Surgimap®

The Physician Driven Imaging Solution®

A Nemaris, Inc. Product

User Guide
For version 2.3.2 and higher

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REVISION 5.0

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Disclaimer

Surgimap is intended as a decision support system for persons who have received appropriate medical training, and should not be used as a sole basis for making clinical decisions pertaining to patient diagnosis, care, or management. All information derived from the software must be clinically reviewed regarding its plausibility before use in treating patients. Any derivation of the application of medical information from the program, other than the original design or intended use thereof, is not advised and considered a misuse of the software product.

Limit of Accuracy for Surgimap

Measurement Type	Unit	Mean Error	Standard Deviation	Precision Estimator
Distance	mm	-0.3	0.8	± 1.6
Angle	degrees	0.0	0.2	± 0.4

EC Directive

C E 0123 This device complies with the Requirements of the 93/42/EEC Directive Concerning Medical Devices, as amended by Council Directive 2007/47/EC.

Legal Manufacturer: Surgimap is:

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Authorized Representative in Europe

Nemaris Inc. has retained the services of MDSS GmbH. Their contact information is:

EC REP MDSS GmbH,

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30175 Hannover
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Tower II, Darling Park
201 Sussex Street
Sydney, NSW 2000
Australia

Contents

Chapter 1: Welcome to Surgimap

Introduction to Surgimap

Thank you for using Surgimap®, The Physician Driven Imaging Solution®.

Surgimap is a standalone software developed by Nemaris Inc. This software aims to provide a complete solution for healthcare providers dealing with medical images. After proper authentication, Surgimap permits the user to retrieve/preview medical images (DICOM and also standard formats such as JPEG, TIFF, PNG, PPT…), save key images to a database, add measurements and clinical information to the images, simulate surgical procedures, plan the logistical aspect of a surgical procedure, and share the information with co-workers via online synchronization.

Surgimap was developed by spine surgeons, researchers, and engineers to function as a stand-alone application that can run directly from your computer hard drive or from an external storage device (e.g., USB key, external hard drive). The key features and benefits of the software are:

- ❖ Universal Image Viewer
- ❖ Portable Encrypted Database
- ❖ Digital Measurement Tools with case simulation
- ❖ Clinical Collaboration
- ❖ Cross-Platform Use

With a rising demand for increased efficiency and a marketplace shift transitioned to digital images, it has become evident there is a need for an image viewer that opens a wide range of image formats, including DICOM files.

With image digitization, filing cabinet storage is inefficient; as such, Surgimap incorporates a database for the storage of images and associated clinical information. Through unique password protection and encryption technology, information, and images stored within the database can be kept confidential.

In addition, with medical images viewed on computer screens, there is a need to have the analysis feature for performing measurements and annotating images as well as a surgical simulation feature for interventional procedures.

Surgimap is organized around five screens. The product features pertaining to each screen are described hereafter. Of note, only high-level features are discussed in this section. A detailed review of the entire set of features is provided in further parts of this document.

- The **LOGIN SCREEN** permits the following actions:
  - Manage user authentication
  - Register and obtain authentication information
  - Request password help (for registered users only)
  - Upgrade the software

- The **HOME SCREEN** permits not only to navigate through Surgimap but also to:
  - Provide prominent links to other screens of Surgimap
  - Display logo and additional information specific to our sponsors
  - Display educational content
  - View the calendar

- The **IMPORT SCREEN** permits a preview of images from digital sources. The high-level features are as follows:
  - Ability to read DICOM images but also standard formats such as JPEG, TIFF, PNG, PPT…
  - Ability to navigate through digital support containing images
  - Ability to retrieve images from other Surgimap local databases
  - Ability to retrieve images from PACS systems
  - Ability to save selected images to the Surgimap local database
  - Ability to send images to Surgimap or other companies
  - Ability to add collaborators
  - Ability to open the selected image(s) to the **DATABASE SCREEN**

- The **DATABASE SCREEN** permits the user to display and search images and other related information saved in the database. The high-level functions are as follows:
  - Extract key information from any DICOM image saved into the database
  - Display a list of patients with associated images
  - Organize the image database according to the following architecture
    - Patient(s) \ Study(ies) \ Series \ Image(s)
  - Ability to manually add or modify clinical information associated with each study
  - Ability to open an image into the **MEASURE SCREEN**
  - Ability to create cases containing images and/or other information
  - Ability to synchronize images and cases online
  - Ability to view the surgical cases in a list or a calendar
  - Ability to order patient-specific implants

- The **MEASURE SCREEN** permits the viewing of images, manipulation thereof, and ability to add measurements/annotations and simulated aspects of surgery. The high-level features are as follows:
  - o Ability to display DICOM images but also standard formats such as JPEG, TIFF, PNG, PPT…
  - o Ability to perform basic image manipulations (zoom, image rotation, brightness, contrast, and gamma adjustment)
  - o Navigate through a set of multiple images
  - o Add and display generic and "specialty" related measurements (distances and angles) to the images
  - o Simulate aspects of surgical procedures such as osteotomies, rod placement, screw placement, and interbody device placement
  - o Visualize the result of the surgical simulation and provide a list of updated measurements
  - o Save images and any optional marking (measurements, annotations and/or surgical simulations) to the Surgimap database
  - o Gain access to published reference values
  - o Share the results of a pre-operative plan or the measurements performed on an image

About this Manual

Overview

This manual assumes that you know how to use Windows and Mac, and have access to digital copies of medical images. For help on these topics, consult your computer owner's guide or IT department.

Often there is more than one way to select a command in Surgimap. A single command may be available from a toolbar icon, from a context-sensitive right-click menu, or with a keyboard command. In most cases, this manual provides instructions for selecting commands from toolbar icons.

As with any software product, there are many ways that the offered tools and features of Surgimap can be used. In addition, the workflow for opening, storing, and making annotations to images will vary from user to user and the surrounding work environment. This manual offers general descriptions of features and tools and is organized to demonstrate a common workflow logic. It is not intended to prescribe the order or sequence in which a user should utilize Surgimap.

Surgimap Versions

This manual is applicable to Surgimap version 2.3.2 and will be updated from time to time as new versions are released.

Customer Service

Online Help

The Surgimap website (www.surgimap.com) contains a product overview, technical support tips, and our contact information. You can also learn about the various training options by contacting Technical Support.

If you are new to Surgimap, our website is the ideal place to get started, but you can find many instructional videos by searching for "Surgimap" on YouTube. Once an account is created with your email address, we will send you a link to download and use the latest version of Surgimap.

Technical Support

How to contact us

Contact Technical Support at Nemaris Inc. if you encounter problems while using Surgimap. When you contact us, please have a clear description of the problem and know the version of your copy of Windows or Mac OS X, as well as the version of Surgimap that you are using.

Technical support can be contacted as follows:

- ❖ **Email**: support@surgimap.com
- ❖ **Internet**: www.surgimap.com
- ❖ **Phone**: +1 646 794 8650

Request training

Should you wish to get trained on the use of Surgimap, please do not hesitate to contact Technical Support. A member of our team will respond to you and organize remote online training sessions or meet with you in person during a specific event attended by the Nemaris team.

How to determine which version of Surgimap you are using

Simply launch the Surgimap application and make a note of the version number indicated in the upper left corner of the LOGIN SCREEN.

Chapter 2: Installing and Upgrading Surgimap

Overview

How to Get Surgimap

There are many ways for users to obtain the Surgimap software. At a number of conferences and meetings pre-loaded USB keys are distributed. A listing of some of these events can be viewed on our website at www.surgimap.com. In addition, our team can be reached by phone or email regarding inquiries on events (contact@surgimap.com, Tel: +1 646 794-8650). The optimal way of obtaining a version of Surgimap is directly through our website at www.surgimap.com. The advantage of a web download is that it permits immediate registration and thus the creation of a password-protected version that offers encryption of patient-related data.

System Requirements

The current version of Surgimap runs on the Windows and Mac operating systems. Although compatible with most versions of Windows and Mac, the possibility for incompatibility with certain versions may exist, and an updated listing of Windows and Mac compatibility can be obtained by directly contacting Nemaris at contact@surgimap.com. Detailed requirements are as follows:

- ❖ **Minimum Hardware Requirements: Windows/Mac**
  - o Personal Computer
  - o 2 Gigabyte (GB) RAM
  - o 1.4 Gigahertz (GHz) CPU or better
  - o 1 Gigabyte (GB) free on the Hard Drive
  - o Keyboard
  - o Mouse, trackball or equivalent device
  - o Monitor with a resolution of 1024x768 pixels
  - o USB port (optional)
- ❖ **Software Requirements**
  - o Windows: Microsoft Windows 7 or newer
  - o Mac: Apple Mac OS X 10.14 or newer

Downloading Surgimap from www.surgimap.com

Overview

Obtaining a version of Surgimap directly from the www.surgimap.com website ensures receiving the latest version of the software. In addition, registration on the site offers the ability to create a unique password and username to benefit from encryption of patient-related data. The process involves providing basic information and downloading Surgimap on any desired computer or portable storage medium (USB preferred).

Download Surgimap

From the **HOME SCREEN** on www.surgimap.com, the first step to downloading a version of the software is to provide minimal information.

1. To register, simply follow the '**Download for Free**' button on the Surgimap website.

   DOWNLOAD FOR FREE

2. On the download page, select your preferred device and installation process.
   a. If you are behind a hospital firewall, we recommend that you manually install the zip file.
   b. If you are *not* behind a firewall, you may auto-install the executable download file.
3. Then complete required fields e.g. Email Address, First Name, Last Name, Password, etc.
4. Press '**Request Download**' button.
5. An automated email entitled "Your Surgimap Registration" is sent directly to your inbox.
6. Click the "Activate Your Account" link to activate your account and initiate the download.
7. Follow the installation instructions to complete the download.

Once the download process is complete, you can decide to run Surgimap directly from your computer or from a USB.

Launch Surgimap

Once download is complete, simply double-click on the Surgimap icon to start the software. This will open the **LOGIN SCREEN** permitting to either login with a registered account or to register a new account.

Running Surgimap from a Preloaded USB Key

Overview

Nemaris will, from time to time, offer preloaded USB keys at events and conferences to provide the current version of Surgimap.

Launch Surgimap

To launch Surgimap from a preloaded USB key, first, plug the key into a Windows or Mac operating system, and start "Surgimap application". This will launch a **LOGIN SCREEN** from which new users can enter existing credentials or register for a new account.

Register

From a preloaded version of Surgimap, it is easy and quick to register. This step offers the benefit of creating a unique password and login protecting access to confidential information stored within the Surgimap database. In addition, registration ensures prompt access to software updates and permits a direct link to the Surgimap team in terms of submission of comments or requests for educational and product-related information.

Upgrading Surgimap

Overview

Occasionally Nemaris issues upgrades to the Surgimap software. These upgrades may reflect improvements in performance, security, or function and, in some cases, offer new features or tools to our users. In order to benefit from upgrades, a user can either download the latest version of Surgimap from our website (www.surgimap.com) or upgrade directly within the **LOGIN SCREEN** if an active Internet connection is available.

It is strongly recommended for users to upgrade with a registered version through the login window as this can avoid the risks of unlinking the Surgimap application from the database (which can block access).

How to Upgrade

Directly from the login window of Surgimap:

❖ Surgimap now performs automatic upgrades.
❖ During the usual login process used to launch Surgimap, upgrade alerts are displayed prominently.

❖ If a user wishes to upgrade, click the 'Upgrade' button to start to upgrade the software, which usually takes less than one minute to complete.

Upgrade Process

Once Upgrade has been pressed:

❖ A backup of your existing version is saved. In the case of internet loss, computer shutdown, or catastrophic failure, this backup can be restored by locating the file now named "Surgimap.exe_old" or "Surgimap.app_old" and renaming by removing the "_old" extension.

❖ New files are downloaded automatically. You will see progress bars indicating the download of new replacement files. The number and size of these files will vary with the size of the update.

❖ Surgimap will restart automatically once the upgrade is complete.

Through a software download from www.surgimap.com:

❖ If a registered user wishes to upgrade to another version of Surgimap through the website, the download of Surgimap must first be completed.

❖ The user can then delete a previous version of Surgimap by removing only the .exe and .app files inside the application folder and replacing them with the new versions in the same location (on PC or USB key).

Chapter 3: Surgimap Guided Tour

Overview

The Usual Workflow

Like with any software, there are multiple ways to use Surgimap. One possible workflow is as follows:

1-Login Screen	•Authentication (login and password) •Start Surgimap
2-Home Screen	•Navigate through the Surgimap Software •Information on spine related items
3- Import Screen	•Preview images and import them to Surgimap database •Image formats supported: DICOM, JPEG, TIFF....
4-Database Screen	•Organize and preview database content •Add clinical information to saved images
5-Measure Screen	•Manipulate, navigate through a set of images •Add generic and spine related measurements, plan surgical procedures

Surgimap: Screen by Screen

1-Login Screen

The main function of the **LOGIN SCREEN** is to permit the user to launch Surgimap with authentication via login and password.
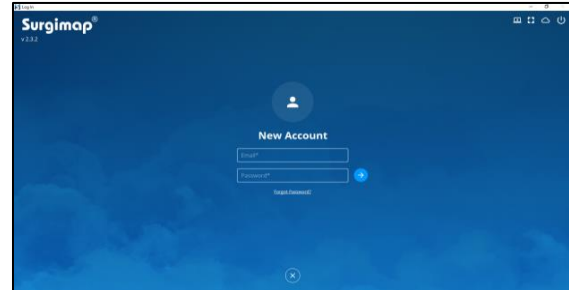
2-Home Screen

The **HOME SCREEN** is the first one to be displayed after authentication. The **HOME SCREEN** allows the user to navigate through different application screens, receive guidance on how to get started with Surgimap, and provide access to educational information or partner data if available. The **HOME SCREEN** also has a tab with in-software notifications.
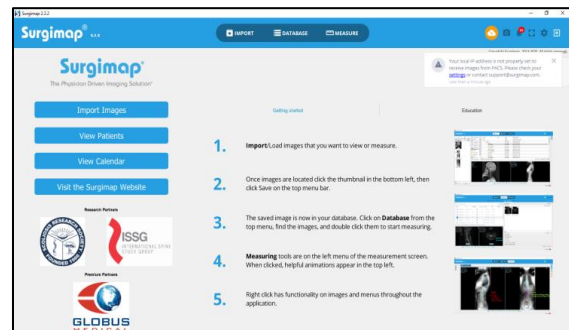
3-Import Screen

The **IMPORT SCREEN** allows the user to retrieve images located on a digital storage device (CD-ROM, USB key, hard drive…), or located on external database (other Surgimap databases, PACS systems). The **IMPORT SCREEN** permits the user to retrieve images in DICOM as well as other standard formats (such as JPEG, JPEG2000, TIFF, PNG, PPT…). This screen also permits the user to import selected images into the Surgimap database, add collaborators, and/or send to Surgimap or other companies, deidentified as established in user settings.
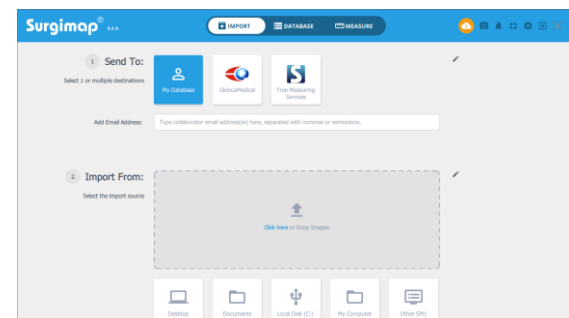
4-Database Screen

The **DATABASE SCREEN** permits the user to review the content of a created database. By default, the database displays all patients and associated studies (images). This screen also permits to query the database (i.e. search), display a preview of the images, and add clinical information to each patient and study.
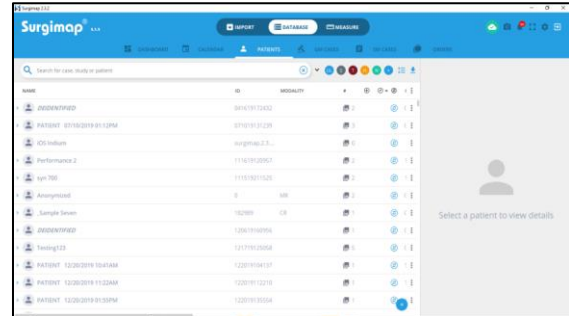
In addition, the **DATABASE SCREEN** permits the user to organize saved images into surgical cases, to backup information online, and to collaborate with other Surgimap users.

5-Measure Screen

The **MEASURE SCREEN** permits the user to view images, manipulate them (e.g., contrast, zoom in/out), add measurements, annotations, and simulate operative strategies.
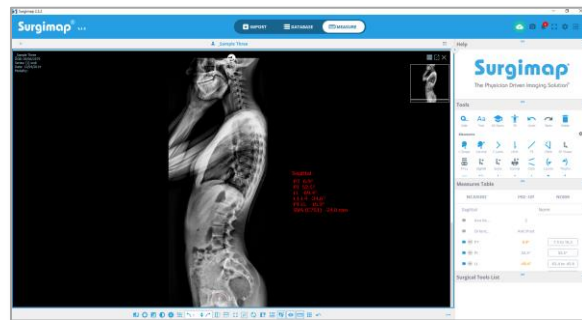
Chapter 4: The Login Screen

Overview

Purpose

The main function of the **LOGIN SCREEN** is to permit the user to launch Surgimap after authentication via login and password. On a second level, the **LOGIN SCREEN** should also:

- ❖ Permit the retrieval of a lost password for registered users
- ❖ Permit the registration of a non-registered user
- ❖ Permit to update Surgimap to more recent version when available

Design Overview

The **LOGIN SCREEN** is the first screen displayed when Surgimap is launched. It permits to associate an existing registered user with Surgimap, Login to Surgimap, register for a new account and access our contact information.
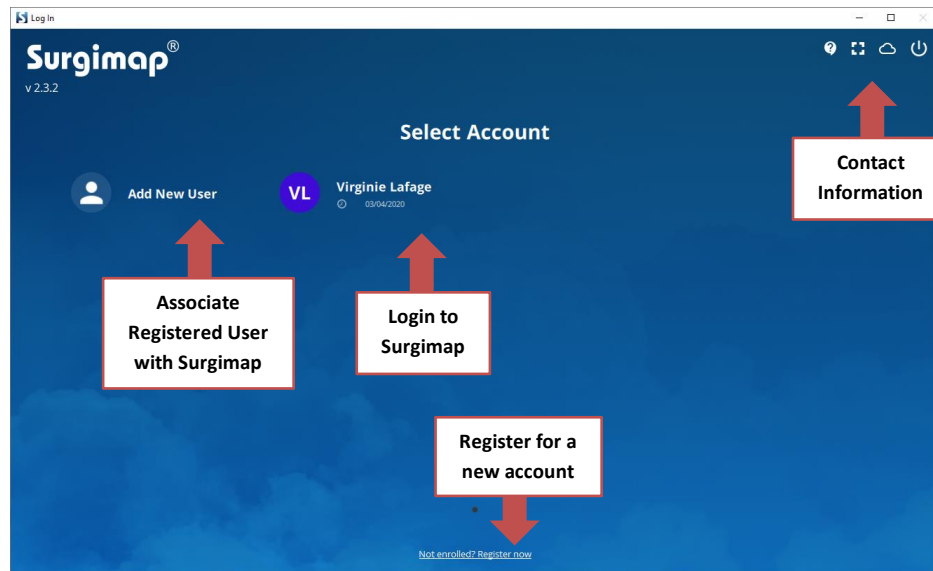
Detailed Description of Each Function

Sign in to Surgimap

The main function of the **LOGIN SCREEN** is to permit the user to launch Surgimap with existing authentication via username (their email address) and password.

Registered users

Registered users will have to enter their own username and password before pushing the enter key on their keyboard or clicking the "light blue arrow". Failure to enter the correct username/password combination will result in an error message and the user will have to restart the process or request support.
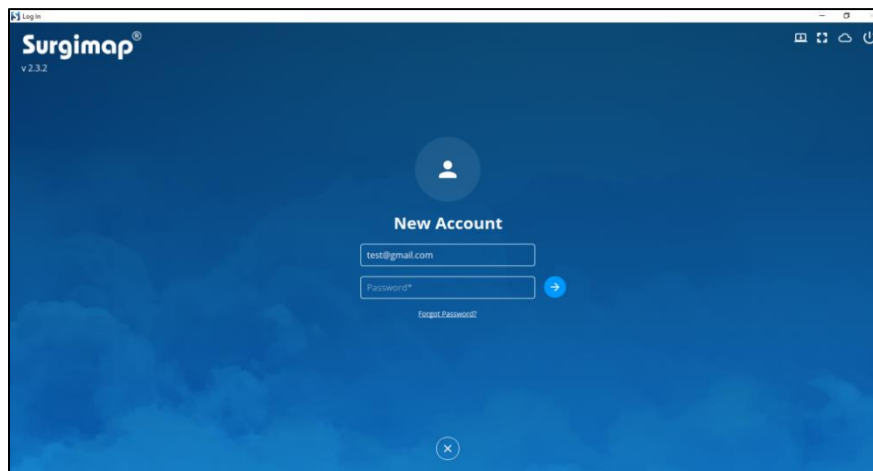
Lost Password?

On **LOGIN SCREEN**, a "Forgot Password…" link is available in case you can't remember your password. Clicking this link will trigger an email to be sent to your registered email address with specific instructions to choose a new password. Of note, the ability to retrieve a lost password is only available for registered users.

Create an Account/Register

From the **LOGIN SCREEN,** clicking int the "Not enrolled? Register now" link permits to register new account. By filling in the "Email", "Password", and "Confirm Password" fields and clicking "Register", a new account will be created. You must then verify the email address by clicking the verification link in the system-generated email sent to your email address. The password requires at least 8 characters with a minimum of one capital letter, one lower case letter, and one number. The confirmation password must match exactly, including capitalization.
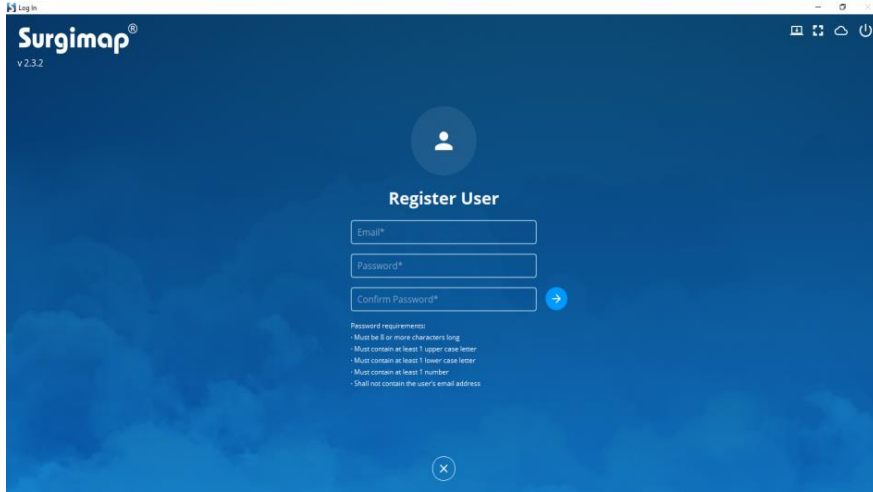
Chapter 5: Home Screen

Overview

Purpose

The **HOME SCREEN** allows the user to navigate through different application screens (navigation pane), and provides access to "Getting Started" and "Education" tutorials.

Design Overview

The **HOME SCREEN** is organized around a navigation pane on the left, a set of logos with hyperlinks, some tutorials on the right, and a horizontal navigation toolbar common to each Surgimap screen. The **HOME SCREEN** is an HTML page downloaded from Surgimap's server, meaning the content may periodically be updated when you log into the software.
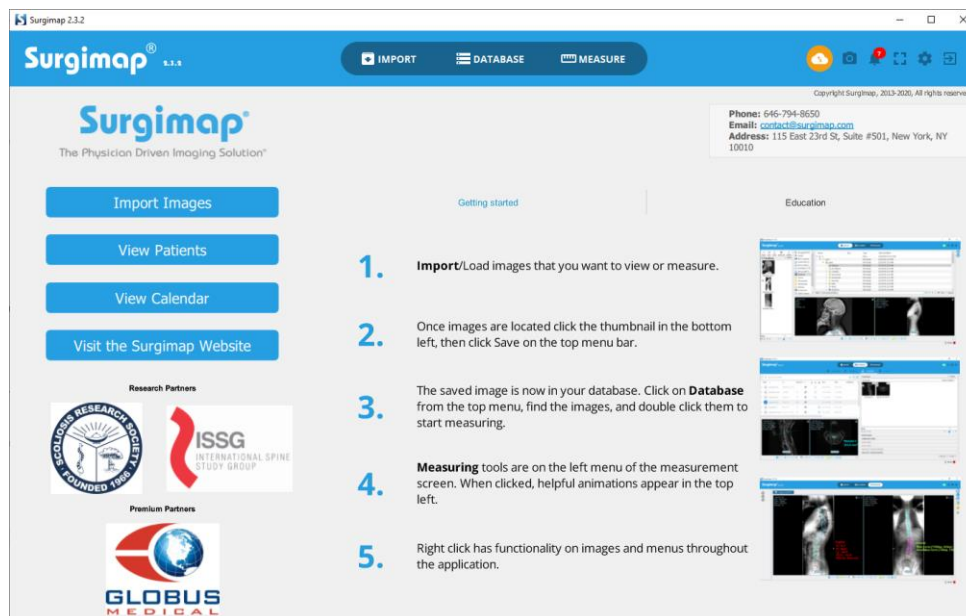
Detailed Description of Each Function

Navigation Pane

This set of functions is designed to allow the user to select Surgimap screens by clicking on the following links displayed in the navigation pane.

- ❖ Import Images
- ❖ View Patients
- ❖ View Calendar
- ❖ Visit the Surgimap Website
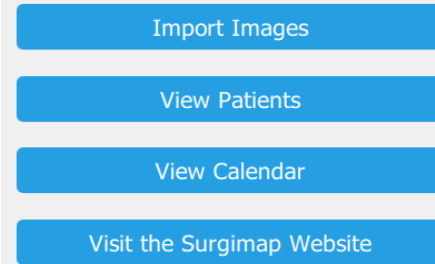
Logos with Hyperlinks

When an internet connection is available, clicking on a logo on the home screen will open a web browser that links directly to the sponsor's website. Of note, depending on which rendition of Surgimap the user is registered for, a different set of logos may be displayed in the HOME SCREEN.

Getting Started Tab

The Getting Started tutorial offers the user a quick overview of the main steps to follow in order to use Surgimap. Of note, this guide may be updated from time to time and will depend on the rendition of Surgimap the user is registered for.

Education Tab

Educational tutorials presented in academic meetings are accessible here.

Partner Specific Content

Depending on the rendition of Surgimap the user is registered for, additional educational material specific to a Surgimap partner may be displayed in the **HOME SCREEN**.

General Icons

The general icons, located in the top right corner, are accessible across all Surgimap screens.

Home Screen

The Surgimap logo on the upper left corner navigates back to the **HOME SCREEN**.

Screenshot Image

Prompts an active, adjustable dialogue box to capture images on a desktop. The captured image appears in the **MEASURE SCREEN** after user inputs required information. See section: Import Non DICOM Image for more details.

Notifications

Displays the number of new notifications in red. Click to view notification details and dismiss read notifications.

Full Screen

Displays Surgimap in Full Screen

Settings

Allows users to edit specifications for the interface, find application-related information, access User Guides, and more. See Chapter 10: Settings for more details.

Chapter 6: The Import Screen

Overview

Purpose

The **IMPORT SCREEN** is designed for the selection and retrieval of images. Key components consist of: saving selected images to a patient database, sending images to Surgimap or other vendors, adding collaborators, and opening images in the **DATABASE SCREEN**

Possible sources of images include digital storage devices (CD-ROM, USB key, hard drive…), PACS system, third party databases, or other Surgimap Databases. Images formats support by Surgimap include DICOM as well as other standard formats (such as JPEG, JPEG2000, TIFF, PNG, PPT …). In the event where a DICOM directory (DICOMdir file) is located on the digital storage device, the content is displayed according to this specific architecture (patient/study/series/images).

Design Overview

The **IMPORT SCREEN** consists of the four distinct panels.

- ❖ The Send Panel permits the user to save images to a patient database and/or send images to Surgimap, vendor, or collaborator
- ❖ The Import Panel permits the user to select the import source and select images to save
- ❖ The Thumbnail Panel displays thumbnails of images contained in the selected source
- ❖ The Details Panel permits the user to create a new patient with new patient/study/series details or add images to an existing patient in the database

Access

The **IMPORT SCREEN** can be accessed from:

- ❖ The **HOME SCREEN**, by clicking on the label "Import Images"
- ❖ By selecting the "Import" tab available from any screen
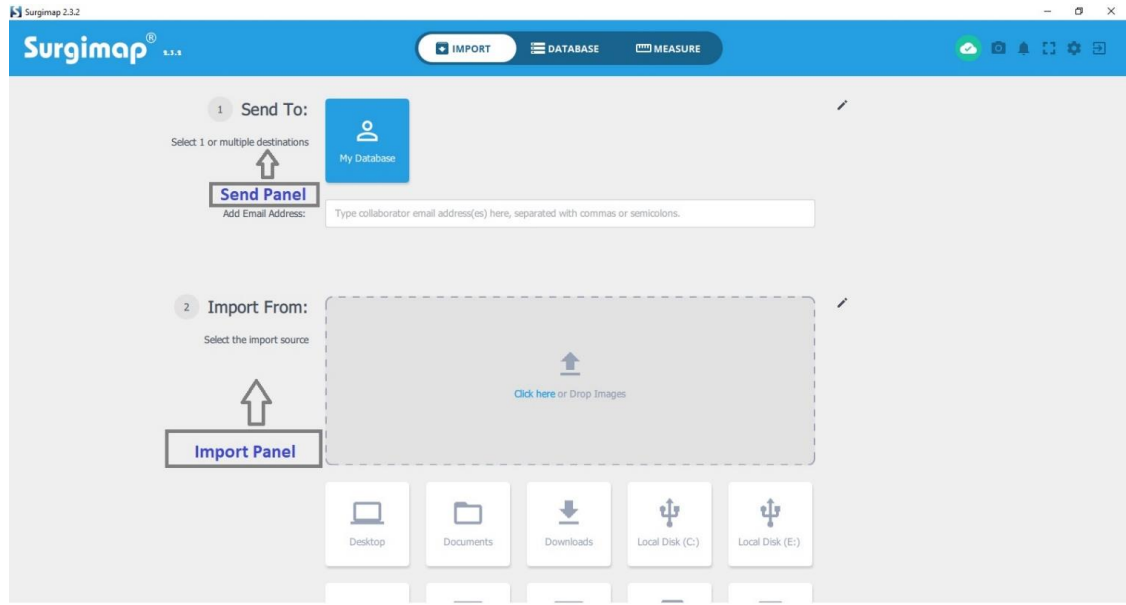
Send Panel

Overview

The Send Panel permits the user to send selected images to various locations by selecting various Send Icons (blue when selected) or by adding collaborators:

- ❖ My Database: automatically selected to save image(s) to the Surgimap account in use
- ❖ Free Measuring Services: sends image(s) to Surgimap for free measurements to be applied and sent back to the user
- ❖ Vendor Icons: send image(s) directly to implant vendors
- ❖ Add Collaborators: send image(s) directly to entered emailed addresses to add these users as collaborators
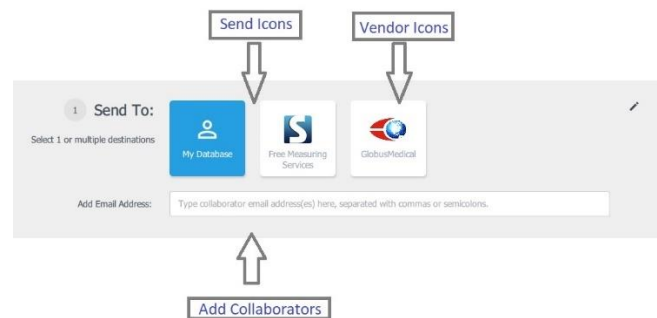
Vendor Setting

Vendor settings can be accessed by selecting the User Settings Icon and the CONTACTS Tab. Use the Primary Reps Panel to set specific Surgimap users as primary vendor reps such that when selecting that Vendor Icon in the Send Panel of the **IMPORT SCREEN**, that rep will receive the image(s).
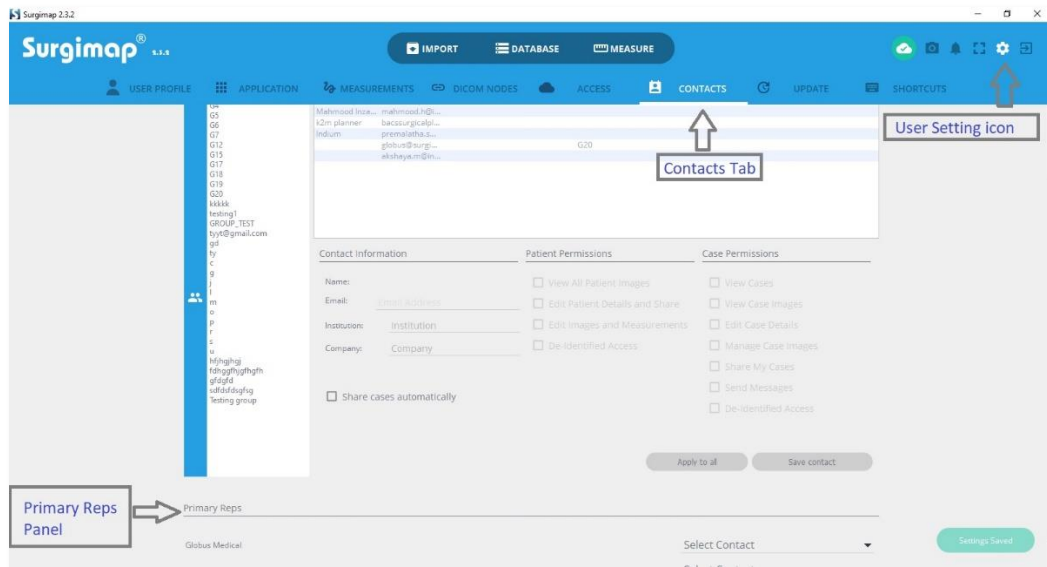
Import Panel

Overview

The Import Panel permits the user to select various digital sources of images and to navigate within these sources. After images are selected and saved, the user is brought to the Thumbnail and Details Panel. The most common sources of images are:

- ❖ File System: this includes local storage (ex: hard drive), network storage (ex: network attached drives), or external storage (ex: CDs, USB keys)
- ❖ Other Surgimap Database
- ❖ PACS System
- ❖ Screenshot
- ❖ Third Party OsiriX Database

Navigate within File System

Selecting Source

The user selects the image(s) import source by first selecting the Source Icon depicting the location of the image(s). The user can adjust which Source Icons are displayed by selecting the Edit Icon at the right.
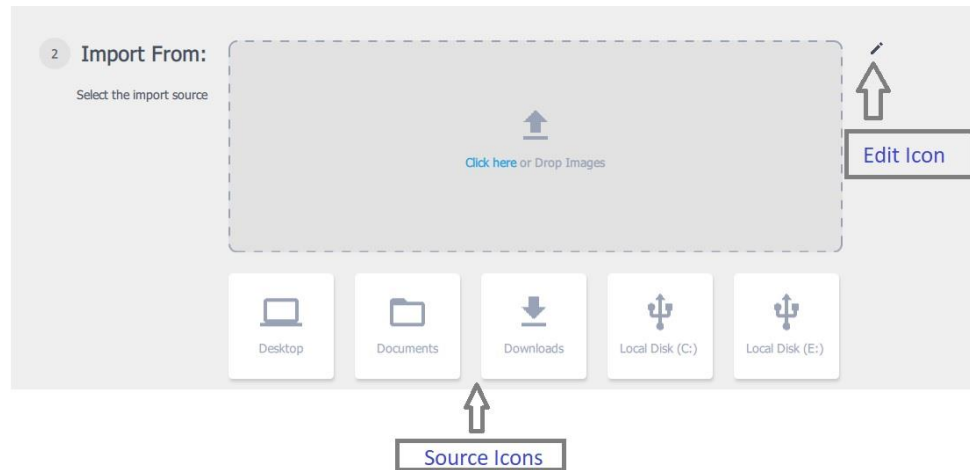
Dialog Box

After selecting the desired Source Icon, a Dialog Box appears to navigate within that source. The Backward and Forward Arrow Icons permit the user to undo or redo clicks within the Dialog Box. The Upward Arrow Icon follows the source to the previous folder. After the user clicks the Save Button, the Thumbnail and Details Panels will appear.
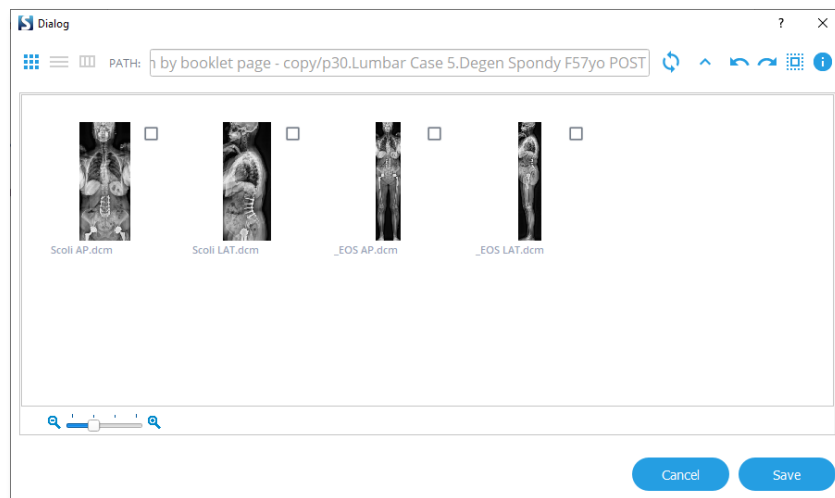
Details Panel

After selecting the image(s) in the dialog box, the Detail Panel permits the user to create a new patient or select an existing patient from the user database for the selected image(s). Patient, study, and series details can be entered.

