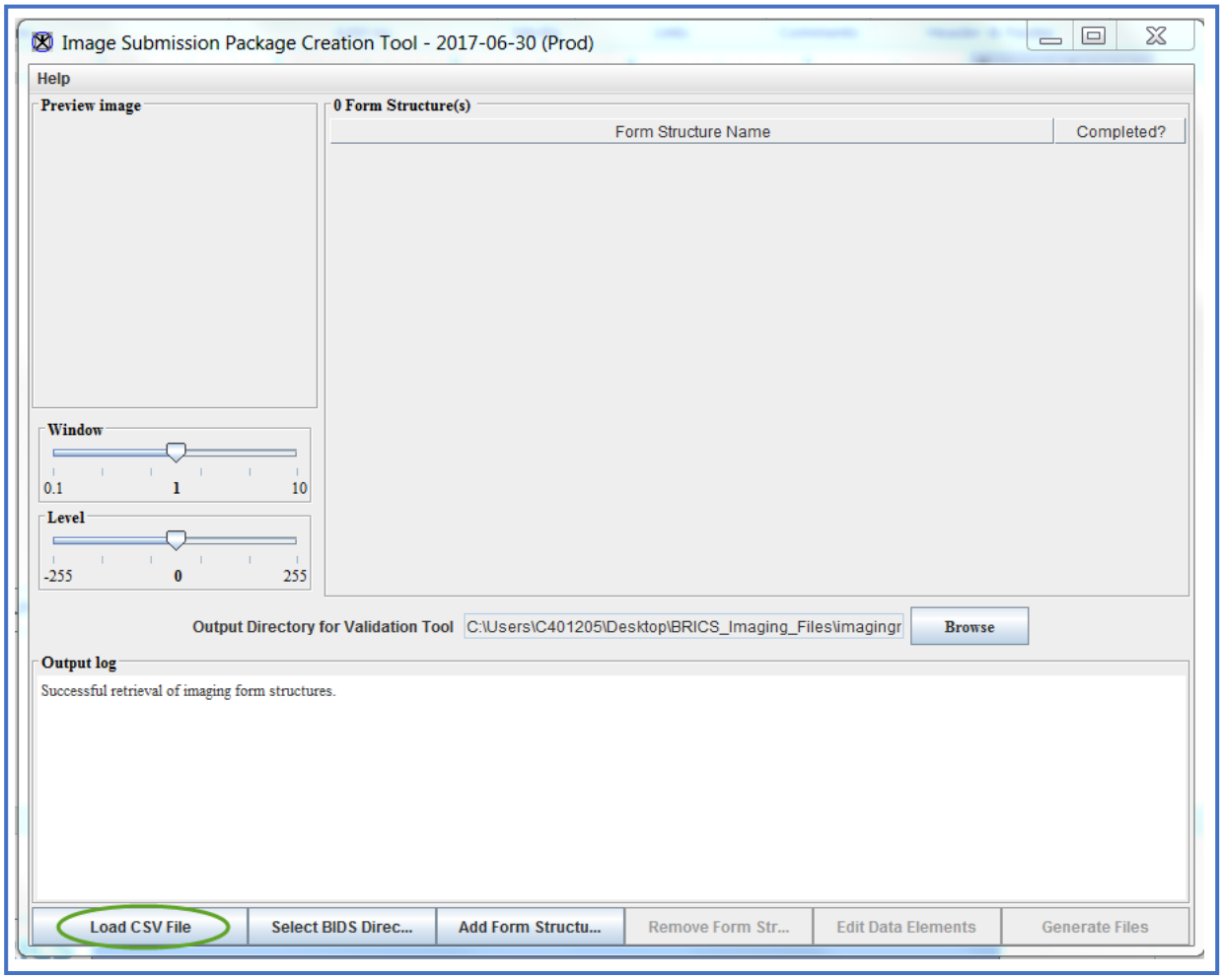
9.3.1 Creating a CSV Template

To create a CSV template: Perform the following actions:

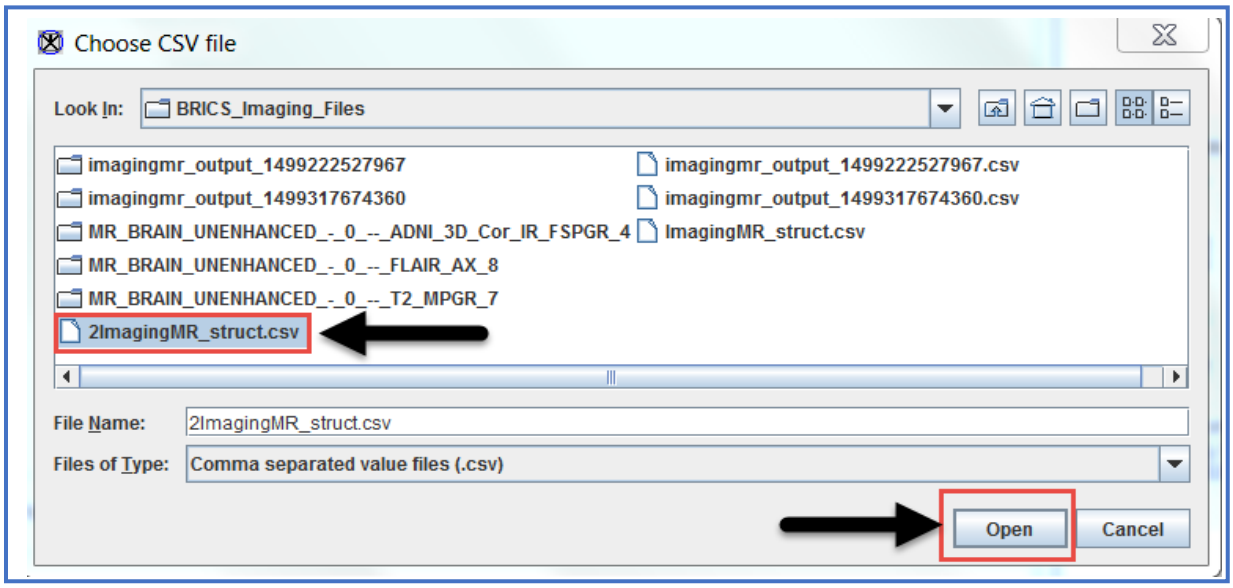
1. Launch the MIPAV Image Submission Package Creation Tool by following the instructions in Section 9.2 of this guide.



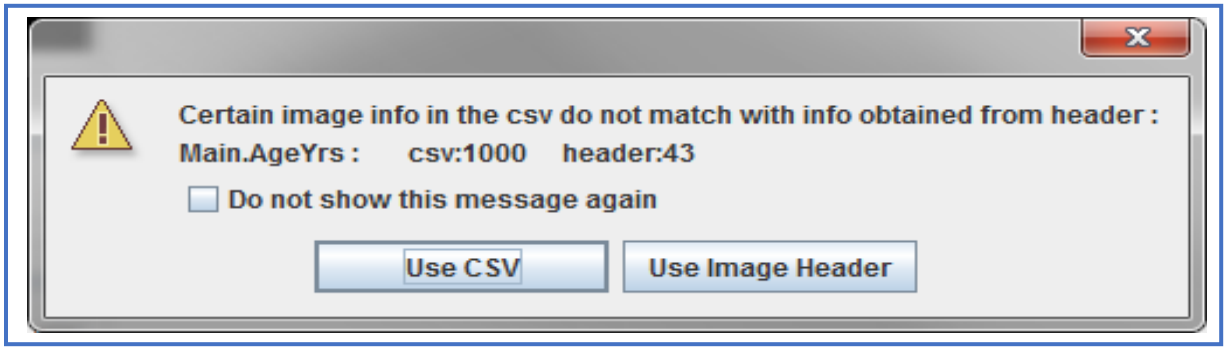
2. In the main window, use the **Load CSV File** button to add the image file(s) and metadata file(s) (in CSV format) needed to create the image submission package.



