

**imbio**

# SEGMENTATION EDITING TOOL

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USER MANUAL

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## 1 Introduction

### 1.1 Prescription Use Statement

Caution: Federal Law restricts this device to sale by or on the order of a physician.

### 1.2 Scope of Manual

This user manual was written for the Imbio Segmentation Editing Tool (SET) Software. Guidance for using the Imbio Core Computing Platform (ICCP) Admin Center is not included in this document.

The ICCP Admin Center is a web-based User Interface that allows the user to investigate the status of a given job sent to Imbio for processing. Additionally, the user can use the Admin Center to launch the Segmentation Editing Tool.

### 1.3 Product Overview

Imbio Segmentation Editing Tool (SET) Software is a segmentation tool designed to allow users to optimize segmentations calculated by Imbio's fully-automated suite of algorithms. Imbio is building a suite of medical image post-processing applications that run automatically after data transfer off the medical imaging scanner. Automatic image segmentation is often an essential step in Imbio's analyses. To date, the automatic segmentation algorithms used in Imbio's applications have been robust, however segmentation failures do occur. The purpose of the Segmentation Editing Tool is to provide customers with a tool to locally correct poor segmentations. Additionally, if the Imbio automatic segmentation fails such that it is unable to produce a result, this tool can be used to semi-manually draw the segmentation required for analysis.

SET reads in anatomical images used in an automatic segmentation algorithm and the results of the automated segmentation algorithm (if available). The user is then able to locally correct insufficiencies in the segmentation result, or create a segmentation mask from scratch. The finalized segmentation mask is then pushed back to Imbio's Core Computing Platform and the job is re-processed.

### 1.4 Imbio Background

At Imbio, we focus on bringing imaging biomarkers pioneered in the academic research world to clinical practice. We work closely with our academic partners to offer applications based on cutting-edge and rigorous research. We bridge the



gap from bench to bedside by refining biomarker algorithms beyond the initial prove-out stage, and working under accredited design controls to create commercial medical software.

Imbio is a privately held company based in Minneapolis and backed by Invenshure, LLC. Our seasoned team of scientists and company builders creates medical software solutions for researchers and clinicians.

For more information on the history of Imbio and its founders, please go to our website, [www.imbio.com](http://www.imbio.com).

## 1.5 Contact Imbio



Imbio LLC  
1015 Glenwood Ave Floor 4  
Minneapolis, MN 55405, USA  
[www.imbio.com](http://www.imbio.com)

## 2 Indications for Use and Requirements

### 2.1 Indications for Use

The Imbio Segmentation Editing Tool Software is used by trained medical professionals as a tool to modify the contours of segmentation masks produced by Imbio algorithms or to manually create segmentation mask contours. The Segmentation Editing Tool can provide further support to the users of Imbio's algorithms.

### 2.2 Intended Users

The intended user base for the Imbio Segmentation Editing Tool Software consists of trained medical professionals including, but not limited to, radiologists, and radiology or medical imaging technologists.

### 2.3 Compatibility with Imbio Algorithms

The Segmentation Editing Tool is functionally compatible with the following Imbio Software:

Imbio Core Computing Platform (ICCP)	v. 2.1 or higher
Imbio CT Lung Density Analysis (LDA)	v. 2.4.2 or higher
Imbio CT Lung Texture Analysis (LTA)	v. 1.3.1 or higher

## 3 Security Recommendations

Imbio's Segmentation Editing Tool (SET) Software is a web-based application hosted within your institution's network. Imbio recommends following standard cybersecurity practices to promote the security of your data and patient's data. These practices include, but are not limited to:

- Do not share your ICCP Admin Center password with anyone.
- Always logout of the application when done. Closing the browser window or leaving the webpage is not the same as logging out.
- Do not leave the computer unattended while logged in to either SET or the ICCP Admin Center.

## 4 Getting Started with SET

Imbio's Segmentation Editing Tool (SET) Software is designed to provide the opportunity to edit segmentation of anatomic structures. This chapter provides an overview of the steps involved in using SET Software.

### 4.1 Basic Usage of SET

SET Software can be launched from the ICCP Admin Center. The landing mode provides an opportunity to review one or more anatomical image series with their respective segmentation mask overlays (if available). Different structures within the segmentation mask are represented by different colors on the mask overlay. This is called Review Mode (See Chapter 5.1).

If it is determined that one or more structures in the segmentation mask require editing, Editing Mode (See Chapter 5.2) can be entered by selecting a structure to edit from the *Edit Structure* dropdown menu. Upon entering Editing Mode, segmentation masks will be converted to contours outlining the selected structure.

*Note: In the event that the automated segmentation algorithm was unable to produce a segmentation result, there will be no segmentation mask overlay in Review Mode or contours in Editing Mode. The user should proceed to create the contours for the selected structure in Editing Mode.*

The main image display shows the original, automated segmentation results with a yellow dotted line and the orthogonal thumbnail views help to visualize the segmentation in 3D. All edits will be shown with cyan color and can be reviewed in all of the three orientation views (See Chapter 5.1.2).

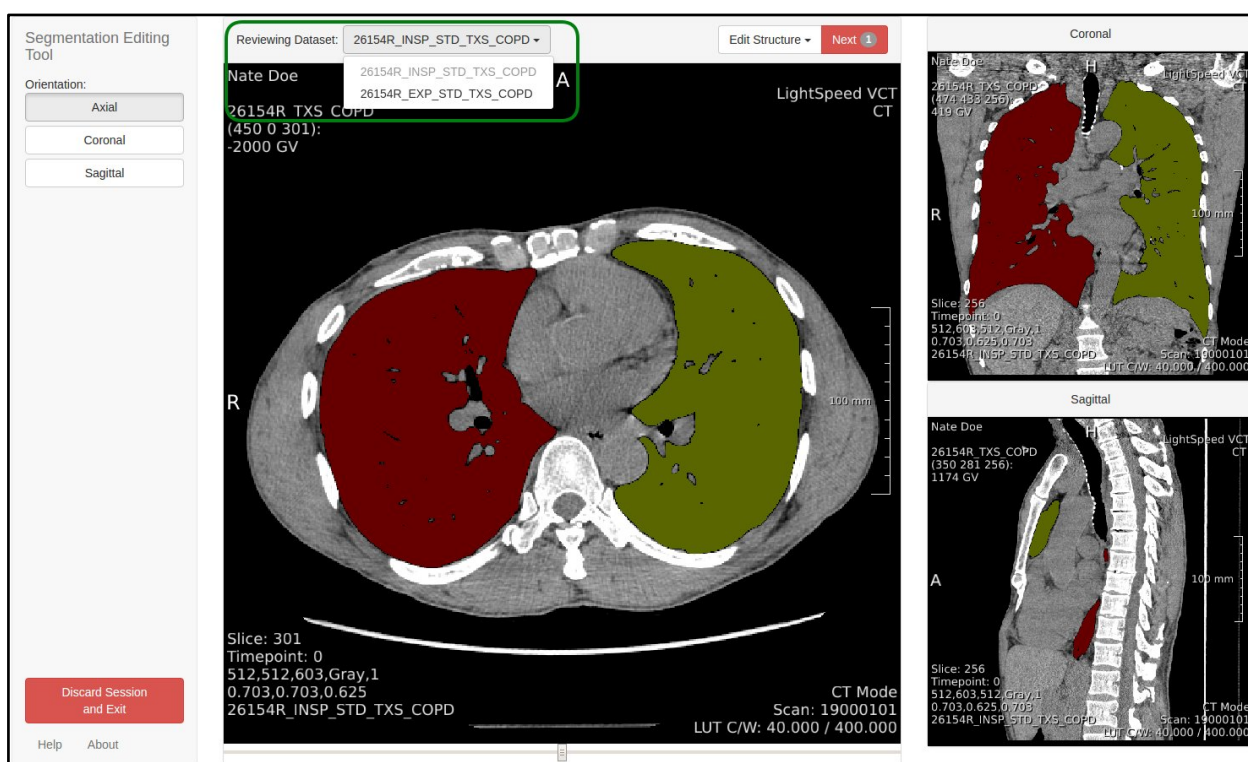
The user can return to Review Mode by selecting the Review button on the top right of the main image display. Hitting Review will accept all the changes made to the contours.

In Review Mode, a different structure can be selected for editing, the session can be discarded (*Discard Session and Exit*), or the session can be approved (*Finish*). Selecting the *Finish* button in the top right corner of the main image viewer sends the image data and the edited segmentation mask back to Imbio's algorithm for re-processing. The original job output will no longer be available to modify.

## 5 Modes

Imbio's Segmentation Editing Tool (SET) Software has two separate modes: Review and Editing Mode. The Review Mode provides an opportunity to review either an automatically created or a newly edited segmentation mask. Editing Mode is entered by selecting the desired structure from the *Edit Structure* dropdown menu. The user always enters into Review Mode when SET is launched and can switch to Editing Mode and back to Review Mode freely.

### 5.1 Review Mode



**Figure 1:** Example selecting a dataset of a job involving more than one image series.

Upon launching SET from the ICCP Admin Center, the user will enter Review Mode, where the user can assess the quality of the automated segmentation result. On the top of the main image display, the text *Reviewing Dataset:* is present (Figure 1). This text indicates that the current mode is Review Mode. The automated segmentation mask is shown as a translucent overlay on top of the anatomical image to which the segmentation mask corresponds. The colors of the translucent overlay indicate structures in the segmentation mask, which are edited separately.

## 5.1.1 Selection of Image Series

If the job being reviewed involves more than one segmentation series, (e.g. Functional LDA, which requires an Inspiration and Expiration segmentation series) the image series can be selected via the *Reviewing Dataset*: dropdown menu (Figure 1). Datasets are identified by the Series Description of the anatomical image.