Patient Details

If creating a new patient with the selected image(s), patient name and patient ID must be entered. Patient ID will be automatically generated by Surgimap. Patient e-mail, gender, birth date, and accession number may also be entered. If the selected image(s) are DICOM images, these categories are automatically populated. The option to sync the patient upon import is also available.

Study and Series Details

The user may input study and series details such as name, date, and modality.

Select from Database

If the selected image(s) are associated with a patient already existing in the user database, the option to add the image(s) to that existing patient is available. Select the "Select from Database" icon at the top right and search for the patient by patient name, study, or series.

Import

The user may choose to import the selected image(s) and remain on the IMPORT SCREEN by selecting the "IMPORT" icon or import the selected image(s) and be directed to the DATABASE SCREEN by selecting the "IMPORT AND FIND IN DATABASE" icon.

Import Image(s) from Other Surgimap Database

Overview

This feature permits the user to import image(s) from another Surgimap database to their own Surgimap database after proper authentication to the other Surgimap database.

Connect to another Surgimap Database

To connect to another Surgimap Database, follow these steps:

❖ In the Import Panel, select the Edit Icon and choose "Other Surgimap 2 database" to connect to a Surgimap 2 database or "Other Surgimap 1 database" to connect to a Surgimap 1 database. Select "Apply" to add the "Other SM" icon(s) to the displayed Source Icons.
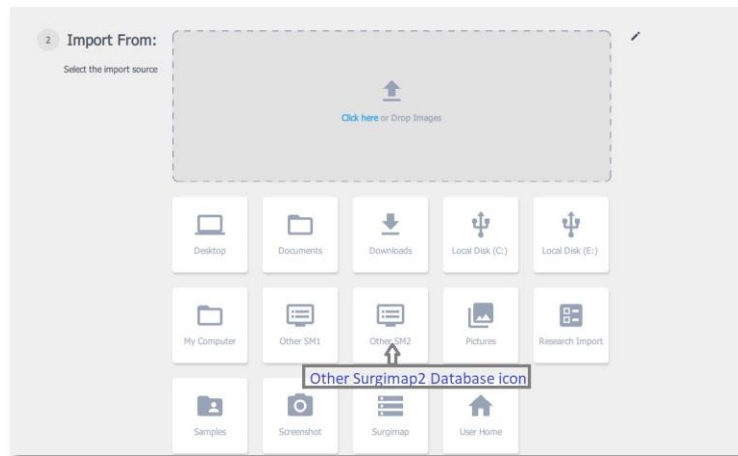
❖ In the pop-up window, select "Select Location" in the upper right corner to navigate to an available connected Surgimap database. Select the database containing the desired image(s), enter the credentials (username and password) associated to this database, and press "OK".
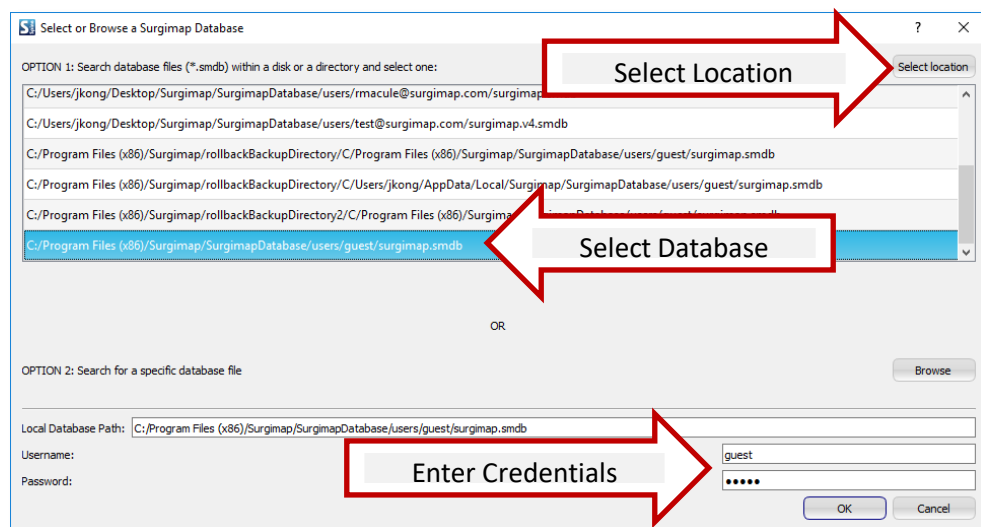
Import images into your Surgimap Database

After proper authentication, the content of the other database will be listed in the **IMPORT SCREEN**. To import items (patient, study, series, images) into the Surgimap database, select the desired item and click "Import". The progress bar will indicate the percentage of completion of the import process.
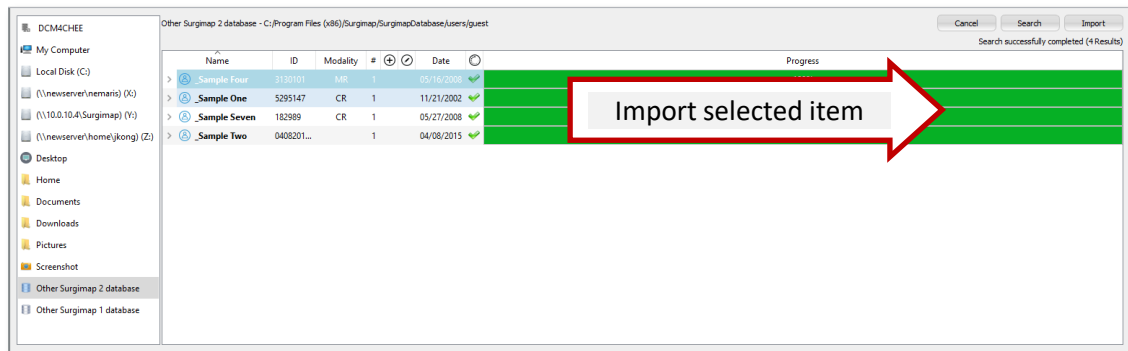
Import Image(s) from PACS System or OsiriX Database

NOTE: Please see our separate Connecting to PACS & Connecting to OsiriX user guides for more detailed set-up instructions along with troubleshooting tips.

Overview

This feature permits the import of images into the Surgimap database from a configured PACS system or 3rd party database e.g., OsiriX. To create a connection between Surgimap and your PACS or OsiriX, you first need to configure the "DICOM NODES". The DICOM NODES Setting Tab is accessible by clicking the User Settings Icon at the top right.
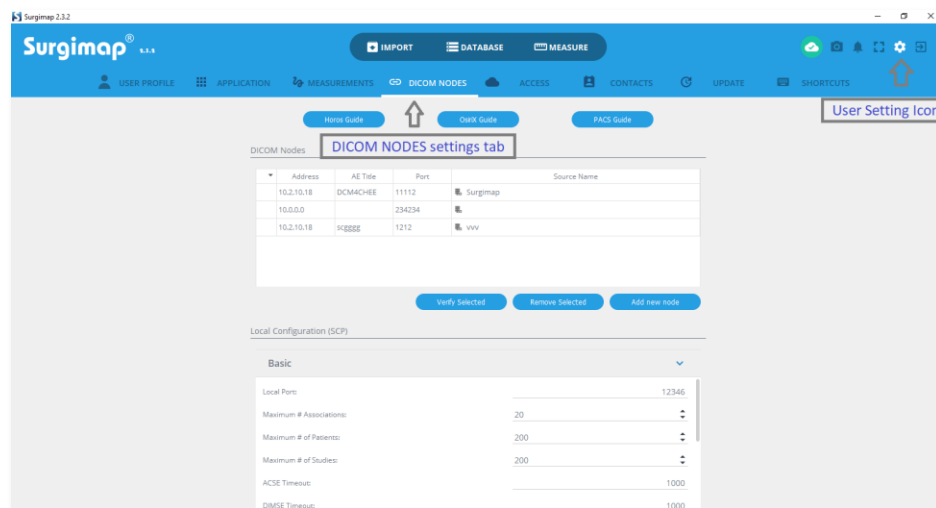
Import image(s) from PACS System

This feature permits to "push" DICOM images from a PACS system into your Surgimap database. You will first need to set up the connection with your PACS system.

Setting up a connection between your PACS system and Surgimap

1. Surgimap and PACS must be on the same network. Surgimap must also be running on a computer with a **static IP address**. After this configuration, the functionality will only work from this specific IP Address. It will not move from system to system if Surgimap is run off a USB key.
2. Click on the "User Settings" icon at top right and navigate to the "DICOM Nodes" tab.
3. Write down the following information found at the bottom of this panel in the area "Local Configuration (SPC): Local Port, Local AE Title, IP Address List.
4. These three values must be entered into the PACS system as a "Send Destination". Request the PACS system administrator's assistance with this process. The steps involved vary from PACS system to PACS system.

Sending images from PACS to Surgimap

❖ After configuration of your PACS system is complete, while PACS is in use, the desired image series can be selected to send to Surgimap by selecting the "Send" option. A list of available send destinations will appear. Choose the AE title from this list, which was just copied from "Local Configuration (SPC)". The DICOMs should now automatically be imported into your Surgimap Database.

❖ Alternatively, images can be sent using the **IMPORT SCREEN** by selecting the "Hospital PACS" source icon in the Import Panel. Search by patient name and select "IMPORT".

Sending Images to PACS from Surgimap

❖ After applying measurements and simulations on your image/patient, you can send this static image back to your PACS server for archiving. From the database tab within Surgimap, right-click on a patient name and select the "Send to PACS" menu option. This will then show you a progress window and close upon completion.

Setting up PACS in a Citrix-RDS environment

To add, for instance, 3 different DICOM nodes you would follow these parameters:

DICOM Node #1	DICOM Node #2	DICOM Node #3
• IP address: 1.1.1.1	• IP address: 2.2.2.2	• IP address: 3.3.3.3
• AE Title: AETITLE1	• AE Title: AETITLE2	• AE Title: AETITLE3
• Port: 11112	• Port: 21112	• Port: 31112
• Name: PACSNODE1	• Name: PACSNODE2	• Name: PACSNODE3

We recommend using two different Local AE Titles, SURGIMAP1 for the first node and SURGIMAP2 for the second and third nodes. Add the following information on the settings.ini file. Note: Place this at the top of the file

----

```
NODE_ADDRESSES=1.1.1.1/%/2.2.2.2/%/3.3.3.3
NODE_AETITLES=AETITLE1/%/AETITLE2/%/AETITLE3
NODE_PORTS=11112/%/21112/%/31112
NODE_NAMES=PACSNODE1/%/PACSNODE2/%/PACSNODE3
AETITLES_TABLE=10.10.10.10/@/SURGIMAP1/%/20.20.20.20/@/SURGIMAP2
SCP_PORT=12346

[application]
PACSSettingsFromINIOverride=true
```

Import image(s) from other OsiriX Database (Mac Only)

From Surgimap, this feature permits the user to retrieve images saved into an OsiriX database. It requires first to set up a connection (via the creation of a DICOM node).

Setting up a connection between OsiriX and Surgimap

1. Open user Settings and select the "DICOM Nodes" tab.
2. Click the "Setup Local OsiriX" button.
3. Importing from OsiriX directly to Surgimap is now enabled.

Importing images from OsiriX to Surgimap

1. In the **IMPORT SCREEN**, select the "Hospital PACS" source icon.
2. Enter patient information in the search field and click the "Search" button.
3. Once results are displayed in the import panel, select the desired patient/study/series, then the "Import" button at the top right corner of the screen.

Chapter 7: The Database Screen

Overview

Purpose

The **DATABASE SCREEN** permits the user to review all the data that the user chooses to store in Surgimap. Data can be visualized on a dashboard, in a calendar, or in a patient list. By default, the patients' list is displayed with an alphabetical listing by patient last name and then by study. For each study, the list of available series is displayed using thumbnails; when selecting a specific series, all associated images are displayed by their thumbnails. When selecting a specific study, the user has the ability to add clinical information and to add customized fields to the database. The database can be sorted and filtered by any field

PATIENT DATABASE SCREEN also permits the user to:

- ❖ Identify images with existing annotations (measurements or surgical simulation)
- ❖ Open image(s) into the Image analysis screen
- ❖ Delete Images, Series, Studies or Patients

Design Overview

The database panel is organized into five tabs: Dashboard, Calendar, Patients, Cases, and Orders.
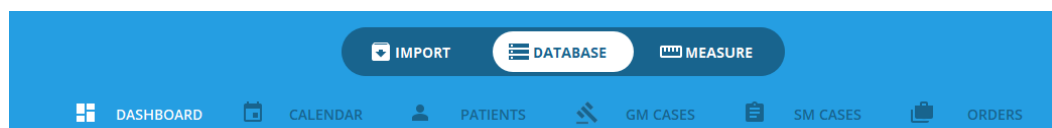
- ❖ The <u>Dashboard</u> tab provides a summary of the contents of your database, which may include data related to patients, studies, series, images, cases, and collaborators.
- ❖ The <u>Calendar</u> tab shows scheduled cases for your selected month or week.
- ❖ The <u>Patients</u> tab shows your patient database with sortable columns. You can search and modify the values of existing fields (other than DICOM tags), add personalized fields, and create labels to group patients.
- ❖ The <u>Cases</u> tab lists your cases with sortable columns. You can filter by scheduled vs. unscheduled cases, perform searches for cases, and make edits depending on your case-level permissions. This tab is hidden from users who do not have the premium **ACCESS** feature enabled.

❖ The <u>Orders</u> tab lists your orders with sortable columns. You can filter by order status, click to view individual case details, and change order status depending on your role. This tab is hidden from users who do not have the premium **ACCESS** feature enabled.

Dashboard Tab

Purpose

This tab provides a visual overview of your database contents with customizable modules. To access the dashboard tab, simply click on the "Dashboard" within the Database view.
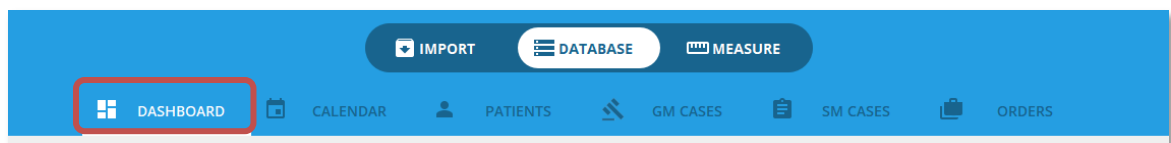
Design

On a high level, this tab list the number of patients, studies, series, images, cases, and collaborator. All the other displayed graphs can be customized by simply selecting the small pencil located in the upper right corner of each graph
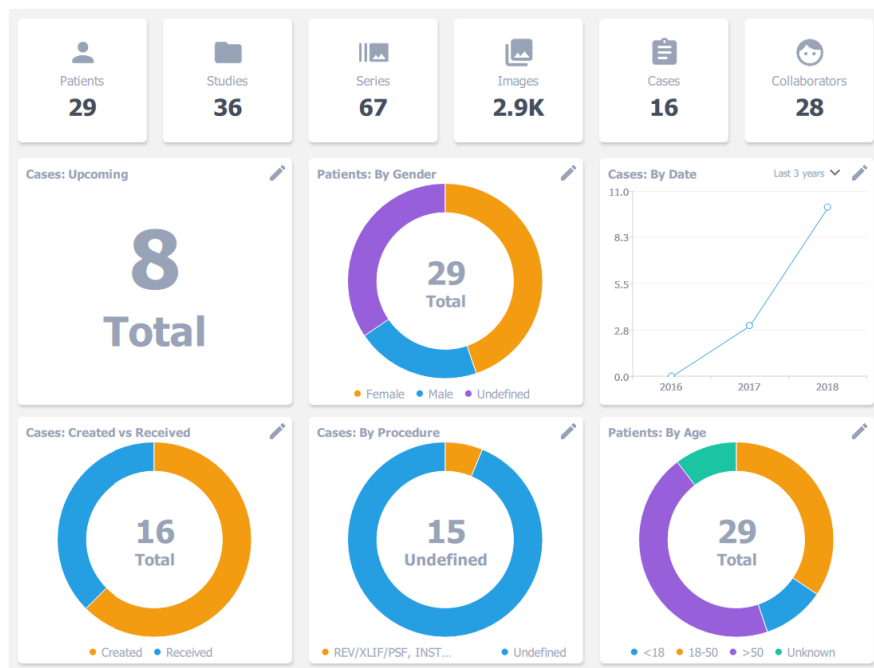
Calendar Tab

Purpose

This tab permits to visualize the list of scheduled cases in calendar form. To access the calendar tab, simply click on the "Calendar" within the Database view.
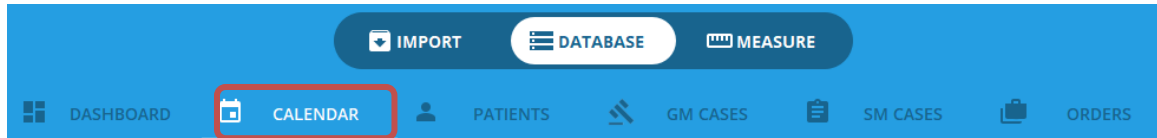
Design

The calendar view contains 2 panels:

❖ The Calendar Panel (on the left) can be displayed by day, week, or month. It contains the list of all the scheduled cased for the displayed period
❖ The Details Panel on the right displays a list of upcoming cases, or the detail of the case selected in the calendar panel

Features of the Calendar Panel

Identify days with scheduled cases

Click on the Calendar tab on the DATABASE SCREEN to view scheduled cases by calendar date, defaulted to the current month.

Reschedule cases

Reschedule individual cases by dragging to a different date.

Cases owned vs received

A color code is used to differentiate cases owned by the current Surgimap user from those received by the current Surgimap user.

List cases when date is clicked

If multiple cases are scheduled for a single date on the calendar, that date can be expanded to view all cases.

Features of the Details Panel

List of upcoming cases

If no case is selected within the calendar, the details panel contains a list of the future cases along with the following information for the upcoming case:

- Patient Name
- Case Name
- Surgeon
- Duration of the case

Details of a case

After selecting a case within the calendar panel, the details panel will display the following information

- Thumbnails of the images associated with the case
- General information
- Case Collaborators
- Attachment
- Clinical Notes
- Messages
- Case Details

Patients Tab

Purpose

This is the primary database tab which allows you to view and manage patients in your database. You can expand and/or collapse patients to view their studies, series, and images. You can also search for patients, sort individual columns, modify values of existing fields (other than DICOM tags), add personalized fields, and create labels to group patients. To access the patient tab, simply click on the "Dashboard" within the Database view.
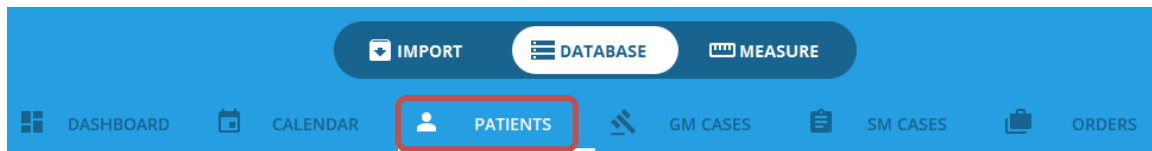
Design

The patients' view contains two panels:

- ❖ The list of patients on the left
- ❖ The Details Panel on the right

List of Patients

Patient Entry

Each patient entry is associated with at least one study (i.e., an image file). By default, the following 8 fields (or columns) are associated with each study. Of note, most of these fields can be extracted from the DICOM file automatically.

Field	Source	Default value	Type
Name	DICOM file or user	DICOM or none	Text
Sex	DICOM file or user	DICOM or none	M or F
DOB (Date of Birth)	DICOM file or user	DICOM or none	Date
Modality	DICOM file or user	DICOM or none	Text (predefined list)
Study date	DICOM file or user	DICOM or none	Date
Study description	DICOM file or user	DICOM or none	Text
Diagnosis	User	None	Text
Number of series	Surgimap	None	Number

Database Columns

DICOM tagged data such as patient name, DICOM ID, Sex, Date of Birth are automatically entered into the database and organized in columns under the default headings pictured below.

NAME	ID	DIAGNOSIS	DOB	MODALITY ▲	⊕	⊘	⊜	DATE	TIME	ACCESSION #	⋮
› 👤 _Sample One	5295147		10/05/1964	CR	⊕	⊘	⊜	04/13/2020	12:00 AM		⋮
› 👤 _Sample Seven	182989		03/26/1938	CR	⊕	⊘	⊜	05/27/2008	11:54 AM		⋮

Clicking a column heading causes the database to become organized by that column, either alphabetically or numerically, and clicking again will reverse the sorting. Clicking and dragging a column header to the left or right changes the position of that column; these changes in column order will be saved for the next time you use the software.

Clicking on the "more" option icon on the right end of the database header brings up a menu permitting to customize the list of columns to be displayed. This menu also includes an option to add new custom columns to the database. Fill in the field under "Custom Columns" then click "Add" and "Apply" and you will see a new column in your database with the entered heading.

Icons

There are three columns in the database which do not include text, but instead display icons if certain things are true about that database entry.

The blue plus sign icon will appear on any database line item, which is newly saved, meaning added to the database this session. It is useful when you have just saved something and want to find it in your database to work with it.

The diagonal blue line icon indicates a database item on which measurements have been added and saved using Surgimap. This icon will appear on the line in the table, but also on individual image thumbnails in the top left corner.

The circling arrow icon indicates whether the item is meant to sync to ACCESS. This icon will only appear if the premium Access feature in enabled on the user account.

Search Database

Just above the database main window is a search bar where you can enter text to search for items containing that particular text string. If you click the small down arrow to the right of the search bar you will be brought to "Advanced Search" which lets you choose specific columns to search within, and allows you to search across multiple fields at the same time.

Add Labels

Click the + icon to add new labels with different colors. Right-click on a patient to assign or remove labels. Hold Shift or Ctrl to multi-select patients, then right-click to assign or remove a group label. Patients may be assigned multiple labels. Click a label in the database header to filter your records according to that group.

Expand/Collapse Patients

Click this icon to fully expand or collapse all patients, depending on whether you wish to view the patient studies and series.

Database Auto-Edit

If you double-click on a database field, you can edit or change the existing information in that field. This feature will not work for "DICOM ID", but can be applied to fields such as patient name, date of birth, etc.…

NAME ▾	ID	MODALITY	#	⊕	⊘	⟳	DATE	TIME	COMMENTS	DIAGNOSIS	DAT
_Sample_CT_Spine	3503912483928851	CT	2		⊘	⟳	01/01/2000	12:00 AM			10/
_Sample Two	04082015121958		1			⟳	04/08/2015	12:00 AM			04/
_Sample Seven	182989	CR	3		⊘	⟳	05/27/2008	11:54 AM			02/
_Sample One	5295147	CR	2		⊘	⟳	11/21/2002	12:00 AM			04/
_Sample Lateral	1.3.6.1.4.1.9590.100.1...	DX	1		⊘	⟳	06/30/2017	01:46 PM			06/
_Sample Four	3130101	MR	1		⊘	⟳	05/16/2008	03:15 PM			04/

Merge/unmerge patients

Hold Shift or Ctrl to multi-select patients, then right click to merge them into one patient. Select the main patient from the dialog, removing the other patient(s). Right click on the main patient to revert the merged patient changes.

Delete Series

To delete a series, right click on the desired series and select "delete" in the contextual menu. Once a series has been deleted, the patient is automatically deleted from the database.

Delete Study/Studies

To delete a study, right click on the desired study and select the "delete" option in the contextual menu. Once all studies have been deleted for a given patient, the patient is automatically deleted from the database.

Delete Image(s)

To delete image(s), right click on the desired images in the thumbnails panel and select "delete" in the contextual menu.

Trigger More actions

On an individual patient level, selecting the "more" options display a contextual menu allowing you to apply certain actions to that patient:

> 👤 _Sample Three   52951426   09/06/1975   MR   ⊕ ⦿ ⟳   12/04/2014   04:13 PM   ⋮
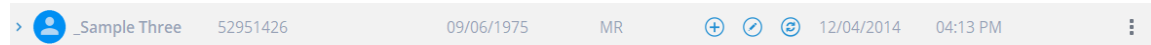
1. Open patient image(s)
2. Open in new tab
3. Delete patient
4. Create or Add a Case
5. Share with
6. Assign labels
7. Sync or re-sync patient and corresponding images (**ACCESS** enabled accounts only)
8. Send to PACS (requires one-time PACS configuration, see "Import Image(s) from PACS system or OsiriX Database" section.)

Details Panel

Purpose

Upon selecting a patient, the details panel permit to previous images associated to this patient, patient details, clinical data, and the list of the collaborator(s). From this view, it is also possible to directly open image(s) in the **MEASURE SCREEN** and/or delete image(s) for the patient records.

Overview

Thumbnails

Thumbnails of images associated with the patient are displayed at the top of the panel. The user can choose to display one image by series, or all the images. Using the control icons, the size of the thumbnails can be adjusted
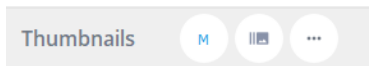
Patient Details

Patient details include information extracted directly from the DICOM tags or entered by the user.

Clinical Data

Clinical data include comments and diagnosis entered by the user

Patient Collaborator(s)

Patient collaborator(s) list all the collaborators who are associated to this patient along with their access level

Online Synchronization of patient

Synchronize to the cloud

If Internet access is present, users with the premium **ACCESS** feature have the ability to synchronize their database our secure AWS cloud server for remote back-up. This means when your Surgimap software has internet connection, the patient will be saved and stored on our secure cloud server. If you ever lose your computer, it is damaged or destroyed, or if you install a copy of Surgimap in a new location, the patient will be synchronized from the cloud into your database once you log in with your account and have Internet access.

Background synchronization:

After defining your synchronization preferences, this setting allows you to continue working while synchronizing.

Cloud Services

☑ Background Synchronization

Synchronization type   All patients, all images ▾

Patient Image Download Setting   Download no patient images▾   **Apply**
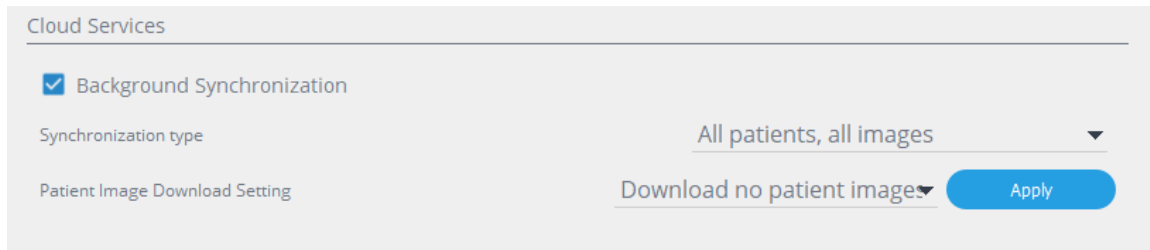
Synchronization preferences consist in:

- **Synchronization type:**
  - All patients, all images
  - Manual selected only
    - This will only synchronize patients marked as "synch" in the database
    - Simply select the patient in the database, click on the "3 dots" ⋮ and select "sync patient"

         Open
         Open in new tab
         Delete
         Create or Add to case
         Share with   ▸
         Assign Labels   ▸
         ✓ Sync Patient
         Send to PACS   ▸

- **Patient Image Download Setting:**
  - No Patient Image
  - 2 weeks back
  - 1 Month back
  - 3 Months back
  - 6 Months back
  - 1 Year back
  - 2 Year back
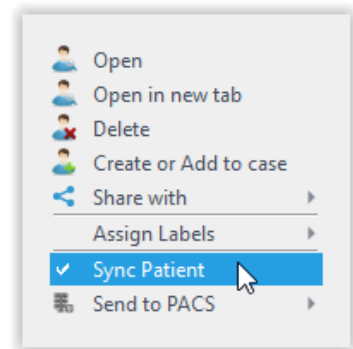
Synchronization status:

If an internet connection is available, the status of the connection will be indicated in the upper right corner of Surgimap

⊘ Sync Required   ⏸ Syncing: Click to pause   ✓ Sync Complete

Patient Share

Overview

Imported patients are by default saved locally to the user's database. You can share the patient to other users by adding them as collaborators on the Patients tab of the **DATABASE SCREEN**.

Add Collaborators

Click to expand the Collaborators section then select "Add from Contacts" to add one or multiple collaborators from your Contacts manager with the proper permissions.

Patient Permissions

Select one or more of the permissions listed below for each collaborator according to their appropriate access level (see Assigning Permissions section):

❖ View All Patient Images
❖ Edit Patient Details and Share
❖ Edit Images and Measurements
❖ De-Identified Access

Cases

Purpose

Cases are surgical plans that are designed to share between Surgimap users. A case consists of images, measurements on those images, and details such as scheduled date, hospital, surgeon, surgical requirements, and collaborators. A user can share a case with contacts while maintaining control over those contacts' permissions to either view and/or edit details in a case. To access the Case tab, simply click on the "SM cases" within the Database view.
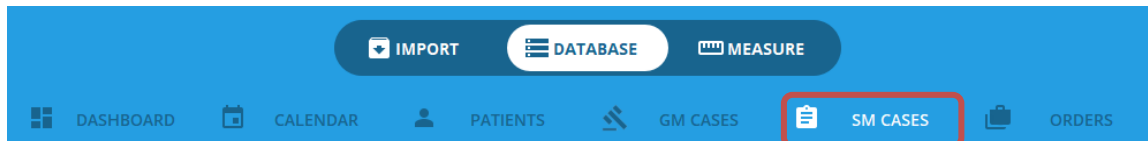
Design

Similar to the Patient Tab, the Case view contains 2 panels:

❖ The list of cases on the left
❖ The Details Panel on the right

List of Cases

By default, the list of cases is organized by date of surgery. The case list can easily be sorted by clicking on any of the column headers. Individual cases can be filtered by using the search box in the upper left corner

Details panel

The details panel (on the right part of the screen) contains all the details of the case selected. More specifically, it includes:

- Thumbnails of images associated to the case
- General Information
    - o Description, patient name, case owner, surgeon name, institution, date of surgery (if already scheduled), expected duration of the surgery
- Case Collaborators
    - o List of Surgimap users the case is shared with (see "Create a case" section for more information on collaborators
- Attachments
- Message
    - o This section permits the collaborators to communicate directly within Surgimap
- Case Details

Create a Case

Overview

When **ACCESS** is enabled, you will have the option to select "Create or Add to Case" from the menu icon in the patient list. Selecting this option will prompt the below dialogue to "Create or Select a Case". Within this window, create a new case by filling out the case details, surgeon, and hospital. You may schedule the case for a specific calendar date or leave it unscheduled. You may also add collaborators to the case and grant them the access level of your choice (see the following section "Share a Case" for more information on adding collaborators). If a case has already been created for this patient, you may choose to "Select from Database" instead. See section: "Adding Images to Existing Cases." Once al the desired information is entered, click on "Create"
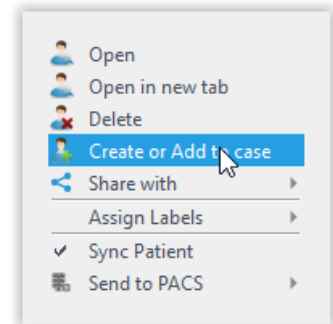
Case Options during the creation of a case

Description

The description should be a text string that will identify the case to the user but should not include patient identifying information. This protects patient information in case the user wishes to share the case with a collaborator in a de-identified fashion.