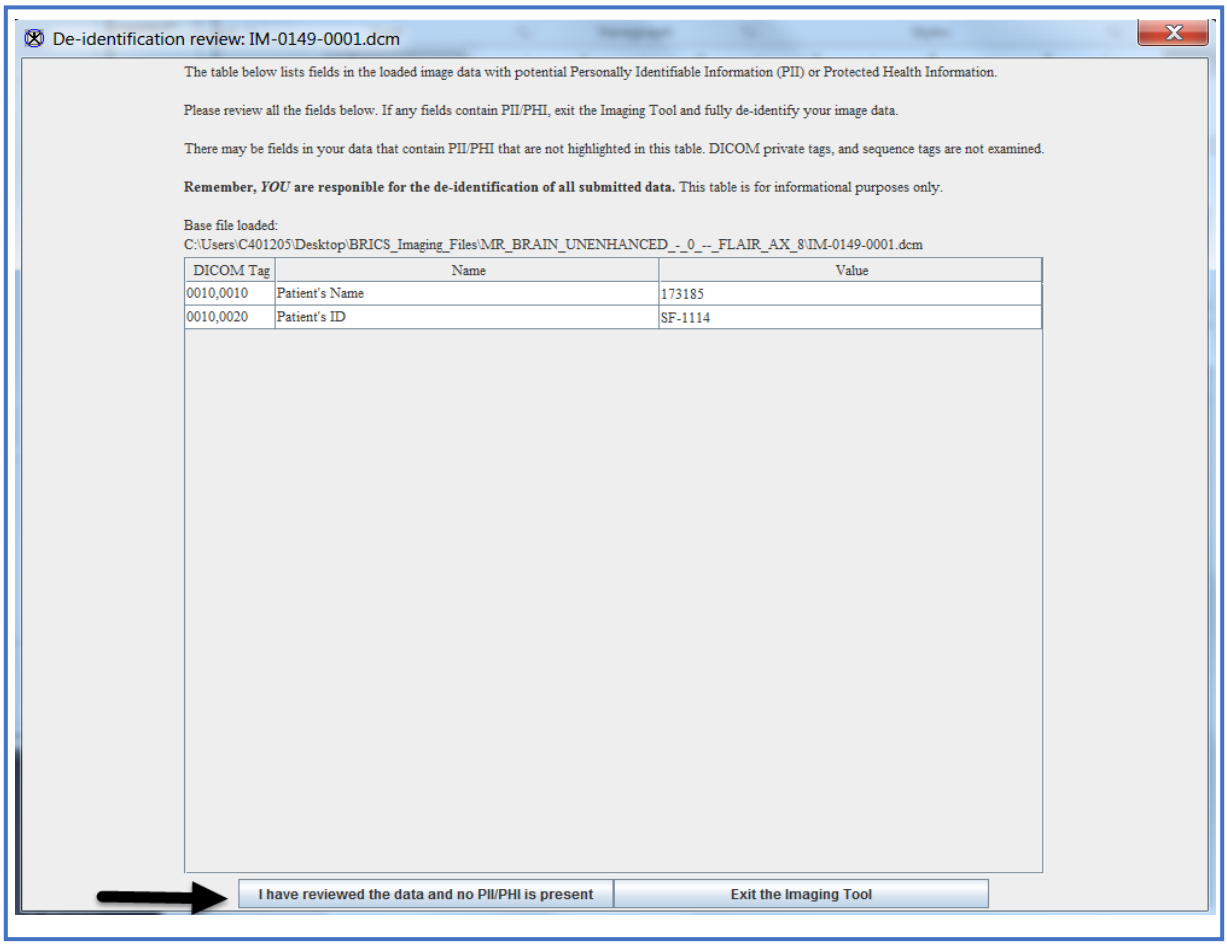
3. In the **Choose CSV file** window that appears, use the navigation buttons to navigate to the folder where you store your CSV files, select the CSV file for upload and Click **Open**.



4. **Note**: The Imaging Tool will read in your selected CSV, and load the imaging data referenced in each row of the CSV. Header data from each image dataset will be mapped onto the Data Elements of the form structure used by the input CSV, and will be merged with any Data Element values specified on that same row of the input CSV. If a conflict exists between the value specified in the input CSV and the value extracted from the image header, the user will be shown each value and prompted to select which of the two values should be used in the output CSV metadata.as shown below:



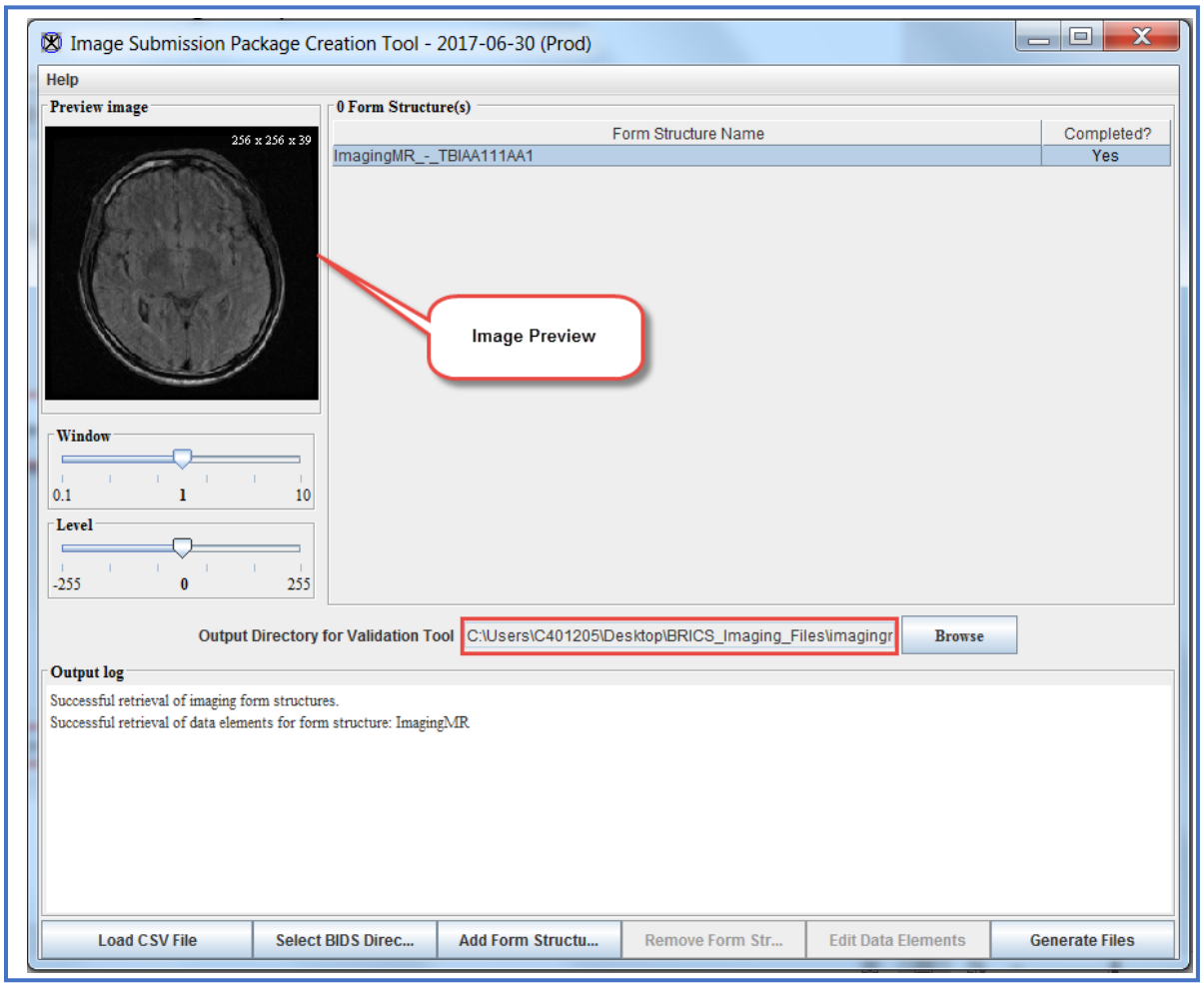
5. After all the rows in the input CSV have been processed, A **De-Identification Review** dialog window will appear for each image volume where values were discovered in potentially PII/PHI-related header locations. Review all the fields that may contain PII/PHI. Click on the "**I have reviewed the data and no PII/PHI is present**" to cotinue OR Click the Exit Imaging tool to discontinue the uploading process.