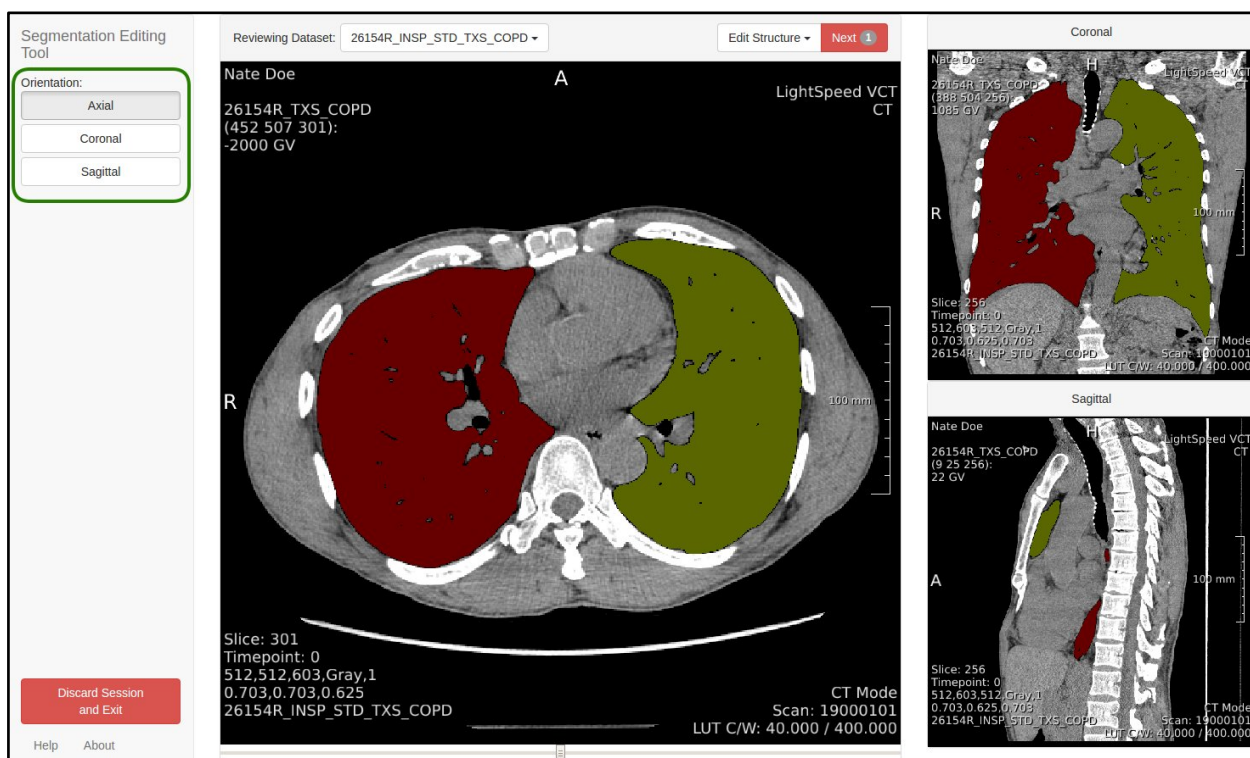
## 5.1.2 Selection of Image Orientation

SET offers three different view orientations:

- Axial (default main display orientation)
- Coronal
- Sagittal

Contour editing must be performed in the main image display. However, the orientation of the main image display can be changed to any of the three orthogonal orientations listed to the left of the main display (Figure 2). The default orientation is the axial plane.

*Note: The orientations can be changed in Editing Mode as well.*

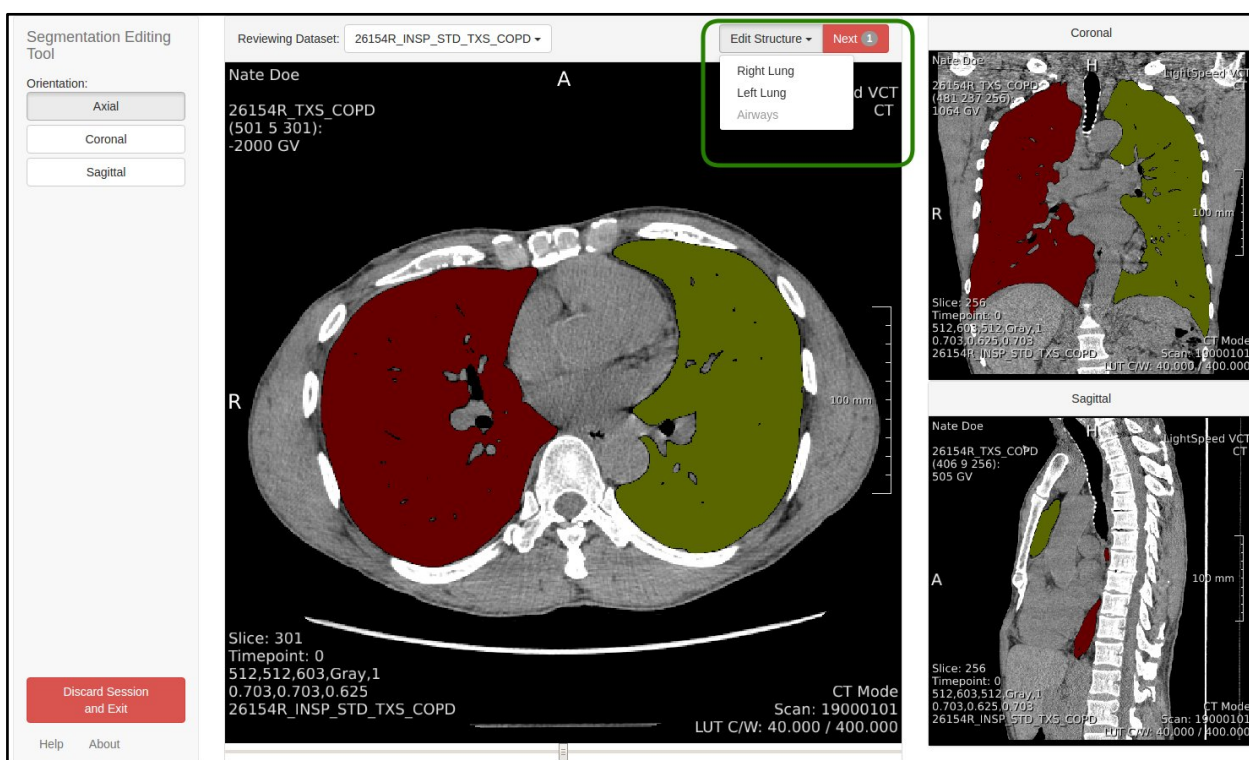


**Figure 2:** The main orientation can be changed via orientation buttons.

## 5.1.3 Selection of Structure to Edit

Individual structures in the segmentation mask must be edited separately (e.g. Left and Right Lung in LDA jobs). The user can select the structure they would like to edit via the *Edit Structure* dropdown menu (Figure 3). This action directs the user into Editing Mode (See Chapter 5.2). Structures that are disabled in the *Edit Structure* dropdown are not available for editing.

*Note: In the event that the automated segmentation algorithm was unable to produce a segmentation result, there will not be an overlay shown in the initial Review Mode. In this case, the user should proceed to select the structure they would like to create via the Edit Structure dropdown menu.*



**Figure 3:** The desired structure can be chosen from ?Edit Structure? dropdown menu. In this example, the Right Lung and Left Lung are editable structures. The grayed out text in the drop down shows the Airways structure is not available for editing.

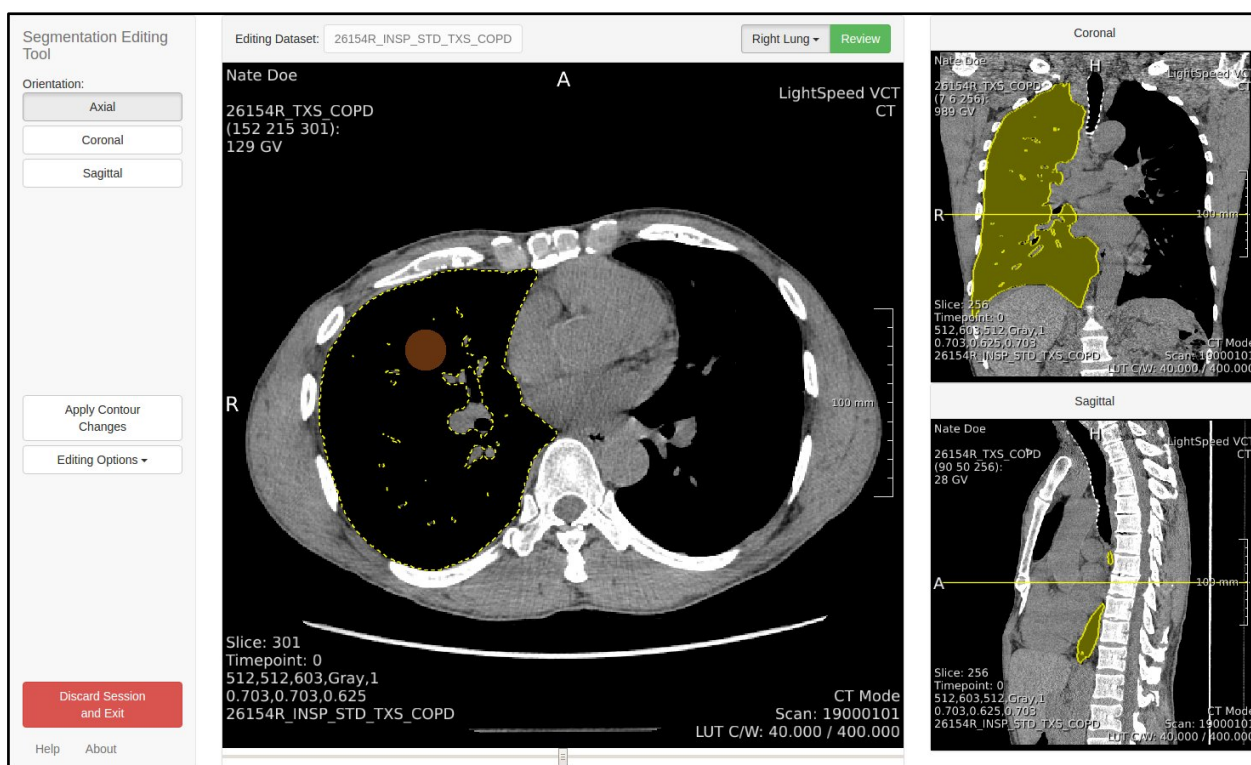
## 5.2 Editing Mode

Editing Mode is entered by selecting the structure to edit from the *Edit Structure* dropdown menu in Review Mode (See Chapter 5.1). On the top of the main image display, the text *Editing Dataset:* is present (Figure 4). This text indicates that the current mode is Editing Mode. In Editing Mode, the original segmentation is shown as a dotted yellow contour. The mouse cursor becomes a circle, referred



to as a brush (Figure 4).