Surgeon

You may set the surgeon on the case as yourself, or as someone from your contact list.

Scheduled

When the "Scheduled" option is selected, editable Date, Time, and Duration fields become visible.

Collaborators

Click the Collaborators section to Add or Remove collaborators from the case. Adding a collaborator opens the Contacts Manager, from which you may select the permissions settings for contact. For more information on permissions, see section "Assigning Permissions" in the "Contacts Manager" section of this user guide

Editing Existing Case Details

The Case Details panel consists of collapsed sections that expand when clicked. This section contains all case details deemed relevant by the case owner.

General Information

Enter or modify general case details, including patient name, surgeon name, hospital, and scheduled date.

Add or Remove Collaborators

Add collaborator(s) to the case by selecting from your Contacts Manager and ensuring the proper access permissions (view, edit, de-identified…). You may also remove selected collaborator(s) from the case.

Add/Remove/Download Attachments

Attach documents from your database to the case, or remove and download existing attachments.

Clinical Notes

Type clinical notes related to the case here.

Messages

Type messages to your collaborators related to the case here.

Case Details

Enter case details including patient diagnosis, planned procedure, surgical approach, co-surgeon, imaging and equipment needs, and/or additional notes here.

Enter or Modify Instrumentation

Select the instrumentation needed for the surgical tray based on an existing list organized by manufacturer.

Revert Case

Revert case to match previously saved details.

Apply a Template

Choose an existing template and update case fields to match the data saved in that field on the template.

Save as Template

Create a new template from the current case details for the future.

Save Case

Save the information contained in the case area in the Surgimap Database.

Contacts Manager

Overview

The Contacts and Groups manager allows **ACCESS** enabled users the ability to manage their contacts for collaboration.
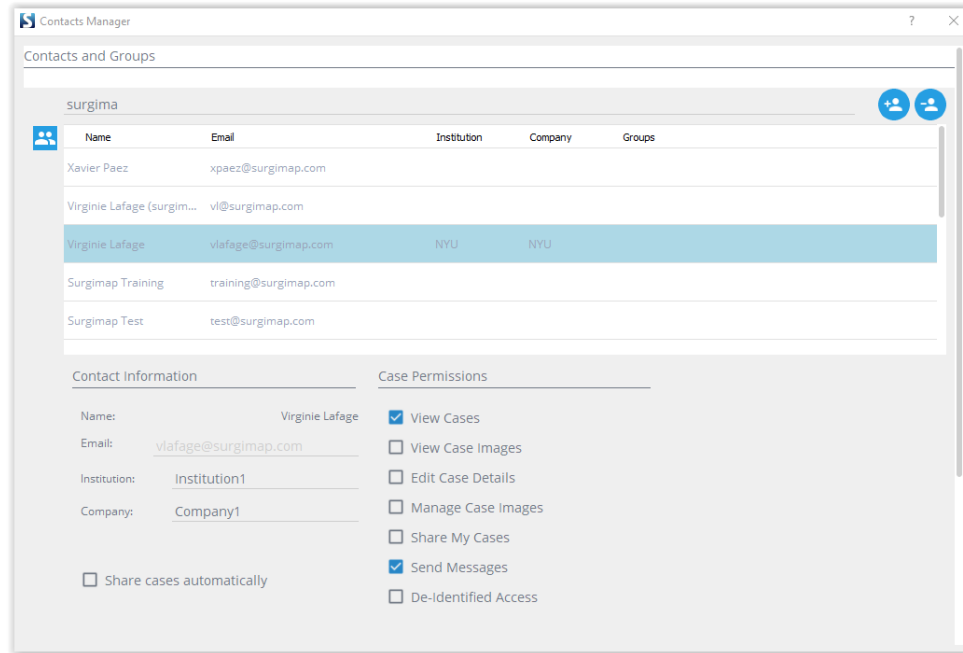
Stimulus

To access the Contacts and Groups manager, go to Settings by clicking the gear icon at top right and select the Contacts tab.

Create New Contact

This feature allows you to add an entry to your list of contacts. Once a contact has been added, you are prompted to assign permissions and access level to the new contact.

Assigning Permissions

This feature permits the user to assign/change permissions of the current contact:

View cases

A contact with this permission checked off is able to see cases shared by the user. If View Case permission is unchecked, the contact will not see cases owned by the user on their case list even if they are on the collaborator list.

View images

If this permission is checked the contact will be able to see images attached to patient and/or case. If this permission is unchecked, no images will be visible to that user.

Edit details

If this permission is checked, the contact will be able to change the content of the patient and/or case detail fields. If this permission is unchecked, the contact will be able to see the information present in the detail fields without the ability to edit them.

Edit/manage images

If this permission is checked the contact will be able to add or delete images, change measurements on the images, and order vendor-specific implants. If this permission is unchecked, the user will not be able to add or remove images from the patient/case, make changes to measurements, or synchronize changes to the cloud.

Share my cases

If this permission is checked, the contact will be able to share the case with collaborators. If the "Share My Cases" permission is unchecked, the contact will not be able to add new collaborators to the case.

Send messages

If this permission is checked, the contact will be able to send messages to other case collaborators through Surgimap. If this permission is unchecked, the contact will not be able to send messages to other case collaborators.

De-identified access

If this permission is checked, the case collaborator will not see the patient name. De-identified access is the default setting for new contacts, and should generally be selected for HIPAA compliance reasons unless the collaborator is a medical professional.

Create Group

To create a new group, click on the "Groups" link, then on the "Add New Group" icon. Enter a name for your new group. To add a contact to a group, right click their email address in Settings or Contacts Dialogue. In the sub-menu, select the "Add to Group" option and choose the group you would like that collaborator to be added to. Instead of adding collaborators to a case one at a time, you can simply add an entire group.

Add Contact

This feature allows you to add a new contact to your contact list. Click the "Add New Contact" icon to input email address of contact.

Remove Contact

This feature permits deletion of a selected contact from the contact list. Requires one step in confirmation process where user must click "OK" to continue.

Primary Reps

Surgimap is partnered with the following spine device manufacturers: Globus Medical, K2M, Orthofix, and Zimmer Biomet. You can set a primary rep for each vendor so that cases can be easily shared to each rep in a HIPAA compliant manner. Simply right click on a patient or image that has been planned with a vendor cage, then select the appropriate vendor rep from the HIPAA Compliant Sharing window.

Orders

Purpose

Users can simulate patient-specific rods from K2M (BACS) then order the implants directly through Surgimap. An internet connection is required for orders to be generated and transmitted to the manufacturer. Images with pending or approved orders are locked for editing to prevent unintentional changes to orders. To access the Orders tab, simply click on the "Orders" tab within the Database view.

BACS Rod

Order patient-specific BACS templates or rod/rails from K2M through Surgimap. Select "Order BACS Patient-Specific" at the bottom of the BACS simulation dialog or right-click on an image with an existing BACS rod to initiate the order workflow.

- ❖ Step 1: Review/edit case details and ensure the case is scheduled beyond the minimum of 15 days for US delivery or 25 days for international delivery.
- ❖ Step 2: Select implant details including category, pedicle screw system, type, size, material, and plan side. Add or remove implants/templates as needed.
- ❖ Step 3: Review order details for accuracy and accept vendor terms.
- ❖ Step 4: Submit order by synchronizing order details to the cloud.
- ❖ Step 5: The order is not processed until the case surgeon approves the order through Surgimap. Issue reminders for surgeon approval as needed. Orders with pending approval can be cancelled then edited before reordering.
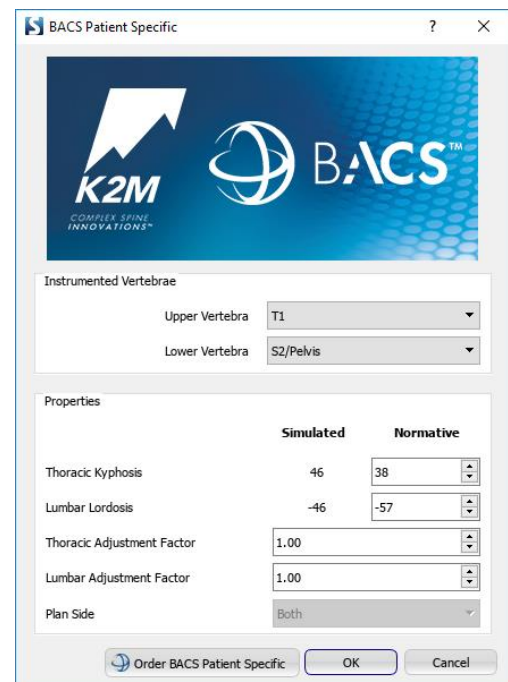
Chapter 8: The Measure Screen

Overview

Purpose

The **MEASURE SCREEN** permits you to view images, manipulate them, add measurements, add annotations, and simulate operative strategies. This module provides the following features:

- Ability to read DICOM images but also standard formats such as JPEG, TIFF, PNG, BMP…
- Ability to perform basic image manipulations including zoom, image rotation, brightness, contrast and gamma adjustment
- Navigate through a set of multiple images
- Add and display generic and spine related measurements (distances and angles) to the images
- Simulate surgical procedures such as osteotomies, screw placement and interbody device placement
- Visualize the possible impact of surgical simulations by providing a list of the updated measurements
- Save images and annotations, measurements (and/or surgical simulations) to the Surgimap database

Access

The **MEASURE SCREEN** can be accessed in 2 ways:

1. By selecting the associated "Measure" tab available from any screen
2. By opening an image from the **DATABASE SCREEN**

Design Overview

The **MEASURE SCREEN** consists of 1) A main display on the left with a central viewing panel and a set of image adjustment icons, and 2) A set of controls on the right

Central Viewing Panel

Overview

Double-clicking on an image in the **DATABASE SCREEN** will open it into the Central Viewing Panel, the main viewer of the software application. If several images or patients are selected for viewing, they will be organized in different tabs or viewing panels.
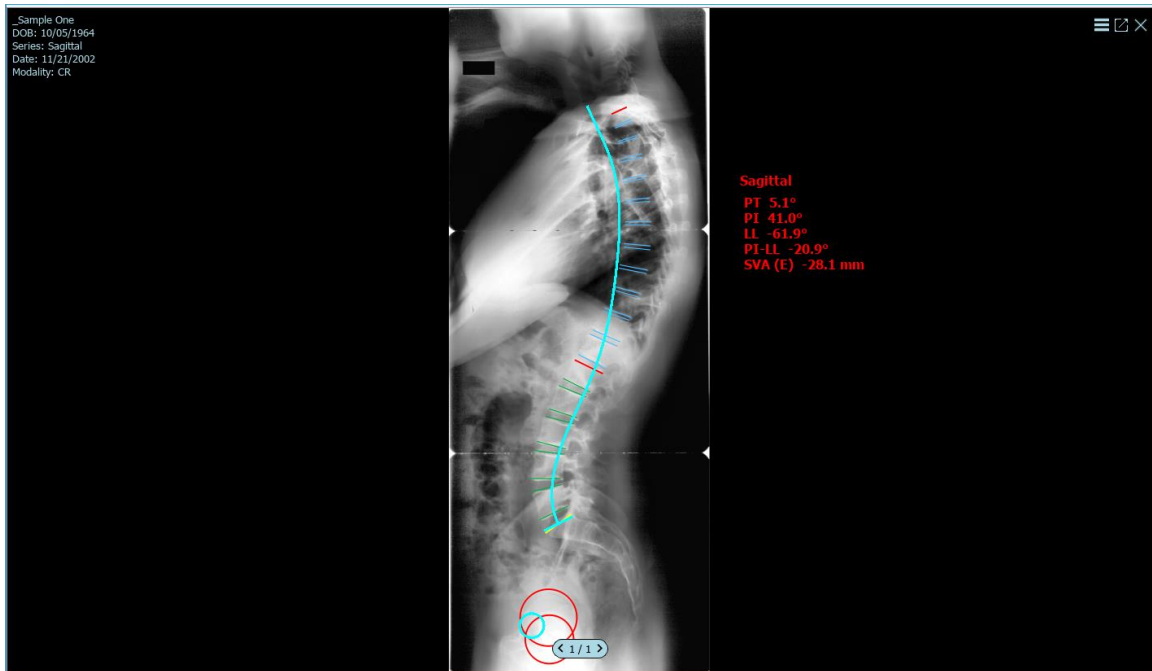
Image Orientation

In most of the instances, Surgimap will automatically detect the image orientation. Should you need to change the detected orientation, simply click on the orientation icon located in the middle of the central viewing panel. Possible orientations are as follows:

Coronal Antero-Posterior

Coronal Postero-Anterior

Sagittal Right

Sagittal Left

Minimap

When zoomed-in on an image in the **MEASURE SCREEN**, a thumbnail will appear with a box indicating the position of the zoomed image. You can drag the box to vertically scroll within the Minimap to see the corresponding section of the zoomed image.
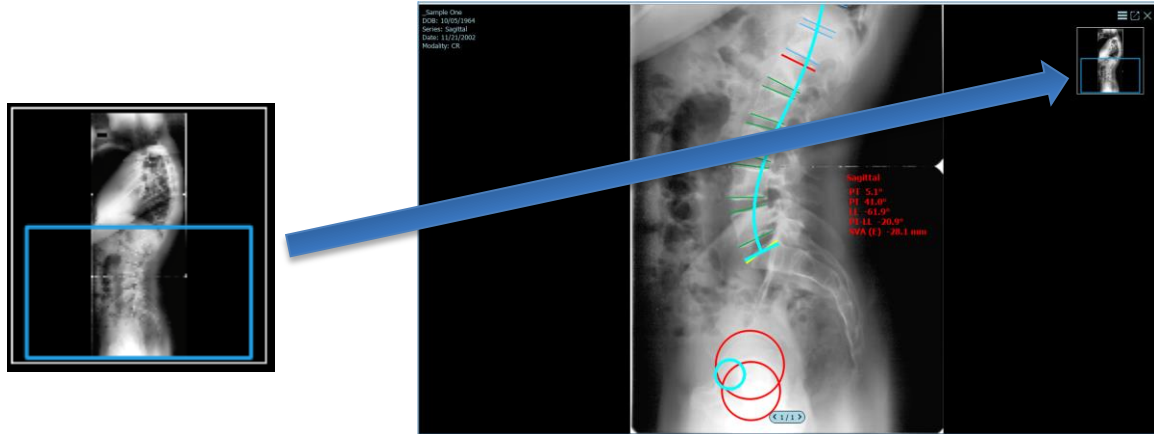
Customizable Viewing

Hide/Show Minimap

The Minimap is defaulted to the Auto On setting, in which it appears only when the image is zoomed in. You may turn it to Always On or Always Off by clicking the "Show/Hide Minimap" button on the image control bar.

Hide/Show Text Overlay

The text overlay is defaulted to show in the top left corner. You may turn it to show or hide by clicking the "Show/Hide text overlay" button on the image control bar.

Modify Layout

Selecting Modify Layout on the image adjustment bar allows users to view one or multiple images from the same patient at the same time. Images can be dragged from the thumbnails section into individual viewing panes.
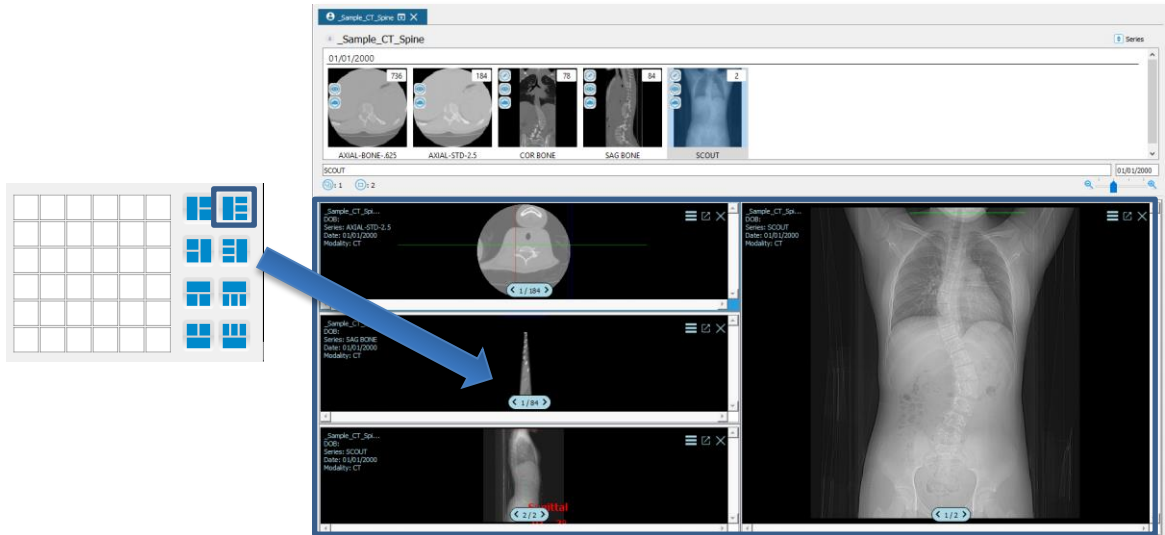
Show/Hide Scout Lines

The image frame displays scout/nav lines in red. These lines represent relative position between two series with the DICOM tag (X). A button to turn scout/nav lines off exists in the bottom image adjustment bar.

Open in Separate Window

Patient images by default organized into tabs. Click this icon to open an image in a separate window. The window can be resized, moved to a different screen (if multiple monitors are connected to your computer), and/or maximized for full screen viewing.

Thumbnails Pane

When multiple images from different series for the same patient have been opened, a thumbnails pane will appear at the top of your screen allowing you to navigate between the images.

Navigating Between Multiple Series

In Series View, you can select the desired studies to compare by dragging and dropping the studies into multiple viewing panels within the Central Viewing Panel.
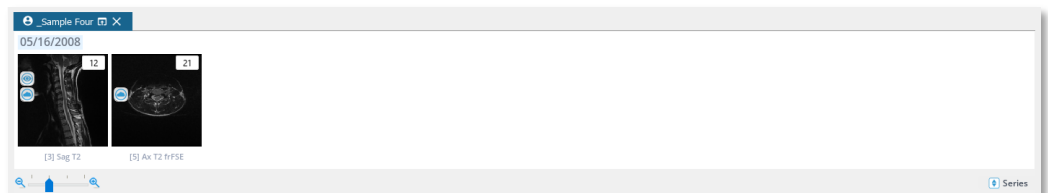
Navigating Images within a Single Series

In Images View, you can select the desired images to compare by dragging and dropping the images into the two compare windows within the central viewing panel.
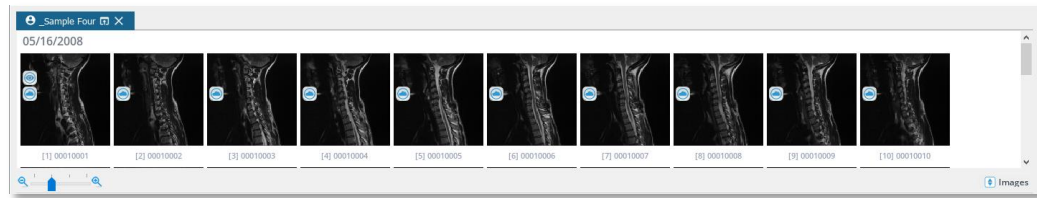
Image Adjustment Bar

At the bottom of the image frame is an image adjustment bar. You will only see one bar per screen, which will apply to the selected image. Adjustments made will transmit to all images in a series in the same frame.

The following image adjustments are available:

- ❖ **Invert Black/White**: inverts colors and black/white to opposites
- ❖ **Brightness**: click icon and drag slider or right click on the image and move the cursor vertically
- ❖ **Gamma**: adjusts the gamma, a hybrid adjust feature combining contrast/brightness
- ❖ **Contrast**: click icon and drag slider or right click on the image and move the cursor horizontally
- ❖ **Max Contrast**: auto-adjusts image contrast to the maximum level
- ❖ **Auto Level Image**: attempts to maximize contrast in the visible portion of the image
- ❖ **Rotate 90 Degrees**: rotates image counter-clockwise or clockwise
- ❖ **Individual Degree Rotation**: rotates an image one degree at a time in either direction
- ❖ **Flip Vertically/Flip Horizontally**: flips image over vertical/horizontal axis
- ❖ **Fit to Screen**: resets zoom, rotation, and flip changes
- ❖ **Zoom**: zooms image in/out
- ❖ **Reset**: restores original image settings
- ❖ **Show/Hide Minimap**: reveals/hides Minimap indicating image cross-section for zoomed images
- ❖ **Show/Hide Text Overlay**: reveals/hides text overlay indicating patient name, DOB, study date, and modality
- ❖ **Show/Hide Scout Lines**: reveals/hides scout lines representing relative position between two image series, if available
- ❖ **Show/Hide Measurements**: reveals/hides all measurements
- ❖ **Show Original Image**: hides all measurements and operative simulations

❖ **Reset Image Orientation**: set new default image orientation (not available for DICOM images)

❖ **Modify Layout**: customizes layout and quantity of viewports, which can be filled by dragging images from thumbnails

❖ **Measurement Rollback**: restores previously saved measurements by rolling back to specific date/time

❖ **Opacity**: adjusts image transparency

Help

Description

The Help feature explains how to apply general tools, measuring tools, and surgical tools. If this process requires multiple steps, the Help Desk will visually walk you through each step.

The Following Sequence is applied for Use of this Tool

When the user clicks a 'measuring tool' or 'surgical tool', the related information for that tool will be displayed in the Help Desk pane. It provides click-by-click instructions on how to apply that specific tool to an image.
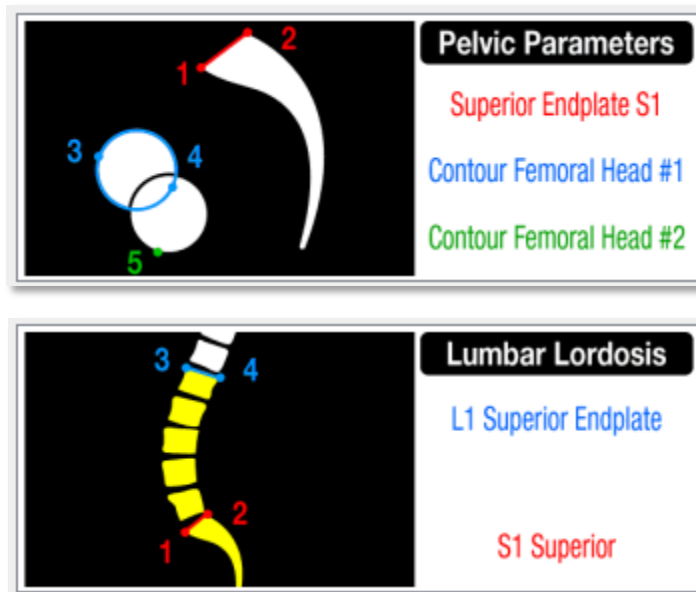
Generic Tools

Calib

This tool enables you to calibrate images so the correct measurements can be calculated. Once calibrate is clicked, the Help Desk animation will ask you to draw a line. Once the line is drawn, the dialog pictured to the right will appear asking you to enter the length of the line. It is important to draw the line over a landmark of known length so the value you enter will be accurate.
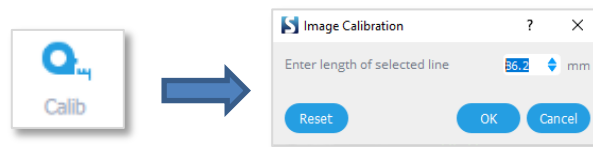
Text

This function permits the user to create text within the application and display it directly on an image:
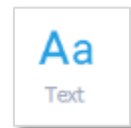
- ❖ Select the "Text" tool.
- ❖ CLICK in main viewing panel.
- ❖ Type desired text.
- ❖ Text can be moved to a different location by clicking and dragging the text.

Age

This function permits to set the patient age. By default the age of the patient is directly extracted from the DICOM tag (if available). To set or change the age, simply click on this icon and fill the "set patient Age" dialog
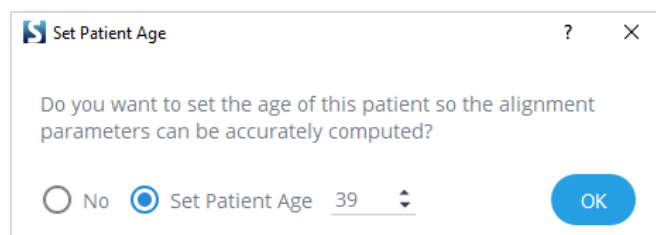
SA Norm.

Description

The SA Norm tool is a premium feature that works in conjunction with the Sagittal Wizard tools. SA Norm simulates the normative spine based on the patient age and the spinal parameters (i.e. pelvic incidence). Changing the patient age or the Sagittal Wizard measurements will change the shape of the SA Norm simulation.
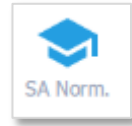
The sequence of steps to use this tool

1. Apply the "SP Shape" or "Sagittal Wizard" tool to the image.
2. Enter/verify the Patient Age.
3. CLICK the "SA Norm" button to generate a light-blue curved line simulating the ideal alignment for this patient.
4. To optimize alignment, rotate up/down to align the normative blue femoral head on top of the red femoral heads.
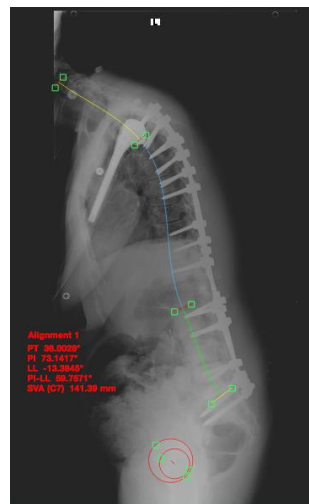
| SA Spine Measurement | SA Spine + SA Norm |
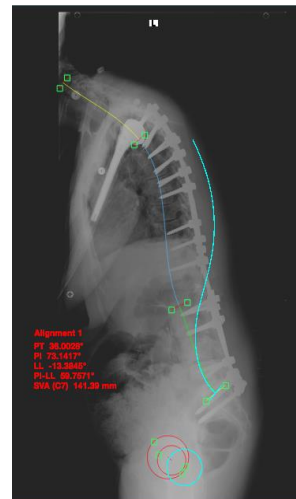
Undo

This function permits the user to revert the last action. It can be accessed through the keyboard shortcut Ctrl+Z on Windows or Command-Z on Mac. Undo the creation/ deletion of a measure(s) or the application of a simulation. While constructing a measurement, undo the last(s) point clicked.

Redo

This function permits the user to restore the last action. It can be accessed through the keyboard shortcut Ctrl+Y on Windows or Command-Y on Mac. Redo the creation/ deletion of a measure(s) or the application of a simulation.
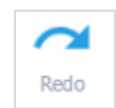
Delete

This function permit to delete the selected measurement. Simply select the measurement or surgical tool, and press "Delete"
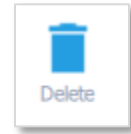
Measure Tools

Overview

This set of features allows the user to create measurements on the image. Instructions for applying each tool are provided in the Help Desk pane in top right corner. To customize the list of measure tools to be displayed, simply click on the setting icons (see below). These measuring tools cover generic and specialty (spine/orthopedic) related tools
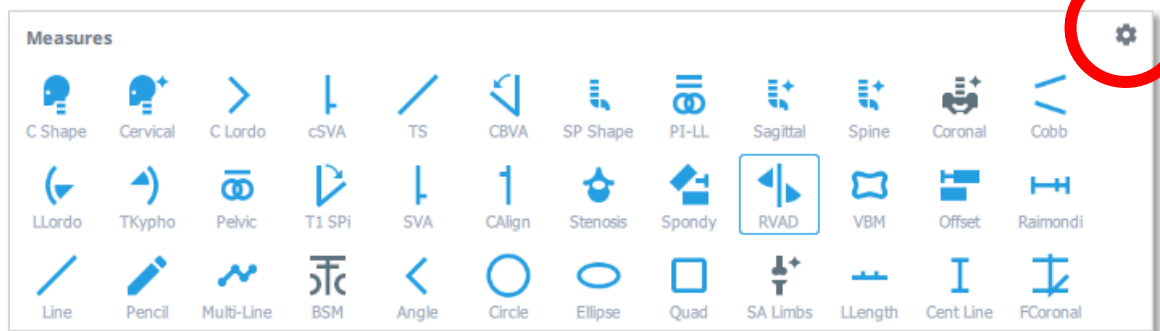
❖ **Generic tools**
- o Line
- o Pencil
- o Multi-Line
- o Back Surface Metrics (BSM)
- o Angle
- o Circle
- o Ellipse
- o Quad

❖ **Orthopedic Related Tools**
- o Lower Limbs Sagittal Alignment Wizard
- o Leg Length Discrepancy
- o Center Line
- o Femur Coronal

❖ **Cervical Spine Related Tools**
- o Cervical Shape
- o Cervical Wizard
- o Cervical Lordosis
- o Cervical SVA
- o T1Slope
- o CBVA

❖ **Spine Related Tools**
- o Sagittal Spino-Pelvic Shape
- o Sagittal PL-LL Shape
- o Sagittal Spino-Pelvic Wizard
- o Sagittal Spinal Wizard (no formal heads)
- o Coronal Wizard
- o Automatically Measure Patient Spine
- o Cobb Angle
- o Lumbar Lordosis
- o Thoracic Kyphosis
- o Pelvic Parameters
- o T1 Spino-Pelvic Inclination
- o Sagittal Vertical Axis(SVA)
- o Central Sacral Vertical Line
- o Stenosis
- o Spondylolisthesis
- o Rib Vertebral Angle Difference
- o Vertebral Body
- o Offset Measurement
- o Raimondi Rotation Angle

General Comments

Selection of the tool

The user can select the desired measuring tool with a CLICK of the mouse, which will highlight the desired tool. Once a tool has been selected, the mouse/cursor is active when passed over the *Central Viewing Pane* of the main viewer. The Help Desk (top right corner of **MEASURE SCREEN**) provides a contextual help on how to use a selected tool.

Limitations

The angle created between the 2 lines (L Lordo, T Kypho, C Lordo, and Angle) cannot be denoted as greater than 180°. Users must pay attention that as they adjust the angle and exceed the 180° range, the displayed value will decline. Also the angle calculated is always the one between the vector formed by the first two points ($\overrightarrow{12}$) selected by the user, and the vector formed by the last two points ($\overrightarrow{34}$) selected by the user. As illustrated on the figure below, the angle calculated will depend on the order of construction of the points.
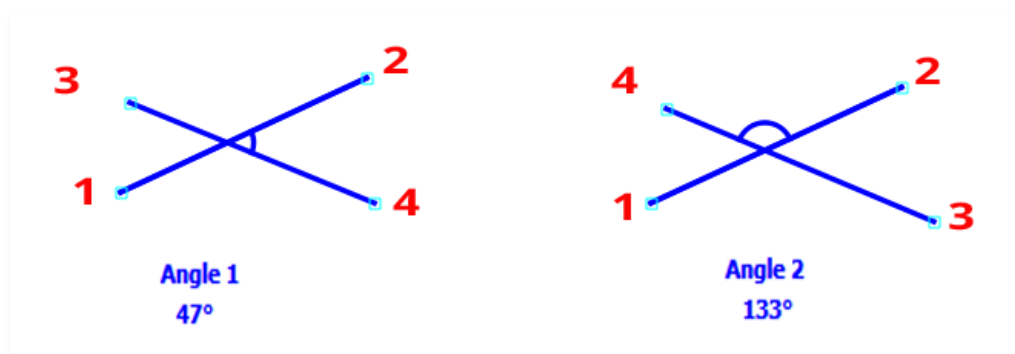
Unit System

All measurements are provided in metric system values (mm for distance, mm² for surface area, and degrees for angle).

Cancelling drawing of a measurement

During the creation (i.e. drawing) of any measurement, pressing the "Delete" or "Escape" key on your keyboard will cancel the creation of this measurement.

Copy and pasting a measuring/surgical tool

Copy measures and implants using the keyboard shortcut Ctrl+C and paste them using Ctrl+V. These functions will only work with tools that allow for more than one in the scene, therefore they are not compatible with the wizard tools. Surgical tools can only be copy and pasted if they are unapplied, i.e. no osteotomy is simulated. A blinking action provides visual indication that a selected measure(s) has been copied. A pasted tool(s) will be offset slightly to the bottom right of the copied tool(s).

Delete a measurement

Removing an existing measurement or annotation can be done in a number of ways:

- ❖ Measurement Table: Highlight a measurement by CLICKING on a specific row. Then, click the Trash icon or use the 'Delete' button on the keyboard to delete the selected measurement or annotation.
- ❖ Main screen: Select any measurement or annotation with the mouse cursor by directly CLICKING on it. Then, click the Trash icon or use the 'Delete' button on the keyboard to delete the selected measurement or annotation.

[Generic] Line

Description

This tool permits drawing of a single segment and displays the associated length (in mm) and horizontal angle (in degrees).

The sequence of steps for use of this tool

1. Select the "Line" tool.
2. **CLICK** to set the first point of the line.
3. **CLICK** to set the second point of the line.
4. The points can be moved after construction to better position the measurement.

Output

The label 'line' appears on the image and its length is displayed (in mm) on the image and in the Measurement Table. The angle (in degrees) between the drawn segment and a horizontal axis is also displayed.

| Construction Sequence | Example |

[Generic] Pencil

Description

The pencil tool permits to make a freehand marking and displays the associated length (in mm).

The sequence of steps for use of this tool

1. Select the "Pencil" tool.
2. **CLICK** to set the first point of the line.
3. Move cursor to draw the line.
4. **CLICK** to set the endpoint of the line.

Optional: Drag handle(s) to extend line length.