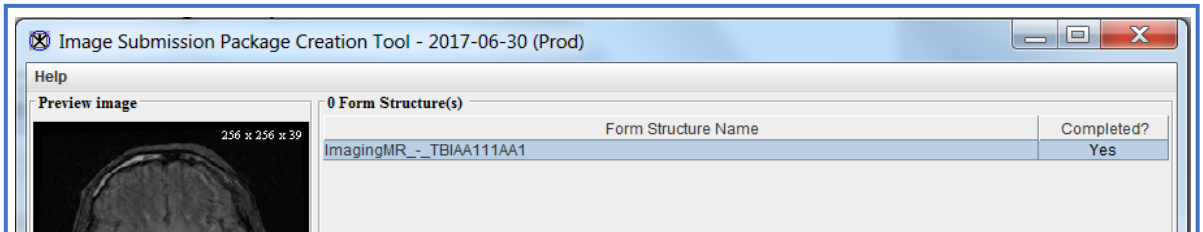
6. The **CSV file** appears in the main window in the **Form Structure Name** table. The corresponding image file appears in the Preview Image box.

If the image file did not appear in the **Preview Image box**, review the error message issued by the system. Chances are that the CSV file has a wrong image file name/location. Review the CSV file and fix the image file name.

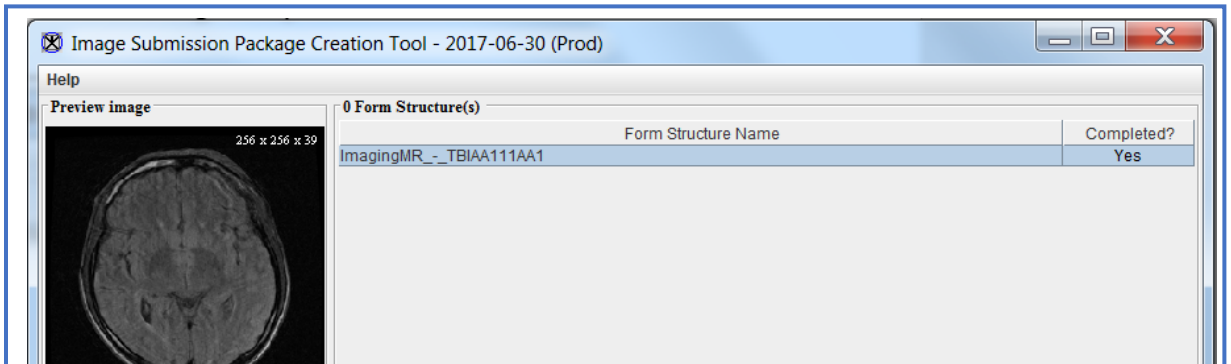
In some cases the CSV appears as not completed (Status Completed is set to No). This means that some essential information is missing and you need to add this information manually.



7. In the main module window, select the **Output Directory** which would be used by the Imaging Data Submission and Validation tool to store temporary files, validation logs and image submission packages.

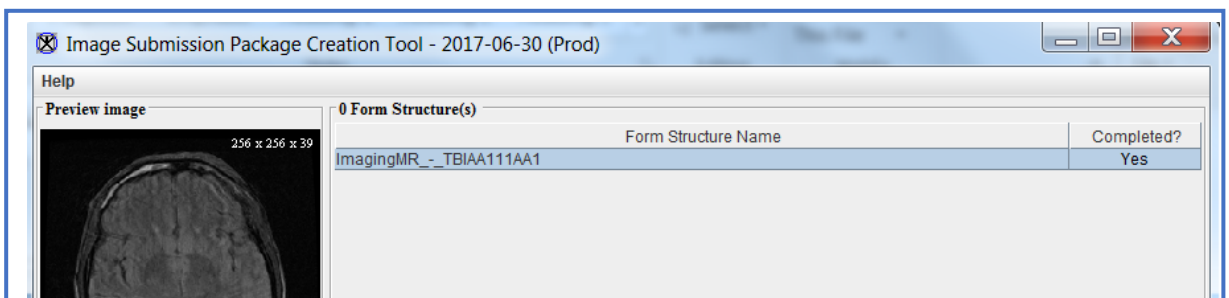


8. Click **Generate Files**. This will generate the image submission package.



9. The **Output log** message appears in the **Output log** window showing the progress, the image submission package file name(s) and location, and other helpful information. Finally, the image submission package appears in the Output directory.

   Click the **Close** button to close the **MIPAV Image Submission Package Creation Tool**.

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