*Tip: Brush size can be changed in the Editing Options dropdown menu or by Control+Shift+Scroll Wheel.*



**Figure 4:** Example of original segmentation shown by yellow dotted line in right lung in main image display and yellow overlay in the orthogonal thumbnail views.

To edit the segmentation, interact with the contour using the brush by pressing and holding the left mouse button.

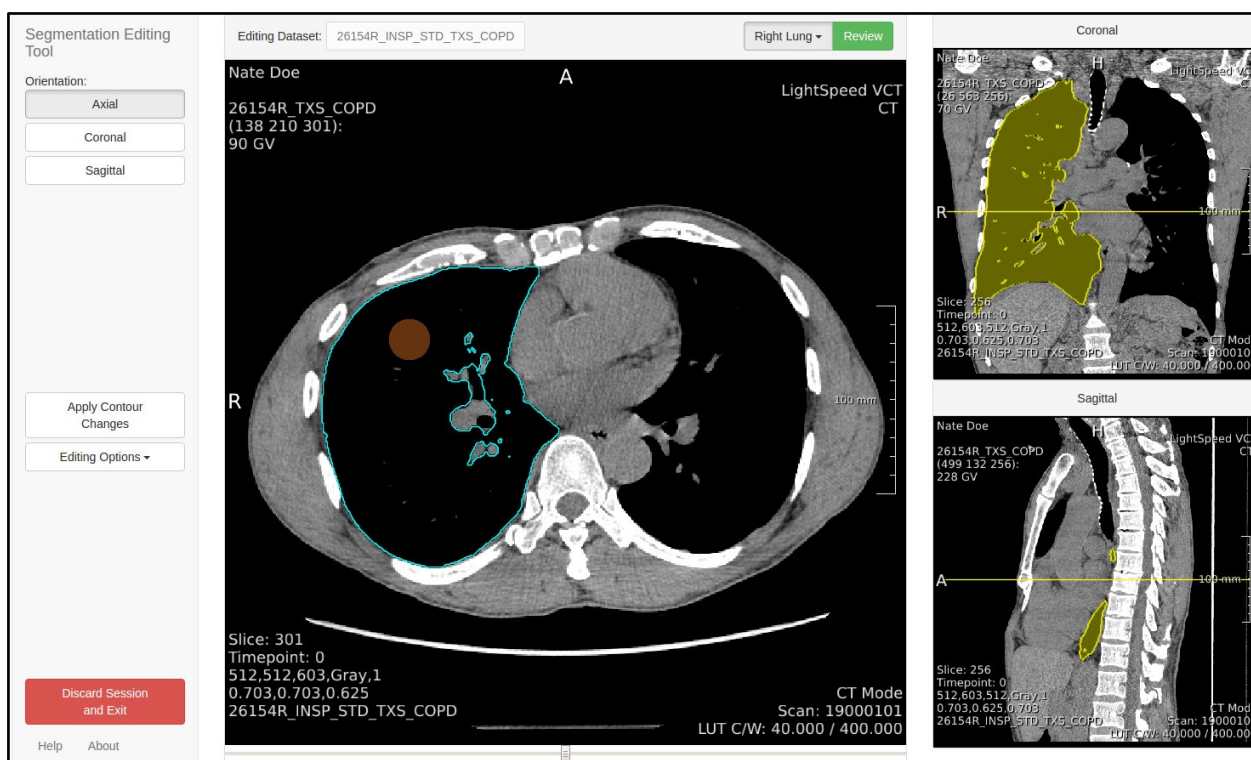
If the brush is outside the contour and the left mouse button is held, the brush will push the contour inwards, effectively erasing area from the segmentation mask.

If the brush is inside the contour and the left mouse button is held, the brush will push the contour outwards, effectively adding area to the segmentation mask.

Once a contour has been edited, indicated to SET by releasing the mouse button, it will change from a dotted yellow to a cyan line (Figure 5).

*Note: In the event that there is no segmentation result available from Imbio's automated algorithm, there will be no contours to edit. In this case, the brush is automatically configured to add area to the segmentation mask. Simply press*





**Figure 5:** Example of a structure that has been edited. This is indicated by the solid cyan line which replaced the initial yellow dotted line.

*and hold the left mouse button to begin drawing a contour.*

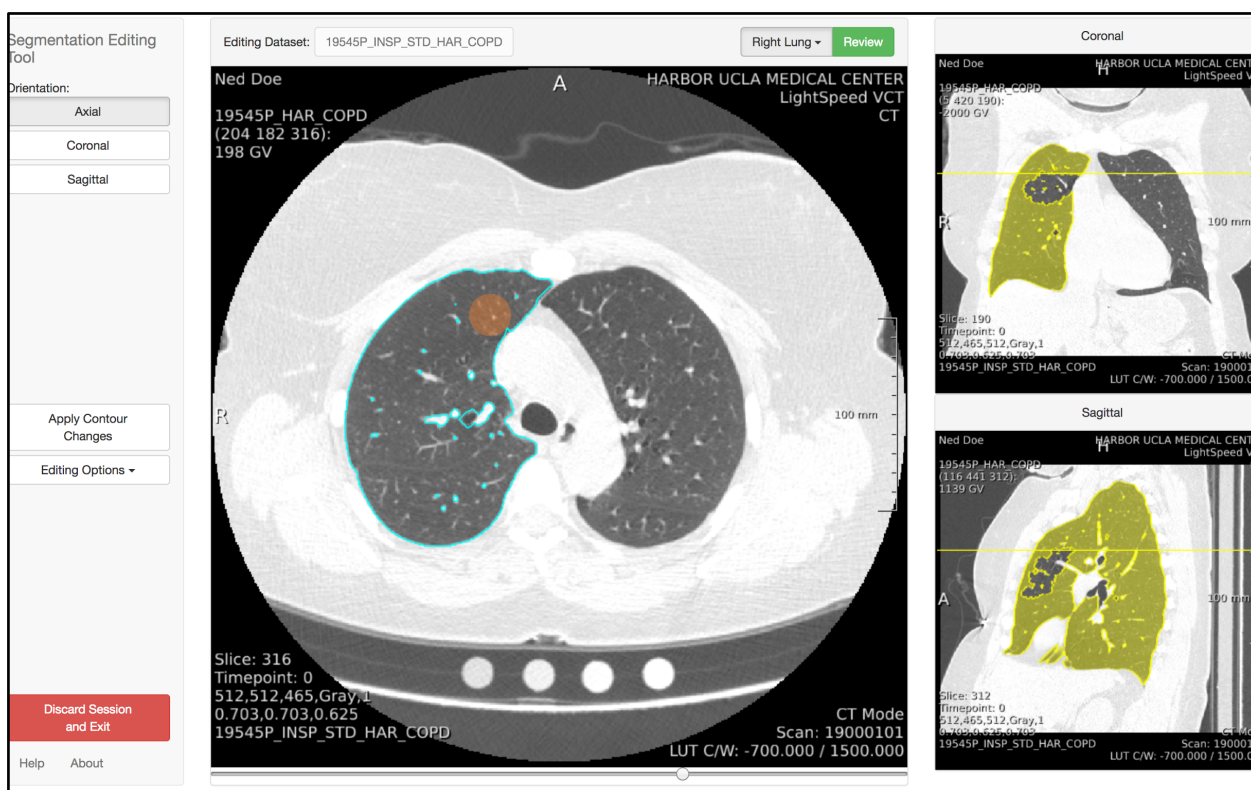
SET provides Smart Editing features to help streamline the process of editing segmentations. These features include *3D Editing with Slice Interpolation* and *Contour Snapping*.

## 5.2.1 Smart Editing Features: 3D Editing with Slice Interpolation

One of the main features of SET is the ability to interpolate edits between slices. This feature can significantly speed up the process of editing segmentations with errors that cover many slices, like the example shown in Figures 6-8. By default, slice interpolation is ON but it can be turned off in the *Editing Options* drop down menu (See Chapter 8.1).

### How to Edit Using 3D Editing with Slice Interpolation

1. Edit the segmentation of the desired slice (Figure 6).
2. Scroll the mouse wheel to another slice that requires similar editing (Figure 7).