[Generic] Multi-Line

Description

The multi-line tool permits to make a multi-point line and displays the associated length (in mm).

The sequence of steps for use of this tool

1. Select the "Multi-Line" tool.
2. **CLICK** to set the first point of the line.
3. **CLICK** to set the next point of the line (repeat this step as desired).
4. **DOUBLE-CLICK** to set the endpoint of the line.

Optional: Drag handle(s) to adjust line placement.

[Generic] Angle

Description

The angle tool permits to measure a generic angle between two segments.

The sequence of steps for use of this tool

5. Select the "Angle" tool.
6. **CLICK** twice to draw the upper line of the angle.
7. **CLICK** twice to draw the lower line of the angle.
8. When the angle measure is selected, a small arc appears on the measurement indicating which angle is being measured.
9. The points can be moved after construction to better position the measurement.

Output

The angle (in degrees) created between the set of 2 lines is displayed on the image and in the Measurement Table. The measured angle is graphically represented on the image by an arc.

Construction Sequence	Example
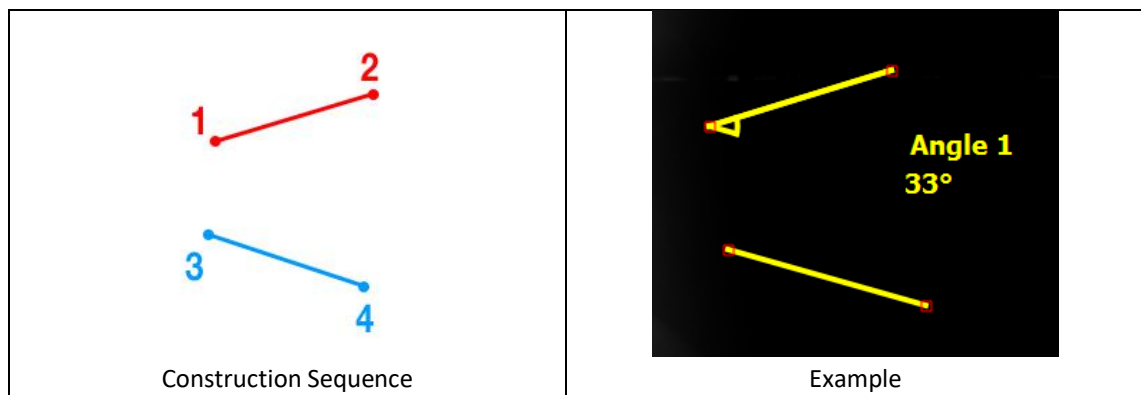
[Generic] Circle

Description

This tool draws a circular segment and displays the associated radius (in mm).

The sequence of steps for use of this tool

1. Select the "Circle" tool.
2. **CLICK** to set the first point of the circle on its perimeter.
3. **CLICK** to set the second point defining the diameter of the circle.
4. The points can be moved after construction to better position the measurement.

Output

The label 'circle' appears on the image and its radius is displayed (in mm) on the image and in the Measurement Table.

Construction Sequence	Example
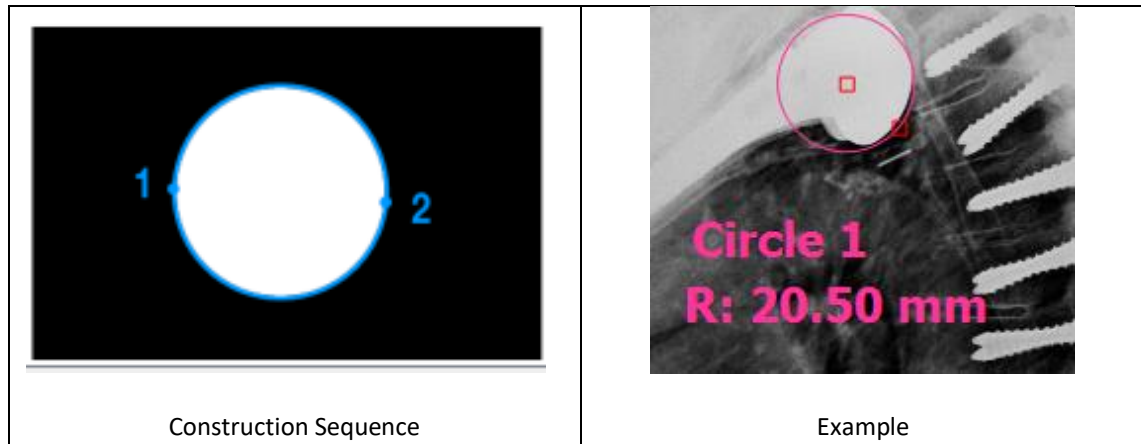
[Generic] Ellipse

Description

This tool draws an ellipse and displays the associated radii, anteversion, and area.

The sequence of steps for use of this tool

1. Select the "Ellipse" tool.
2. **CLICK** twice to set the first diameter.
3. **CLICK** to set the second diameter.
4. The points can be moved after construction to better position or rotate the measurement.

Output

The label 'Ellipse' appears on the image and its radii (in mm), anteversion (in degrees), and area (in mm^2) are displayed on the image and in the Measurement Table.

[Generic] Quad

Description

This tool draws a quadrilateral and displays the associated area.

The sequence of steps for use of this tool

1. Select the "Quad" tool.
2. **CLICK** to set the first corner.
3. **CLICK** to set the opposite corner.
4. The points can be moved after construction to better position or rotate the measurement.

Output

The label 'Quad' appears on the image and its area (in mm^2) is displayed on the image and in the Measurement Table.

[Generic] Back Surface Metrics: "BSM"

Description

The Back Surface Metrics tool permits to characterize asymmetry of the back from a digital photograph. After the identification of 11 landmarks, a total of 8 different measures are generated by the tool. A step by step guided is provided in the animated help section.
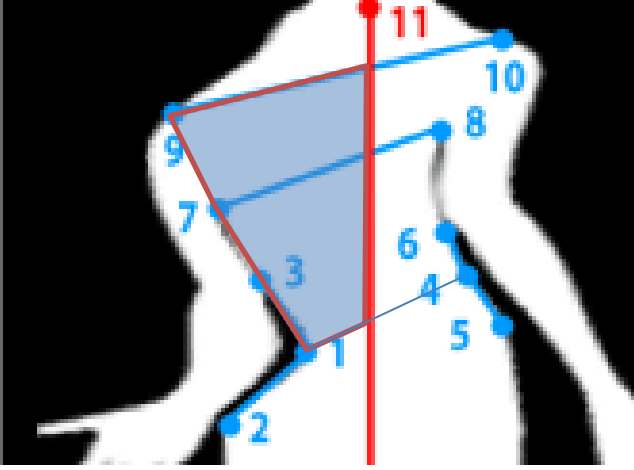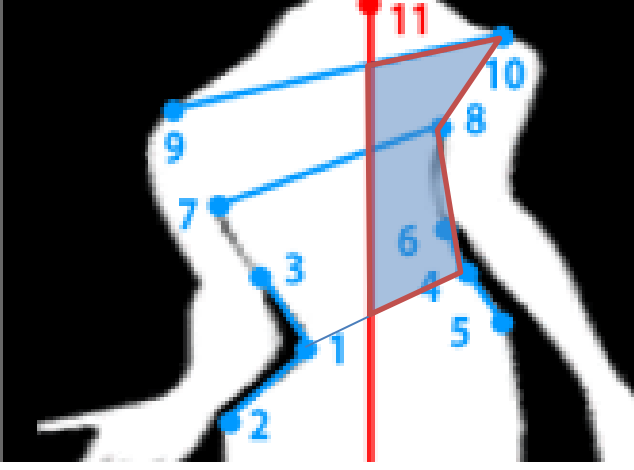
The sequence of steps for use of this tool

1. Select the "BSM" tool.
2. **CLICK** 3 times to outline the Left Waist (landmarks .1, 2, and 3)
3. **CLICK** 3 times to outline the Right Waist (landmarks .4, 5, and 6).
4. **CLICK** twice to outline the line formed from the left and right axilla (landmarks 7, and 8)
5. **CLICK** twice to outline the line formed from the left and right shoulder (landmarks 9, and 10)
6. **CLICK** once drop a cervical plumbing

Output

Parameter	Calculation	Illustration
Left Waist Angle [**L. WA**]	Angle between the segments 1-2 and 1-3	
Right Waist Angle [**R. WA**]	Angle between the segments 4-5 and 4-6	
Waist Height Angle [**WHA**]	Angle between the horizontal and the segment 1-4	
Shoulder Height Angle [**AHA**]	Angle between the horizontal and the segment 7-8	
Shoulder Height Angle [**SHA**]	Angle between the horizontal and the segment 9-10	

Left Hemi-trunk Area	Area between formed by the following landmarks: • #1 • #7 • #9 • Intersection between cervical plumbline and the segment 9-10 • Intersection between cervical plumbline and the segment 1-4 • #1	
Right Hemi-trunk Area	Area between formed by the following landmarks: • #4 • #8 • #10 • Intersection between cervical plumbline and the segment 9-10 • Intersection between cervical plumbline and the segment 1-4 • #4	
Hemi-trunk Area Ratio	Ratio between Left and Right Hemi-trunk Areas	

[Cervical Spine] Cervical Lordosis: "C Lordo"

Description

The Cervical Lordosis is a curvature of the cervical vertebrae in the neck region.
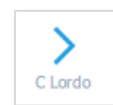
The sequence of steps for use of this tool

7. Select the "C Lordo" tool.
8. **CLICK** twice to outline the C7 inferior endplate.
9. **CLICK** twice to outline the C2 inferior endplate.
10. When the angle measure is selected, a small arc appears on the measurement indicating which angle is being measured.

11. The points can be moved after construction to better position the measurement.

Output

The Cervical Lordosis (in degrees) is displayed on the image and in the Measurement Table.

| Construction Sequence | Example |

[Cervical Spine] Cervical Sagittal Vertical Axis: "cSVA"

Description

The cSVA is the distance between C7 plumbline and the posterosuperior corner of C7 in the sagittal plane.

The sequence of steps for use of this tool

1. Select the "cSVA" tool.
2. **CLICK** the center of C2.
3. **CLICK** the C7 posterosuperior corner. This draws a line indicating the cSVA offset.
4. The points can be moved after construction to better position the measurement.

Output

The cSVA (in degrees) is displayed on the image and in the Measurement Table.

| Construction Sequence | Example |
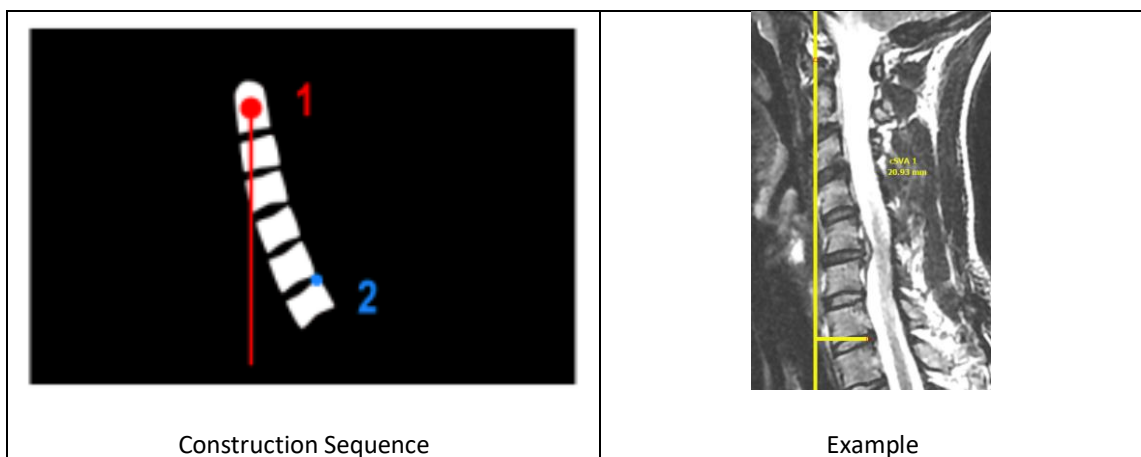
[Cervical Spine] T1 Slope: "TS"

Description

The T1 Slope (TS) is the angle between the horizontal and the cranial endplate of T1.

The sequence of steps for use of this tool

1. Select the "TS" tool.
2. **CLICK** twice to outline the T1 Superior Endplate
3. The points can be moved after construction to better position the measurement.

Output

The TS (in degrees) is displayed on the image and in the Measurement Table.

Construction Sequence	Example
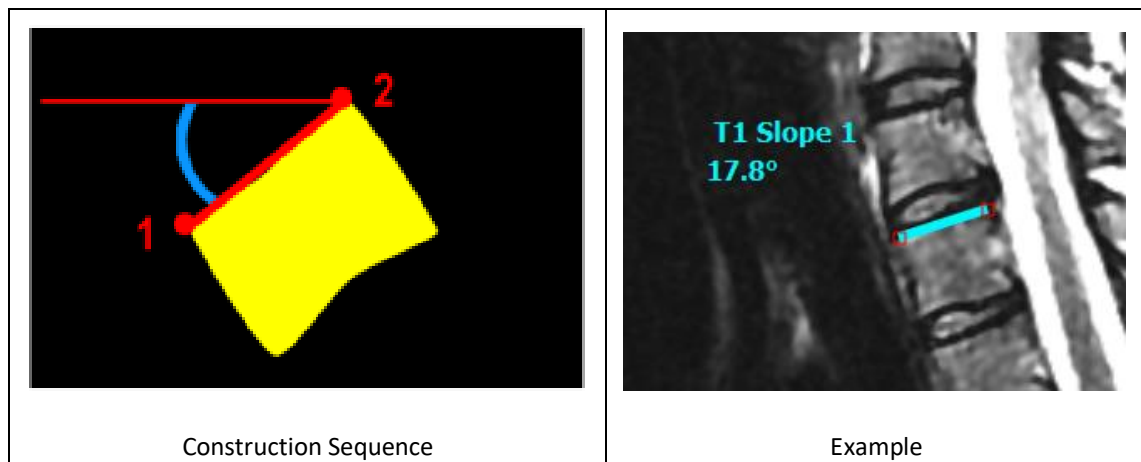
[Cervical Spine] Chin Brow Vertical Angle: "CBVA"

Description

This function permits to measure the Chin Brow Vertical Angle (CBVA) on a sagittal image. CBVA is the angle subtended by a vertical line and a line from the chin to the forehead. NOTE: a positive value denotes a "downward gaze", a negative value denotes an "upward gaze"

The sequence of steps for use of this tool

1. Select the "CBVA" tool.
2. **CLICK** on the chin.
3. **CLICK** on the brow.
4. The points can be moved after construction to better position the measurement.

Output

The Chin Brow Vertical Angle (in degrees) is displayed on the image and in the Measurement Table.

| Construction Sequence | Example |
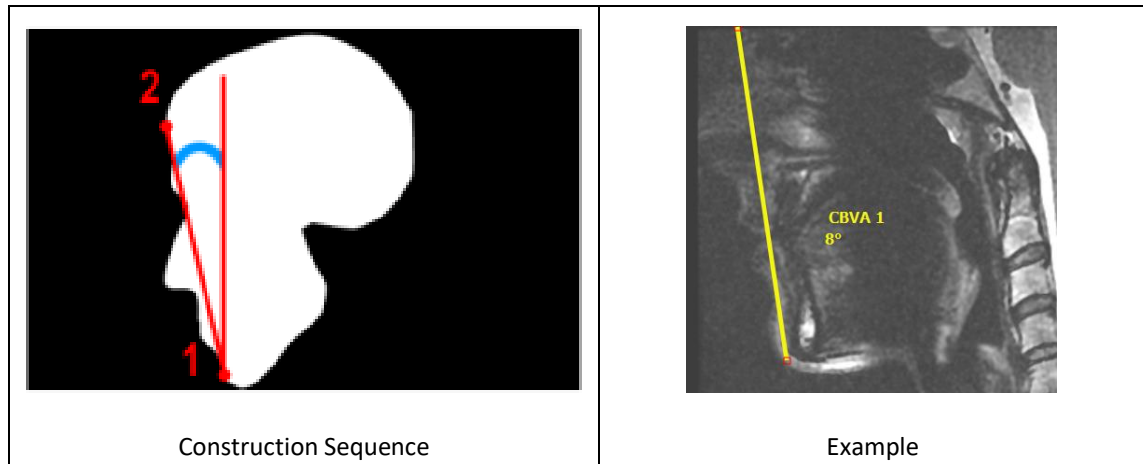
[Cervical Spine] Cervical Shape: "C Shape"

Description

The Cervical Shape tool permits measurements from C1-C2, C2 to C7 (CL), T1 Slope, T1-CL & cSVA.
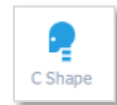
The sequence of steps for use of this tool

1. Select the "Cervical **Shape** " tool.
2. **CLICK** twice to outline the superior endplate of T1, from anterior to posterior.
3. **CLICK** twice to outline the inferior endplate of C2, from anterior to posterior.
4. **CLICK** on the anterior point of the C1 ring.
5. **CLICK** on the posterior point of the C1 ring.
6. The points can be moved after construction to better position the measurement.

Optional: **RIGHT CLICK** on the completed measurement to add additional cervical measurements i.e. Chin Brow, McGregor Line, Center of Gravity.

Output

Cervical measurements including C1-C2, C2-C7 (CL), T1 Slope, and T1-CL (in degrees) as well as cSVA (in mm) are displayed on the image and in the Measurement Table.

| Construction Sequence | Example |
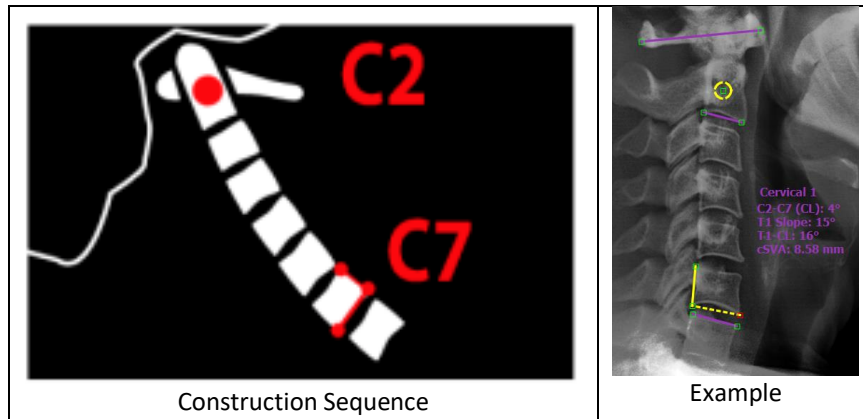
[Cervical Spine] Cervical Wizard: "Cervical"

Description
The Cervical Wizard tool permits measurements from C1-C2, C2 to C7 (CL), T1 Slope, T1-CL & cSVA.
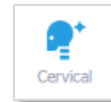
The sequence of steps for use of this tool
1. Select the "Cervical Wizard " tool.
2. **CLICK** twice to outline the superior endplate of T1, from anterior to posterior.
3. **CLICK** twice to outline the inferior endplate of C2, from anterior to posterior.
4. **CLICK** on the anterior point of the C1 ring.
5. **CLICK** on the posterior point of the C1 ring.
6. Adjust the intermediate endplates.

Optional: **RIGHT CLICK** on the completed measurement to add additional cervical measurements i.e. Chin Brow, McGregor Line, Center of Gravity.

Output
Cervical measurements including C1-C2, C2-C7 (CL), T1 Slope, and T1-CL (in degrees) as well as cSVA (in mm) are displayed on the image and in the Measurement Table.

| Construction Sequence | Example |
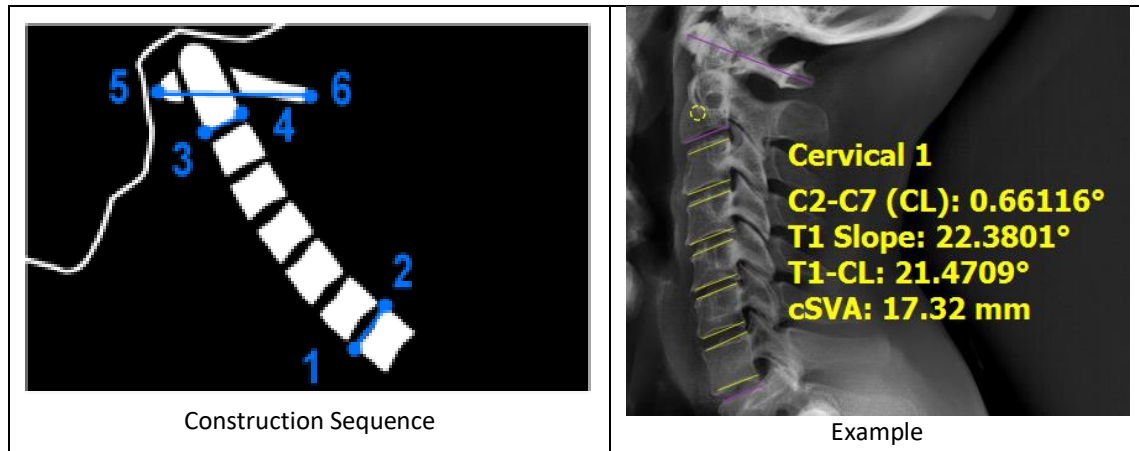
[Spine] Cobb Angle: "Cobb"

Description

The Cobb Angle tool permits to measure a generic angle between two segments.
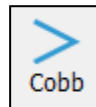
The sequence of steps for use of this tool

1. Select the "Cobb" tool.
2. **CLICK** twice to outline upper endplate.
3. **CLICK** twice to outline lower endplate.
4. When the angle measure is selected, a small arc appears on the measurement indicating which angle is being measured. This is the Coronal Cobb Angle.
5. The points can be moved after construction to better position the measurement.

Output

The Cobb angle (in degrees) between the set of 2 lines is displayed on the image and in the Measurement Table.

| Construction Sequence | Example |
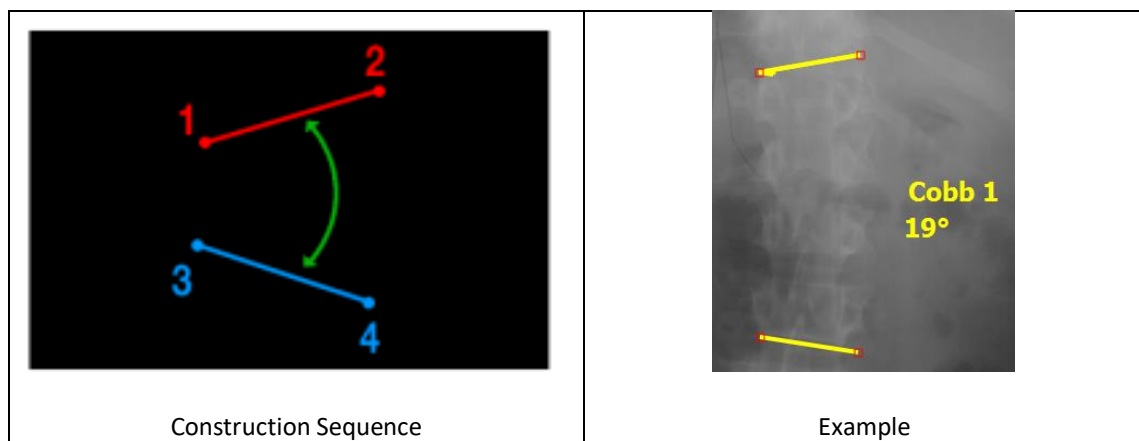
[Spine] Lumbar Lordosis: "LLordo"

Description

This function permits the user to measure the lordosis angle on a sagittal (lateral view) image by identifying two vertebral endplates (two clicks per endplate). The angle created between the two segments cannot be greater than 180° (see limitations notice to angles). NOTE: a negative value denotes a lordotic alignment, a positive value denotes a kyphotic alignment.
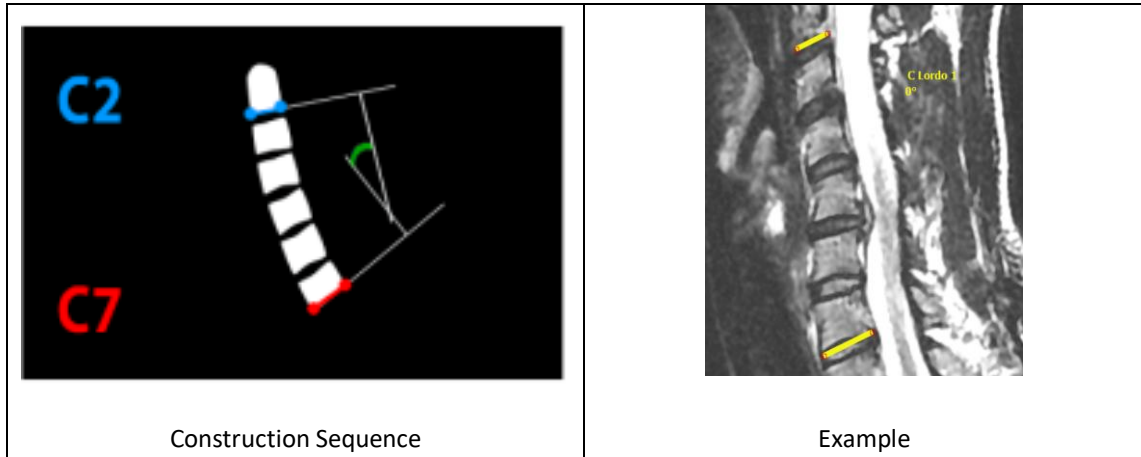
The sequence of steps for use of this tool

1. Select the "LLordo" tool.
2. **CLICK** twice to outline the S1 superior endplate.
3. **CLICK** twice to outline the L1 superior endplate.
4. When the angle measure is selected, a small arc appears on the measurement indicating which angle is being measured.
5. The points can be moved after construction to better position the measurement.

Output

The Lordosis angle (in degrees) is displayed on the image and in the Measurement Table.

| Construction Sequence | Example |
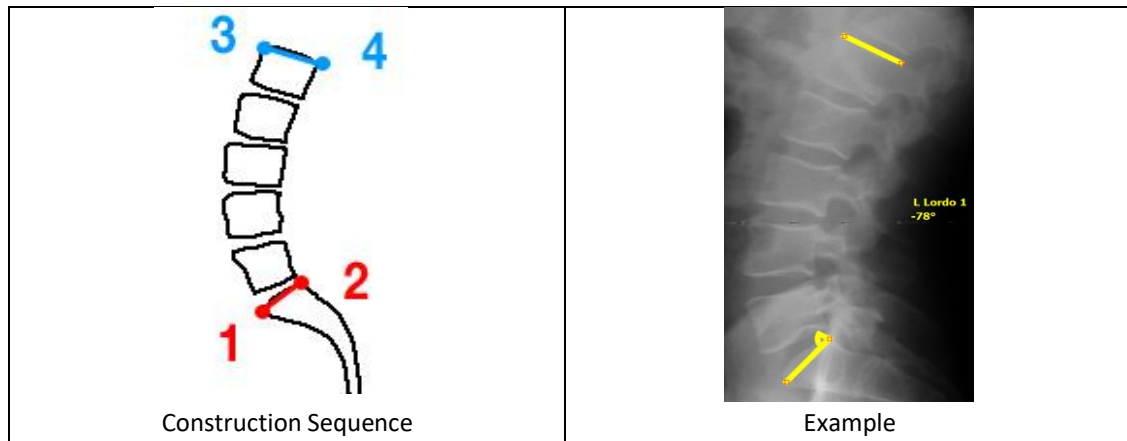
[Spine] Thoracic Kyphosis: "TKypho"

Description

This function permits the user to measure the kyphosis angle on a sagittal (lateral view) image by identifying two vertebral endplates (two clicks per endplate). The angle created between the two segments cannot be greater than 180° (see limitations on angle measurements). NOTE: a negative value denotes a lordotic alignment, a positive value denotes a kyphotic alignment.

The sequence of steps for use of this tool

1. Select the "TKypho" tool.

2. **CLICK** twice to outline the T12 inferior endplate.
3. **CLICK** twice to outline the T4 superior endplate.
4. When the angle measure is selected, a small arc appears on the measurement indicating which angle is being measured.
5. The points can be moved after construction to better position the measurement.

Output

The Kyphosis angle (in degrees) is displayed on the image and in the Measurement Table.

| Construction Sequence | Example |
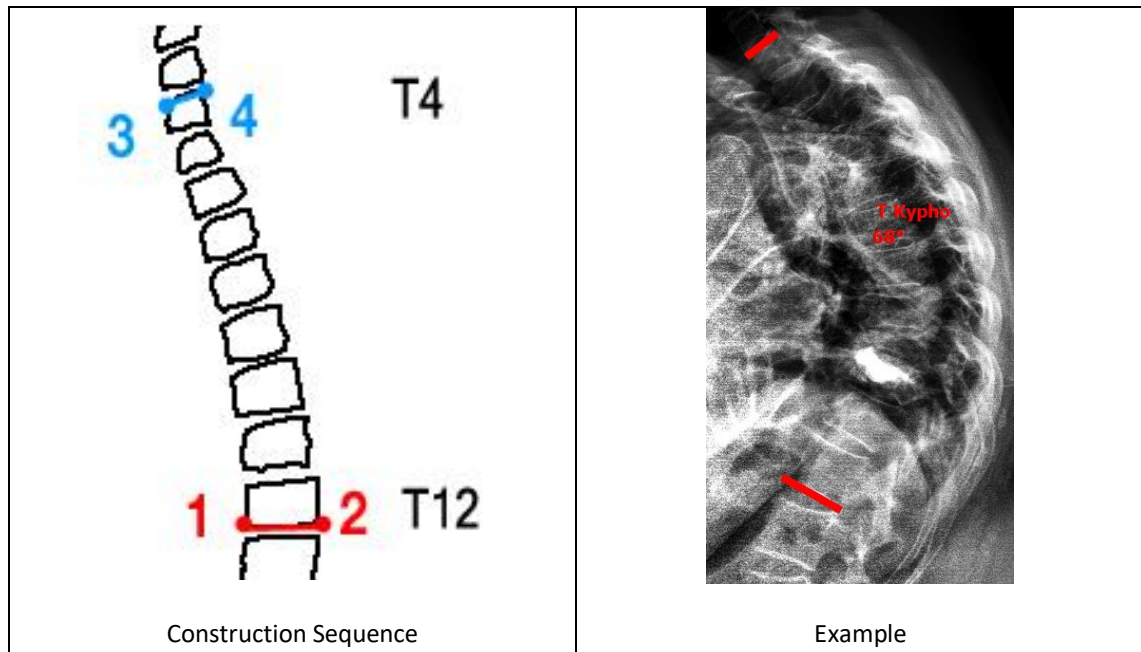
[Spine] Pelvic Measures: "Pelvic"

Description

This tool permits the user to calculate the Pelvic Incidence, Pelvic Tilt and Sacral Slope parameters on a sagittal (lateral view) image. It requires identifying the sacral endplate as well as the two femoral heads.

Definition of Pelvic Parameters

❖ Pelvic Incidence (PI): the angle between the perpendicular to the sacral endplate and a line from the center of the sacral endplate to the center of the femoral heads
❖ Sacral Slope (SS): the angle between the upper endplate of the sacrum and a horizontal line.
❖ Pelvic Tilt (PT): the angle a vertical line and a line from the center of the sacral endplate to the center of the femoral heads.

❖ Note: PI=SS+PT

The sequence of steps for use of this tool

1. Select the "Pelvic" tool.
2. **CLICK** twice to outline the superior endplate of S1.
3. **CLICK** twice to outline the perimeter of the first femoral head.
4. **CLICK** twice to outline the perimeter of the second femoral head.
5. The points can be moved after construction to better position the measurement.

Output

The pelvic parameters (pelvic incidence, pelvic tilt and sacral slope) are displayed on the image and in the Measurement Table in degrees.

| Construction Sequence | Example |
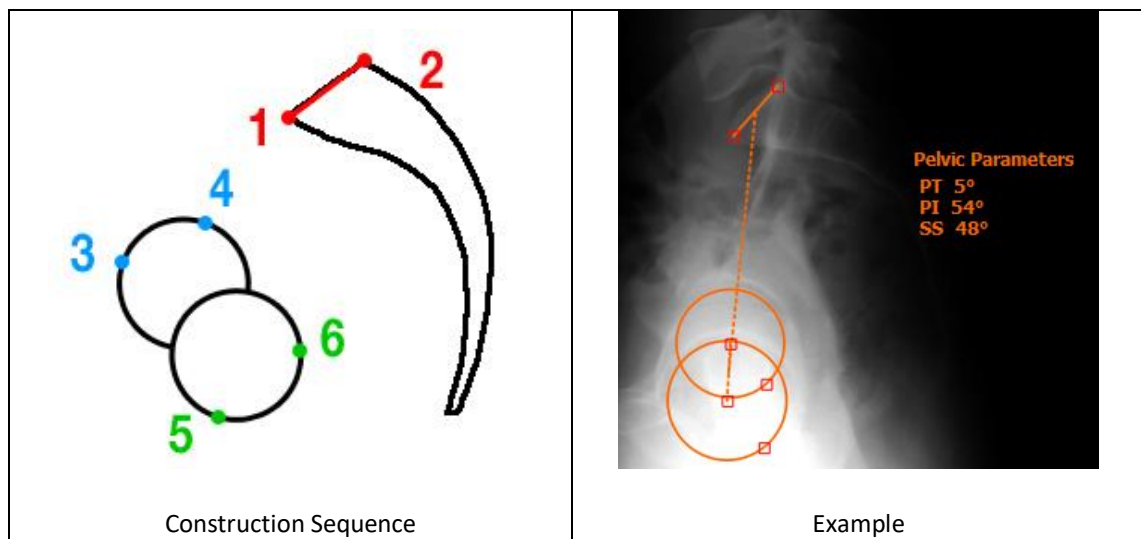
[Spine] T1 Spino-Pelvic Inclination: "T1 SPi"

Description

This tool permits the user to calculate the T1 Spino-Pelvic Inclination on a sagittal (lateral view) image. A prerequisite for the use of this tool is the existence of pelvic parameters on the image. NOTE: a positive value denotes an anterior alignment with T1 in from of the femoral heads, a negative value denotes a posterior alignment.

The sequence of steps for use of this tool

1. Select the "T1 SPi" tool.
2. **CLICK** the center of the T1 vertebral body.
3. The points can be moved after construction to better position the measurement.

