



# Surgical Planning User Manual

VisAR Surgical Planning User Manual —Version 3.1.0 – Part No. L-PL-IUV.002– Rev. 02–March 2026  
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## TABLE OF CONTENTS

Device Overview .....	1	Navigation Focus.....	11
Intended Use .....	2	Screw Planning .....	11
Intended Users.....	2	Additional fields.....	11
Contraindications .....	3	AI-Assisted Pedicle Screw Planning .....	12
Warnings.....	3	AI Pedicle Screw Planning Workflow.....	12
Precautions.....	3	Clinician Review and Editing .....	12
System Requirements .....	4	Incisions Planning .....	13
Web-Deployed Surgical Planning Application	4	Creating an Incision .....	13
Managed Surgical Planning Workstation.....	4	CUTS .....	14
LAUNCHING Surgical Planning ON A		MODELS .....	14
Workstation .....	4	Bone Detection.....	14
User Interface Overview.....	6	Model Separation.....	14
Surgical Planning App Menu.....	6	Model Options.....	14
Surgical Planning WINDOW .....	7	Models Tab Details.....	14
General Surgical Planning Workflow .....	7	X-RAY REGISTRATION .....	15
MOUSE OPTIONS.....	8	Table Removal Tools .....	17
Radius Menu .....	8	3D Sculpting .....	18
Tags .....	8	Image display and Navigation Tools .....	18
Adding Tags.....	8	Reset View .....	18
Tag Orientation Tools .....	9	Cross Localization.....	19
Tag Weight.....	9	Show Unselected .....	19
Window/Level Adjustments for Tags .....	9	Align Views.....	19
Landmarks .....	9	Error Logging and Troubleshooting.....	19
Adding Landmarks .....	10	Technical Specifications.....	21
Needle and Trajectory Planning.....	10	Support .....	21
Creating a Needle Trajectory .....	11		
Editing Needle Parameters.....	11		

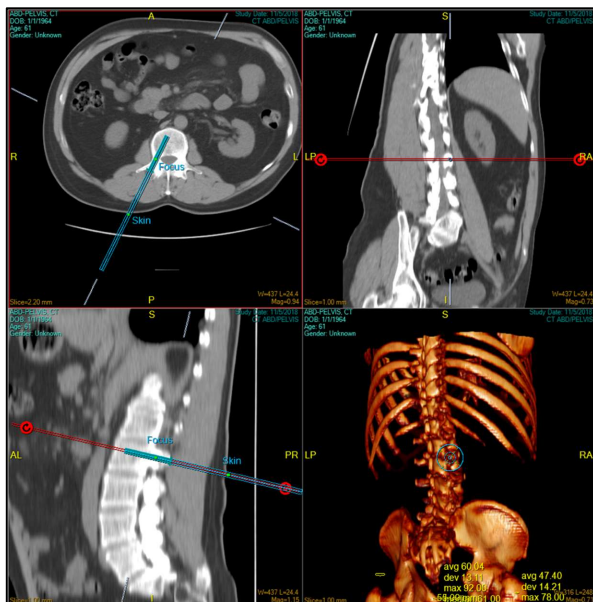
## DEVICE OVERVIEW

The VisAR Surgical Planning Software is a medical imaging application designed to assist surgeons in planning surgical procedures using patient imaging data.

The system enables surgeons to:

- Load and review patient imaging datasets
- Identify anatomical landmarks
- Generate anatomical models
- Plan surgical trajectories
- Define surgical entry points
- Create virtual surgical instruments
- Plan pedicle screw trajectories
- Export surgical plans for intraoperative visualization