**Figure 6**

### 3. Edit the segmentation of the second selected slice (Figure 8).

*Note: In Figure 8, the cyan slab in the orthogonal thumbnail views corresponds to the slab indicated by the Slice Interpolation Indicator line.*

*Note: In Figure 9, there is a small red line on the left hand side of each thumbnail view. This is the Slice Interpolation Indicator line. This indicates the slab of contours that will be changed via interpolation if the contour on the current slice is edited. The slab spans the distance between the currently viewed slice and the closest, previously edited slice.*

Once editing on the second slice is complete, which is indicated to SET by releasing the mouse button, the interpolation algorithm will begin its calculation.

*Tip: Since interpolation is initiated once the mouse button is released, complete all desired edits to the current contour before release the mouse button.*

*Tip: The accuracy of the interpolation algorithm and the time required to calculate the interpolation depend on the following:*

- The number of slices included in interpolation.
- The similarity of segmentation shape between the two edited slices.

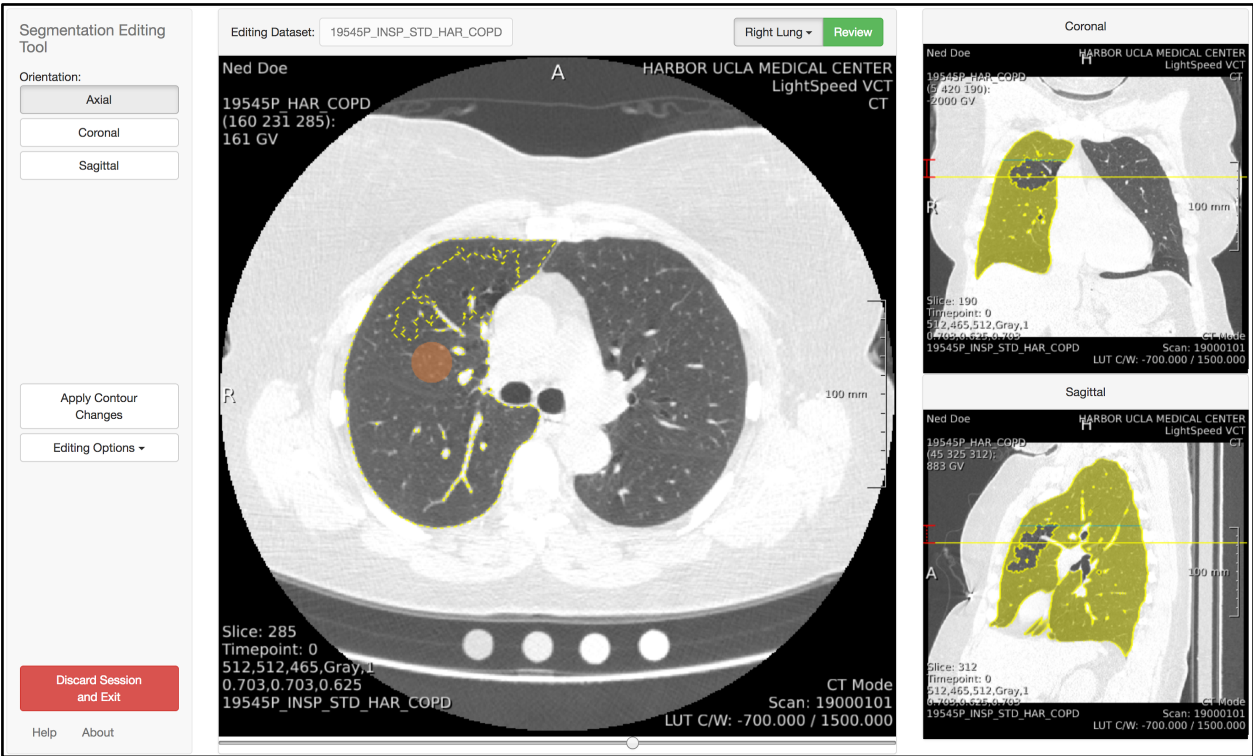


Figure 7

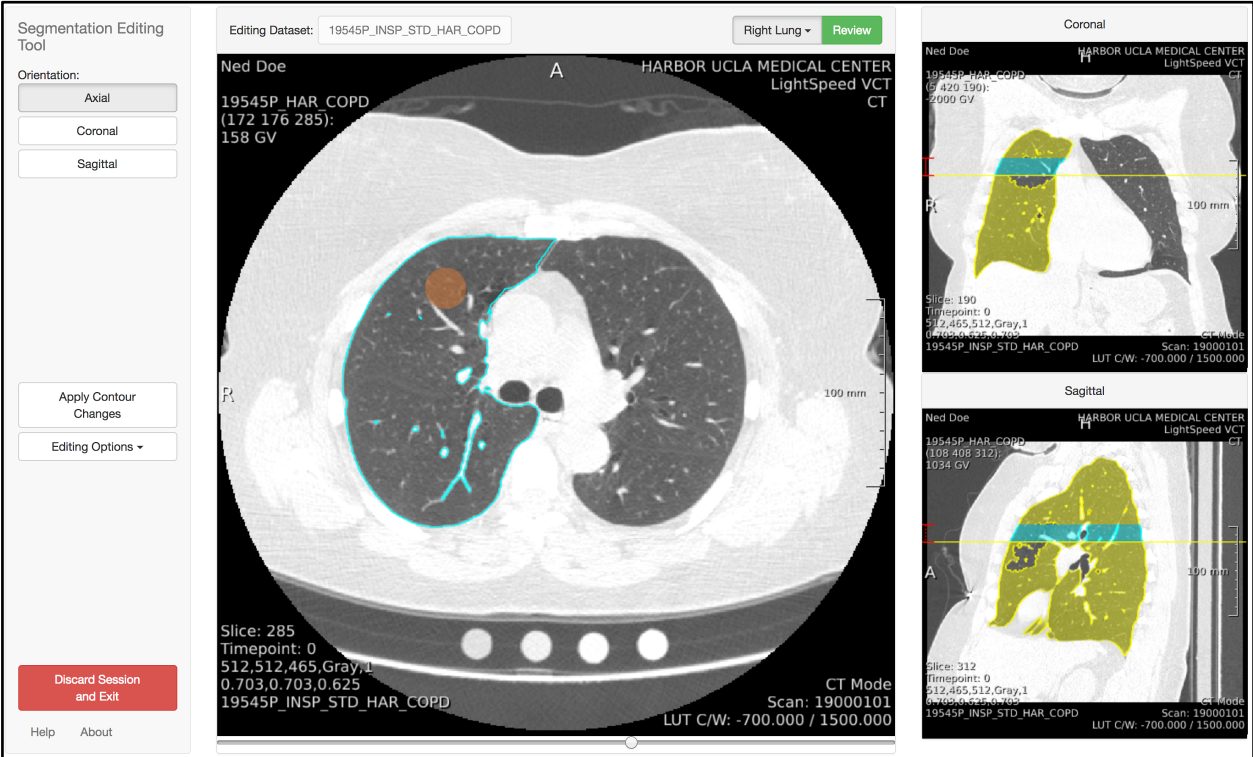
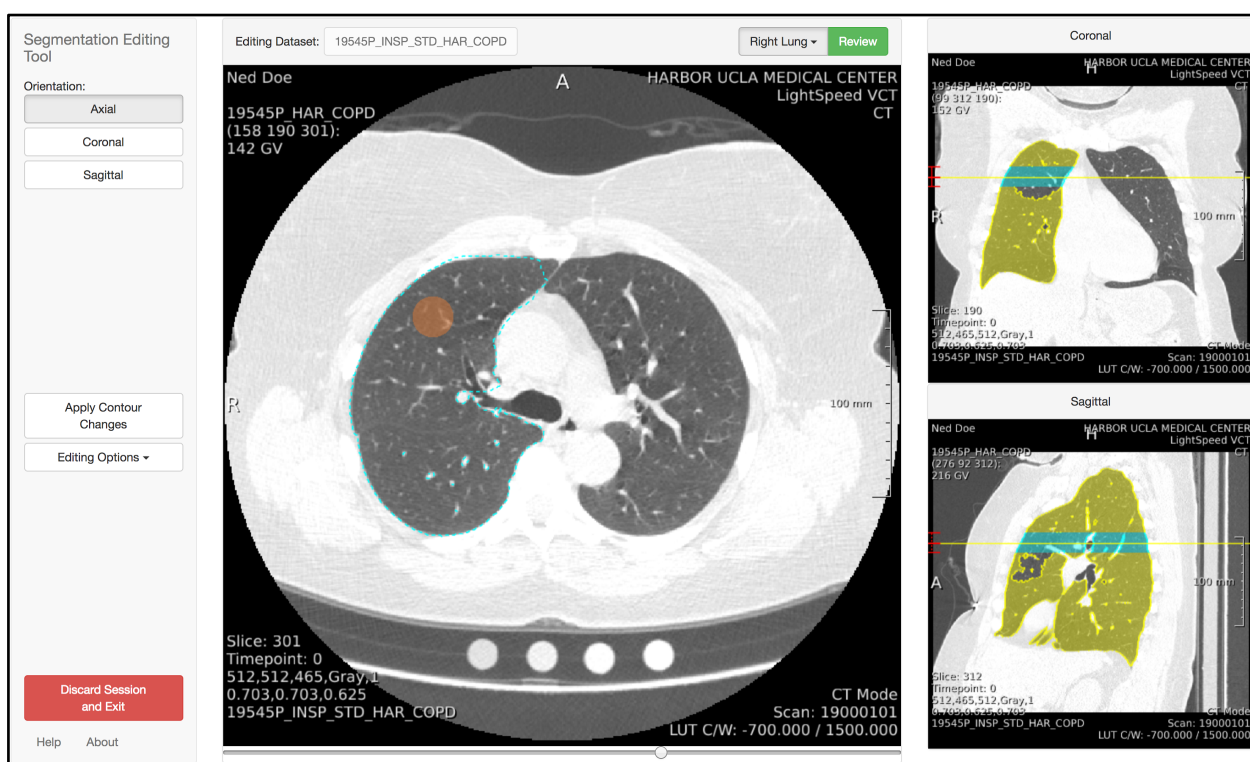


Figure 8



- *The total number of contours in the slice (e.g. the number of holes in the segmentation mask, see Chapter 8.1.10 for more information on how to improve performance by automatically filling holes.)*

The interpolation is complete when the cyan slab appears in the orthogonal thumbnail views (Figure 8). The cyan slab shows all the slices that were changed due to interpolation. In the main image viewer, contours that were changed via interpolation are represented by a dotted cyan line (Figure 9), while contours that were changed manually are a solid cyan line (Figure 8).