Output

The T1 Spino-Pelvic inclination is displayed on the image and in the Measurement Table in degrees.

| Construction Sequence | Example |
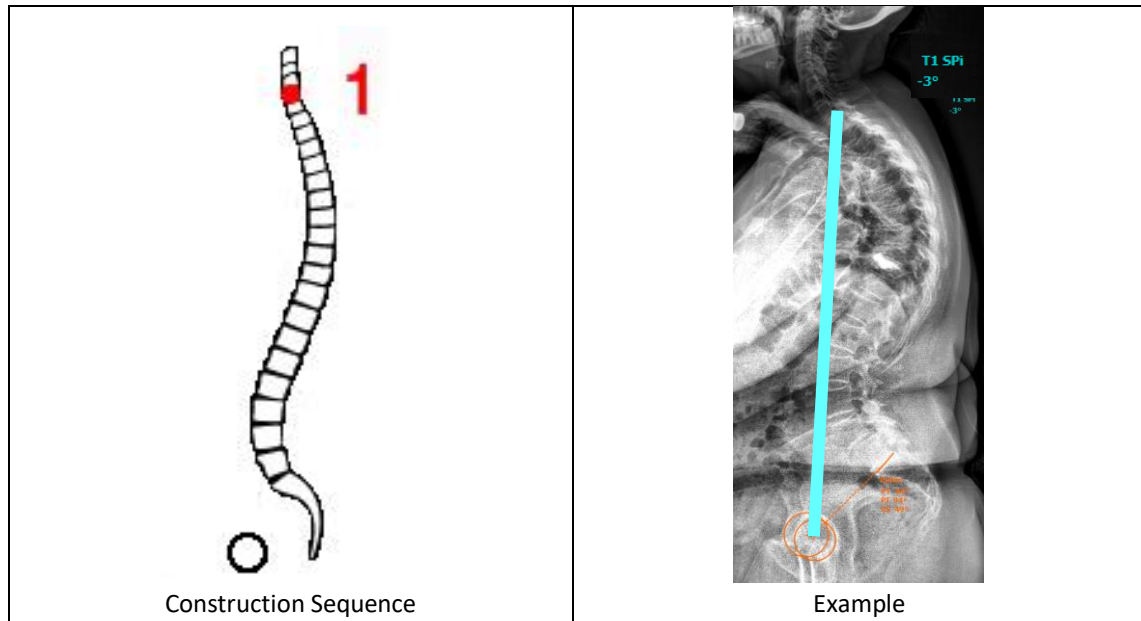
[Spine] Sagittal Vertical Axis: "SVA"

Description

This tool measures the horizontal offset between a vertical line and any selected anatomical landmark. Most commonly, this is employed to measure the vertical offset between the C7 vertebra and posterosuperior corner of the sacrum. NOTE: a negative value denotes a plumbline posterior to the posterosuperior corner of S1, a positive value denotes a plumbline anterior to the posterosuperior corner of S1.

The sequence of steps for use of this tool

1. Select the "SVA" tool
2. **Click** the center of C7.
3. **Click** the posterosuperior corner of S1.
4. The points can be moved after construction to better position the measurement.

Output

The label 'SVA' appears on the image and the offset (in mm) between the vertical line and the second point at the end of the horizontal line is displayed on the image and the 'Measurement' table in mm. This function requires the image to be calibrated.

Construction Sequence	Example
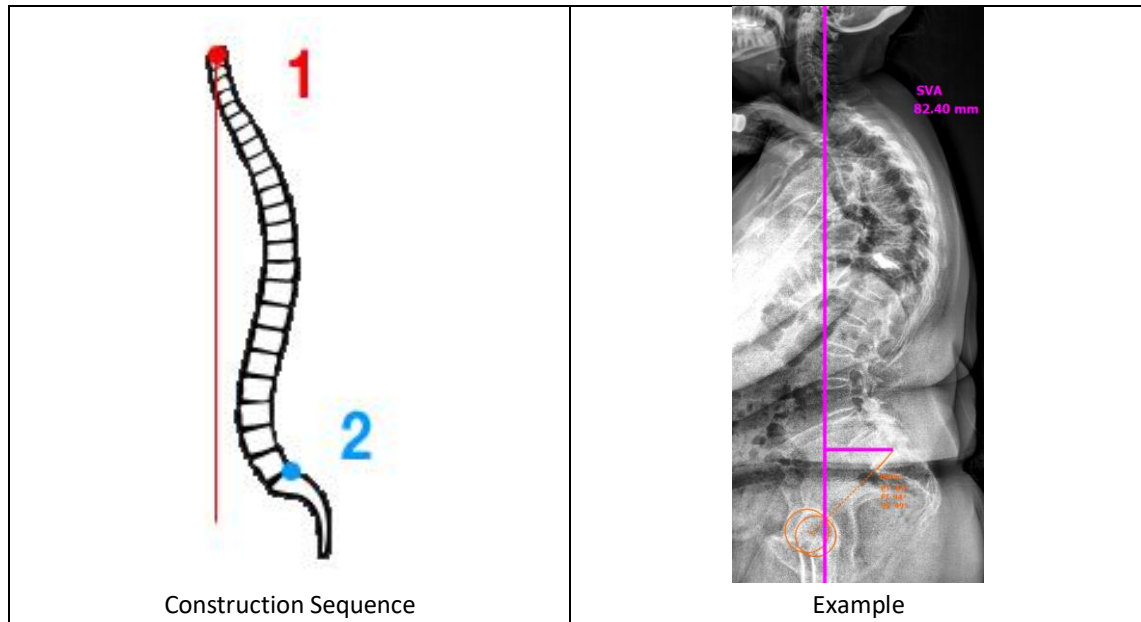
[Spine] Central Sacral Vertical Line: "CAlign"

Description

This tool provides a visual representation of the vertical line bisecting the sacrum and measures the horizontal offset from that line and any selected anatomical landmark. Most commonly, this is employed to measure the offset between the C7 vertebra and midpoint of the sacrum. NOTE: a negative value denotes a plumbline to the left of S1 center, a positive value denotes a plumbline to the right of S1 center.
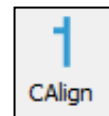
The sequence of steps for use of this tool

1. Select the "CAlign" tool
2. **CLICK** the midpoint of S1.
3. **CLICK** the midpoint of C7.
4. The points can be moved after construction to better position the measurement.

Output

The label 'CAlign' appears on the image and the offset (in mm) between the vertical line and the second point at the end of the horizontal line is displayed on the image and the 'Measurement' table in mm. This function requires the image to be calibrated.

[Spine] Stenosis

Description

Spinal stenosis refers to the narrowing of anatomical passages for neurological structures. Most commonly stenosis is measured on axial images of the spine obtained by MRI or CT. The 'stenosis' tool permits quantification of the cross sectional area of the spinal canal in mm^2.

The sequence of steps for use of this tool

1. Select the "Stenosis" tool.
2. CLICK any point along the periphery of the cross-sectional area to be measured.
3. Continue to CLICK along the contour of the spinal canal to create a continuous outline formed in spline fashion (curved segments, not straight line segments).
4. Once the canal is outlined, DOUBLE-CLICK on the contour between the first and last point to close the measurement.
5. The points can be moved after construction to better position the measurement.

Output

The label 'Stenosis' appears on the image and the cross sectional area is displayed in mm^2 on the image and in the Measurement Table. This function requires the image to be calibrated.

| Construction Sequence | Example |
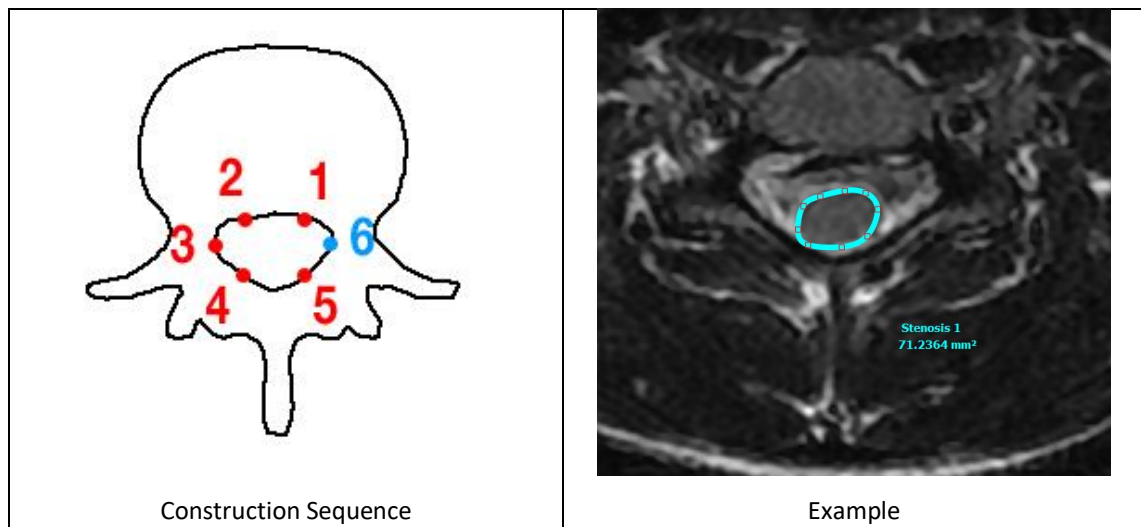
[Spine] Spondylolisthesis: "Spondy"

Description

This function permits to measure a spondylolisthesis as defined by slippage of one vertebra versus another in the sagittal plane. This function requires the identification of

two vertebral endplates and permits the user to calculate the angle between the segment as well as the slippage in mm and percentage (or grade).

The sequence of steps for use of this tool

1. Select the "Spondy" tool.
2. **CLICK** twice to outline the inferior endplate of the superior vertebra, from posterior to anterior.
3. **CLICK** twice to outline the superior endplate of the inferior vertebra, from posterior to anterior.
4. The points can be moved after construction to better position the measurement.

Output

The label 'Spondy" appears on the image and following parameters are reported in the Measurement Table:

❖ **Spondy Distance**: value of the slippage in mm (requires the image to be calibrated)
❖ **Spondy Slip Angle**: angle between the two segments in degrees
❖ **Spondy Grade**: grade and percentage of the slippage
  o *Grade 1 up to 25% of vertebral body has slipped forward*
  o *Grade 2 25-50% slippage*
  o *Grade 3 50-75%*
  o *Grade 4 75-100%*
  o *Grade 5 Vertebral body completely displaced/fallen off*

| Construction Sequence | Example |
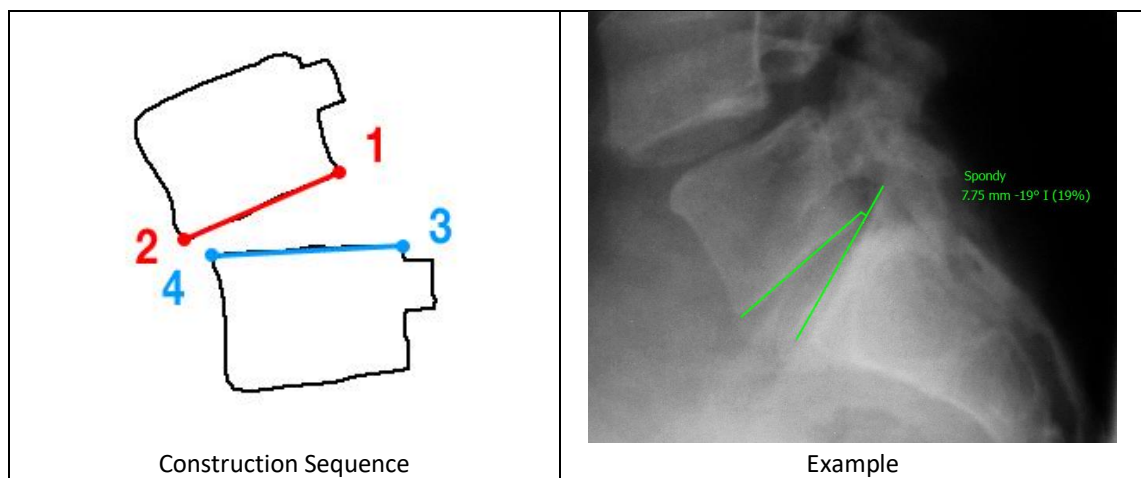
[Spine] Offset Measurement: "Offset"

Description

This function permits to calculate the listhesis in mm between two vertebrae on the coronal plane.

The sequence of steps for use of this tool

1. Select the "Offset" tool.
2. **CLICK** twice to outline the inferior endplate of the superior vertebra.
3. **CLICK** twice to outline the superior endplate of the inferior vertebra.
4. The points can be moved after construction to better position the measurement.

Output

The label "Offset" appears on the image and the coronal listhesis/distance of slippage in mm is displayed on the image and in the Measurement Table.

[Spine] Rib-Vertebra Angle: "RVAD"

Description

This function permits to calculate the rib-vertebra angles on the convex and concave side of a coronal deformity as well as the rib-vertebra angle difference. The rib-vertebra angles have to be measured at the apical level of the deformity and are defined as the angle between the perpendicular to the lower apical endplate and each rib (concave and convex side). The rib-vertebra angle difference (RVAD) is defined by the difference between the concave and the convex side.

The sequence of steps for use of this tool

5. Select the "RVAD" tool.
6. **CLICK** twice to outline the inferior endplate of the apical vertebra.
7. **CLICK** twice to draw a line along the concave rib from head to neck (away from the spine).
8. **CLICK** twice to draw a line along the convex rib from head to neck (away from the spine).
9. The points can be moved after construction to better position the measurement.

Output

The label "RVAD" appears on the image and the following values are displayed on the image and in the Measurement Table:

- ❖ **RVAD RVAcave** Rib Vertebral angle on the concave side
- ❖ **RVAD RVAvex** Rib Vertebral angle on the convex side
- ❖ **RVAD RVD** Rib Vertebral Angle Difference (concave minus convex)

| Construction Sequence | Example |
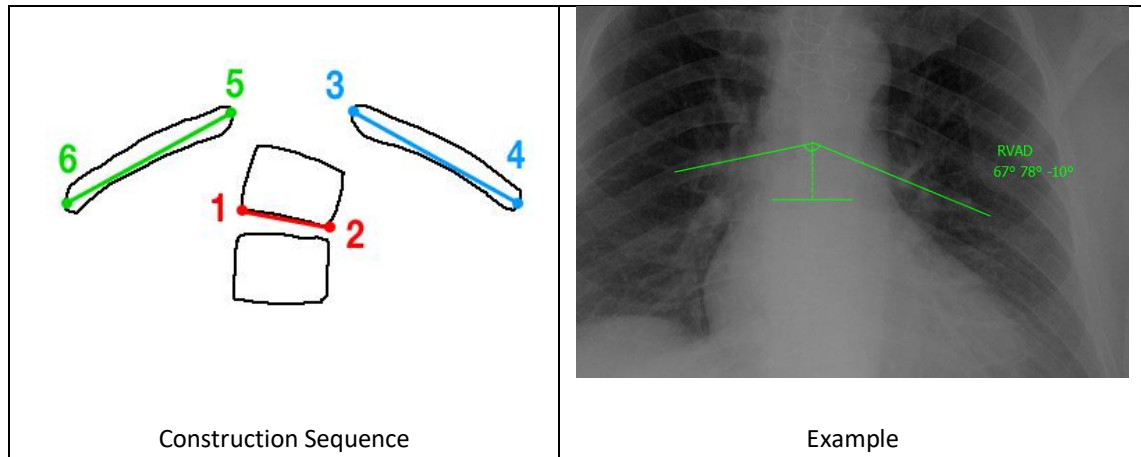
[Spine] Vertebral Body Measurement (VBM)

Description

The surface area of vertebral body in mm^2, the anterior and posterior distance between the superior and posterior endplates and the Cobb angle between the superior and inferior endplates of a vertebra can be measured using this tool. These measurements are acquired on sagittal images of the spine obtained by MRI or CT. Additionally, it is possible to measure the Cobb angle between the inferior endplate of the superior vertebra and the superior endplate of the posterior vertebra (Regional Angle).
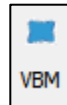
The sequence of steps for use of this tool

1. Select the "VBM" tool from Measuring Tools.
2. **CLICK** on the inferior anterior corner of vertebral body.
3. **CLICK** on the inferior posterior corner of the vertebral body.
4. **CLICK** on the superior anterior corner of the vertebral body.
5. **CLICK** on the superior posterior corner of the vertebral body.
6. An outline of the vertebra body is created, which provides 6 additional handles. Adjust these to the outline to the vertebral body.

Optional: In order to calculate Regional Angle, **RIGHT CLICK** on the measurement and select Add Regional Angle.

1. **CLICK** on the anterior corner of the superior endplate of the inferior vertebra.
2. **CLICK** on the superior posterior corner of the superior endplate of the inferior vertebra.
3. **CLICK** on the inferior anterior corner of the inferior endplate of the superior vertebra.
4. **CLICK** on the inferior posterior corner of the inferior endplate of the superior vertebra.
5. To remove, **RIGHT CLICK** on the measure and select Remove Regional Angle.

Output

The label 'VBM' appears on the image and the anterior and posterior distance between the superior and posterior endplates, the vertebral body area in mm^2 and the Cobb angle between the superior and inferior endplates of a vertebra are displayed on the image and in the Measurement Table. This function requires the image to first be calibrated.

Applied Measurement	Applied with Regional Angle
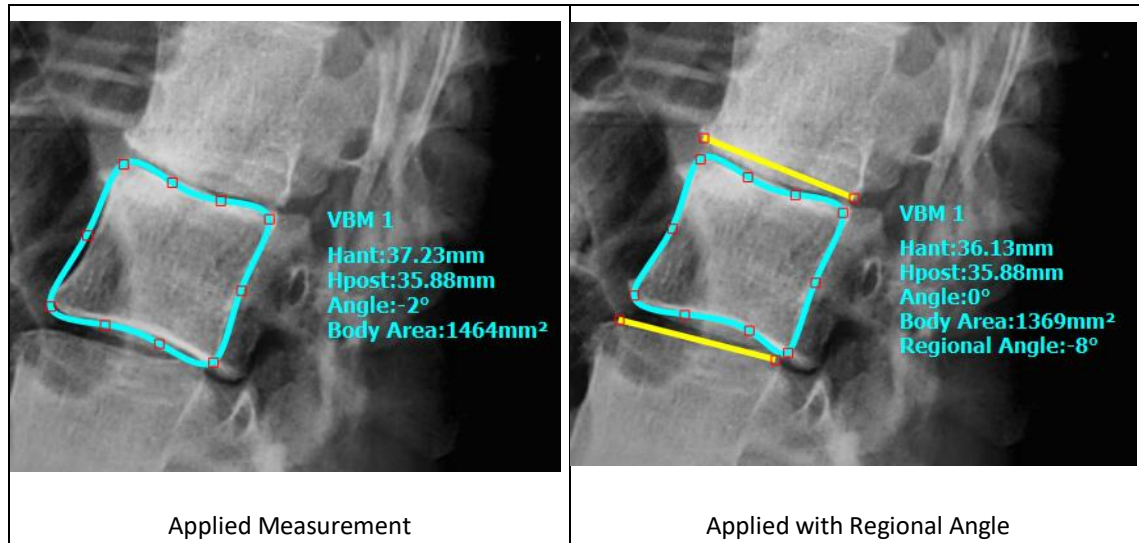
[Spine] Sagittal Spino-Pelvic Shape: "SP Shape"

Description

The Sagittal Spino-Pelvic Shape permits the user to perform a full evaluation of the sagittal plane by following a step-by-step workflow displayed in the Help Desk. After proper identification of key anatomical landmarks (femoral heads, S1, L1, T1, and C2), key radiographic parameters will be computed and displayed. NOTE: this tool does not necessarily require images up to C2 and is applicable for x-rays up to L1 or T1.

The sequence of steps to use this tool

1. Select the "SP Shape" tool.
2. First femoral head
   a. **CLICK** on the perimeter of the first femoral head.
   b. **CLICK** on the opposite edge of the first femoral head to draw a circle.
3. Second femoral head
   a. **CLICK** on the perimeter of the second femoral head.
   b. **CLICK** on the opposite edge of the second femoral head to draw a circle.
4. Superior S1 endplate
   a. **CLICK** the corner of the upper S1 endplate.
   b. **CLICK** the other corner to finish outlining the sacral endplate.

5. Superior L1 endplate
    a. **CLICK** the corner of the upper L1 endplate.
    b. **CLICK** the other corner to finish outlining the upper L1 endplate (or **DOUBLE-CLICK** to end measurement at L1).
6. Superior T1 endplate
    a. **CLICK** the corner of the upper T1 endplate.
    b. **CLICK** the other corner to finish outlining the upper T1 endplate (or **DOUBLE-CLICK** to end measurement at T1).
7. Inferior C2 endplate
    a. **CLICK** the corner of the lower C2 endplate.
    b. **CLICK** the other corner to finish outlining the lower C2 endplate.
8. Adjust shape
    a. All segments remain modifiable with active handle points that can be dragged to improve accuracy.
    b. To add an additional adjustable handle, **DOUBLE-CLICK** any point along the displayed measure.

Optional: **RIGHT CLICK** on the completed measurement to toggle normative alignment or simulate a rod implant.

Output: Measurements

The label "Alignment" appears on the image and the following values are displayed on the Measurement Table. Of note, the list of measurements displayed will depend on the identified landmarks (i.e. up to L1, T1, or C2). The list of measurements displayed can also be customized (i.e. turned on or off) in the "Display Settings Manager".

Parameters	Femoral heads to C2	Femoral heads to T1	Femoral heads to L1
Pelvic Tilt	Yes	Yes	Yes
Pelvic Incidence	Yes	Yes	Yes
Sacral Slope	Yes	Yes	Yes
Lumbar Lordosis	Yes	Yes	Yes
Pelvic Incidence minus Lumbar Lordosis	Yes	Yes	Yes
Thoracolumbar	Yes	Yes	-
Thoracic Kyphosis	Yes	Yes	-
T9 SPi	Yes	Yes	-
T1 SPi	Yes	Yes	-
Sagittal Vertical Axis	Yes	Yes	
T1 Slope	Yes	Yes	-
T1 Pelvic Angle	Yes	Yes	-
T1 Slope minus Cervical Lordosis	Yes	-	-
Cervical Lordosis	Yes	-	-

C2-C7	Yes	-	-
C2 Slope	Yes	-	-
C2 Pelvic Angle	Yes	-	-
C2 T1 Pelvic Angle	Yes	-	-

Output: Normative values

In addition to the measured parameters, normative values from peer-review publications are also provided in the Measurement Table for the sagittal alignment parameter. Double-clicking on a normative value opens a new window containing literature details and associated source.

Construction Sequence	Example

[Spine] Sagittal PI-LL Shape: "PI-LL"

Description

The Sagittal PI-LL Shape tool permits the user to perform an evaluation of the sagittal plane by following a step-by-step workflow displayed in the Help Desk. After proper

identification of key anatomical landmarks (femoral heads, S1, and L1), pelvic and lumbar parameters will be computed and displayed.

The sequence of steps to use this tool

1. Select the "PI-LL" tool.
2. First femoral head
    a. **CLICK** on the perimeter of the first femoral head.
    b. **CLICK** on the opposite edge of the first femoral head to draw a circle.
3. Second femoral head
    a. **CLICK** on the perimeter of the second femoral head.
    b. **CLICK** on the opposite edge of the second femoral head to draw a circle.
4. Superior S1 endplate
    a. **CLICK** the corner of the upper S1 endplate.
    b. **CLICK** the other corner to finish outlining the sacral endplate.
5. Superior L1 endplate
    a. **CLICK** the corner of the upper L1 endplate.
    b. **CLICK** the other corner to finish outlining the upper L1 endplate (or **DOUBLE-CLICK** to end measurement at L1).

Optional: **RIGHT CLICK** on the completed measurement to toggle normative alignment or simulate a rod implant.

Output: Measurements

The label "Alignment" appears on the image and the following values are displayed on the Measurement Table.

Parameters	Femoral heads to C2	Femoral heads to T1	Femoral heads to L1
Pelvic Tilt	Yes	Yes	Yes
Pelvic Incidence	Yes	Yes	Yes
Sacral Slope	Yes	Yes	Yes
Lumbar Lordosis	Yes	Yes	Yes
Pelvic Incidence minus Lumbar Lordosis	Yes	Yes	Yes

Output: Normative values

In addition to the measured parameters, normative values from peer-review publications are also provided in the Measurement Table for the sagittal alignment parameter. Double-clicking on a normative value opens a new window containing literature details and associated source.

[Spine] Sagittal Spino-Pelvic Wizard: "Sagittal"

Description

The Sagittal Spino-Pelvic Wizard permits the user to perform a full evaluation of the sagittal plane by following a step-by-step workflow displayed in the Help Desk. After proper identification of key anatomical landmarks (femoral heads, S1, L1, T1, and C2), key radiographic parameters will be computed and displayed. NOTE: this tool does not necessarily require images up to C2 and is applicable for x-rays up to L1 or T1.

The sequence of steps to use this tool

1. Select the "Sagittal" tool.
2. First femoral head
    a. **CLICK** on the perimeter of the first femoral head.
    b. **CLICK** on the opposite edge of the first femoral head to draw a circle.
3. Second femoral head
    a. **CLICK** on the perimeter of the second femoral head.
    b. **CLICK** on the opposite edge of the second femoral head to draw a circle.
4. Superior S1 endplate
    a. **CLICK** the corner of the upper S1 endplate.
    b. **CLICK** the other corner to finish outlining the sacral endplate.
5. Superior L1 endplate
    a. **CLICK** the corner of the upper L1 endplate.
    b. **CLICK** the other corner to finish outlining the upper L1 endplate (or **DOUBLE-CLICK** to end measurement at L1).
6. Superior T1 endplate
    a. **CLICK** the corner of the upper T1 endplate.
    b. **CLICK** the other corner to finish outlining the upper T1 endplate (or **DOUBLE-CLICK** to end measurement at T1).
7. Inferior C2 endplate
    a. **CLICK** the corner of the lower C2 endplate.
    b. **CLICK** the other corner to finish outlining the lower C2 endplate.
8. Adjust shape
    a. All segments remain modifiable with active handles to displace them.
    b. **DRAG** to adjust intermediate endplates until the schematic vertebrae overlay with the x-ray.

Optional: **RIGHT CLICK** on the completed measurement to toggle normative alignment, insert an implant or wedge osteotomy, and show vertebrae markers or spline.

Output: Measurements

The label "Sagittal" appears on the image and the following values are displayed on the Measurement Table. Of note, the list of measurements displayed will depend on the identified landmarks (i.e., up to L1, T1, or C2). The list of measurements displayed can also be customized (i.e., turned on or off) in the "Display Settings Manager".
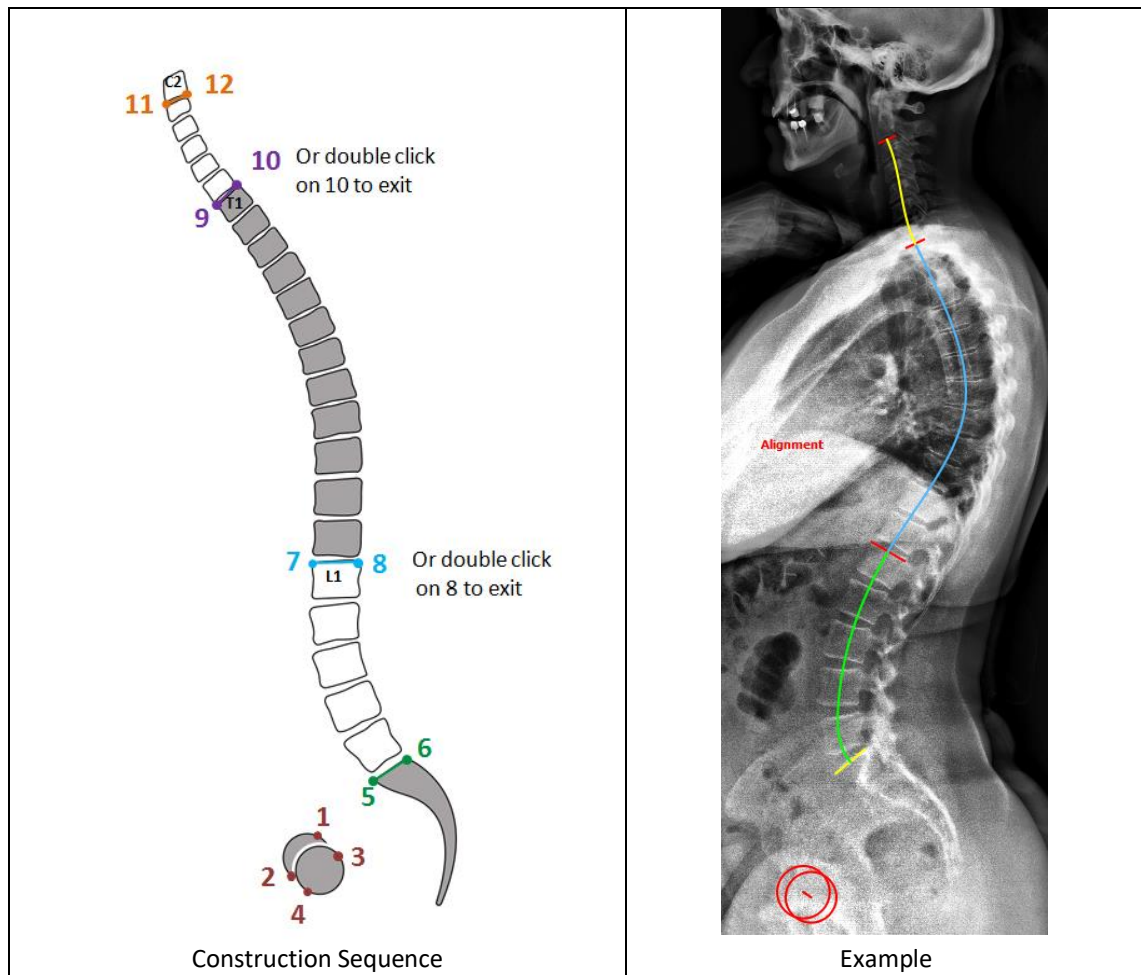
Parameters	Femoral heads to C2	Femoral heads to T1	Femoral head to L1
Pelvic Tilt	Yes	Yes	Yes
Pelvic Incidence	Yes	Yes	Yes
Sacral Slope	Yes	Yes	Yes
Lumbar Lordosis	Yes	Yes	Yes
Pelvic Incidence minus Lumbar Lordosis	Yes	Yes	Yes
Thoracolumbar	Yes	Yes	-
Thoracic Kyphosis	Yes	Yes	-
T9 SPi	Yes	Yes	-
T1SPi	Yes	Yes	-
Sagittal Vertical Axis	Yes	Yes	
T1 Slope	Yes	Yes	-
T1 Pelvic Angle	Yes	Yes	-
T1 Slope minus Cervical Lordosis	Yes	-	-
Cervical Lordosis	Yes	-	-
C2-C7	Yes	-	-
C2 Slope	Yes	-	-
C2 Pelvic Angle	Yes	-	-
C2 T1 Pelvic Angle	Yes	-	-

Output: Normative values

In addition to the measured parameters, normative values from peer-review publications are also provided in the Measurement Table for the sagittal alignment parameter. Double-clicking on a normative value opens a new window containing literature details and associated source (see below example for Pelvic Tilt, PT).

Pelvic Tilt (PT)

Pelvic Tilt (PT) Positive way

PI = PT + SS

- **Pelvic Tilt** (PT) is the angle between a line from the center of the femoral head axis to the midpoint of the sacral plate and the vertical.

- Normative value is **13° ± 6** in young adult
  - Range: -4.7 ° to 27 °

- In asymptomatic subjects PT correlates with PI but varies less than SS.
  - PI=35° => PT ~6°
  - PI=50° => PT ~11°
  - PI=85° => PT ~24°

- PT is a compensatory mechanism and increases with loss of lumbar lordosis. PT correlates with patient reported outcomes (disability)

Vialle R. et al., JBJS 2005
Lafage V. et al. Spine 2009

| Construction Sequence | Example |
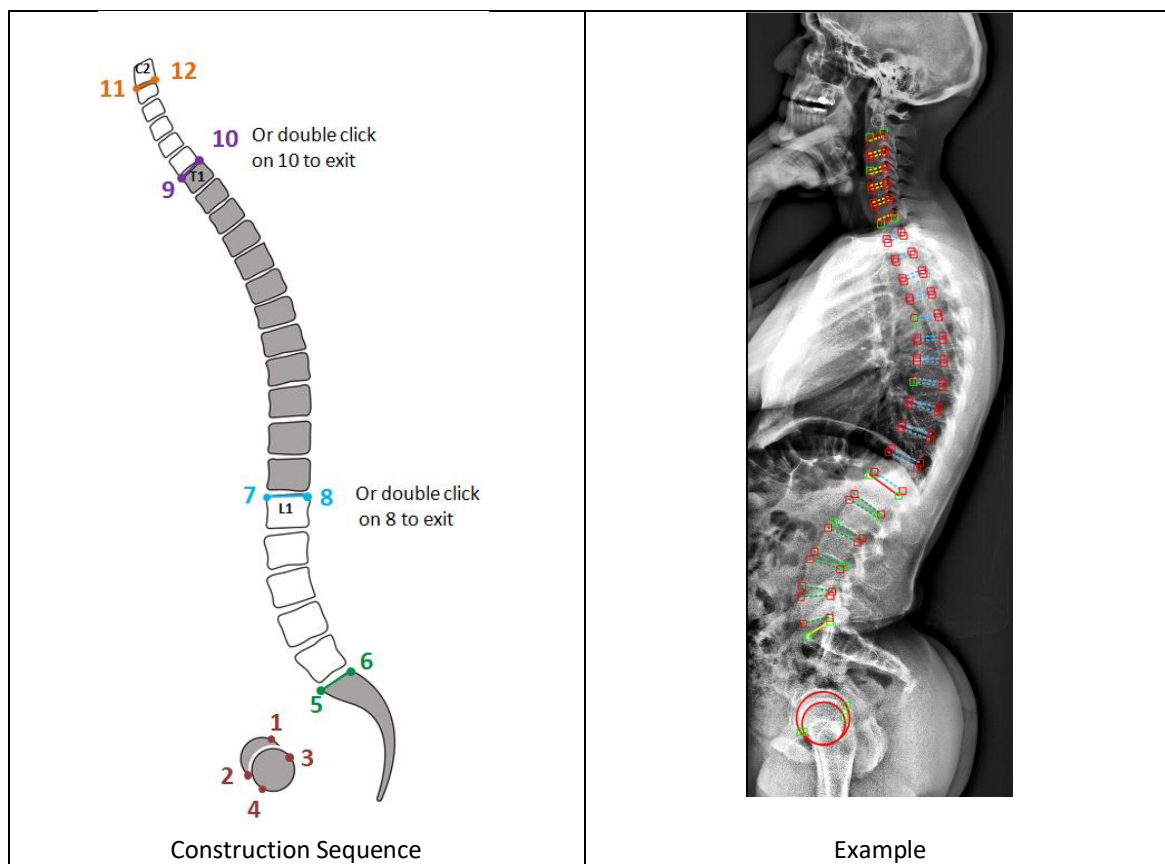
[Spine] Sagittal Spinal Wizard: "Spine"

Description

The Sagittal Spinal Wizard permits the user to perform an evaluation of the sagittal plane from S1 to C2 (i.e. no femoral heads). After proper identification of key anatomical landmarks (S1, L1, T1, and C2), key radiographic parameters will be computed and displayed. NOTE: this tool does not necessarily require images up to C2 and is applicable for x-rays up to L1 or T1.