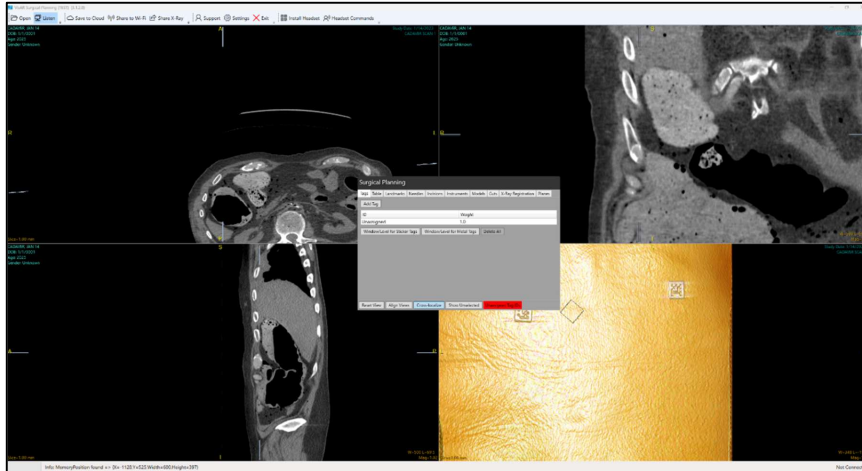
The software provides an interactive planning environment where surgical annotations, trajectories, and anatomical models can be created using both 2D imaging views and 3D reconstructed anatomy.



The surgical plan generated by the software is exported as an optical code (QR code). The VisAR headset uses this code to retrieve and download the surgical plan. The downloaded image dataset includes all annotations and planned details.

## INTENDED USE

The Surgical Planning Software is intended to assist surgeons in preoperative or intraoperative planning by allowing visualization of patient imaging data and creation of surgical plans, including anatomical landmarks, trajectories, and models.



The software does not perform automated diagnosis or treatment and does not replace the surgeon's judgment.

## INTENDED USERS

The software is intended for use by trained healthcare professionals, including:

- Surgeons
- Surgical residents
- Radiologists
- Surgical planning personnel
- Medical engineers
- Clinical technologists

The system is intended for use in:

- Hospitals
- Surgical centers
- Clinical planning environments
- Operating rooms

The system is not intended for home use.

### CONTRAINDICATIONS

There are no known contraindications associated with the use of the Surgical Planning software.

### WARNINGS



**WARNING:** The Surgical Planning software is intended solely as a planning aid. Surgical decisions must be made by the surgeon based on their professional judgment and the clinical situation.



**WARNING:** Incorrect placement of anatomical markers, landmarks, or trajectories may result in inaccurate surgical planning and inaccurate surgical navigation.



**WARNING:** Image quality, imaging artifacts, or segmentation inaccuracies may affect planning accuracy.



**WARNING:** Any automatically generated surgical trajectory or AI-assisted suggestion must be reviewed and confirmed by the clinician prior to use.

### PRECAUTIONS

Planning accuracy depends on both image quality and correct user interaction with the planning tools.

- Ensure patient imaging data corresponds to the correct patient.
- Verify the accuracy of all landmarks and annotations.
- Confirm surgical trajectories prior to use during navigation.
- Use imaging datasets with adequate spatial resolution.
- Avoid placing tags or landmarks on anatomical structures likely to move during surgery.

## SYSTEM REQUIREMENTS

The Surgical Planning software may be deployed in two configurations.

### WEB-DEPLOYED SURGICAL PLANNING APPLICATION

Requirements include:

- Desktop or laptop computer
- Supported Microsoft operating system
- Modern web browser
- Network connectivity

### MANAGED SURGICAL PLANNING WORKSTATION

The software is installed and configured by Novarad personnel.