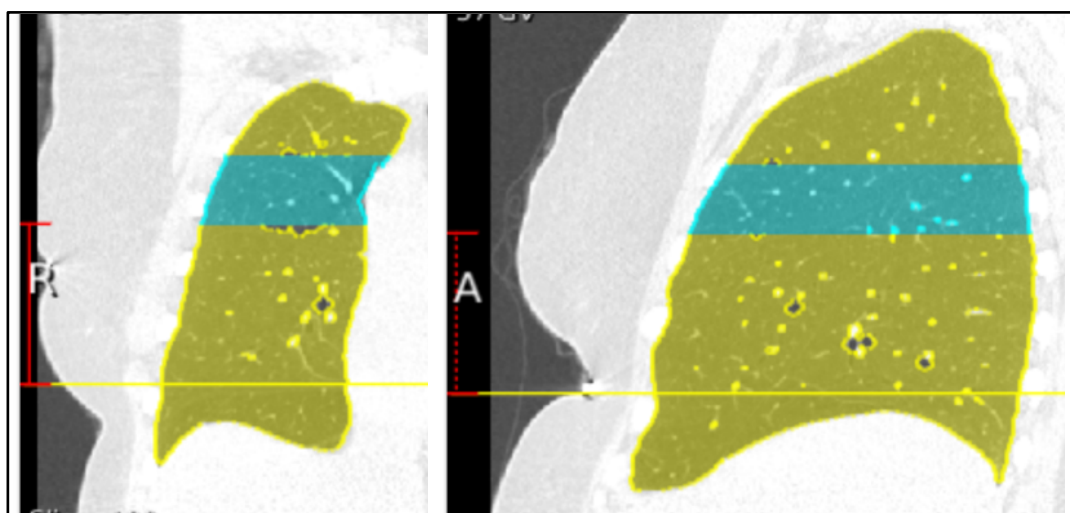
**Figure 9:** Example of interpolated contour due to 3D Editing with Slice Interpolation indicated by cyan dotted line in the main image display and with a cyan slab in the orthogonal thumbnail views.

After the interpolation is complete and the user continues to scroll through the slices, the red Slice Interpolation Indicator line in the orthogonal thumbnail views show the slab of contours that will be changed due to interpolation if the user edits the current slice shown in the main image display (Figures 10 and 11).

If the user wants to make an edit to the currently viewed slice without initiating the interpolation indicated by the Slice Interpolation Indicator line, the *Apply Contour Changes* button will reset the memory of the slice interpolator (Figure 12). In this case, all previously edited contours will change from cyan to yellow indicating that the changes has been accepted and the user can proceed to edit a contour on a new slice without initiating 3D Editing with Slice Interpolation.



**Figure 10:** The Slice Interpolation Indicator line in the thumbnail views shows the slab of contours that will be changed if the contour of the currently viewed slice is edited. Interpolation is calculated between the contour on the current slice and the closest, previously edited contour.



**Figure 11:** Closeup of Slice Interpolation Indicator in the Coronal (right) and Sagittal (left) thumbnail views of Figure 10.

## 5.2.2 Smart Editing Features: Contour Snapping

Another Smart Editing Feature is Contour Snapping. When Contour Snapping is enabled, the contour will automatically detect and snap to a nearby edge in



**Figure 12:** Apply Contour Changes button resets the memory of the slice interpolator. Note that there is no longer a Slice Interpolation Indicator line in the orthogonal thumbnail views. This indicates that the contour of the current slice can be edited without initiating slice interpolation.

the image. This feature can speed up the process of segmentation by correcting small imperfections in the manual segmentation performed by the user. By default, Contour Snapping is ON for the creation of a contour where none previously existed and is OFF for editing of a pre-existing contour (Figure 13). These options can be changed in the *Editing Options* dropdown menu (See Chapter 8.1).

*Note: If Snapping is enabled, the user can hit the Space key to toggle between the manually edited/created contour and the contour resulting from the Snapping procedure (Figure 14). This can be used to undo the snapping procedure and revert back to the manual contour for the currently viewed slice.*

## 5.2.3 Manual Editing Mode

By turning off all Smart Editing Features in the *Editing Options* dropdown menu (i.e. deselecting Snapping (Contour Creation), Snapping (Contour Editing), and Interpolation), the user can enter into a fully manual editing mode.



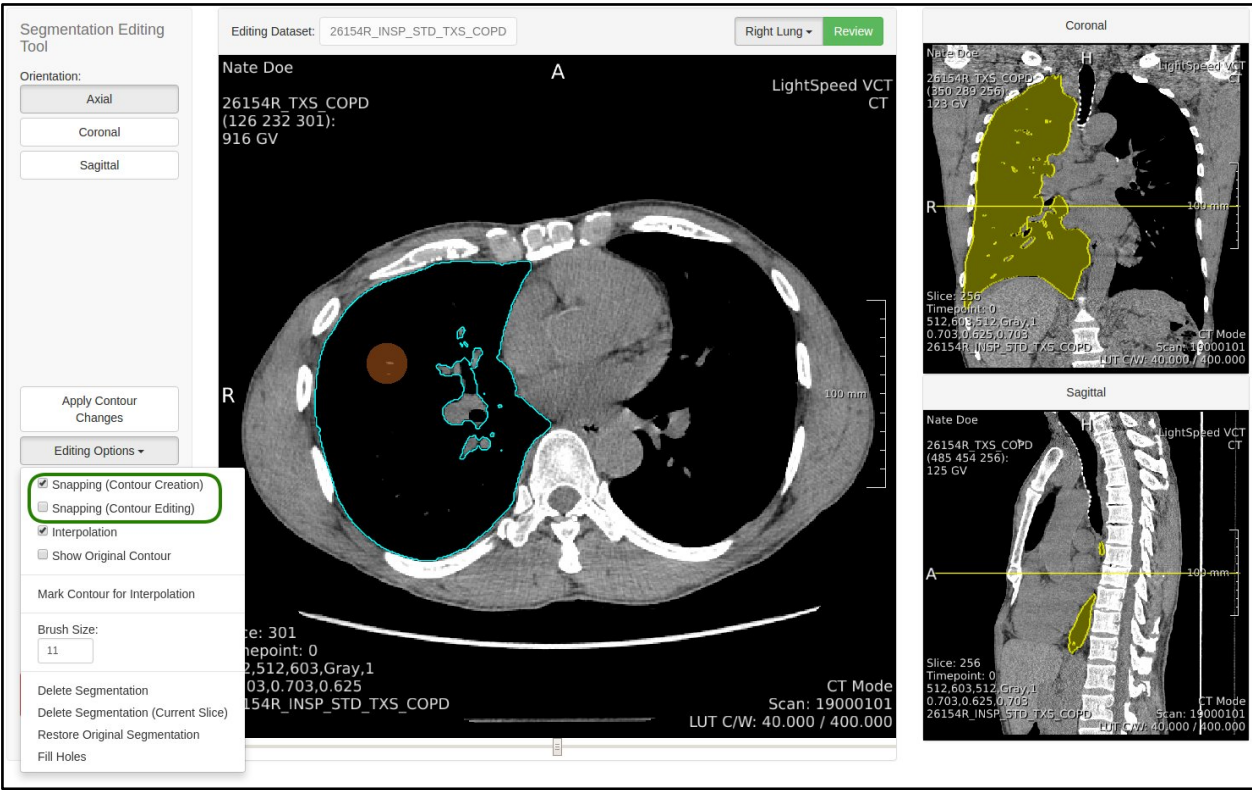


Figure 13: List of editing options including Snapping parameters.

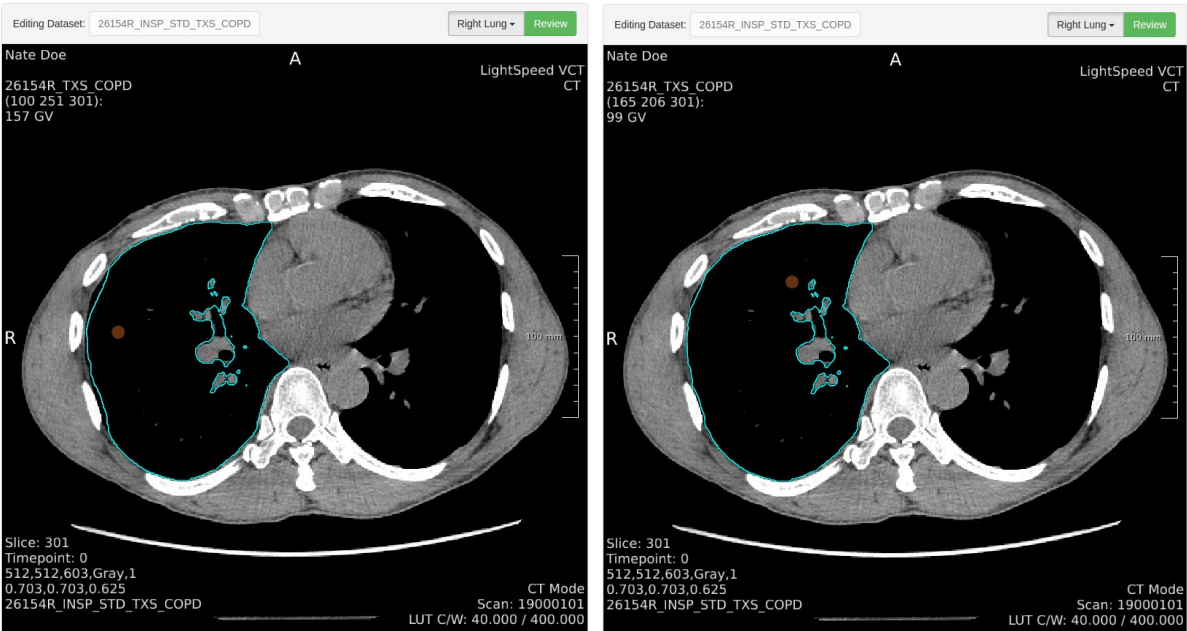


Figure 14: On the left side a manually edited contour is shown prior to the automatic snapping procedure. On the right side, the contour has been automatically snapped to the detected edge. The Spacebar will toggle the contour of the current slice between the most recent manual edit and most recent snapping result.