The sequence of steps to use this tool

1. Select the "Sagittal" tool.
2. Superior S1 endplate
   a. **CLICK** the corner of the upper S1 endplate.
   b. **CLICK** the other corner to finish outlining the sacral endplate.
3. Superior L1 endplate
   a. **CLICK** the corner of the upper L1 endplate.
   b. **CLICK** the other corner to finish outlining the upper L1 endplate (or **DOUBLE-CLICK** to end measurement at L1).
4. Superior T1 endplate
   a. **CLICK** the corner of the upper T1 endplate.

b. **CLICK** the other corner to finish outlining the upper T1 endplate (or **DOUBLE-CLICK** to end measurement at T1).

5. Inferior C2 endplate
    a. **CLICK** the corner of the lower C2 endplate.
    b. **CLICK** the other corner to finish outlining the lower C2 endplate.

6. Adjust shape
    a. All segments remain modifiable with active handles to displace them.
    b. **DRAG** to adjust intermediate endplates until the schematic vertebrae overlay with the x-ray.

Optional: **RIGHT CLICK** on the completed measurement to insert an implant or wedge osteotomy, and show vertebrae markers or spline.

Output: Measurements

The label "Sagittal" appears on the image and the following values are displayed on the Measurement Table. Of note, the list of measurements displayed will depend on the identified landmarks (i.e., up to L1, T1, or C2). The list of measurements displayed can also be customized (i.e., turned on or off) in the "Display Settings Manager".
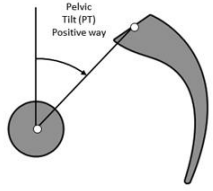

Parameters	S1 to C2	S1 to T1	S1 to L1
Sacral Slope	Yes	Yes	Yes
Lumbar Lordosis	Yes	Yes	Yes
Thoracolumbar	Yes	Yes	-
Thoracic Kyphosis	Yes	Yes	-
Sagittal Vertical Axis	Yes	Yes	
T1 Slope	Yes	Yes	-
T1 Slope minus Cervical Lordosis	Yes	-	-
Cervical Lordosis	Yes	-	-
C2-C7	Yes	-	-
C2 Slope	Yes	-	-

[Spine] Coronal Wizard: "Coronal"

Description

The Coronal Wizard permits the user to perform a full evaluation of the coronal plane by following a step-by-step workflow displayed in the Help Desk. After proper identification of key anatomical landmarks (S1, L1, and T1), key radiographic parameters will be computed and displayed. NOTE: this tool does not necessarily require images up to T1 and is applicable for x-rays up to L1.

Coronal

The sequence of steps to use this tool

1. Select the "Coronal" tool.
2. Superior S1 endplate
    a. **CLICK** the corner of the upper S1 endplate.
    b. **CLICK** the other corner to finish outlining the sacral endplate.
3. Superior L1 endplate
    a. **CLICK** the corner of the upper L1 endplate.
    b. **CLICK** the other corner to finish outlining the upper L1 endplate (or **DOUBLE-CLICK** to end measurement at L1).
4. Superior T1 endplate
    a. **CLICK** the corner of the upper T1 endplate.
    b. **CLICK** the other corner to finish outlining the upper T1 endplate (or **DOUBLE-CLICK** to end measurement at T1).
5. Adjust shape
    a. All segments remain modifiable with active handles to displace them.
    b. **DRAG** to adjust intermediate endplates until the schematic vertebrae overlay with the x-ray.

Optional: **RIGHT CLICK** on the completed measurement to add pelvic measurements e.g. Iliac Crest or Femoral Heads, Central SVL and CSVL offset lines, and vertebrae markers or spline.

Output: Measurements

The label "Coronal" appears on the image and the following values are displayed in the Measurement Table. Of note, the list of measurements displayed will depend on the identified landmarks (i.e., up to S1, L1, or T1). The list of measurements displayed can also be customized (i.e., turned on or off) in the "Display Settings Manager".

Parameters	Main Curve	Secondary Curve	Tertiary Curve
C7PL	Yes	Yes	Yes
Cobb	Yes	Yes	Yes
Type	Yes	Yes	Yes
Apex	Yes	Yes	Yes
Apex Deviation	Yes	Yes	Yes
Upper/Lower	Yes	Yes	Yes

Example
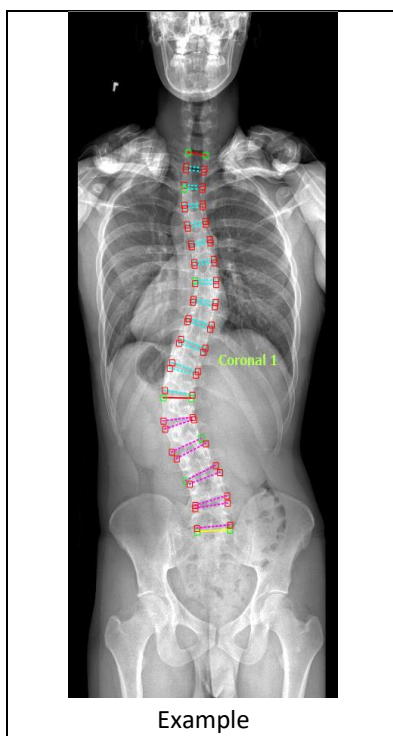
[Spine] Raimondi Rotation Angle: "Raimondi"

Description

The Raimondi Rotation angle tools permit to calculate the axial rotation of the apical vertebra on a coronal xray. This tool is based on the identification of the width of the apical vertebra at the most narrow spot (i.e. the vertebral waist) and the center of the convex-sided pedicle.

The sequence of steps to use this tool

1. Select the "raimondi" tool.
2. **CLICK** twice to outline the apical vertebral waist.
3. **CLICK** once to identify the center of the **convex-sided** pedicle

Output

Based on the published Raimondi's table, the tool calculate the axial rotation

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[Ortho] Lower Limbs Sagittal Alignment Wizard: "SA Limbs"

Description

This function measures the lower limbs alignment in the sagittal plane by quantifying 3 angles: SFA (sacro-femoral angle), knee angle (knee flexion), and ankle angle (ankle dorsiflexion). This tool is based on the identification of the knee axis and tibia axis. Of note, this function requires the image to be calibrated and the sagittal alignment tool to be placed (SA Spine or Sagittal).
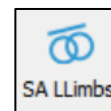
The sequence of steps to use this tool

4. Select the "SA Limbs" tool.
5. **CLICK** twice to outline the first condyle of the first knee.
6. **CLICK** twice to outline the second condyle of the first knee.
7. **CLICK** twice to outline the first condyle of the second knee.
8. **CLICK** twice to outline the second condyle of the second knee.
9. **CLICK** twice to draw the axis of the first superior tibia.
10. **CLICK** twice to draw the axis of the second superior tibia.
11. **CLICK** twice to draw the axis of the first inferior tibia.
12. **CLICK** twice to draw the axis of the second inferior tibia.
13. The points can be moved after construction to better position the measurement.

Output

The label "SA: Lower Limbs" appears on the image and the three radiographic parameters for SFA, knee angle, and ankle angle are displayed in mm on the image and in the Measurement Table. SFA is the angle between middle of sacral endplate and bicoxo-femoral axis and femoral mechanical axis. Knee angle is the angle between femoral mechanical axis and tibia axis. Ankle angle is the angle between tibia axis and vertical.

Steps 2-3	Steps 4-5	Steps 6-7	Steps 8-9
Construction Sequence			
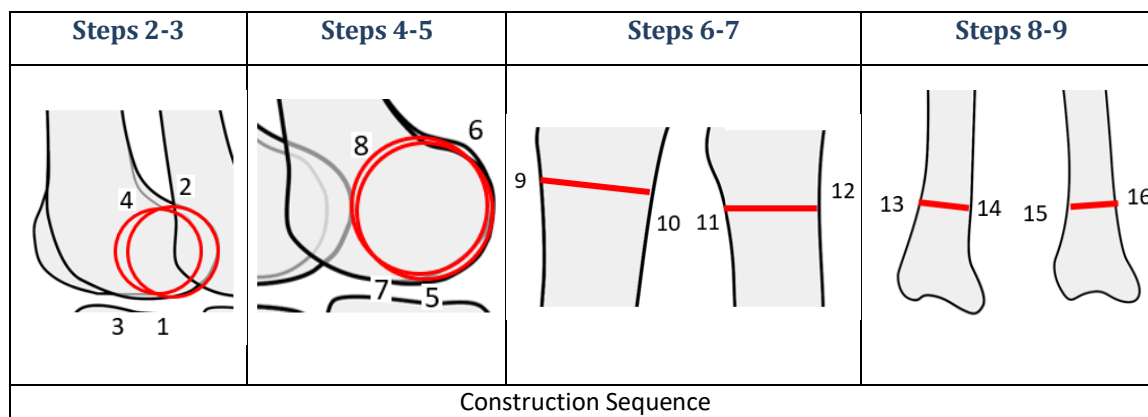
[Ortho] Leg Length Discrepancy: "LLength"

Description

This function permits to measure the leg length discrepancy. After identifying the two ischial tuberosities (points 1 and 2), and the center of the two lesser trochanters (points 3 and 4), the difference in leg length discrepancy is computed. Of note, this function requires the image to be calibrated.

The sequence of steps to use this tool

1. Select the "LLength" tool.
2. **CLICK** on the first ischial tuberosity.

3. **CLICK** on the second ischial tuberosity.
4. **CLICK** on the first anatomical landmark.
5. **CLICK** on the second anatomical landmark.
6. The points can be moved after construction to better position the measurement.

Output
The label "Leg Length" appears on the image and the leg length discrepancy is displayed in mm on the image and in the Measurement Table.

| Construction Sequence | Example |
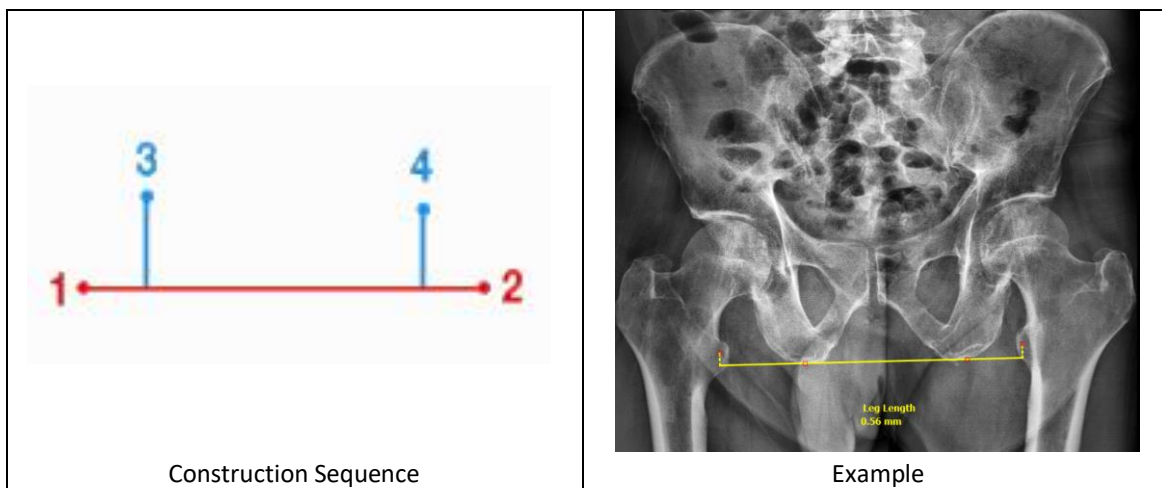
[Ortho] Center Line: "Cent Line"

Description
This function locates the center line on long bones (ex: femur, tibia). After identification of two transversal segments of the bone, the center line is displayed and the angles between the center line and the two segments are computed.

The sequence of steps to use this tool
1. Select the "CentLine" tool.
2. **CLICK** the top left edge of the femur.
3. **CLICK** the top right edge of the femur.
4. **CLICK** the bottom left edge of the femur.
5. **CLICK** the bottom right edge of the femur.
6. The points can be moved after construction to better position the measurement.

Output
The value of the angles between the center line and the two drawn segments are displayed directly on the image and in the Measurement Table.

| Construction Sequence | Example |
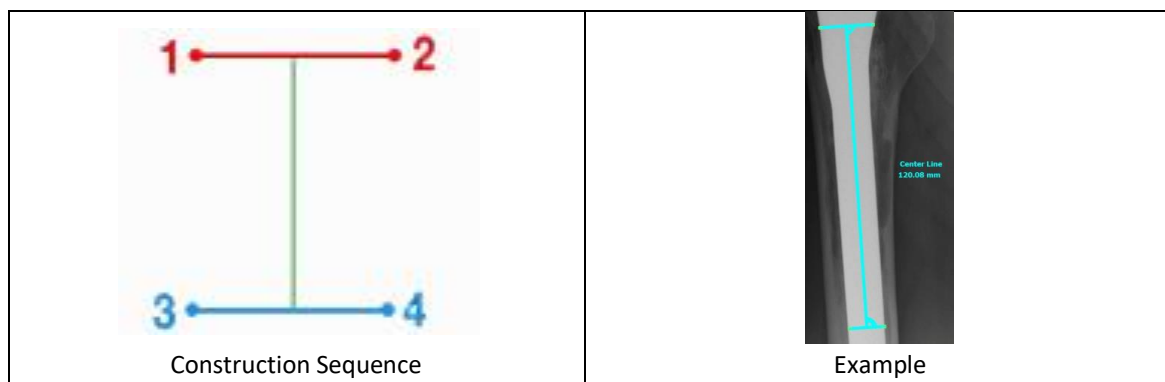
[Ortho] Femur Coronal: "FCoronal"

Description

This tool allows user to apply an orthopedic center line measure. Specifically, it measures the center line between the femoral neck and its diameter and center as well as the angle between femoral shaft axis and femoral neck axis.

The sequence of steps to use this tool

1. Select the "FCoronal" tool.
2. **CLICK** on the perimeter of the femoral head
3. **CLICK** on the opposite perimeter of the femoral head to complete the outline.
4. **CLICK** on the greater trochanter.
5. **CLICK** the bottom left edge of the femur.
6. **CLICK** the bottom right edge of the femur.
7. The points can be moved after construction to better position the measurement.

Output

The output is angle values allowing user to determine the anatomical Medial Proximal Femoral Angle (aMPFA), mechanical Lateral Proximal Femoral Angle (mLPFA), anatomical Lateral Distal Femoral Angle (aLDFA) and the mechanical Lateral Distal Femoral Angle (mLDFA).

| Construction Sequence | Example |
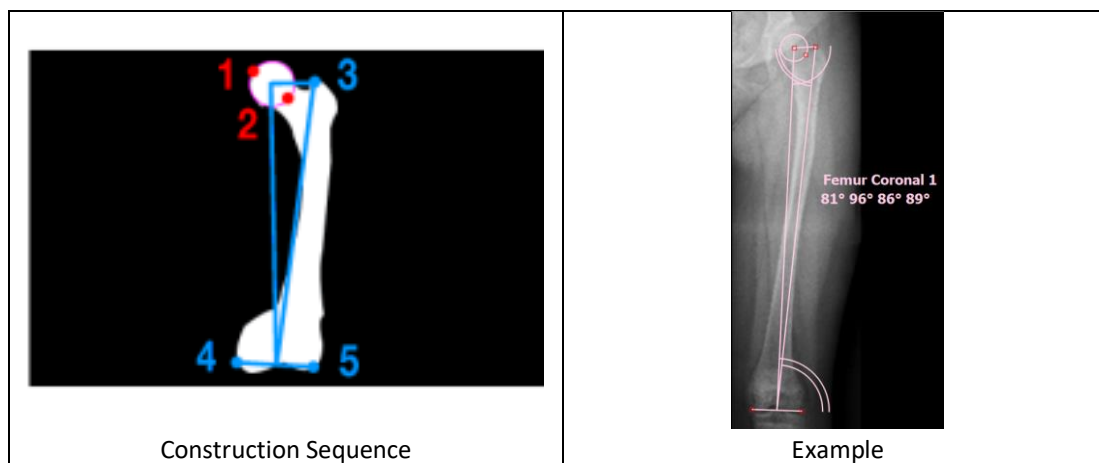
Surgical Tools

Overview

This set of tools helps to create visual simulations for estimating interventional procedures. Each surgical tool can be selected with a click of the mouse. The surgical tools simulate procedures by offering visual representation of image manipulations. The application of a simulation leads to displacement or overlay of objects on image segments. To customize the list of measure tools to be displayed, simply click on the setting icons (see below).
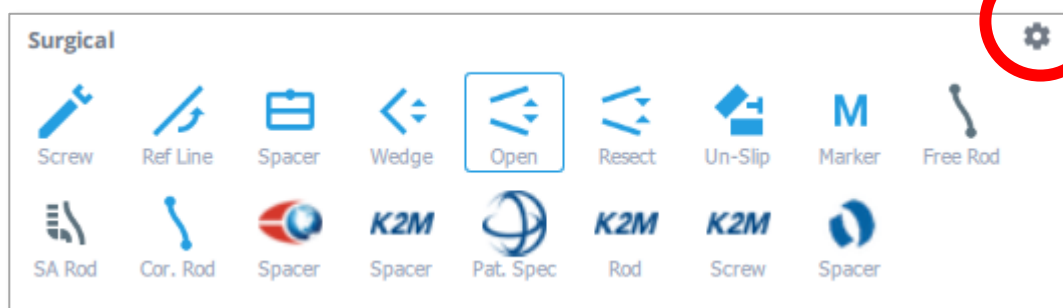
The following surgical tools are available to simulate various surgical procedures:

- ❖ **Procedures**
    - o Wedge Osteotomy(ex:SPO,PSO)
    - o Opening Osteotomy
    - o Resect Osteotomy
    - o Un-Slip (i.e. spondylolisthesis correction)
    - o Anatomical Marker
- ❖ **Generic Implants**
    - o Screw Implant
    - o Reference Line for Screw
    - o Interbody Spacer
    - o Freehand Rod
    - o SA Rod
    - o Coronal Free hand
- ❖ **Vendor Specific Implant**
    - o Globus Medical Spacer Template
    - o Globus Rod
    - o K2M Interbody Spacer Template
    - o K2M BACS Patient Specific Rod
    - o K2M Pre-Bent Rod Template
    - o K2M Screw

[Procedure Osteo] Wedge Osteotomy: "Wedge"

Description

This tool permits the user to create a wedge-shaped resection of a portion of an image in the main viewing screen. The application of a simulation will remove a portion of the image in a wedge shape and displace other portions of the image. Upon application, all existing measurements will be updated in the Measurement Table.

The following sequence is applied for use of this tool

Drawing the osteotomy

1. Select the "Wedge" tool.
2. **CLICK** the anterior point of a desired resection wedge.
3. **CLICK** to form the posterior point of the lower resection line.
4. **CLICK** to form the posterior point of the upper resection line. An angle/wedge shape appears with a bisecting dotted yellow line between the created solid lines.

Modifying the osteotomy

1. All lines remain modifiable with active handles to **DRAG**. When handle points are moved, the angle and ratio of the simulated osteotomy will adjust accordingly.

Applying the osteotomy(ies) to the image

1. **RIGHT CLICK** the wedge on the image, then select "Apply"; or
2. Locate the "Wedge" measurement in the Measurement Table, then check the box associated with it.

Un-applying the osteotomy(ies)

1. **RIGHT CLICK** the wedge on the image, then select "Unapply"; or
2. Uncheck the box in the Measurement Table associated with the Wedge Osteotomy.

Output

Upon application of the osteotomy(ies), the image is modified (i.e. a portion is visually removed and image portions displaced around the removed wedge) and the existing measurements are updated on the image and within the Measurement Table.

| Construction Sequence | Example: unapplied osteotomy | Example: applied osteotomy |
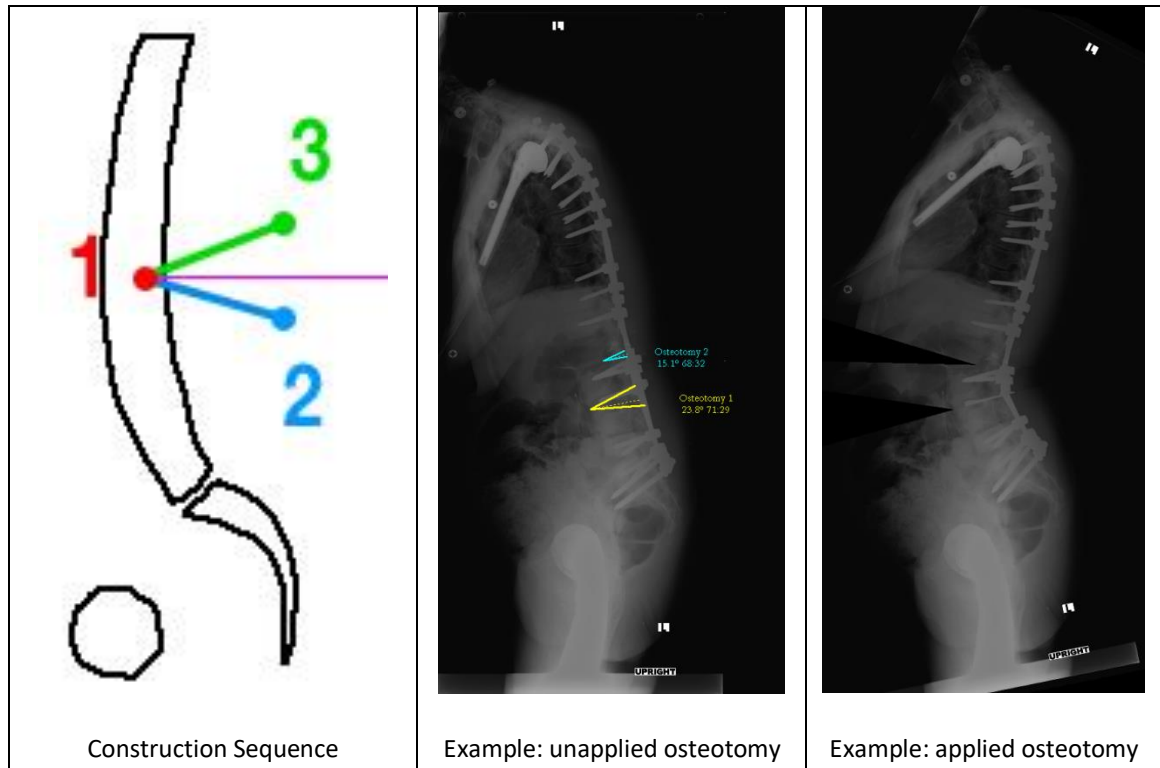
[Procedure Osteo] Resect Osteotomy: "Resect"

Description:

This tool permits the user to simulate the removal of segments within an image with adjustable variability in offset, distance and angulation between segments. Application of the simulation will resect a portion of the image between the user applied osteotomy lines and approximate the remaining image fragments to join at the user specified weld-points.

The following sequence is applied for use of this tool

Drawing the osteotomy

1. Select the 'Resect' tool.
2. Inferior line
   a. **CLICK** the anterior point of inferior line of desired resection.
   b. **CLICK** the posterior point of inferior line of desired resection.
3. Superior line
   a. **CLICK** the anterior point of superior line of desired resection.
   b. **CLICK** the posterior point of superior line of desired resection.

Modifying the osteotomy

1. All lines remain modifiable to DRAG. When handle points are moved, the angle of the simulated osteotomy will adjust accordingly.

Applying the osteotomy(ies) to the image

1. RIGHT CLICK the resect osteotomy in the image, then select "Apply"; or
2. Locate the "Resect Osteotomy" measurement in the Measurement Table, then check the box associated with it.

Un-applying the osteotomy(ies)

1. RIGHT CLICK the resect osteotomy on the image, then select "Unapply"; or
2. Uncheck the box in the Measurement Table associated with the Resect Osteotomy.

Output

Upon application of the osteotomy(ies), the image is modified (i.e. visual resection of the user designated portion with apposition of image segments at the weld points) and the existing measurements are updated on the image and within the Measurement Table.

| Construction Sequence | Example: unapplied osteotomy | Example: applied osteotomy |

[Procedure Osteo] Opening Osteotomy: "Open"

Description:

This tool permits simulation of procedures that involve the displacement by separation of anatomic landmarks. Simulation of opening osteotomy, anterior implant placement or devices can be applied to an image by the user.

The following sequence is applied for use of this tool

Drawing the osteotomy

1. Select the "Open" tool.
2. **Click** twice to draw a line along the desired opening.
3. **Click** and drag handles above and/or below the line to adjust the opening.

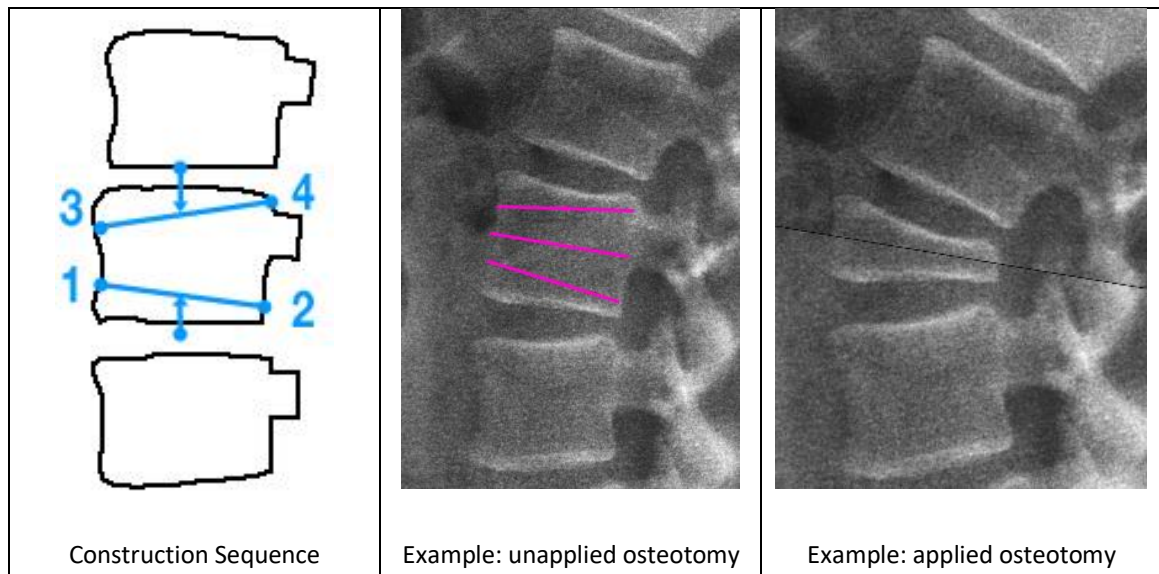**Applying the osteotomy(ies) to the image**

1. **Right click** the opening osteotomy on the image, then select "Apply"; or
2. Locate the "Opening Osteotomy" measurement in the Measurement Table, then check the box associated with it.

Un-applying the osteotomy(ies)

1. **Right click** the opening osteotomy on the image, then select "Unapply"; or
2. Uncheck the box in the Measurement Table associated with the Opening Osteotomy.

Output

Application of the simulation will split the image and displace it above and below the lines to create a gap between image fragments. Existing measurements will be updated on the image and in the Measurement Table.

| Construction Sequence | Example: unapplied osteotomy | Example: applied osteotomy |
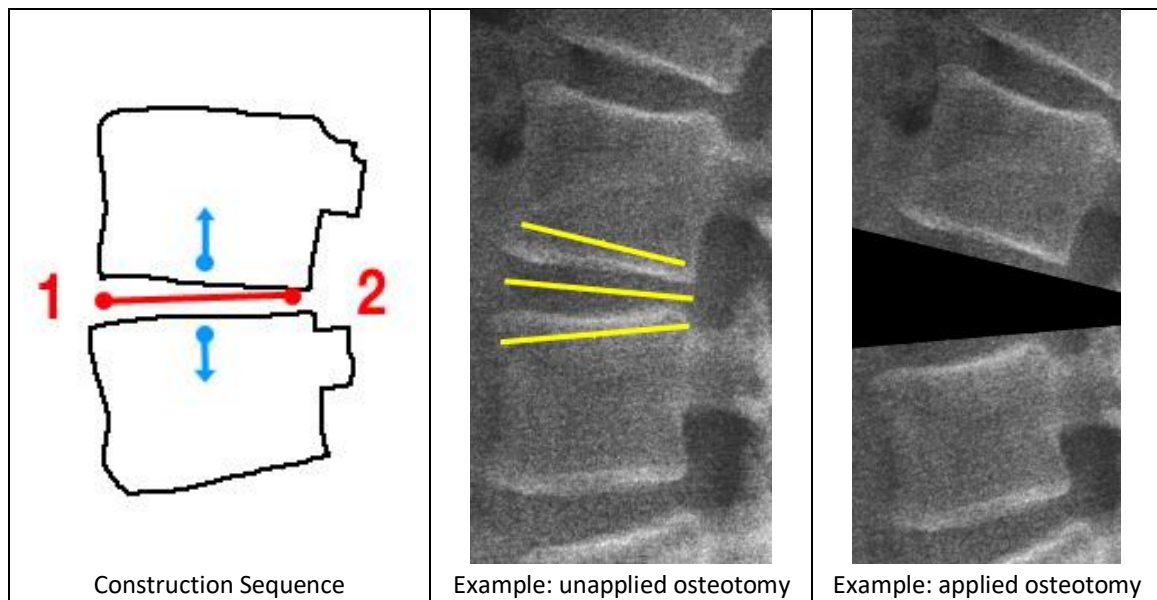
[Procedure Correction] Spondy Correction: "Un-Slip"

Description

This tool allows the user to simulate spondylolisthesis correction in the sagittal plane.

The following sequence is applied for use of this tool

1. Select the "Un-Slip" tool.

2. **CLICK** twice to outline the inferior endplate of the superior vertebra, from posterior to anterior.
3. **CLICK** twice to outline the superior endplate of the inferior vertebra, from posterior to anterior.
4. In the "Listhesis Correction" window, adjust the Angle and Grade to correct the slippage.
5. The points can be moved after construction to better position the line. **RIGHT CLICK** to further adjust the listhesis correction.

Output

The label "Un-Slip" will appear on the image with the new distance, slip angle, and grade. The Measurement Table will show both baseline and simulated distance, slip angle, and grade.

[Procedure] Anatomical Landmarks: "Marker"

Description

This feature allows the user to add anatomical landmarks to an image.

These markers include:

◆◆ Anomalous Anatomy	✶✶ Apex of Deformity	ᗯᗯ Cable/Wire
↓↑ Direction of Segmental Force Application 1	← → Direction of Segmental Force Application 2	⌐↓ Downgoing Hook"
▮ Interbody Device	← Left Arrow	L Lumbar Laminar Hook
● Monoaxial Screw	P Pedicle Hook	○ Polyaxial Screw
PO Ponte Osteotomy	XX Pre-Operative Unstable Anatomy	→ Right Arrow
T Thoracic Laminar Hook	PC Transverse Connector	TP Transverse Process Hook
◑ Uni-Planar Screw	↑⌐ Upgoing Hook	

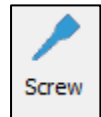### *The following sequence is applied for use of this tool*

1. Select the "Marker" tool.
2. **CLICK** on image to place the anatomical marker.
3. Choose the desired marker tool from pop-up.
4. At the top of the pop-up, adjust the marker size (in mm) if necessary.

5. Press "OK".
6. To edit anatomical marker type and/or size, RIGHT CLICK on applied marker on the image or Measurement Table.

[Implant] Generic Screw: "Screw"

Description

This tool permits the user to draw a screw on digital images. Use of this tool requires the images to first be calibrated. In addition to displaying a generic screw overlay on the image, this tool also provides the dimensions of the drawn screw.

The following sequence is applied for use of this tool

1. Select the "Screw" tool.
2. CLICK to set the start point of the screw.
3. CLICK to set the end point of the screw.
4. CLICK to set the diameter of the screw.
5. The points can be moved after construction to modify the screw dimensions, including diameter and length.