Requirements include:

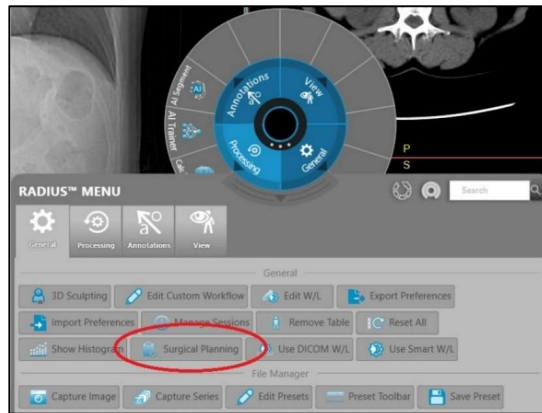
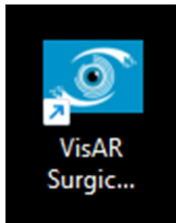
- Desktop PC
- Supported operating system
- Web browser
- Internet connection
- Hardware meeting PACS system performance requirements



### LAUNCHING SURGICAL PLANNING ON A WORKSTATION

- 1) Surgical Planning App
  - a. Download the Surgical Planning app
  - b. Double Click to launch (image 1)

2) Open Surgical Planning from the Radius Menu in the Enterprise System of VisAR



## USER INTERFACE OVERVIEW

### Surgical Planning App Overview Screen



### SURGICAL PLANNING APP MENU

- Open: Opens a study
- Save to Cloud: Saves the encrypted study to the CryptAR server and generates a QR code
- Share to Wi-Fi: Generates a QR code and shares the study over Wi-Fi from the local computer
- Share X-Ray: Opens the X-Ray preview window and prepares the study to share with VisAR
- Start Monitor: Starts the sharing monitor
- Settings: Opens the Surgical Planning Application settings

**Commented [CS1]:** USB is misleading as it opens a file explorer window and doesn't require a USB

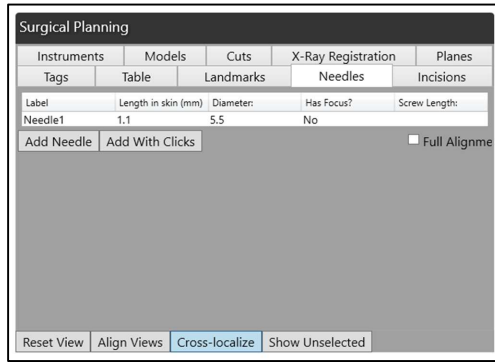
**Commented [CS2]:** Shares study over Wi-Fi network, generates QR code

## SURGICAL PLANNING WINDOW

The Surgical Planning Window is the primary interface for creating and modifying surgical plans.

The interface includes multiple tabs:

- Tags
- Landmarks
- Needles
- Incisions
- Instruments
- Cuts
- Models
- Planes
- X-Ray Registration



Commented [CS3]: Tabs missing from list

These tools allow users to create and modify annotations and surgical planning objects within both 2D imaging views and 3D anatomical models.

## GENERAL SURGICAL PLANNING WORKFLOW

The recommended workflow for creating a surgical plan is as follows:

1. Load patient imaging data.
2. Review imaging in 2D and 3D views.
3. Remove CT Table.
4. Sculpt away unnecessary anatomy.
5. Identify anatomical reference points.
6. Place tags or landmarks.
7. Generate anatomical models if required.
8. Plan surgical trajectories.
9. Define surgical entry points and targets.
10. Review and validate the plan.
11. Save to Cloud to export in the form of an optical code (QR code).

Commented [DG4]: Add a caption that says what this chart shows?

## MOUSE OPTIONS



### SCROLL

Left-click, hold and drag up and down



### ZOOM

Right and left-click, hold and drag up and down



### WINDOW LEVEL/MEASURE/PEN

Right-click, hold and drag up and down or side to side



### PAN

Click the mouse wheel, hold and drag in the direction you want to pan

## RADIUS MENU

Right-click on an image for the Radius Menu.

The options on the Radius Menu are:

- Processing
- Annotations
- View
- General

Clicking on any of these options will show tools relating to that option

Clicking the option at the bottom of the Radius Menu displays all tools and lets you search for specific ones.