## 6 SET Workflows

The sections below describe the workflow required to edit or create segmentation masks from different Imbio algorithms.

### 6.1 Editing Segmentation for Job with One Image Series

1. Launch SET from ICCP Admin Center
2. Review segmentation mask
  - (a) You will automatically be directed to Review Mode, where you can review the segmentation mask produced by the automated algorithm.
3. Select structure to edit
  - (a) Under the *Edit Structure* dropdown menu, select a structure to edit. This will automatically direct you to Editing Mode.
4. Perform desired edits.
5. Switch to another structure(s) in *Edit Structure* dropdown menu, if necessary OR proceed to Review Mode by hitting the *Review* button in top right corner of the main image display.
  - (a) All edits are automatically saved when performing either of the above actions.
6. Review segmentation mask
  - (a) Once all desired edits are complete, review the edited segmentation mask.
7. Click the *Finish* button OR reselect a structure that requires more editing.

*Note: The Finish button sends the image data with the edited segmentation mask back to Imbio's algorithm for re-processing.*

### 6.2 Editing Segmentations for Job with More Than One Image Series

1. Launch SET from ICCP Admin Center
2. Select desired Image Series via the *Reviewing Dataset* dropdown menu.
  - (a) Image series are identified by their Series Descriptions
3. Review segmentation mask



4. Select structure to edit
  - (a) Under the *Edit Structure* dropdown menu, select a structure to edit. This will automatically direct you to Editing Mode
5. Perform desired edits
6. Switch to other structure(s) in *Edit Structure* dropdown menu, if necessary OR proceed to Review Mode by hitting *Review* button in top right corner of main image display.
  - (a) All edits are automatically saved when performing either of the above actions.
7. Review segmentation mask
  - (a) Review the edited segmentation mask and either re-enter Editing Mode for any structure OR select *Next*, which will finalize the edits made to the first segmentation.
  - (b) The *Next* button forces the user to review and accept or edit the other segmentation mask associated with the job.
8. Review other segmentation mask
  - (a) Review the segmentation mask and select structure to edit and repeat editing process for this image series if necessary.
9. Click the *Finish* button OR reselect a structure that requires more editing.

*Note: The Finish button sends the image data with the edited segmentation mask back to Imbio's algorithm for re-processing.*

## 6.3 Creating Segmentation for Job with One Image Series

1. Launch SET from ICCP Admin Center
2. Select a structure to create
  - (a) You will automatically be directed to Review Mode, however since there was no segmentation mask produced by the algorithm, there will be no mask to review. Select a structure from the *Edit Structure* dropdown menu to enter Editing Mode.
3. Create the desired segmentation mask
4. Switch to other structure(s) in *Edit Structure* dropdown menu, if necessary OR proceed to Review Mode by hitting *Review* button in top right corner of main image display.

- (a) All edits are automatically saved when performing either of the above actions.
- 5. Review segmentation mask
  - (a) Once all desired edits are complete, review the created segmentation mask
- 6. Click the *Finish* button OR reselect a structure that requires more editing.

*Note: The Finish button sends the image data with the created segmentation mask back to Imbio's algorithm for processing.*

## 6.4 Creating Segmentations for Job with More Than One Image Series

1. Launch SET from ICCP Admin Center
2. Select desired Image Series via the *Reviewing Dataset* dropdown menu.
  - (a) Image series are identified by their Series Descriptions
3. Select structure to create
  - (a) Since there was no segmentation mask produced by the algorithm, there will be no mask to review. Select a structure from the *Edit Structure* dropdown menu to enter Editing Mode.
4. Create the desired segmentation mask
5. Switch to other structure(s) in *Edit Structure* dropdown menu, if necessary OR proceed to Review Mode by hitting *Review* button in top right corner of main image display.
  - (a) All edits are automatically saved when performing either of the above actions.
6. Review segmentation mask
  - (a) Review the created segmentation mask and either re-enter Editing Mode for any structure OR select *Next*, which will finalize the edits made to the first segmentation.
  - (b) The *Next* button forces the user to review and accept or edit the other segmentation mask associated with the job.
7. Review/Create other segmentation mask
  - (a) Review the segmentation mask if available and either select structure to edit and repeat editing process for this image series if necessary.

8. Click the *Finish* button OR reselect a structure that requires more editing.

*Note: The Finish button sends the image data with the created segmentation mask back to Imbio's algorithm for processing.*

## 7 Result Handling

Once editing is complete, the users can accept or discard all segmentation changes.

### 7.1 Accept Changes

#### 7.1.1 Selecting a Different Structure

Selecting a different structure to edit from the *Edit Structure* dropdown menu will automatically accept any edits made to the current structure.

#### 7.1.2 Selecting Review

Selecting the *Review* button while in Editing Mode will automatically accept any edits made to the current structure.

#### 7.1.3 Finish Button

Once the user is satisfied with all edits, the new segmentation masks can be accepted by hitting the *Finish* button while in Review Mode. The *Finish* button sends the image data with the edited segmentation mask back to Imbio's algorithm for re-processing and a new job will be started automatically.

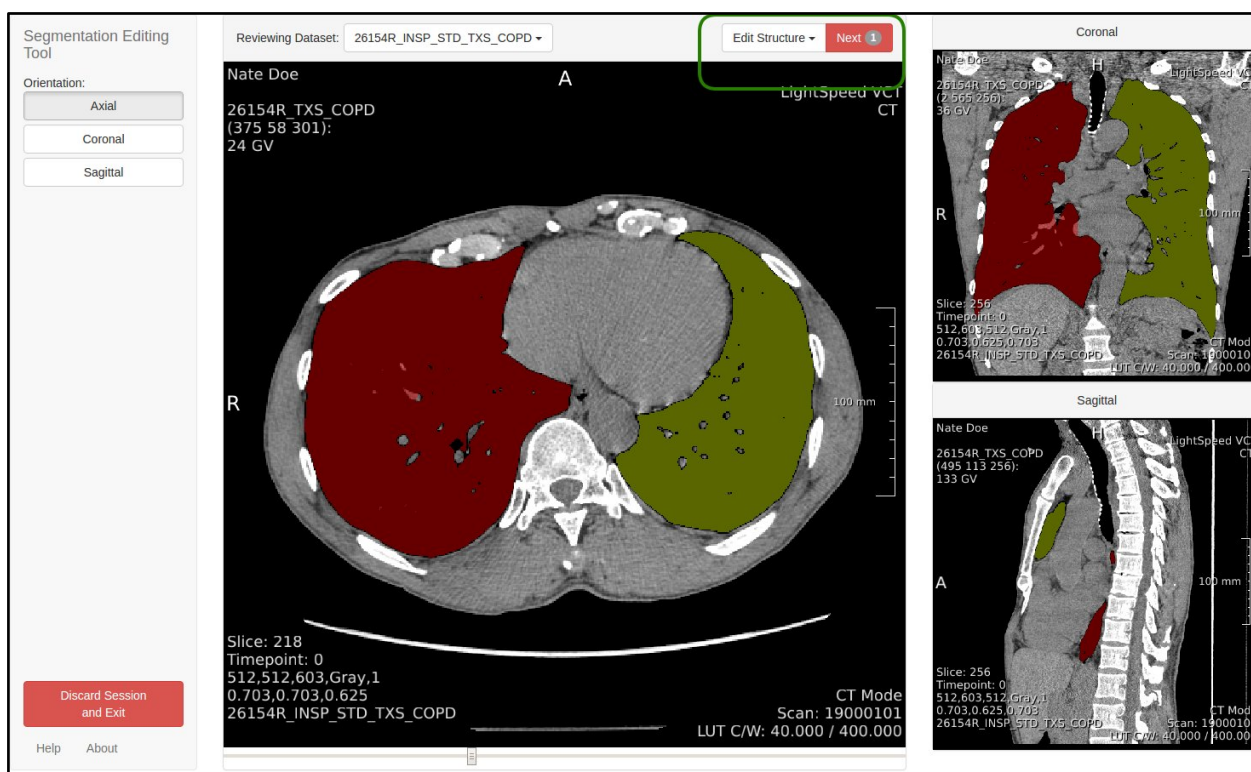
*Note: Those jobs which have more than one image series cannot be completed until all of the segmentation masks associated with the job have been reviewed. In this case the Finish button is replaced with Next button with a number indicating the number of waiting series (Figure 15).*

### 7.2 Discard Changes

The segmentation edits can be reverted by one button click. SET offers a restore original segmentation option to discard any applied changes.