Output

The label "Screw" and its measurements will be displayed on the image and in the Measurement Table.

| Construction Sequence | Example |

[Implant] Generic Reference Line: "Ref Line"
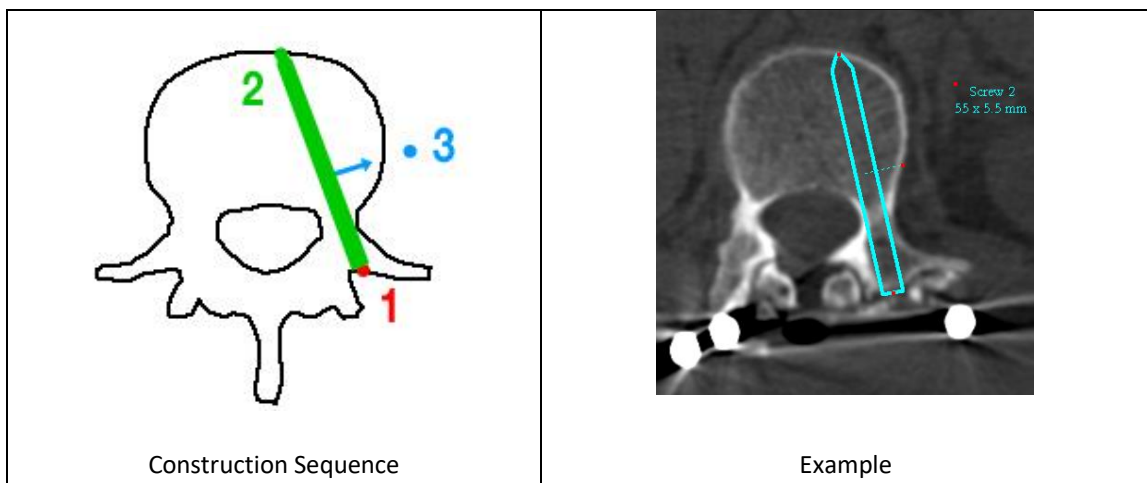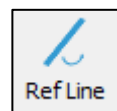
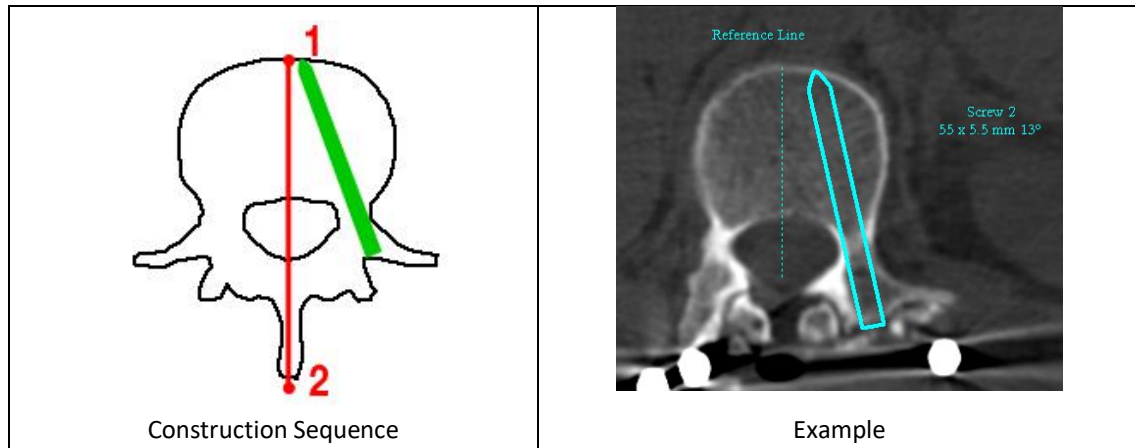### *Description*

This tool permits to create a reference line.

The following sequence is applied for use of this tool

1. Select the "Ref line" tool.
2. **CLICK** to set the first point of the reference line.
3. **CLICK** to set the second point of the reference line.
4. The points can be moved after construction to better position the line.

Output

The label "Reference Line" will appear on the image and in the Measurement Table.

| Construction Sequence | Example |

[Implant] Generic Interbody Spacer: "Spacer"

Description

This tool permits the user to plan the placement of an inter-vertebral graft (cage, bone graft …). If the graft fits the inter-vertebral space, the application of the "cage" tool will simply draw the graft. On the other hand, if the graft placement aims to distract the inter-vertebral space, the application of the tool will expand the space and all existing measurements will be updated. This tool will also provide the measurements of the drawn cage (requires the image to be calibrated).
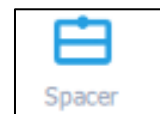
The following sequence is applied for use of this tool

Drawing the Spacer (graft)

1. Select the "Spacer" tool.
2. **CLICK** the left corner of the inferior vertebra.
3. **CLICK** the right corner of the inferior vertebra.
4. **CLICK** the left corner of the superior vertebra.
5. **CLICK** the right corner of the superior vertebra.

Modifying the Spacer

1. To expand the implant, drag the middle handle point on the top line upward.
2. Move the handle points to adjust the cage shape and angle.

Applying the Spacer to the image

1. RIGHT CLICK the Spacer on the image, then select "Apply"; or
2. Locate the "Spacer" measurement in the Measurement Table, then check the box associated with it.

Un-applying the Spacer

1. RIGHT CLICK the Spaceron the image, then select "Unapply"; or
2. Uncheck the box in the Measurement Table associated with the Spacer.

Output

The label "Spacer" and its corresponding angle will appear on the image, and its dimensions are displayed in the Measurement Table. Modifying the handle points on the image will update the Spacer measurements on the image and in the Measurement Table.

| Construction Sequence | Example: unapplied cage | Example: applied cage |
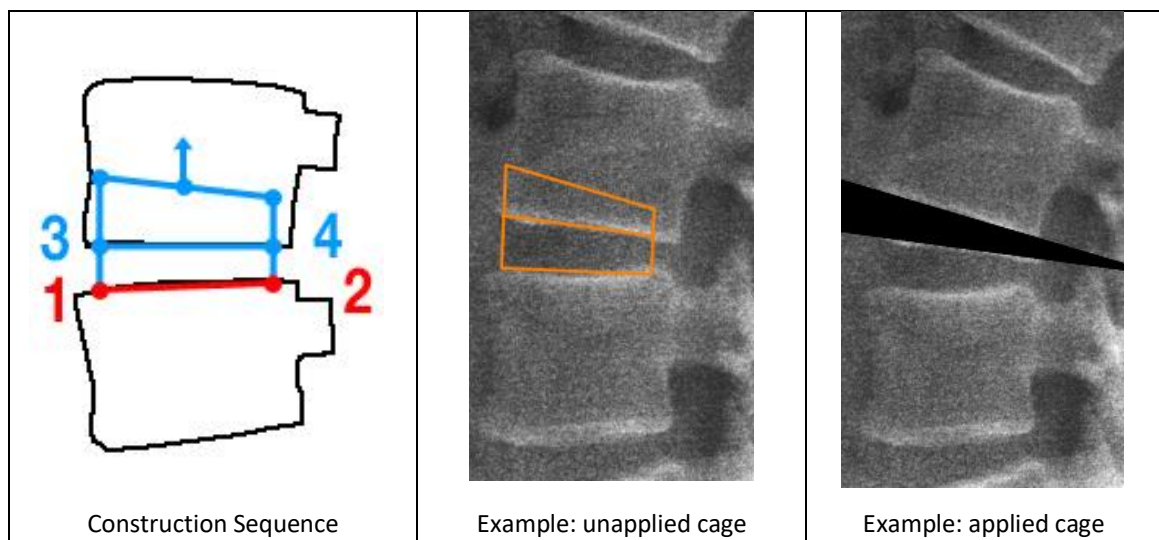
[Implant] Freehand Rod: "Free Rod"

Description

This tool permits the user to simulate rod implants in the sagittal plane. NOTE: this feature requires the image to be calibrated.

The following sequence is applied for use of this tool

1. Select the "Free Rod" tool.
2. CLICK on image at upper location of initial rod attachment to pedicle screw.
3. Continue to CLICK as you move cursor downward along the spine to outline the intended rod shape.

4. To complete the drawing, DOUBLE-CLICK at the location of the desired rod endpoint. A 10 mm blue extension appears on either end of the drawn rod.
5. The points remain movable and can be dragged to reposition the rod.
6. DOUBLE-CLICK any point along the rod to add a new handle for fine-tuning its shape.

Output

The label "Free Rod" and its length will appear on the image.

| Construction Sequence | Example |

[Implant] Coronal Freehand: "Cor. Rod"

Description

This tool permits the user to simulate rod implants in the sagittal plane. <u>NOTE: this feature requires the image to be calibrated.</u>
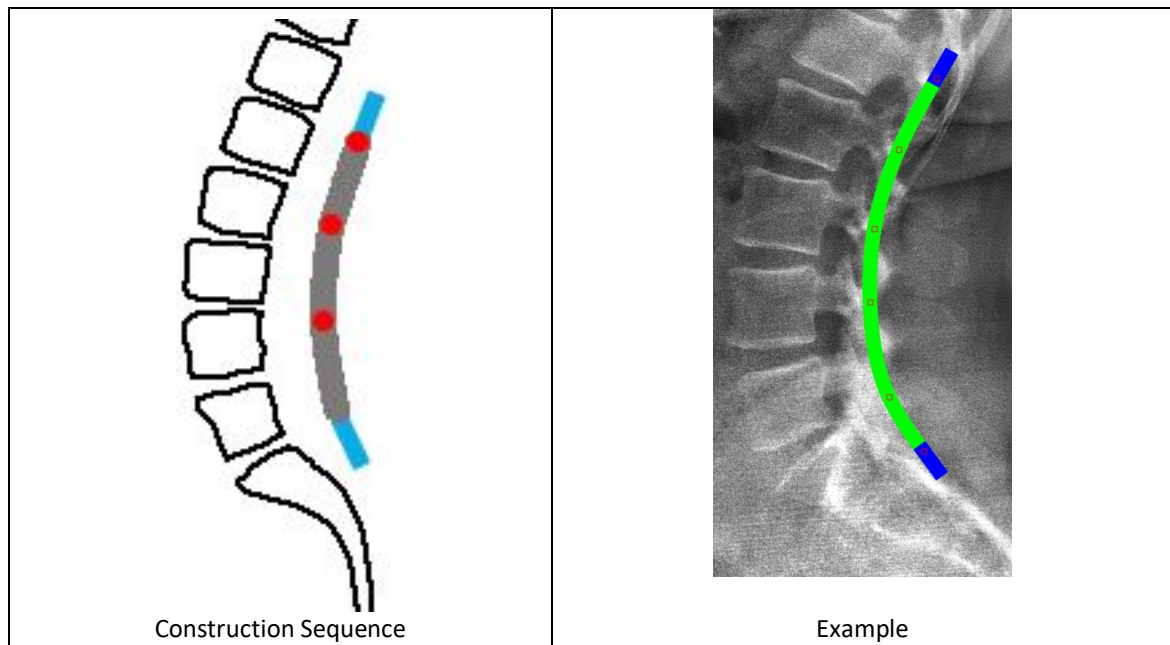
The following sequence is applied for use of this tool

Please refer to the "Free Rod" tool

[Implant] SA Rod

Description

The purpose of this tool is to permit the user to generate a rod implant based on the shape defined by a sagittal alignment tool. <u>NOTE: this feature requires the image to be calibrated, as well as the application of either the "SP Shape", "Sagittal Wizard", or "Spine Wizard".</u>

The following sequence is applied for use of this tool

1. After placement of a sagittal alignment tool, select the "SA Rod" tool. A pop-up will appear.
2. Select the upper and lower instrumented vertebrae from the dropdown menus (max T1 to ilium).
3. Specify the desired rod thickness (in mm).
4. Press "OK". A rod is now displayed on the image. At this stage, the rod is "attached" to the sagittal alignment tool so that the shape of the rod will be affected by any adjustments made to the sagittal alignment tool.
5. To detach the rod from the sagittal alignment tool, CLICK and drag one of the rod's handle points or RIGHT CLICK on the rod and select "Detach Rod".

Output

The label "SA Rod" and its length will appear on the image.

Construction Sequence	Example
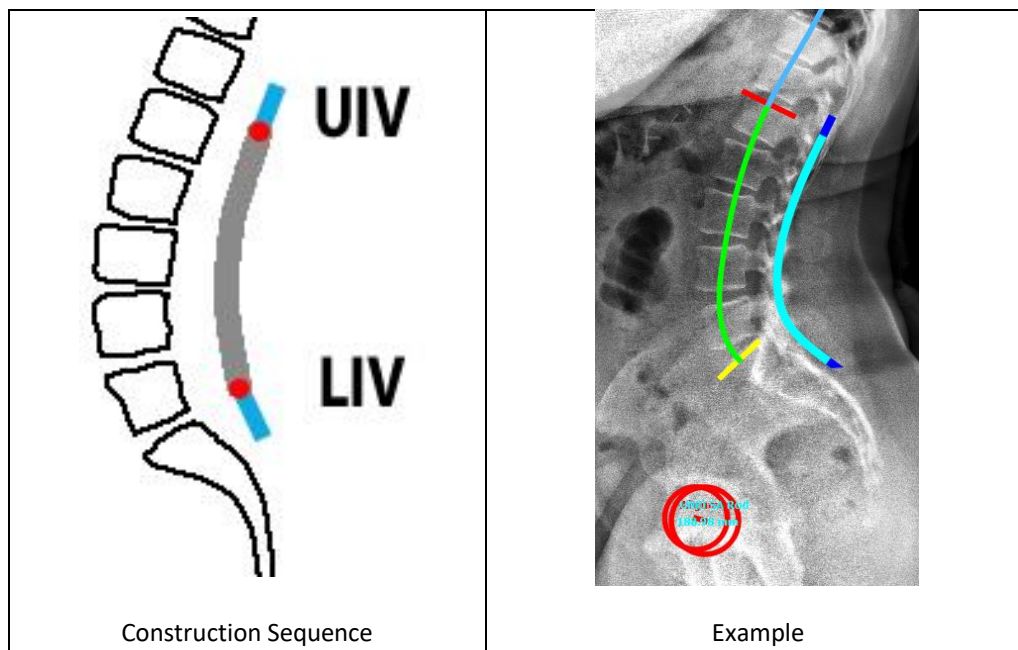
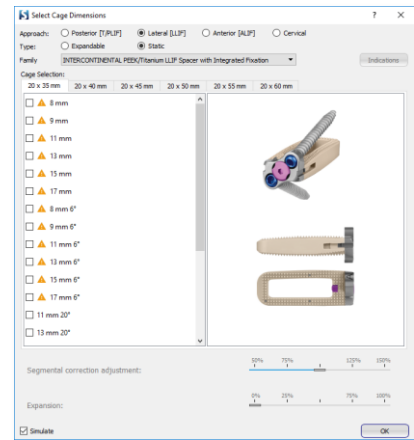# [Vendor] Globus Medical Interbody Cage Template: "Globus"

Description

This is a premium feature and may not appear in your Surgimap software. If you are interested in activating this feature, contact support@surgimap.com. This tool simulates interbody Spacer implants to the dimensions manufactured by Globus Medical. NOTE: this feature requires the image to be calibrated.

The following sequence is applied for use of this tool

1. Select the "Globus Medical Spacer" tool.
2. **CLICK** 4 times to outline the disc space of desired Spacer location. The pop-up shown on the right will appear.
3. Select the desired Spacer approach, type, and family.
4. Check the box in front of the Spacer option you would like to simulate. Mouse-over Spacers with a warning icon to see why it is not recommended for the disc space. The Spacer shape on the image updates to match the selected Spacer dimensions.
5. If applicable, drag the segmental correction and/or expansion sliders to adjust simulation.
6. Press "OK" to finalize selection. The Spacer on the image is locked into this shape such that the handles cannot be moved. To change the Spacer, **RIGHT CLICK** on the Spacer, choose "edit Spacer dimensions," and reuse this menu.

NOTE: If you have applied the Sagittal Wizard, you may **RIGHT CLICK** on the image at the desired disc space for Spacer insertion, then select "Insert Spacer at…". Choose "Globus Medical" from the pop-up that appears, then follow Steps #3-6 above.

Output

The Spacer appears on the image and in the Measurement Table according to the selected dimensions and lordosis.

[Vendor] K2M Interbody Spacer Template: "K2M Spacer"

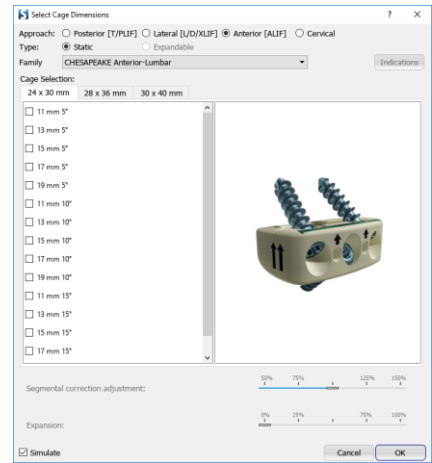### *Description*

This is a premium feature and may not appear in your Surgimap software. If you are interested in activating this feature, contact support@surgimap.com. This tool simulates interbody Spacer implants to the dimensions manufactured by K2M. NOTE: this feature requires the image to be calibrated.

The following sequence is applied for use of this tool

1. Select the "K2M Spacer " tool.
2. CLICK 4 times to outline the disc space of desired Spacer location. The pop-up shown on the right will appear.
3. Select the desired Spacer approach, type, and family.
4. Check the box in front of the Spacer option you would like to simulate. Mouse-over Spacer with a warning icon to see why it is not recommended for the disc space. The Spacer shape on the image updates to match the selected Spacer dimensions.
5. If applicable, drag the segmental correction and/or expansion sliders to adjust simulation.
6. Press "OK" to finalize selection. The Spacer on the image is locked into this shape such that the handles cannot be moved. To change the Spacer , RIGHT CLICK on the Spacer , choose "edit Spacer dimensions," and reuse this menu.

NOTE: If you have applied the Sagittal Wizard, you may RIGHT CLICK on the image at the desired disc space for Spacer insertion, then select "Insert Spacer at…". Choose "K2M" from the pop-up that appears, then follow Steps #3-6 above.

Output

The Spacer appears on the image and in the Measurement Table according to the selected dimensions and lordosis.

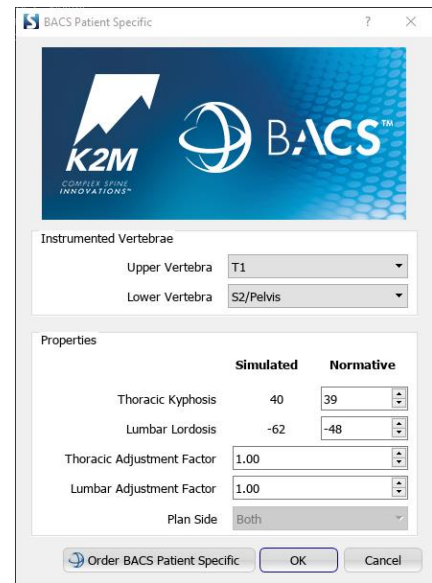# [Vendor] K2M BACS Patient Specific Rod: "K2M Pat. Spec"

Description

This is a premium feature and may not appear in your Surgimap software. If you are interested in activating this feature, contact support@surgimap.com. The purpose of this tool is to permit the user to order a rod template or patient specific rod/rail of specified dimensions from K2M for delivery to the operating room. This tool directly generates a rod/rail based on the shape defined by a sagittal alignment tool. NOTE: this feature requires the image to be calibrated, as well as the application of either the Sagittal Wizard or SA Spine tool.

The following sequence is applied for use of this tool

1. After placement of a sagittal alignment tool (see Sagittal Wizard or SA Spine), select the "K2M Pat. Spec" tool. A pop-up will appear.
2. Select the upper and lower instrumented vertebrae from the dropdown menu (max T1 to S2/pelvis).
3. Apply thoracic and/or lumbar adjustment factors to adjust curvature.
4. Press "OK". A rod is now displayed on the image. At this stage, the rod is "attached" to the sagittal alignment tool so that the shape of the rod will be affected by any adjustments made to the sagittal alignment tool.

Optional: **DRAG** the rod's endpoint handles to manually change the UIV/LIV and alter rod length.

Output

The implant name "BACS Patient Specific" along with rod length in millimeters will appear on the image and in the Measurement Table. The Measurement Table will also display additional parameters including thoracic bend angle, lumbar bend angle, thoracic radius, thoracic segment, thoracic chord length, transition length, lumbar radius, lumbar segment, and lumbar chord length.

Ordering

To order the BACS template and/or rod/rail implant from K2M, please refer to the section "Ordering Patient Specific Rods" in Chapter 9.

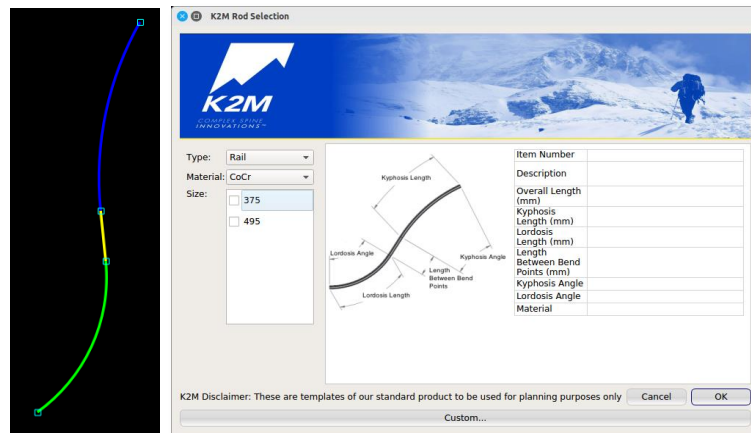# [Vendor] K2M Pre-bent Rod Template: "K2M Rod"

Description

This is a premium feature and may not appear in your Surgimap software. If you are interested in activating this feature, contact support@surgimap.com. This tool generates a rod implant to the specifications manufactured by K2M. NOTE: this feature requires the image to be calibrated.
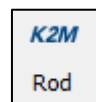
The following sequence is applied for use of this tool

1. Select the "K2M Rod" tool.
2. **CLICK** to place rod center at thoracolumbar junction. A dialog window will appear.
3. Select the type, material, and size of the desired rod.
4. Press "OK". At this stage, the rod is placed starting from the initially placed junction point.
5. **DRAG** the midpoint handles to rotate the rod

6. To adjust the rod's length, **DRAG** the endpoint handles to adjust the thoracic and lumbar segments of the rod.
7. **RIGHT CLICK** placed rod and select "Edit Rod Shape" to reopen the dialog window to make changes.

Output

The vendor name "K2M" along with type, material and the size in millimeters will appear on the image and in the Measurement Table.

[Vendor] K2M Screw Template: "K2M Screw"

Description

This is a premium feature and may not appear in your Surgimap software. If you are interested in activating this feature, contact support@surgimap.com. This tool generates a screw implant to the specifications manufactured by K2M.

NOTE: this feature requires the image to be calibrated.

The following sequence is applied for use of this tool

1. Select the "K2M Screw" tool.
2. **CLICK** to place the screw head/entry point.
3. **CLICK** to place the screw trajectory.
4. Select screw type and dimensions in window.

Output

The screw brand, type, and dimensions in millimeters will appear on the image and in the Measurement Table.
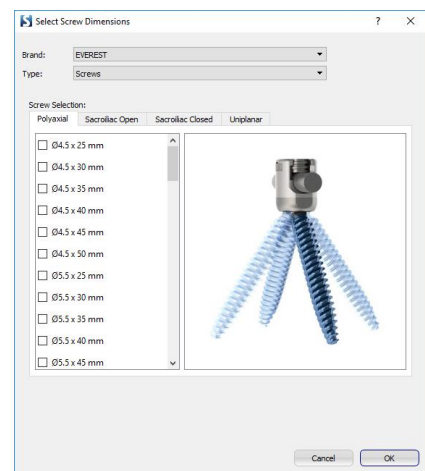
Measurement Table

Overview

The Measurement Table displays the values of measurements added to an image. It is color coded to allow users to quickly evaluate the need for surgical simulations and their impact on the measure values. The Measurement Table has columns labeled "Measurement", "Baseline", and "Norm". A "Simulated" column will appear once a simulated procedure is applied.

Features

Color Coding

- ❖ Green indicates a measurement value within the normative range.
- ❖ Orange indicates a measurement value just outside the normative range.
- ❖ Red indicates a measurement value far outside the normative range.

Surgical simulations

A horizontal line divides the Measurement Table in two parts. The portion of the table above the line is where measurements are listed, and below the line is where surgical simulations are listed. To apply a surgical simulation to the image you must find it on the Measurement Table and check the check box to the left of the procedure name. You can also right click the surgical simulation on the image and choose "Apply" from the menu that appears.

Measurement enumeration

When a measurement is added to an image, a label is generated followed by a number. The number indicates the amount of times the particular measure has been added to the image. The first time a tool is applied, the number 1 will follow the measure name (e.g. Line 1), and subsequent uses of the same tool on the same image will increment by +1 (e.g. Line 2, etc.). This enumeration method does not apply for the wizard tools, as only one wizard is allowed per image.

MEASURE	PRE-OP	POST_OP	NORM
Sagittal		Norm	
Ara Ve...	2	2	
Orient...	Ant|Post	Ant|Post	
UIV	T12	T12	
LIV	L5	L5	
PT	33.2°	21.9°	13.1 to 23.9
PI	64.2°	64.2°	64.2°
LL	-23.5°	-56.4°	-69.1 to -51.3
L1-L4	3.2°	-29.7°	-34.2 to -19.4
L4-S1	-28.5°	-38.6°	-43.6 to -31.6
PI-LL	40.6°	7.8°	-6.3 to 10.3
TL	16.1°	6.0°	-8.5 to 6.1
TK	36.6°	33.4°	26.9 to 45.5
T2-T5	20.0°	20.0°	
T5-T12	31.2°	28.1°	
T1 Slope	51.1°	26.3°	15.8 to 30.6
TPA	41.1°	16.3°	7.3 to 18.9
T1-CL	38.9°	14.1°	14.4 to 29.0
cSVA (C...	32.7 mm	-2.2 mm	16.7 to 32.9
SVA (C...	156.7 mm	-0.4 mm	-23.8 to 39.0

Change measure labels

Double-click a measurement name in the Measurement Table or on the image's measurement label, and you will see a cursor appear. Now you can type the desired text in place of the original label. The new label will update on the image and in the Measurement Table.

Show/hide parameter visualization

Click the eye icon to the left of a parameter name to hide/show a visual representation of the measured angle/length on the image. The example to the right shows a visual representation of lumbar lordosis.
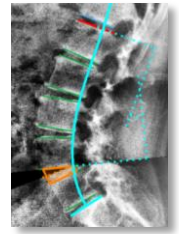
View normative citation

Click any value in the Norm column to view the research citation for the measured parameter and its normative values.
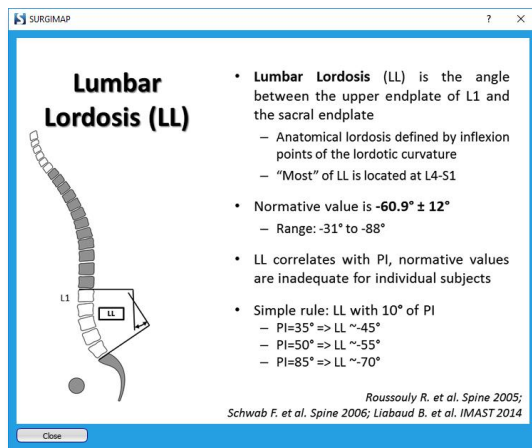
Display Settings Manager

Overview

This set of functions allows the user to modify settings associated with measurements. To access the Display Settings Manager, Go to Settings and toggle to "Measurements" tab

Functions

Show / Hide All Measurements

This function causes all measurements, labels, and text on images to be hidden or displayed on an image in the **MEASURE SCREEN**. This can be used in cases when a measurement is drawn, but user wants to see an anatomical landmark directly beneath the measurement.

Show / Hide All Labels

This button causes all labels of measures on the image to be hidden or displayed on the image. It is useful if the labels are occluding areas of the image.

Measurements Color Manager

This function enables the user to choose the color that will be applied to all future measurements added to the image. This will not affect existing measures and will have no affect if "use default measure colors" is applied.

Handles Color Manager

This function enables the user to choose a new color for handles of new measurements placed on an image. This will not affect existing measurements.

Font Size

This function changes the font size of labels and text that will be added to the image in the future. This will not affect existing measures.

Line Weight

This function changes the thickness of lines in the measurements. This will not affect existing measurements.

Rod Weight

This function changes the thickness of lines of rods that will be drawn on the image in the future. This will not affect existing rods.

Use Default Measure Colors

If applied, future measures added to the image will ignore the color selected in the measures color manager and instead will be the default color. The default colors vary from measure to measure, making them easy to distinguish. This saves time from manually changing colors between different measures.

High Precision Measurements

If applied, the measurements made on the image will be displayed to 4 significant digits. This is useful for researchers who need very precise measurements.

Line Tool: Display Horizontal Measure

If applied, the line tool will display the angle to horizontal in addition to the length both on the label on the image and in the measure table.

Circle Tool: Moving Center Moves Circle

If applied, the center handle that appears when the circle measurement is complete will move the entire circle measure.

Osteotomy / Cage tool: Show Applied Osteotomy / Cage

If applied, surgical simulations with their check boxes checked in the Measure Table (they are actively deforming the image) will not be drawn or labeled on the image.

Mouse Button Release Places a Handle During Construction

If applied, releasing the mouse when constructing a measurement will place a handle. This will allow users to perform measurements by clicking and dragging, and reduces the number of clicks.

Repeat Measurement: Keep Tool Active until Esc is Pressed

If applied, this will allow you to repeatedly use a measurement tool (without having to reselect the corresponding icon) until Esc is pressed.

Alignment Tool Measurements:

Here are checkboxes for each component of the Sagittal Wizard and SA Spine tools. If checked to apply, the measurement component will be displayed in the Measurement Table. If unchecked, the measurement component will be hidden from the Measurement Table.

Alignment Tool Measurements		
Lumbar	**Thoracic**	**Cervical**
☐ SS	☑ TL	☐ CL
☑ LL	☑ TK	☑ cSVA (C2C7)
☑ L1-L4	☐ T9 SPi	☐ C2 Slope
☑ L4-S1	☐ T1 SPi	☐ CPA
	☑ T1 Slope	☐ CTPA
	☑ T1-CL	☐ McGregor's Slope
Spine Length		
☐ Full (T1-S1)	☐ Thoracic (T1-L1)	☐ Lumbar (L1-S1)

Add Custom Measurement

This function enables adding custom measurements to the Sagittal Alignment Plan to be displayed on the Measurement Table. Specifically, user can create a custom measure by identifying the type of measure (e.g., 3 point angle, 4 point angle, slope, tilt, plumbline), selecting the appropriate landmarks referencing the visual vertebra or pelvis guide, and if desired, creating a descriptive label and norm value before saving the custom measure.
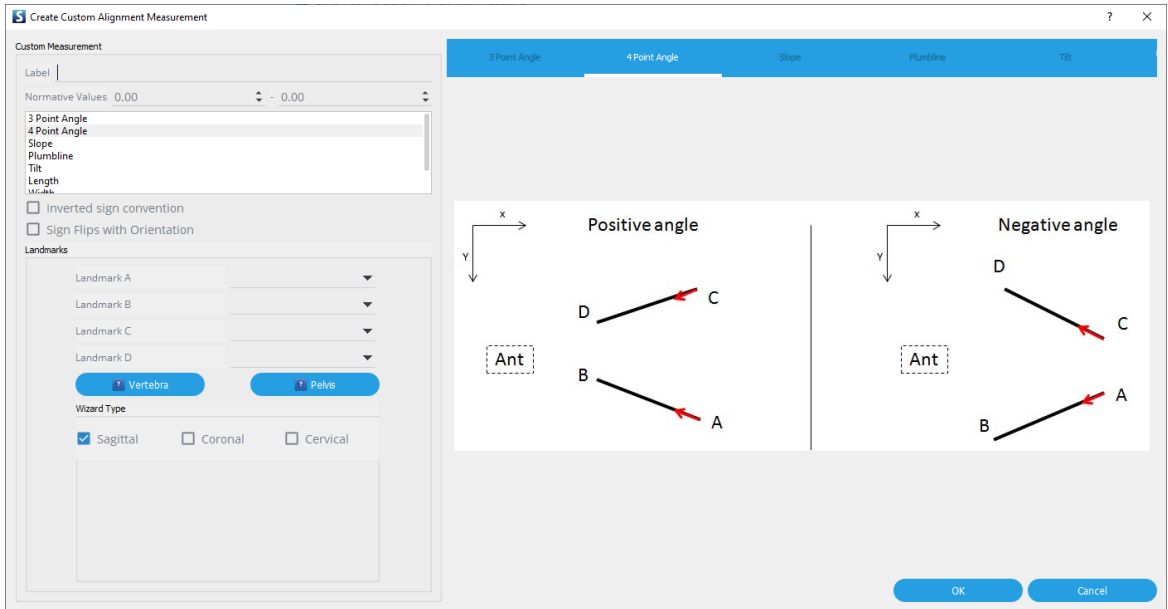
Chapter 9: MPR

Overview

What is MPR

Purpose

Multi-Planar Reconstruction (MPR) allows volumetric 3D data (CTs, MRIs) to be shown in other planes that were not acquired directly. It re-formats images using the pixel data from a series of base images to construct 3D and orthogonal views. MPR images aid perception of anatomy by creating a visualization not seen in the base images alone.

Design Overview

The **MPR Screen** is divided into three sections:

- ❖ **Viewing Panels**: Shows an image simultaneously in multiple planes including axial, coronal, and sagittal, as well as 3D. Axes may be adjusted to create oblique planes.
- ❖ **View Settings**: Adjusts the layout and number of viewing panels.
- ❖ **Reset**: Resets the original image slicing position, brightness, and contrast.
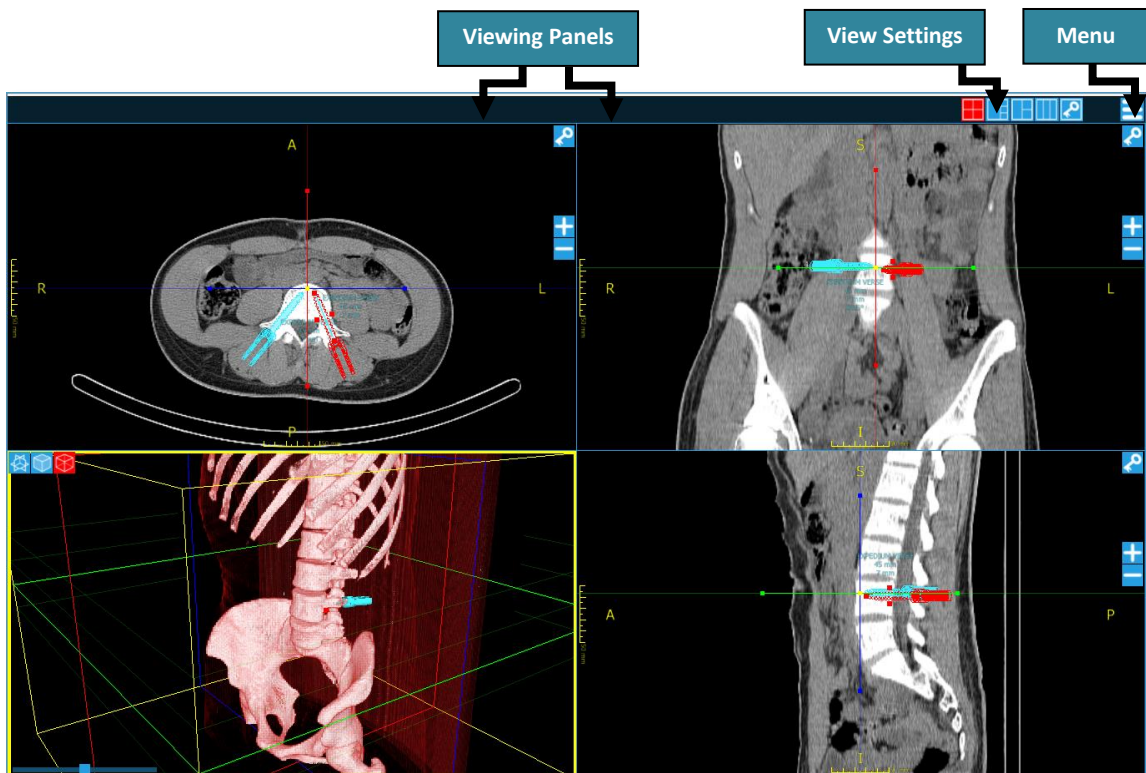
Stimulus

To get to the **MPR Screen** from the **Database** or **Measure Screen**, you may either**:**

- ❖ Right click on an image within viewing panel and select "MPR" from the drop-down list
- ❖ Click the menu button   at the top right of an image and select "MPR" from the drop-down list

<u>Note</u>: Only volumetric 3D data (CTs or MRIs with DICOM tags) can be opened in the MPR window. MPR is a premium feature and may not appear in your Surgimap software. If you are interested in activating this feature, contact support@surgimap.com.