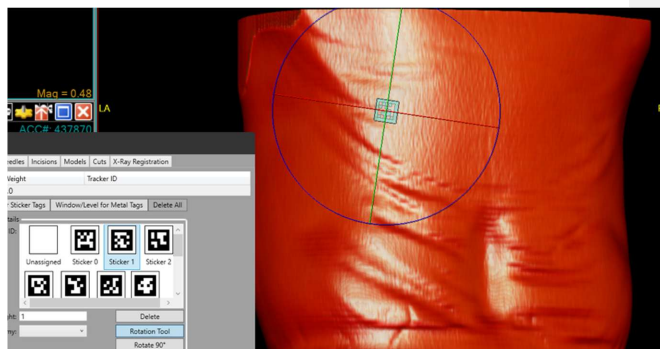
## TAGS

Tags represent identifiable markers within imaging datasets. They may correspond to physical markers placed on the patient or identifiable anatomical locations.

## ADDING TAGS

1. Select Add Tag.
2. Left-click on the 3D image to place the tag.
3. Assign a Tag ID from the tag list.
4. Adjust orientation if necessary.

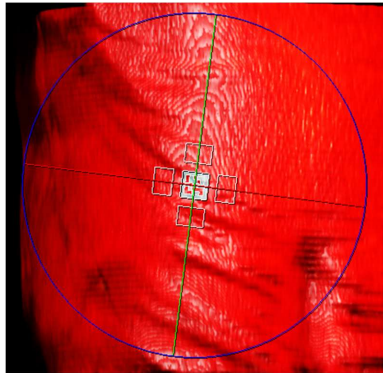
If a tag ID is not assigned, the system will display an Unassigned Tag ID warning.



### TAG ORIENTATION TOOLS

The following tools allow tag orientation adjustment:

- Rotation tool
- Rotate 90 degrees
- Flip tag orientation



### TAG WEIGHT

Tags include a weight value indicating the reliability of the tag. Lower weight values may be assigned to markers placed on anatomical structures that may move during surgery.

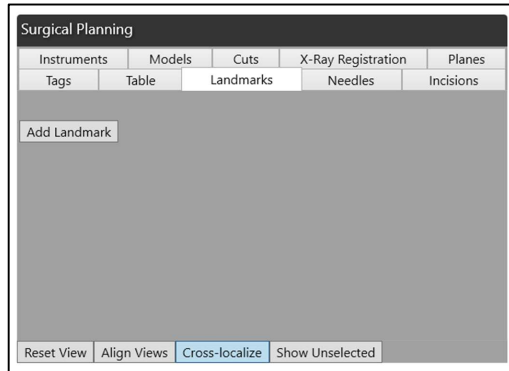
### WINDOW/LEVEL ADJUSTMENTS FOR TAGS

The Window/Level Adjustments planning instructions include:

- Window/Level for Sticker Tags
- Window/Level for Metal Tags

## LANDMARKS

Landmarks represent anatomical points identified on patient imaging. They may be used in place of physical markers.



### ADDING LANDMARKS

1. Select Add Landmark.
2. Click on the 3D image to place the landmark.
3. Assign name and weight value.

Multiple landmarks may be created within a surgical plan.

### NEEDLE AND TRAJECTORY PLANNING

The Needles tab allows users to define instrument trajectories used for surgical guidance. These trajectories may represent:

- Needles
- Guidewires
- Surgical instruments
- Pedicle screw trajectories

## CREATING A NEEDLE TRAJECTORY

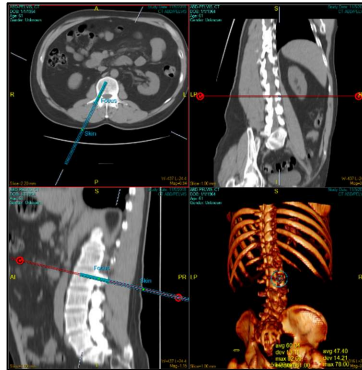
1. Select Add Needle.
2. Define the trajectory by dragging from the target location outward.