#### 7.2.1 Restore Original Segmentation

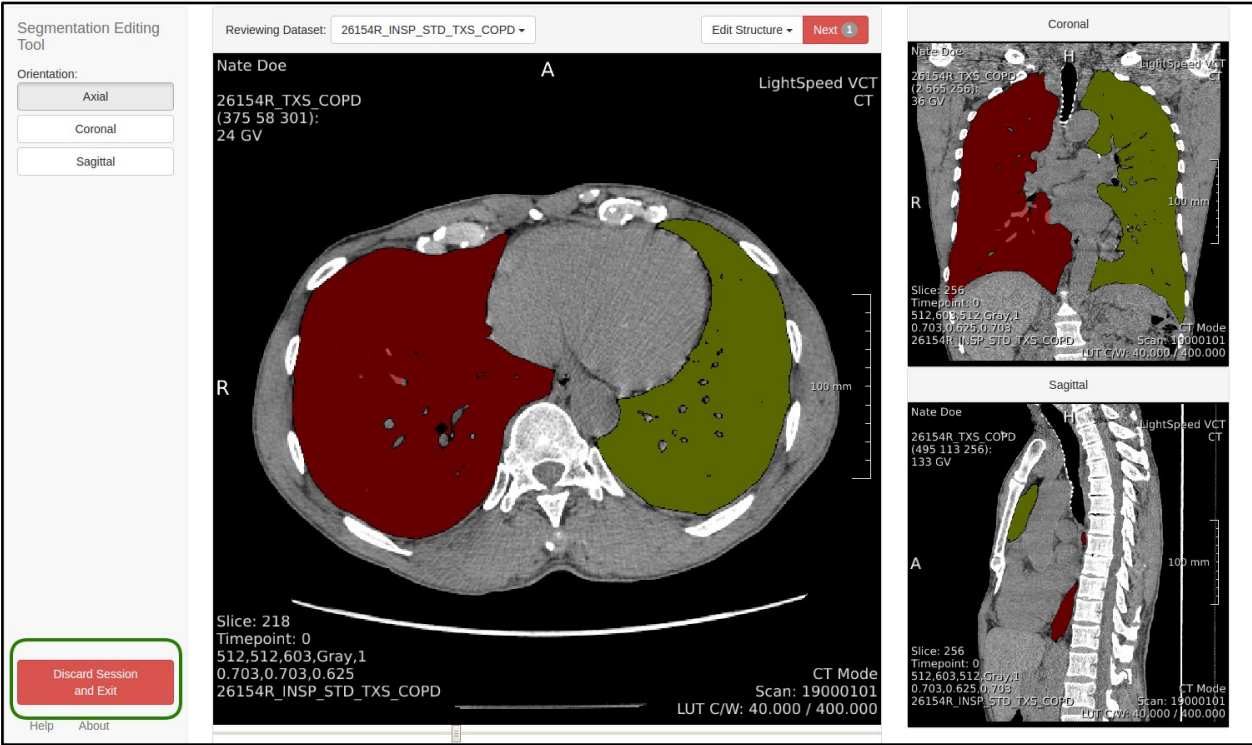
Under the *Editing Options* dropdown menu (See Chapter 8.1) the user can restore the original segmentation of the current structure by pressing this option. This option will restore the current structure to the original segmentation regardless of whether Smart or Manual Editing was used.



**Figure 15:** Example of job which has more than one image series to review.

## 7.2.2 Discard Session

The user can completely discard the session by pressing the *Discard Session and Exit* button (Figure 16) which sends the user back to the Admin Center page. This button is available in both Review and Editing Mode.



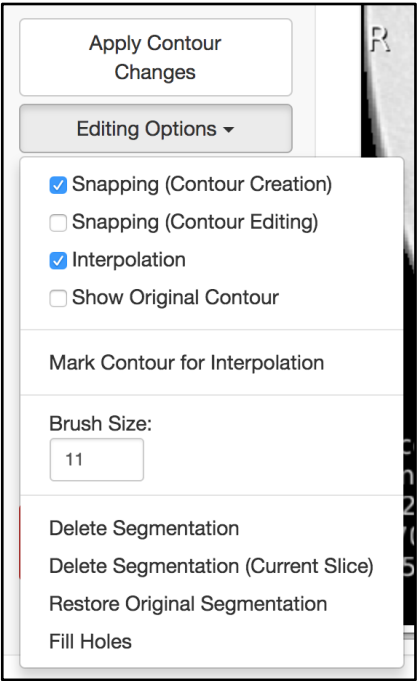
**Figure 16:** Discard Session and Exit button is shown.

## 8 Additional Information

The following sections offer information regarding editing options, shortcuts and other helpful information.

### 8.1 Editing Options

The *Editing Options* dropdown menu offers the opportunity to turn on and off Smart Editing Features and perform other helpful tasks. Each of the features in the *Editing Options* dropdown (Figure 17) will be described in the subsections below.



**Figure 17:** The Editing Options dropdown menu is available in Editing Mode. This figure shows the default settings of all options.

#### 8.1.1 Snapping (Contour Creation)

One of the main Smart Editing Features is Contour Snapping (See Chapter 5.2.2). When Contour Snapping is enabled, the contour will automatically detect and snap to a nearby edge in the image. This feature can speed up the process of segmentation by correcting small imperfections in the user's manual segmentation. This editing option refers to Contour Snapping when creating a contour from scratch, which by default is ON.

*Note: By default, Contour Snapping is ON for the creation of a contour where none previously existed. To initiate Manual Editing mode the Interpolation must be turned off.*

## 8.1.2 Snapping (Contour Editing)

One of the main Smart Editing Features is Contour Snapping (See Chapter 5.2.2). When Contour Snapping is enabled, the contour will automatically detect and snap to a nearby edge in the image. This feature can speed up the process of segmentation by correcting small imperfections in the user's manual segmentation. This editing option refers to Contour Snapping when editing an existing contour, which by default is OFF.

*Note: By default, Contour Snapping is OFF for the editing of a pre-existing contour. To initiate Manual Editing mode the Interpolation must be turned off.*

## 8.1.3 Interpolation

One of the main Smart Editing Features is 3D Editing with Slice Interpolation (See Chapter 5.2.1). This feature can significantly speed up the process of editing segmentations with errors that cover many slices. By default slice interpolation is always ON but it can be turned off in the *Editing Options* dropdown menu.

*Note: By default, Interpolation is ON. To initiate Manual Editing mode the Interpolation must be turned off.*

## 8.1.4 Show Original Contour

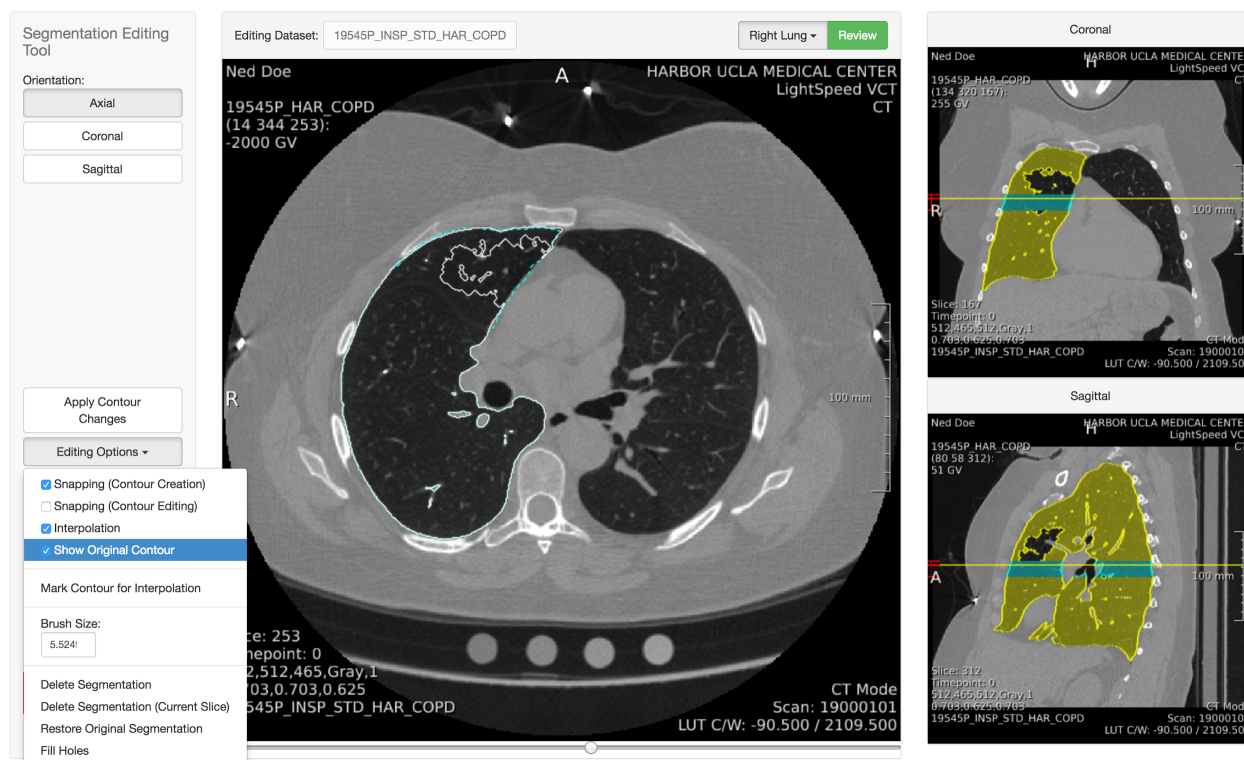
If the *Show Original Contour* option is selected, the original segmentation mask produced by Imbio's automated algorithms will appear as a white contour in the main image display (Figure 18). The original contour representation is solely for visualization purposes and cannot be interacted with.