Detailed Description of Each Function

Viewing Panels

Dynamic Representation

MPR images are automatically generated in orthogonal views and 3D views. Projected images are adjustable such that users can change the position and orientation of slicing planes. When adjusting the position or orientation of any of the MPR planes on one view, the other MPR projections will be calculated dynamically and displayed in real time.

Axial

The axial viewing pane shows the set of axial image slices.

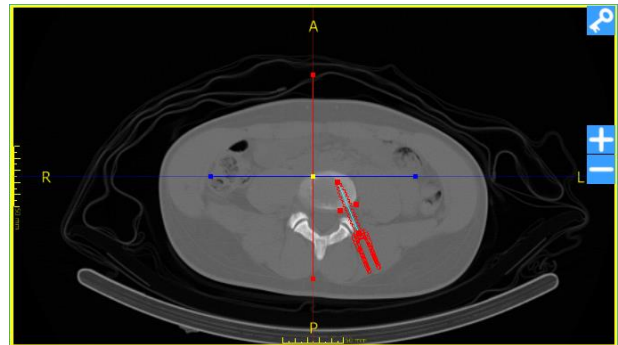### *Image Adjustment Options for Axial Panel*

Save as key image (OR view)

Move to the next superior image slice

Move to the next inferior image slice

Coronal

The coronal viewing pane depicts the set of coronal image slices.

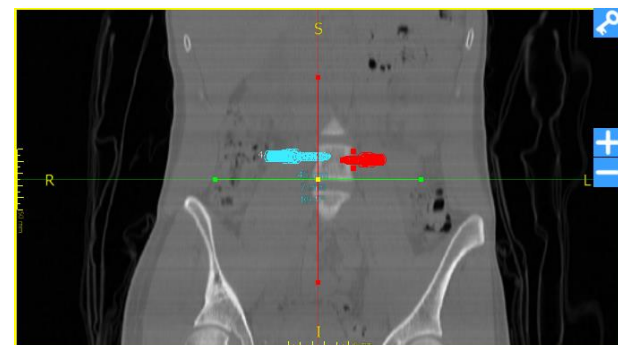
Image Adjustment Options for Coronal Panel

Save as key image (OR view)

Move to the next anterior image slice

Move to the next posterior image slice

Sagittal

The sagittal viewing pane visualizes the set of sagittal image slices.

Image Adjustment Options for Sagittal Panel

🔑	Save as key image (OR view)
➕	Move to the next leftward slice
➖	Move to the next rightward slice
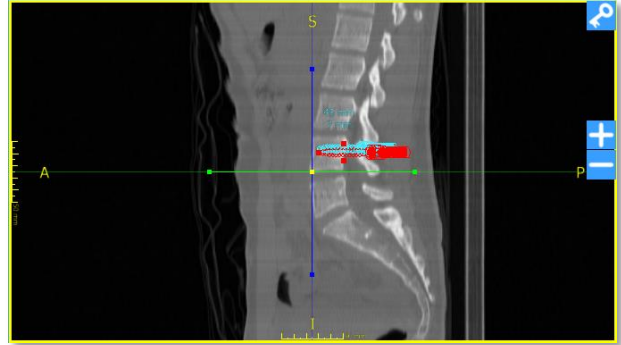
3D

The 3D viewing pane generates a 3-dimensional view from the base images.
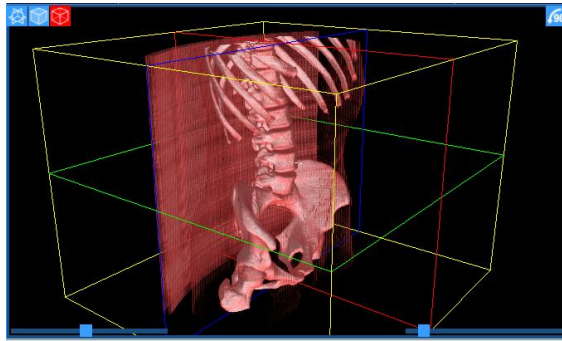
3D Surface Rendering View
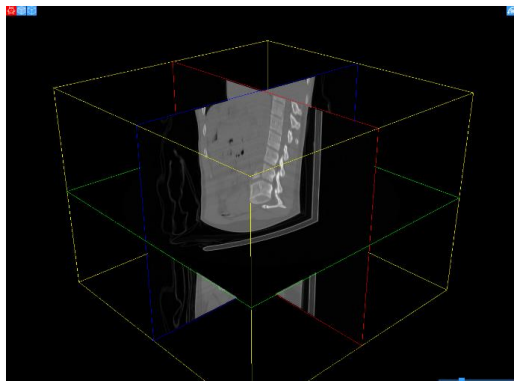
3D Planar View
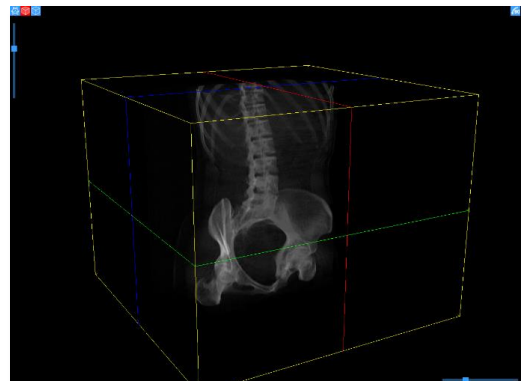
3D Volumetric View

Image Adjustment Options for 3D Panel:

	3D planar view
	3D volumetric view
	3D surface rendering view

View Settings

4-Panel Quadrants

This is the default setting and shows the axial, coronal, 3D, and sagittal planes in equal-sized quadrants.
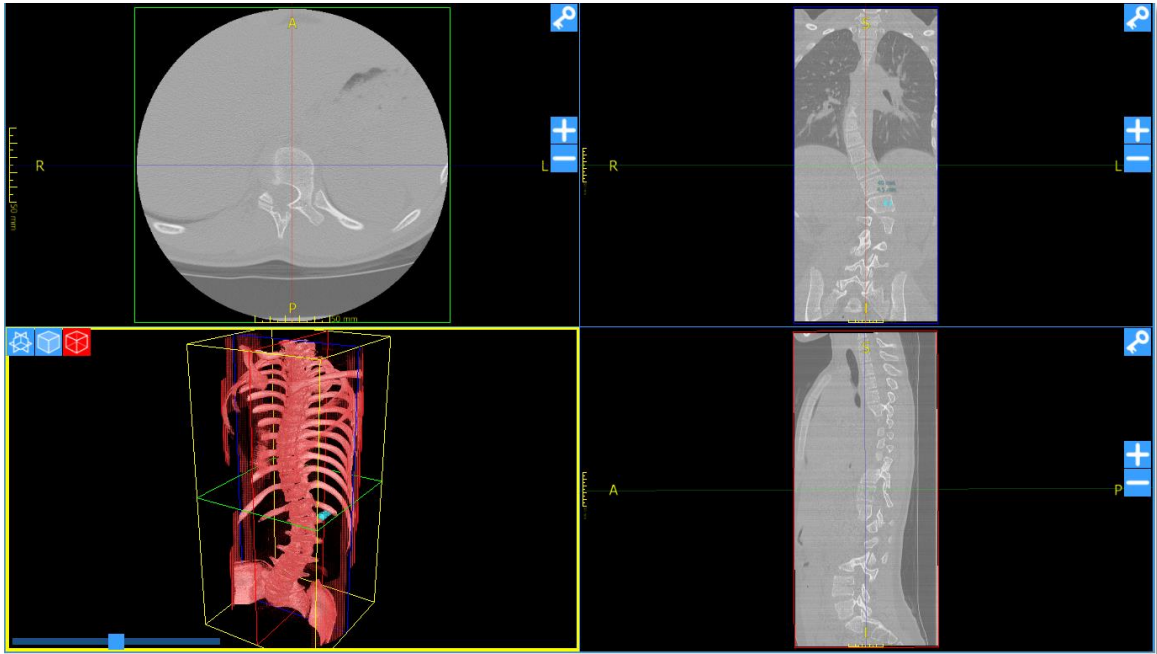
4-Panel 3D

This setting shows the 3D view in 1 large panel and the axial, coronal, and sagittal views in 3 smaller panels.
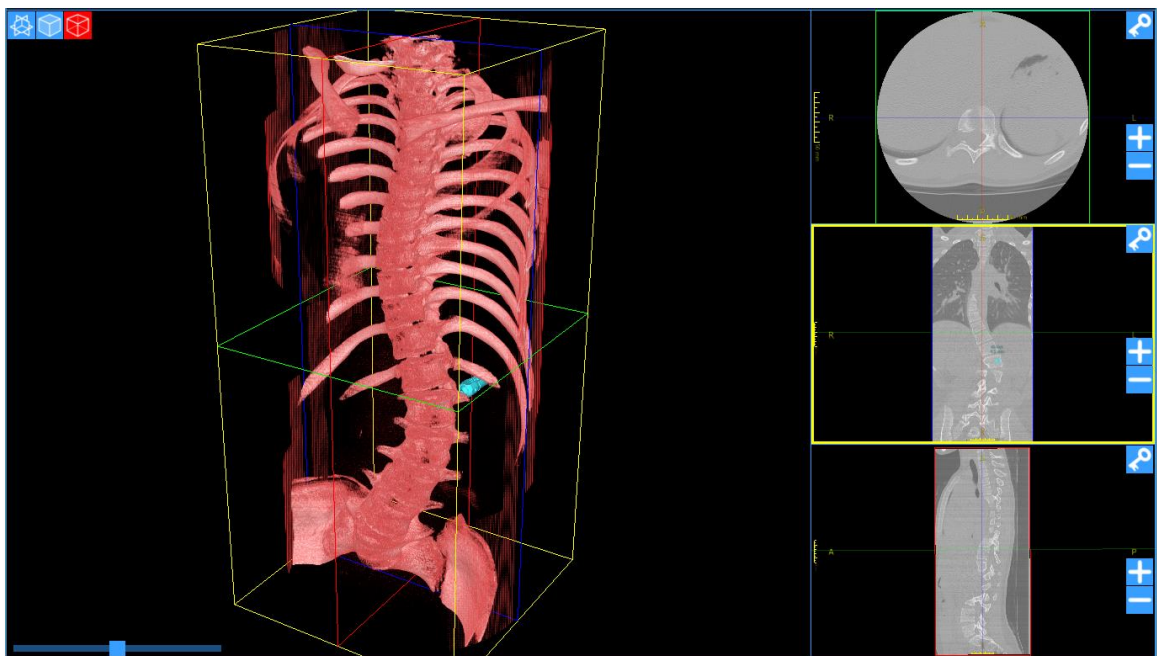
3-Panel

This setting shows the axial, coronal and sagittal views with enlarged axial view to facilitate screw placement planning.
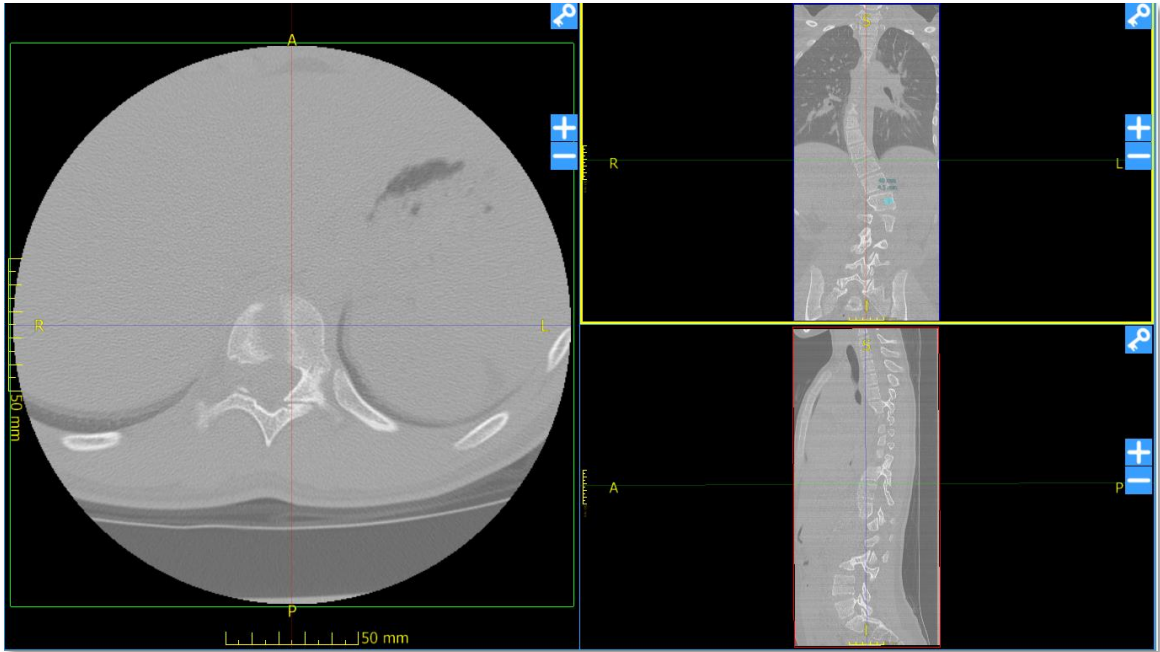
3-Panel Column

This setting shows the axial, coronal, and sagittal views side by side in a 3-column format.
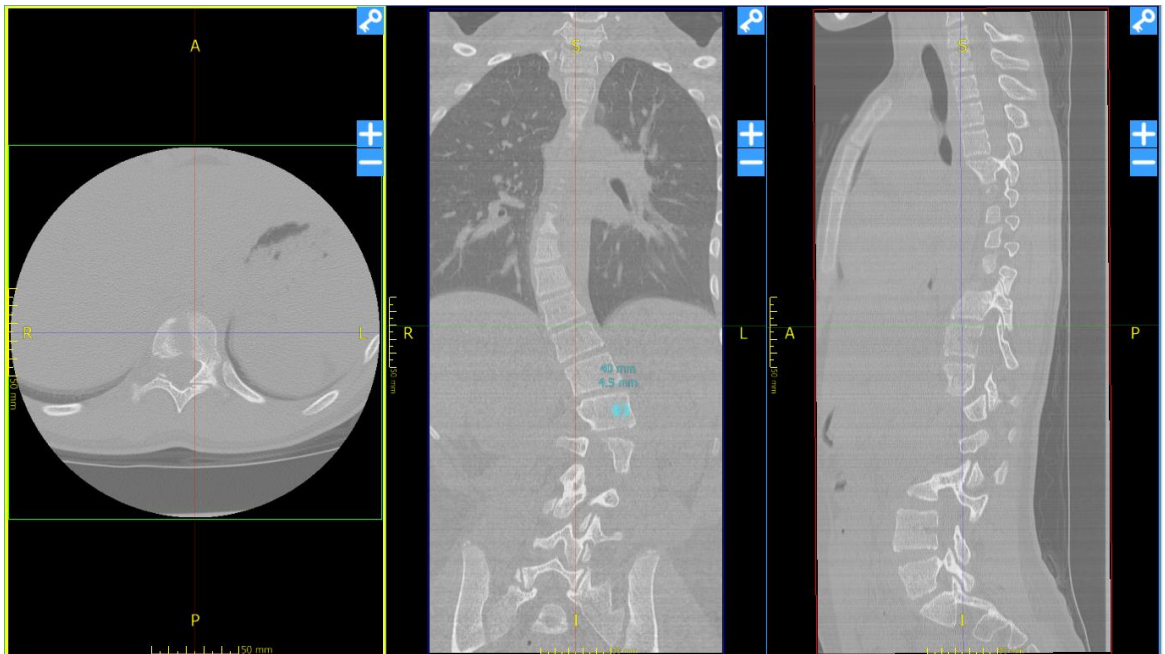
Key Images (OR View)

Each of the orthogonal views has the ability to mark the current image as a "key image". Current position and orientation of this MPR projection will be saved as a "session" in the Key Images View for hands-free OR viewing.
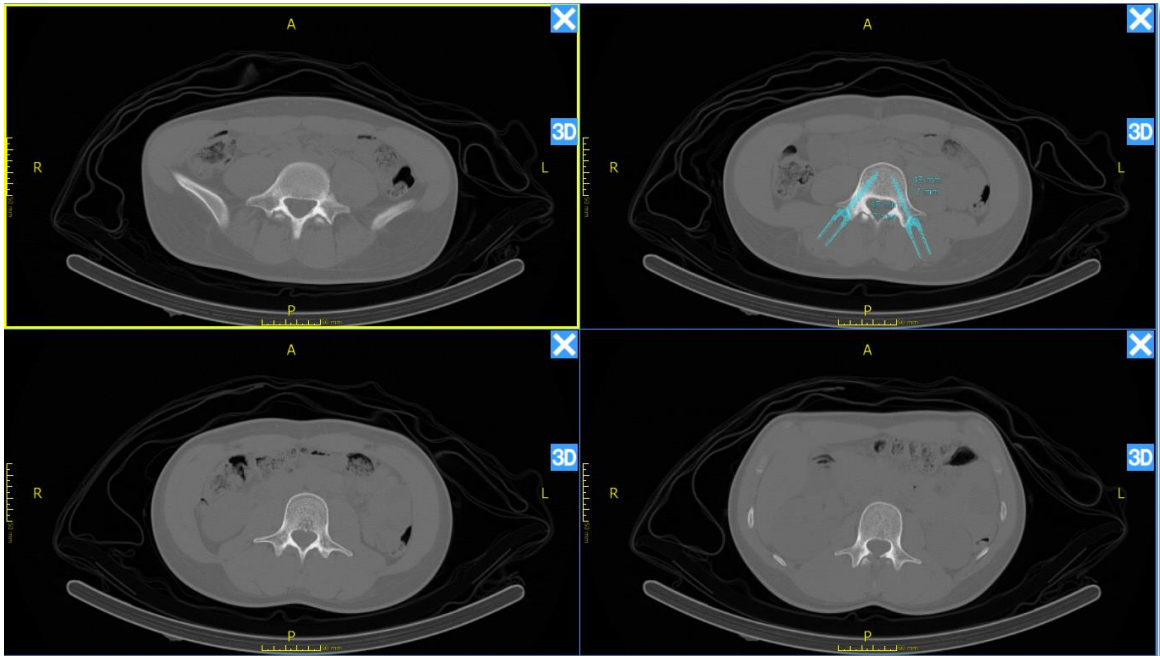
Chapter 10: Settings

Settings Panel

What are Settings

Purpose

Settings enable customization of your Surgimap software to meet user specific goals.

Design Overview

The Settings are broken down into tabs based on which aspect of the software they influence.

- ❖ **User Profile**: edit or apply account-level settings
- ❖ **Application**: general settings not specific to one screen
- ❖ **Import/Export**: settings related to getting images into or out of Surgimap
- ❖ **Measurements**: settings that affect measures on images
- ❖ **DICOM Nodes**: settings related to the import tab PACS and OsiriX connectivity
- ❖ **Access**: settings related to the Access cloud sharing feature
- ❖ **Contacts**: duplicates the functionality of the Contacts Manager from the Access feature
- ❖ **Update**: provides update status, capability, and release notes
- ❖ **Shortcuts**: sign keyboard shortcuts for easy access to frequently used functions

Stimulus

To navigate to the Settings Panel, click the "Settings" button at top right corner.

User Profile Settings

First and Last Name:

Type your first and last name here. Please use your real name since this will be displayed to other users for collaboration purposes.

Alternate Email:

If you registered for Surgimap with a different email address than the one you use regularly, you can designate an alternate email address here. Any system-generated emails from Surgimap will be sent to the inbox of the alternate email address instead.

Time Zone:

Set the time zone for your geographic location. Surgimap will display all dates accordingly.

Addresses:

Set your hospital shipping address for the delivery of patient specific implant and/or templating orders. Please ensure the address is correct so that orders are shipped to the appropriate destination. You can add multiple addresses although your primary shipping address should be designated as the default.

Change Password:

We recommend that you periodically change your password to protect your account along with the patient information saved to your database. Passwords must be at least 8 alphanumeric characters including 1 uppercase letter, 1 lowercase letter, and 1 number.

Application Settings

Account Details:

The email address registered to your account and Database UID are displayed here. These values may be useful when discussing Surgimap with our customer service department.

Information:

The version number and revision number are additional pieces of information, which may be useful when discussing the product with our Customer service department.

Scroll Behavior:

If the Mouse wheel zoom button is checked, this setting will allow you to zoom in and out with the scroll button on your mouse. If the TrackPad zoom button is checked, this setting will allow you to zoom in and out using the trackpad on your laptop.

Scroll Bar Policy:

Mac users, please follow the instructions provided to apply this setting.

Home Page Preference:

A user has the option to customize their homepage view between the Surgimap calendars, notifications, sponsor, or last used. If "last used" is selected, this will display the most current tab you toggled to.

Notifications:

Select the types of notifications you would like to receive here, along with their expiration period.

Dialogs:

This option shows all hidden dialogs.

Viewport Settings:

This option allows you to customize your minimap, text overlay, and scout locking settings.

Timeout:

This option allows you to disable Surgimap's default 30-minute inactivity timeout feature. We recommend that you leave this HIPAA-related digital safeguard enabled to protect your database.

Import / Export Settings

Import:

Check for Anonymized DICOM files: When importing DICOMs, the default behavior is to assume none of the files are anonymized. This speeds up the import process dramatically. If you want to import anonymized DICOMs, check this checkbox. Now the import process will check every DICOM file to see if it is anonymized. This slows the import process down dramatically but allows you to enter personalized patient names for these files.

Select last imported patient when switching between Import & Database: If this setting is enabled when you switch from the Import tab to the Database tab, the software will automatically find and select the last imported patient. This automates a common step of the standard Surgimap workflow.

Scan USB Keys at the startup: If this setting is enabled, your USB thumb drive will be scanned upon starting Surgimap.

External Drive Behavior:

Selection Policy: When a CD, eternal drive, or USB is attached to the system while Surgimap is running, this setting controls the behavior of the **IMPORT SCREEN**. If "No

action" is selected nothing will happen, but if "Populate and select new drive" the file system selection will automatically update to have the new drive selected and the thumbnail panel will display the content.

Import Policy: When a CD, eternal drive, or USB with a DICOMDIR directory is attached to a system while Surgimap is running, users may select to automatically import the content of that disk. This function allows the import to initiate without requiring the user to navigate to the **IMPORT SCREEN**.

Filtered Extensions:

Here the user can specify which file extensions not to show within Surgimap when browsing the file system.

Measurement Settings

This tab duplicates the functionality previously described in the "Display Settings Manager" section.

DICOM Nodes

The functionality of configuring DICOM Nodes from this tab has previously been described in the "Import Image(s) from PACS system or OsiriX Database" section.

The other settings here (under Advanced) are specific to the DCMTK file transfer syntax and follow our DICOM Conformance Statement. They should not be changed unless the user is familiar with them already.

Access Settings

Calendar:

Display Week Number: Enable to display the week number (1-52) for each week on the **HOME SCREEN** calendar.

Week Starts on: Customize your calendar to begin each week on the day of your choice.

Case Settings:

Automatically Select the New Case Immediately after Creation:
Enable to immediately select a case after it is created. The calendar and case details panels will become visible if they were hidden.

Create PRINT Image when Measurements are Present:

Presents option to create a JPEG image with measures "burned" in. This new image will be added to the patient record and measures can no longer be adjusted. Ideal for surgeons/users who want a onetime snapshot of their image with measures for record keeping purposes.

Cloud Services:

Background Synchronization:

Allows user to keep working while syncing. Disable this setting for manual sync.

Synchronization Type:

Allows user to customize how much of their data will be synced to the cloud. Options include "Manually selected only" where only patients and cases with checkboxes marked by the user will sync, and "All patients, all images" where every existing patient and case will be synced.

Patient Image Download Setting:

Allows user to customize quantity of patient images to download. "Download no patient images", "2 Weeks Back", "1 Month Back", "3 Months Back", "6 Months Back" & "Download All Patient Images" are the available choices from this dropdown menu.

Archive:

This action will remove images from the current device only to make space for future work. Options of "Keep All", "2 Weeks", "1 Month", "3 Months", "6 Months" & "1 Year" are the available choices from this drop down box.

Templates:

Any templates created from cases are listed in this section. The "Delete Selected Template" button at the bottom will remove the template from your key and the cloud.

Contacts

This tab duplicates the functionality previously described in the "Contacts Manager" section.

Update

This tab provides Update Status and will advise whether an available update is ready to be installed. Users have the option to "Check for Updates" and "Install Update" within this tab. If an update is available, the program will also notify the users of the available update via an automatic pop up window 1-2 minutes after logging into Surgimap.

Shortcuts

This tab allows you to view and assign hotkeys for easy access to frequently used commands. The key sequences indicated in red are assigned by default and cannot be changed. All other functions may be customized to your preference or left unassigned. Click the 'Restore Defaults' button to remove all customized hotkey commands.

Command Prompts for Windows

Overview

Purpose

Command lines enable users to interact with Surgimap through the Command Prompt (command-line interpreter) on Windows.

Stimulus

There are several ways to open the Command Prompt on Windows:

- ❖ Open the Run Window (press Win+R on your keyboard), then type "cmd" and Enter
- ❖ Perform a Windows Search for "Command Prompt", then click to launch the Command Prompt Window

Commands

Type your Surgimap directory into the command line, then enter the below:

```
Surgimap for Windows

(c) 2018 Nemaris, Inc. All rights reserved.


Usage: "Surgimap for Windows.exe"        [-front] [-max] [-close] [-topleft] [-bottomright]

                                         [-h] [--help] [-memory] [-opensave]

Options:

                                         To open Surgimap.

   -front                                To bring Surgimap to front.

   -max                                  To maximize Surgimap.

   -close                                To close Surgimap.

   -topleft                              To move Surgimap window to the top left corner.

   -bottomright                          To move Surgimap window to the bottom right corner.

   -h --help                             To show this screen.

   -memory                               To show how much memory Surgimap is using.

   -opensave arg1 arg2 arg3 arg4         To save an image into Surgimap.

                                             Where arg1: username

                                                   arg2: password

                                                   arg3: file path

                                                   arg4 (optional): patient name
```

Settings.ini

Overview

Purpose

You can manually specify settings within the Surgimap application's settings.ini file to override default application settings.

Stimulus

In order to access the Settings.ini file, you would need to change some settings in your computer in order to **show hidden files.**

For Mac OS:

1. Open Terminal found in Finder > Applications > Utilities
2. In Terminal, paste the following:
   defaults write com.apple.finder AppleShowAllFiles YES
3. Press return

4. Hold the 'Option/alt' key, then right click on the Finder icon in the dock and click Relaunch.

For Windows:

See https://support.microsoft.com/en-us/help/14201/windows-show-hidden-files.
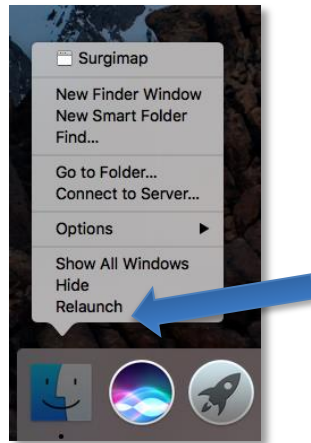
Once hidden files are shown either in Mac OS or Windows, go to the Surgimap main folder an open the settings.ini file with any text editor.
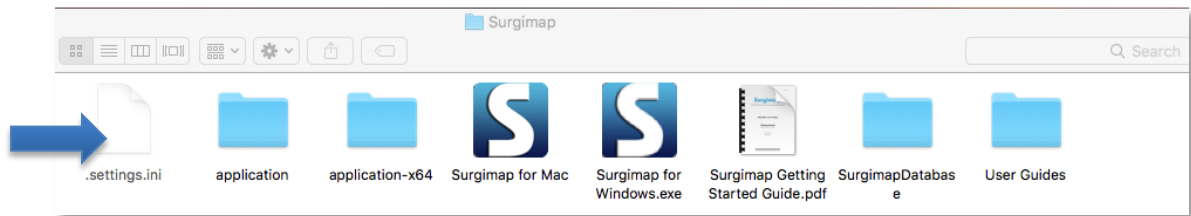
Settings

Under the [application] group:

Parameters	Value Type
databaseDirectory	text values
PACSSettingsFromINIOverride	true/false values

In order for PACS parameters to be read, the PACSSettingsFromIniOverride parameter must be true.

PACS Settings parameters are set under the [General] group:

Parameters	Value Type
NODE_ADDRESSES	text values

NODE_AETITLES	text values
NODE_PORTS	text values
NODE_NAMES	text values
SCP_AETITLE	text values
AETITLES_TABLE	text values
NODE_LOCALAETITLES	text values
SCP_PORT	numeric values
SCP_MAXASSOCIATIONS	numeric values
SCP_MAXPDU	numeric values
SCP_FILEPAD	numeric values
SCP_ITEMPAD	numeric values
SCP_ACSETIMEOUT	numeric values
SCP_DIMSETIMEOUT	numeric values
MAX_NUM_PATIENTS	numeric values
MAX_NUM_STUDIES	numeric values
WILDCARD_POLICY	numeric values
LOGGING_LEVEL	numeric values
SCP_SINGLEPROCESS	true/false values
SCP_SUPPORTPATIENTROOT	true/false values
SCP_SUPPORTPATIENTSTUDYONLY	true/false values
SCP_SUPPORTSTUDYROOT	true/false values
SCP_REFUSEMULTIPLESTORAGEASSOCIATIONS	true/false values
SCP_IGNORESTOREDATA	true/false values

SCP_BITPRESERVING	true/false values
SCP_CORRECTUIDPADDING	true/false values
SCP_USEMETAHEADER	true/false values
SCP_KEEPDBHANDLEDURINGASSOCIATION	true/false values
SCP_DIMSEBLOCKINGMODE	true/false values
UNIQUE_KEYS_FOR_HIGHER_LEVELS	true/false values
ADVANCED_LOGS	true/false values
SCU_DECOMPRESSION	true/false values
SCU_HALTONFAILURE	true/false values
SCU_ALTERNATEPROPOSALMODE	true/false values

Then, for Mac OS only:

After Settings.ini is updated please revert the changes made to show hidden files following these instructions.

1. Open Terminal found in Finder > Applications > Utilities
2. In Terminal, paste the following:
   defaults write com.apple.finder AppleShowAllFiles NO
3. Press return
4. Hold the 'Option/alt' key, then right click on the Finder icon in the dock and click Relaunch.

Chapter 11: Frequently Asked Questions (FAQ)

Who can I contact for help?

The software has a built in Help function with instructional animations depicting how to perform measurements or simulate procedures. We have additional FAQs and instructional videos on our website at www.surgimap.com. You can also send an email to support@surgimap.com for guidance or to request an online demo. We are here to help.

I can't register behind my hospital firewall.

Please discuss with your IT staff or send an email to support@surgimap.com so we can help you create an account.

Images don't export with measurements.

To export an image with the measurements, open the image, click "Export", select your desired output image format, and select the "Draw Measurements on Exported Image with Measurements" checkbox. It is not possible to export with measures as a DICOM.

Can I anonymize images to share?

To anonymize a DICOM image, click "Export" and export as a standard image format e.g. JPEG. To export with the original calibration as a DICOM, check the "Anonymize DICOM Files" checkbox. The exported images will have patient information removed.

I can't see the vertical scroll bar when browsing for images.

Try expanding to full screen mode if some elements of the image are missing. If full screen is still too small, try clicking on a folder and scrolling with your mouse wheel to move up and down in the file tree.

Can I view multiple patient images at the same time?

Yes, simply open the images from Browse or the Database to the MEASURE SCREEN by double-clicking or selecting them and clicking "Open." Then click the "Tiles and Tabs" button to view each image in a free-floating window. Alternatively, you may click the "Compare Mode" button to split the screen into two viewing panels. Then drag the images for comparison into the viewing panels.

What do the screw dimensions represent?

The length shown on the image and table is for the shaft without head. Length increments are 1 mm while width increments are 0.5 mm.

I received a USB with the software, can I copy the software to my laptop?

Yes, just create a folder on your computer and make sure you copy all files from the USB (e.g., use "Ctrl + A" to select all files), then drag and drop them into the new folder. You can also copy the software to a larger USB key to allow for a larger database.

If I have copied Surgimap to another location and have 2 databases, how can I share files between them?

Click the Import tab and select the Edit icon in the Import Panel. Select the "Other Surgimap 1 database" label or the "Other Surgimap 2 database" and "Apply" to permit importing from these databases. Select the "Other SM" icon as the import source for your images. Then click "Select Location" in the top right area or browse to the other Surgimap and enter your authentication information on bottom right. Once identified images are found and authentication is provided, click "OK".

How can I import images I have saved in a Power Point presentation?

Open the PPT document, use "Save As JPEG". This will create a new folder and save each slide of the presentation as a separate JPEG image. Use the Import function of Surgimap to navigate to this folder, select the desired JPEG images, and load into your Surgimap patient database.