Alternatively:

1. Select Add with Clicks.
2. Click the target point.
3. Click the entry point.

The trajectory will appear in both **2D imaging views** and the **3D model**.

*\*A user can create needles using AI (AI Assisted Pedicle Screw Planning)*



## EDITING NEEDLE PARAMETERS

Users may modify:

- Needle label
- Diameter
- Trajectory length
- Navigation focus point

## NAVIGATION FOCUS

The Set Nav View Focus feature allows the user to define a reference point along the trajectory to assist visualization during navigation.

## SCREW PLANNING

When planning pedicle screw placement:

1. Enable the Has Screw option.
2. Configure screw parameters as required.

The screw trajectory will be stored as part of the surgical plan.

## ADDITIONAL FIELDS

- Screw Length – Allows user to specify the screw length in mm.
- Skin Point Alignment

- Needle List Table Display – Allows user to view, select, and manage existing planned needles.

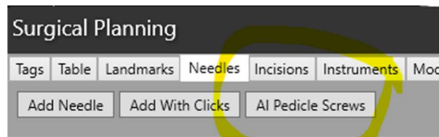
## AI-ASSISTED PEDICLE SCREW PLANNING

The Surgical Planning software includes an optional AI-Assisted Pedicle Screw Planning feature.

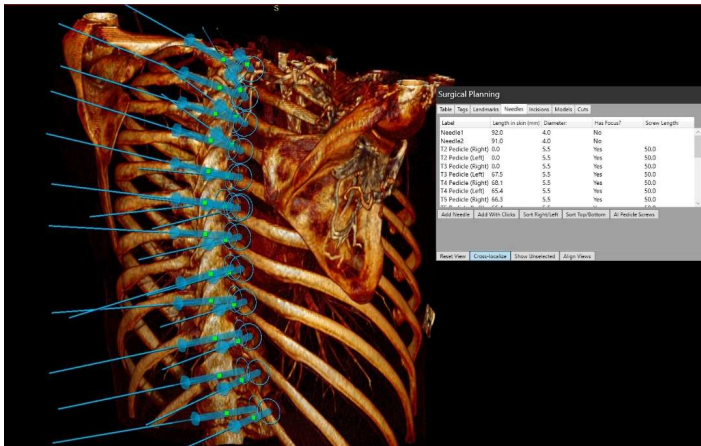
This feature analyzes the patient's imaging data to generate suggested pedicle screw trajectories based on anatomical structures.

### AI PEDICLE SCREW PLANNING WORKFLOW

1. Load the patient imaging dataset.
2. Activate the AI Screw Planning feature.



3. The software analyzes vertebral anatomy.
4. Suggested screw trajectories are generated.
5. The trajectories appear as candidate needle paths within the planning window.



### CLINICIAN REVIEW AND EDITING

The clinician reviews all suggested trajectories and may:

- Modify trajectory orientation

## Surgical Planning User Manual

- Adjust entry points
- Adjust screw length or diameter
- Delete suggested trajectories
- Create new trajectories manually

\*Important Note: AI-generated trajectories are planning suggestions only. The software *does not* autonomously determine final surgical plans.

The clinician remains responsible for:

- Reviewing all suggested trajectories
- Confirming anatomical appropriateness
- Modifying trajectories as required

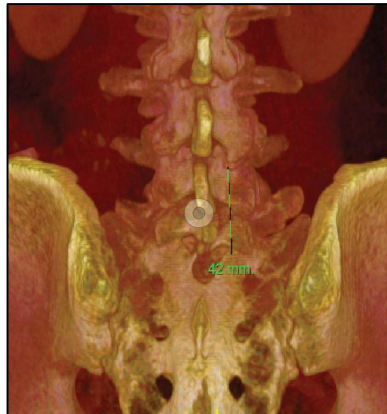
## INCISIONS PLANNING

Incisions may be planned using the Incisions **tab**.