*Note: By default, Show Original Contour is OFF.*

## 8.1.5 Mark Contour for Interpolation

One of the main Smart Editing Features is 3D Editing with Slice Interpolation. The *Mark Contour for Interpolation* option allows the user to select an original contour to be used for interpolation. The color of selected segmentation contour changes from a dotted yellow to a cyan line. For example, if a segmentation needed editing over a small span of slices, one could mark *Mark Contours for Interpolation* on the slices closest to the error that still have acceptable contours.





**Figure 18:** When Show Original Contour is selected, the original contour appears as a white line in the main image display.

## 8.1.6 Brush Size

The size of the brush can be set to the appropriate dimension to optimize segmentation editing.

*Note: By default, Brush Size is 11. Brush size can also be changed by Ctrl+Shift+ Scroll Wheel.*

## 8.1.7 Delete Segmentation

The whole segmentation for the current structure can be deleted. This offers the opportunity to create a new segmentation manually for the selected structure.

## 8.1.8 Delete Segmentation (Current Slice)

The original or edited segmentation for the current structure can be deleted on a slice by slice basis with this option. This offers the opportunity to create a new segmentation for the selected slice.

## 8.1.9 Restore Original Segmentation

The original segmentation can be restored for the current structure. This option will revert all the changes during Smart and/or Manual Editing Mode for the current structure on every slice.

## 8.1.10 Fill Holes

The Fill Holes option is a very useful feature that is compatible with either Smart or Manual Editing. When Fill Holes is initiated, the small holes inside of the segmentation line will be filled in to create a more homogeneous segmentation. This can significantly improve SET performance and user experience.

## 8.2 Shortcuts

The following keyboard shortcuts can be used to improve user experience and perform certain tasks quickly.

Navigate through slices	Scroll wheel keyboard keys Scroll bar at bottom of main image
Adjust Window Level	Press and hold right mouse button
Zoom	Ctrl + middle mouse button/scroll wheel pressed
Pan	Shift + middle mouse button/scroll wheel pressed
Disable annotation on main image	Space keyboard key
Change brush size	Ctrl + Shift + mouse wheel
Invert brush interactions	Press and hold shift during interaction
Toggle between snapped and manually edited contours	Space keyboard key

## 8.3 Help

The Help menu, located in the lower left corner of the SET interface, is a great reference to remind users of various editing actions and shortcuts.

## 8.4 About

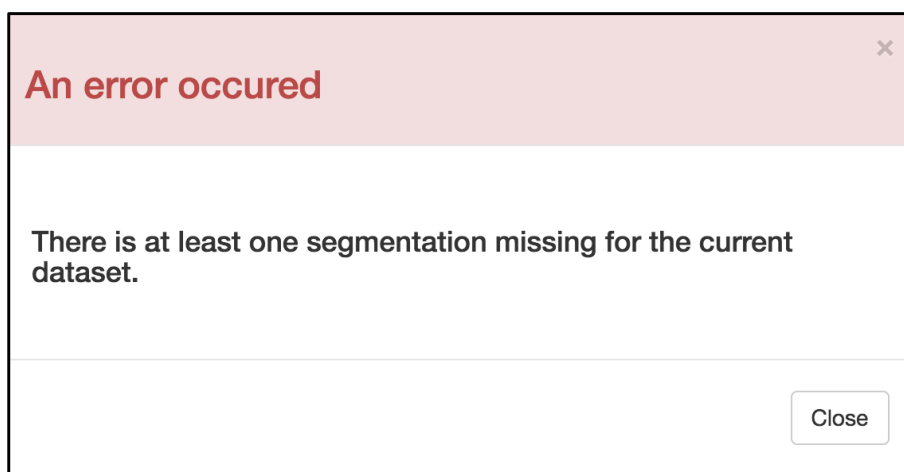
Under About, located in the lower left corner of the SET interface, the user can see manufacturing and version information about the Segmentation Editing Tool.

## 9 Possible Encountered Errors

The SET Software produces notifications and errors when an exception is encountered within the software. Below are possible errors generated by the software with further descriptions and probable causes of the exceptions.

### 9.1 Missing Segmentation

Segmentations are required for each structure listed in the *Edit Structure* drop-down menu. If the *Finish* button is selected and a segmentation does not exist for all structures, an error message will be displayed (Figure 19). This error could be encountered if the entire structure segmented by Imbio's automated algorithm was deleted and not replaced, or if a structure was not created in the event that Imbio's automated segmentation algorithm could not produce a result.



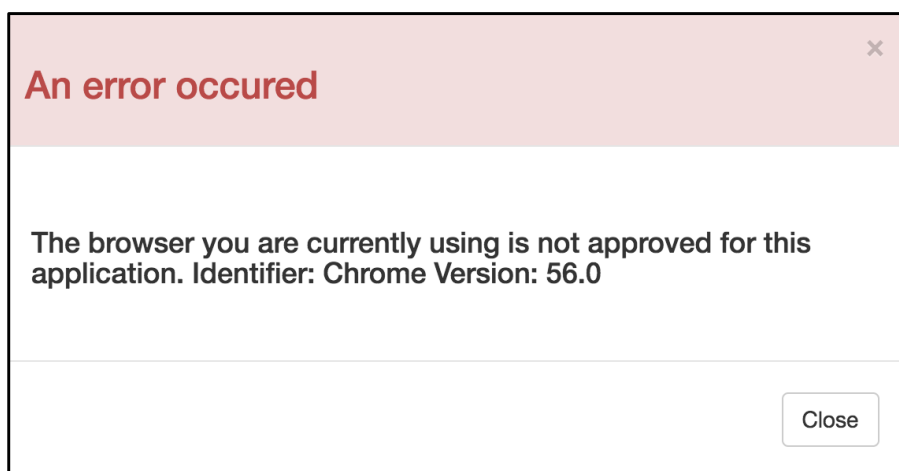
**Figure 19:** Missing segmentation error message.

### 9.2 Browser Not Approved

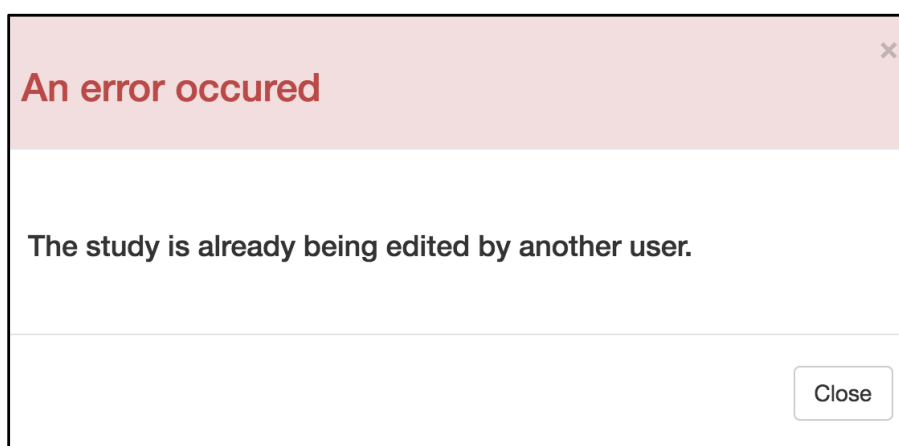
SET is approved to run on Internet Explorer versions 10 and 11 and Google Chrome version 70.0. If SET is accessed through another browser, the error message in Figure 20 will appear.

### 9.3 Study Being Edited By Another User

Only one user can use SET for a given dataset at a time. In the event that two users try to open the same dataset, the second user will see the error message in Figure 21.



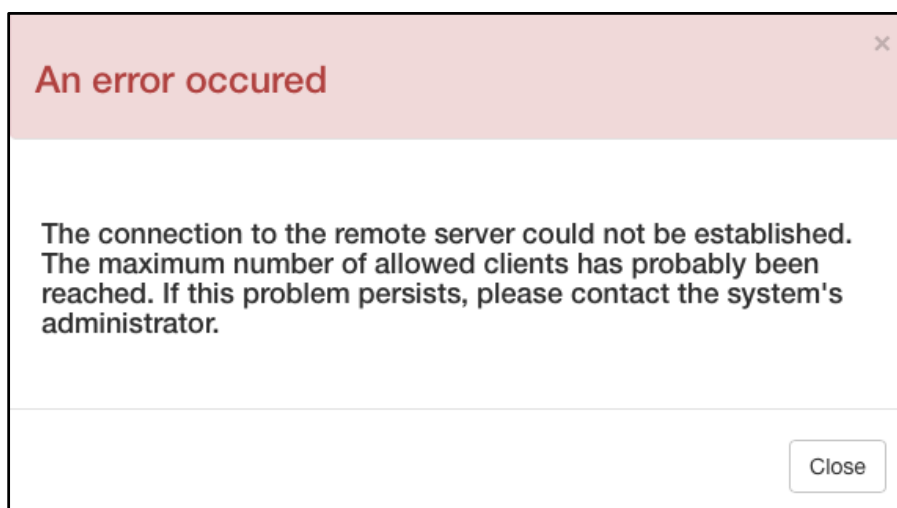
**Figure 20:** Non-approved browser error message



**Figure 21:** Concurrent editing error message

## 9.4 Maximum Number of Concurrent Users

To maintain a basic level of performance, SET limits the number of users that can be accessing it concurrently. This is set at installation and may vary from site to site. If more than the allowed number of concurrent users try to access SET, users will see the error message in Figure 22.



**Figure 22:** Concurrent users error message.

10 Software Label