### CREATING AN INCISION

1. Select Add Incision.
2. Drag across the image to draw the incision path.
3. Enter a label for the incision.
4. Incisions are measured in mm

Multiple incisions may be created.



## CUTS

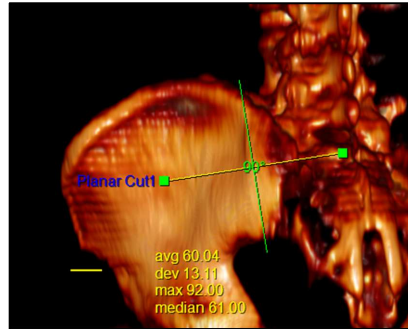
Bone cuts simulate osteotomies or surgical resections. Available cut types include:

Planar cuts

- Planar cuts with guideline measurements
- Freehand cuts

After creating a cut, users may adjust:

- Label
- Width
- Height
- Orientation



These cuts allow anatomical models to be separated into independent segments.

## MODELS

The Models tab enables segmentation and manipulation of anatomical surfaces.

### BONE DETECTION

Users may identify bone structures using threshold selection tools.

### MODEL SEPARATION

Using cuts, models may be separated into independent segments. This feature supports planning scenarios, including:

- Bone repositioning
- Fragment manipulation
- Surgical access planning

### MODEL OPTIONS

Available display options include:

- Transparent models
- Virtual instrument overlay
- Annotation assignment to models

### MODELS TAB DETAILS

The Models tab includes:

# Surgical Planning User Manual

- Lateral ventricle detection (brain imaging)
- Import model
- Model color changes
- Model editing tools

## X-RAY REGISTRATION

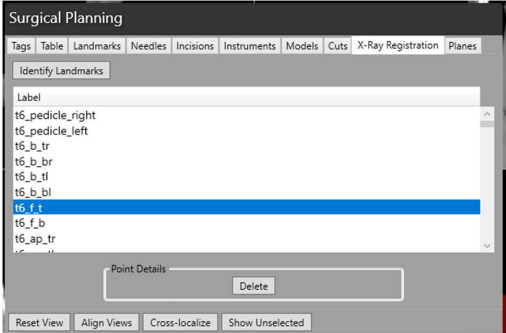
Load orthogonal X-Ray images into the Surgical Planning App and click on "Identify Landmarks." The application will identify landmarks in preparation for AI-assisted X-Ray registration.

Delete any landmarks that will not be used for registration.

Share X-Ray

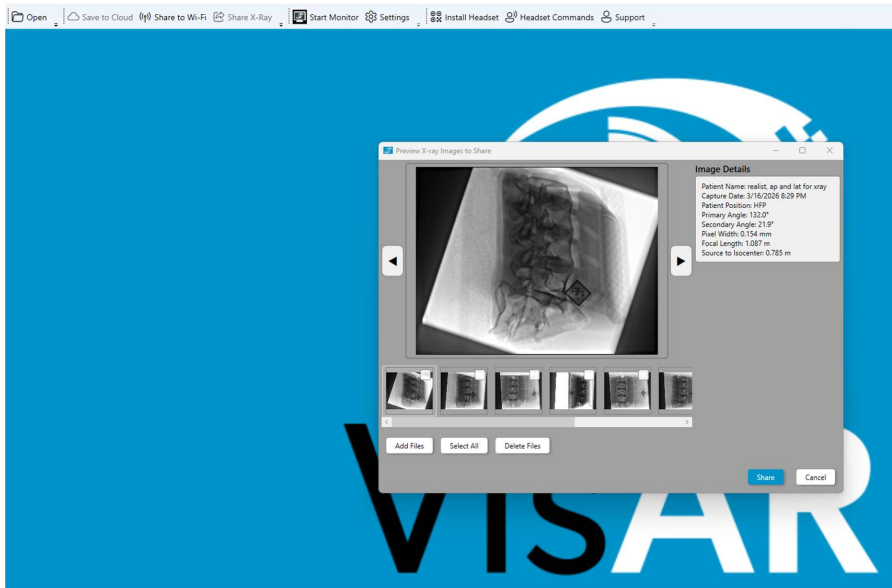
Steps:

1. Acquire images on a jump drive from the fluoro machine
2. Click "Share X-ray" and navigate to the file with DICOM images taken from the C-arm by clicking "Add Files".



Name	Status	Date modified	Type	Size
<input type="checkbox"/> XA.1.3.12.2.1107.5.4.5.125108.30000026031618202904600000127.001.dcm	●	3/19/2026 4:34 PM	DCM File	9,313 KB
<input type="checkbox"/> XA.1.3.12.2.1107.5.4.5.125108.30000026031618202904600000131.001.dcm	●	3/19/2026 4:34 PM	DCM File	9,313 KB
<input type="checkbox"/> XA.1.3.12.2.1107.5.4.5.125108.30000026031618202904600000133.001.dcm	●	3/19/2026 4:34 PM	DCM File	9,313 KB
<input type="checkbox"/> XA.1.3.12.2.1107.5.4.5.125108.30000026031618202904600000139.001.dcm	●	3/19/2026 4:34 PM	DCM File	9,313 KB
<input type="checkbox"/> XA.1.3.12.2.1107.5.4.5.125108.30000026031618202904600000143.001.dcm	●	3/19/2026 4:34 PM	DCM File	9,313 KB
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3. Select the files to add



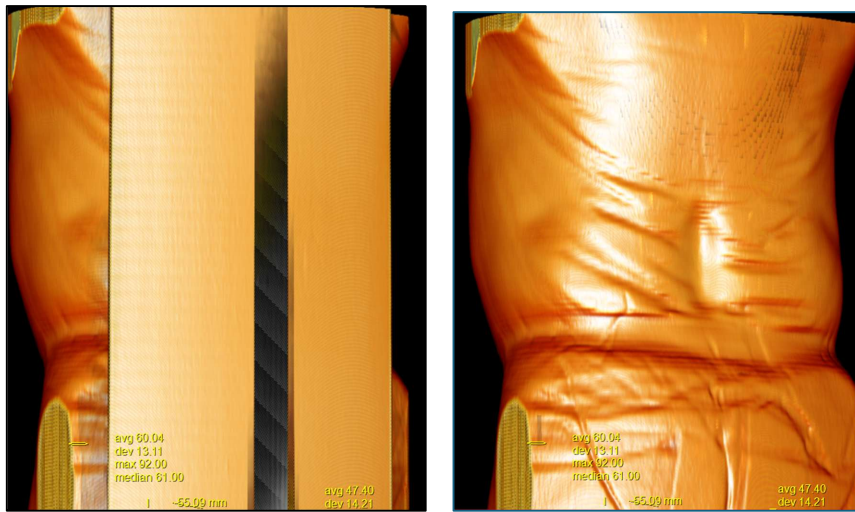
4. Click "Share" when ready to share to any VisAR headset on the same network.

\*Note: the majority of X-ray registration is done in the headset.

## TABLE REMOVAL TOOLS

The Table tab includes:

- Remove Table (in 3D)
- Auto-Remove Table
- Don't Remove Table
- 3D Sculpting tools



These tools allow for the removal of the CT table and editing of the 3D model.

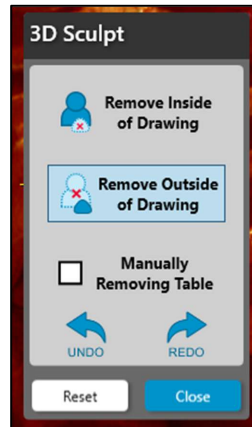
## 3D SCULPTING

Users can:

- Remove the inside of a drawn shape
- Remove the outside of a drawn shape

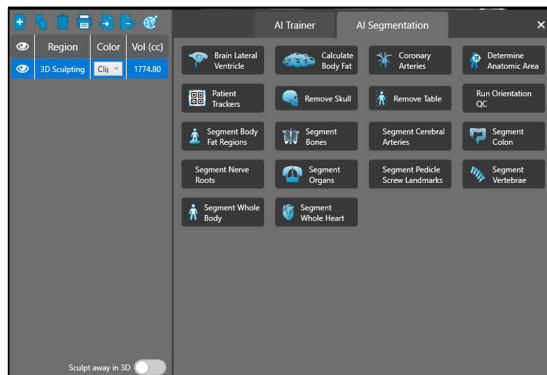
Directions:

1. Right mouse click on Viewer.
2. Select General.
3. Select 3D sculpting.
4. Right-click and hold while circling the area you wish to remove or keep.
5. Let go of the mouse button, and the action will take place.
6. Easily Undo or Redo a sculpting by clicking the respective arrows.



You can also manually remove the table by clicking the checkbox.

Any sculpting done can be toggled on/off or removed from the Segmentation Screen by clicking the Eye icon or clicking the Delete icon.



## IMAGE DISPLAY AND NAVIGATION TOOLS

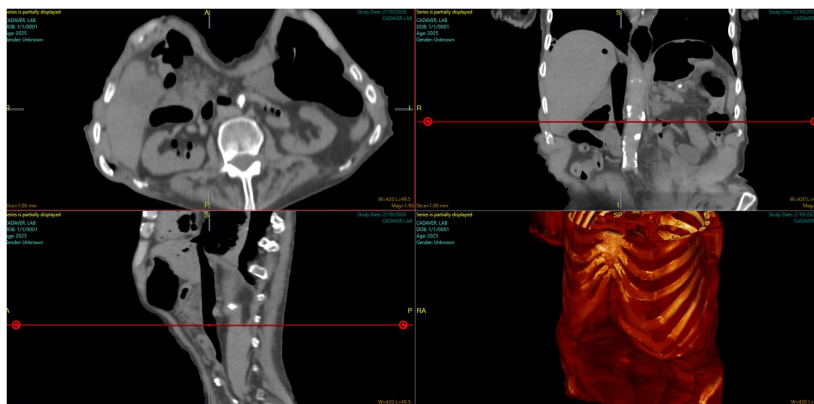
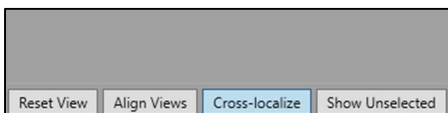
Additional image navigation tools assist with the visualization and review of planning elements. These tools include the following:

### RESET VIEW

Returns the 3D view to its default orientation.

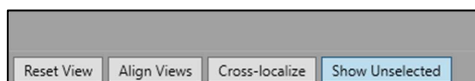
## CROSS LOCALIZATION

Displays the intersection of imaging planes across MPR views.



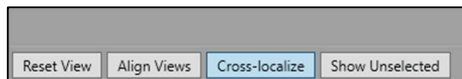
## SHOW UNSELECTED

Displays all annotations in the surgical plan.



## ALIGN VIEWS

Aligns imaging slices to a selected annotation.



## ERROR LOGGING AND TROUBLESHOOTING

If the software encounters an unexpected error:

- An error log is automatically generated.
- The log may be exported for technical support analysis.

Error logs assist support personnel in diagnosing system issues.



## TECHNICAL SPECIFICATIONS

### Network

- TCP/IP communication
- DHCP client
- TLS 1.1 or higher
- AES-256 encryption

### Wireless

- 802.11ac Wi-Fi
- 5.15–5.25 GHz frequency band

### Environmental

- Operating temperature:  
10°C – 27°C
- Operating humidity:  
35% – 65% RH
- Storage temperature:  
20°C – 30°C

## SUPPORT

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### Document Control

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